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APPENDICES

None

13 Population and Human Health

13.1 Introduction

- 13.1.1 This chapter presents the Preliminary Environmental Information (PEI) in relation to the population and human health assessment.
- 13.1.2 There may be interrelationships related to the potential effects on population and health and other disciplines. Therefore, please refer to the following chapters:
- Chapter 5: Air Quality
 - Chapter 9: Geology and Soils
 - Chapter 10: Landscape and Visual Effects
 - Chapter 12: Noise and Vibration.
- 13.1.3 The methodology used follows the requirements of Design Manual for Roads and Bridges (DMRB) LA 112 Population and Human Health (DMRB LA 112) (Highways England, 2020a)¹.

13.2 Legislative and Policy Framework

Legislation

- 13.2.1 The following key legislation is relevant to the assessment:
- Localism Act 2011
 - The Commons Registration Act 1965
 - The Countryside and Rights of Way Act 2000.

National policy statement for national networks

- 13.2.2 The primary policy basis for deciding whether or not to grant a Development Consent Order (DCO) is the National Policy Statement for National Networks (NPSNN) (Department for Transport, 2014)², which sets out policies to guide how DCO applications will be decided and how the effects of national networks infrastructure should be considered by the relevant decision maker. The policies for accessibility, health and land use include statements that:
- 13.2.3 “The Government is committed to creating a more accessible and inclusive transport network that provides a range of opportunities and choices for people to connect with jobs, services and friends and family... National road and rail networks and strategic rail freight interchanges have the potential to affect the health, well-being and quality of life of the population. They can have direct impacts on health because of traffic, noise, vibration, air quality and emissions, light pollution, community severance, dust, odour, polluting water, hazardous waste and pests. New or enhanced national network infrastructure may have indirect health impacts; for example if they affect access to key public services, local transport, opportunities for cycling and walking or the use of open space for recreation and physical activity.” (NPSNN paragraphs 3.19, 4.79 and 4.80)

¹ Highways England (2020a) Design Manual Roads and Bridges LA 112 Population and Human Health, available at: <https://www.standardsforhighways.co.uk/prod/attachments/1e13d6ac-755e-4d60-9735-f976bf64580a?inline=true> [accessed 9 September 2021]

² Department for Transport (2014) National Policy Statement for National Networks, available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/387222/npsnn-print.pdf [accessed 9 September 2021]

13.2.4 The NPSNN also advises:

13.2.5 “The applicant should identify measures to avoid, reduce or compensate for adverse health impacts as appropriate. These impacts may affect people simultaneously, so the applicant, and the Secretary of State (in determining an application for development consent) should consider the cumulative impact on health... Applicants can minimise the direct effects of a project on the existing use of the proposed site or proposed uses near the site by the application of good design principles, including the layout of the project and the protection of soils during construction.” (NPSNN paragraphs 4.82 and 5.179)

13.2.6 Table 13-1: Relevant NPSNN policies for the population and human health assessment methodology, identifies the *NPSNN* policies relevant to the population and human health assessment methodology.

Table 13-1: Relevant NPSNN policies for the population and human health assessment methodology

Relevant NPSNN paragraph reference	Requirement of the NPSNN (paraphrase)
3.17	Applicants should use reasonable endeavours to address the needs of cyclists and pedestrians in the design of new schemes and should identify opportunities to deliver improvements where the national road network severs communities and acts as a barrier to cycling and walking, ensuring that it is easy and safe for cyclists to use junctions.
4.64	Applicants should be able to demonstrate that within their schemes they have taken all reasonable steps to contribute to improvements in road safety for walkers and cyclists.
4.79 - 4.82	The applicant should identify measures to avoid, reduce or compensate for adverse health impacts as appropriate.
5.165	The assessment should identify existing and proposed land uses near the project, including the effects of replacing an existing development or use, or the effects which preclude new development or uses under the development plan of the local authority.
5.166	Development upon existing open space, sports and recreational buildings and land should not occur unless the land is surplus to requirements or better provisions in terms of quantity and quality is provided in a suitable location.
5.168	Applicants should take into account the economic and other benefits of the best and most versatile agricultural land
5.184	The NPSNN recognises the importance of Public Rights of Way (PRoW), National Trails and other rights of access to land for WCH. Where severance occurs, mitigation measures are required to address adverse effects. Evidence is also required to show that projects have used reasonable endeavours to address any existing severance issues.

National planning policy framework (NPPF)

- 13.2.7 The *NPPF* (Ministry of Housing, Communities & Local Government, 2021)³ originally published in March 2012 and most recently updated in July 2021, sets out the government’s planning policies for England and provides a framework within which locally prepared plans can be produced. The *NPPF* is “*an important and relevant matter to be considered in decision making for NSIP*”.

Local planning policy

- 13.2.8 The following regional and local policies are relevant to the assessment:
- The Cumbria Council Plan 2018-2022, Cumbria County Council (2018)⁴
 - The County Durham Plan (Durham County Council, 2020)⁵
 - North Yorkshire County Council: Council Plan 2021-2025 (North Yorkshire County Council, 2021)⁶
 - Eden District Local Plan 2014-2032 (Eden District Council, 2014)⁷
 - Richmondshire Local Plan Core Strategy 2012-2028 (Richmondshire District Council, 2021)⁸
 - The Cumbria Joint Health and Well-being Strategy 2019-2029 (Cumbria County Council, 2018)⁹

Standards and guidance

- 13.2.9 In addition to compliance with the NPSNN and NPPF, this assessment has been compiled in accordance with professional standards and guidance. The standards and guidance which relate to the assessment are:
- *DMRBLA 112*

³ Ministry of Housing, Communities & Local Government (2021) National Planning Policy Framework, available at:

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1005759/NPPF_July_2021.pdf [accessed 19 July 2021]

⁴ Cumbria County Council (2018) Cumbria Council Plan 2018 to 2022, available at: <https://www.cumbria.gov.uk/elibrary/Content/Internet/536/647/43146134439> [accessed 9 September 2021]

⁵ Durham County Council (2020) County Durham Plan

⁶ North Yorkshire County Council (2021) Council Plan (2021-2025), available at: <https://www.northyorks.gov.uk/council-plan> [accessed 9 September 2021]

⁷ Eden District Council (2014) Eden Local Plan 2014-2032, available at: <https://www.eden.gov.uk/media/5032/edenlocalplan2014-2032finalwithoutforeword.pdf> [accessed 9 September 2021]

⁸ Richmondshire District Council (2021) Richmondshire Local Plan Core Strategy 2012-2028, available at: <https://www.richmondshire.gov.uk/media/9616/core-strategy-2012-28.pdf> [accessed 9 September 2021]

⁹ Cumbria County Council (2018) The Cumbria Joint Health and Wellbeing Strategy 2019-2029, available at: <https://councilportal.cumbria.gov.uk/documents/s90974/Appendix%203%20CHWBB%2018419%20-%20Joint%20Health%20and%20Wellbeing%20Strategy%202019-29.pdf> [accessed 9 September 2021]

13.3 Assessment Methodology

Population

- 13.3.1 The population assessment follows the approach outlined in DMRB LA 112. It has focussed on land use and accessibility within the following sub-topics:
- Private property and housing: the location and number of both residential and commercial properties at risk of demolition, or from which land would be required or have access affected.
 - Community land and assets: the location and number of community land and assets and their level of existing accessibility. The assessment does not include data on the frequency of use, but this will be included in the Environmental Statement (ES), where possible.
 - Development land and businesses: the location and number of businesses at risk of demolition, or from which land would be required or have access affected. Likewise, the location of land allocated for development by local authorities and the number of future jobs that will be affected by the project. The assessment does not account for the number of jobs at each business, but this will be included in the ES, where possible.
 - Agricultural land holdings: the type, location and number of agricultural holdings at risk of demolition or from which land would be required/access affected by the project. The assessment does not account for their frequency of use and their level of existing accessibility, but this will be included in the ES, where possible.
 - WCH: the type, location and extent of WCH provision (for example, public rights of way) within the study area. The assessment does not include their frequency of their use, but this will be included in the ES, where possible.
- 13.3.2 In accordance with *DMRBLA 112* the baseline section details the existing baseline to aid identification of the key receptors within the study area for each of the sub-topics listed above.
- 13.3.3 The following publicly available data has been used to inform the baseline assessment:
- Ordnance Survey (OS) mapping
 - Aerial photography
 - OS AddressBase Plus data
 - Sustrans National Cycle Network (NCN) online mapping application
 - The A66 Northern Trans-Pennine Project Walking, Cycling & Horse-Riding Assessment and Review (WCHAR) Assessment Report
 - Cumbria County Council Plan (2018 – 2022)
 - County Durham Plan (2020)
 - The Country Durham Vision 2035
 - North Yorkshire County Council Plan 2021-2025
 - Eden District Local Plan 2014 – 2032
 - Richmondshire Local Plan Core Strategy 2012-2028.
- 13.3.4 The value of the baseline receptors for population is determined using Table 3.11 within *DMRBLA 112*.
- 13.3.5 The methodology for the assessment of effects comprises the following stages:
- Identify the importance (value) of receptors identified.
 - Determine the magnitude of impact with consideration of any embedded measures and additional mitigation.

- The significance of effect is then derived by comparing the value of receptors with the magnitude of impact.
- 13.3.6 The magnitude of impact and significance of effect has been based upon Table 3.12 within *DMRBLA 112*.

Human health

- 13.3.7 The human health assessment follows the approach set out in *DMRBLA 112*.
- 13.3.8 The demographic, social and health characteristics of the communities in the study area have been reviewed using publicly available data to develop a profile of the communities in the study area. This has enabled the health assessment to take account of the sensitivity of the population and to identify specific effects on vulnerable groups. The baseline includes information on:
- General health indicators, including life expectancy and self-rated health
 - Prevalence of children and older people
 - Prevalence of people with long-term limiting illness or disability
 - Mortality rates from cardiovascular disease and respiratory disease
 - Levels of employment, income and deprivation.
- 13.3.9 Data has been obtained from the following online sources:
- Office for National Statistics (Office for National Statistics, 2011)¹⁰
 - Public Health England Fingertips (Public Health England Fingertips, 2020)¹¹
 - Local Authority Health Profiles (Government, 2019a)¹²
 - Nomis Official Labour Market Statistics (Office of National Statistics, 2020)¹³
 - English Index of Multiple Deprivation (Government, 2019b)¹⁴
- 13.3.10 Data have been obtained at the most detailed geographic level available. This comprises a mixture of Local Authority, Ward and Lower Layer Super Output Area (LSOA)¹⁵ data.
- 13.3.11 Baseline data on residential property, community land and assets, and Public Rights of Way (PRoW), is set out in the population baseline, Section 13.5 below. Baseline data relevant to health determinants, including Air Quality Management Areas (AQMA), noise sensitive areas and landscape designations have been sourced from the relevant EIA topic baselines, and a summary provided in the health baseline, Section 13.5.
- 13.3.12 Health effects have been identified through qualitative judgement of the likely effects on health outcomes for a defined receptor community. This is based on:

¹⁰ Office for National Statistics (2011) Census data available at:

<https://www.ons.gov.uk/census/2011census> [accessed 9 September 2021]

¹¹ Public Health England Fingertips (2020) Public Health Profiles available at:
<https://fingertips.phe.org.uk/> [accessed 9 September 2021]

¹² Government (2019a) Local Authority Health Profiles (2019) available at:
<https://www.gov.uk/government/statistics/local-authority-health-profiles-2019> [accessed 9 September 2021]

¹³ Office of National Statistics (2020) Nomis Official Labour Market Statistics available at:
<https://www.nomisweb.co.uk/> [accessed 9 September 2021]

¹⁴ Government (2019b) English indices of deprivation, available at: 2019:
<https://www.gov.uk/government/statistics/english-indices-of-deprivation-2019> [accessed 9 September 2021]

¹⁵ Lower Layer Super Output Areas (LSOA) are geographic areas for which data are provided. LSOA have a mean populations of 1,500.

- The nature, severity and geographic extent of an impact on a health determinant.
 - The size and sensitivity of the population exposed to the change, defined as low, medium or high and evidenced using the health baseline data.
 - Knowledge of associations between health determinants and health outcomes, based on published research.
- 13.3.13 Judgements on the likely health outcomes (effects) have been made on a case-by-case basis and a rationale has been provided within the assessment text. Health outcomes have been defined in accordance with *DMRB LA 112* (Table 3.32) as follows:
- Positive- a beneficial health impact is identified
 - Neutral- no discernible health impact is identified
 - Negative- an adverse health impact is identified
 - Uncertain- uncertainty exists as to the overall health impact
- 13.3.14 There is no accepted definition of significance for health effects. The description of the changes to health determinants, the characteristics and sensitivity of the receptor population and the likelihood of negative or positive health outcomes (effects) has been undertaken in accordance with *DMRB LA 112* and provides information to inform stakeholders and decision makers of the likely direction of change in terms of health outcomes. Therefore, in line with current knowledge and methods of assessment, the consideration of health outcomes reports effects as being positive, negative or neutral, rather than indicating a level of significance.

13.4 Assessment Assumptions and Limitations

- 13.4.1 Detailed construction methods have not yet been defined. As such the full details of the potential temporary construction PRoW diversions are not yet fully known. Where the detail has been provided it has been assessed however a general route wide assessment has been undertaken in addition. This is to ensure that any specific known impacts are reported within this PEI Report. Additional construction information will be made available as the design progresses into the ES and the effects will be assessed on an individual receptor basis.
- 13.4.2 No site visits have been undertaken at this stage due to the Covid-19 pandemic potentially yielding inaccurate results particularly regarding the usage of open spaces and community facilities. All findings within the PEI Report are based upon desk-top research.
- 13.4.3 No walking, cycling and horse-riding surveys have been carried out as part of this assessment, due to the Covid-19 pandemic potentially yielding inaccurate results. Historical WCH data was made available for the assessment however due to the age of the data and sporadic coverage of the study areas, it has not been utilised. For the purposes of this PEI Report the sensitivity of PRoWs has been assigned using a combination of the *DMRB LA112* guidance, specifically where the PRoWs provide access to, and professional judgement.
- 13.4.4 No detailed consultation has been undertaken with business owners or landowners at this stage, however this will be undertaken in advance of the ES. An assumption has been made to grade the frequency of use and sensitivity to its highest value (i.e. the worst-case scenario) via the use of professional judgement.
- 13.4.5 This PEI Report may not contain all of the agricultural land holdings across the study areas of each scheme. An agricultural land holdings assessment will be included in the ES. For the purposes of the preliminary assessment in this PEI Report, a worst

- case assumption has been made that all identified holdings could potentially be significantly affected during construction. That preliminary assessment has been based on a mixture of the findings from ongoing consultation with landowners and the use of AddressBase plus data. The agricultural land holdings assessment which will inform the ES will identify any additional holdings.
- 13.4.6 With the objectives of the project being to improve connectivity a general assumption has been made in the route wide assessment that agricultural land holdings and development land and businesses could experience beneficial operational effects. Whether the effects are significant or not will be subject to confirmation within the ES upon completion of surveys.
- 13.4.7 At Cross Lanes to Rokeby the largest possible draft DCO boundary which incorporated all options was assessed as this is considered to be the largest and worst case of the three alternatives. The baseline section will therefore report what is located within the combined draft DCO boundary. Any potential differences in likely significant effects will be reported in Section 13.8.
- 13.4.8 Where detailed information is not available at this stage to inform the human health assessment, the assessment has been based on reasonable worst case assumptions and these have been explained in the text. Qualitative assessment judgements will be reviewed at the ES stage when more detailed information is available and may be subject to change. A conservative view of reasonable worst case effects has been used in the PEI Report. As such, there is a potential for some negative health effects to be reduced in the ES. However, new positive or negative outcomes beyond what is reported in this PEI Report are not anticipated.

Study Area

- 13.4.9 In line with *DMRBLA 112*, the study area has been defined by:
- The extent and characteristics of the project.
 - The communities directly and indirectly affected by the project.
- 13.4.10 A 500m study area has been utilised for the assessment. Where changes to land use and accessibility or health determinants are identified outside this area (e.g. due to impacts identified by other EIA topics) then these have also been considered in the assessment.
- 13.4.11 It should be noted that the population assessment has been extended to include the following the receptors, due to their sensitivity and value to the local area:
- Center Parcs Whinfell Forest
 - British Gypsum at Kirkby Thore
 - Appleby Golf Course
 - Helbeck Quarry.

13.5 Baseline Conditions

- 13.5.1 The following section outlines the population and human health baseline for each of the schemes and their relevant alternatives. The locations of the key baseline receptors are displayed on Figures 13.1 to Figure 13.5:
- Figure 13.1: Population and Human Health Study Area
 - Figure 13.2: Key Receptors
 - Figure 13.3: Local Plan and Development Land Allocations
 - Figure 13.4: Walking, Cycling and Horse-Rider Provisions
 - Figure 13.5: Agricultural Land Holdings.

M6 Junction 40 to Kemplay Bank

Population

Private property and housing

- 13.5.2 The scheme is located to the south of Penrith along the alignment of the existing A66, with surrounding land uses predominantly urban in nature. There are dense residential areas located to the north and south of the draft DCO boundary which includes the areas known as Pategill, Carleton Eamont Bridge and Redhills.
- 13.5.3 There are approximately 2,400 existing residential properties located within the study area of this scheme, none of which are located directly within the draft DCO boundary. The closest residential receptors are those located within the residential areas of Clifford Road, Skirsgill Lane, Skirsgill Close, Redhills Lane, Pategill Road, Pategill Park, Carelton Hall Road, Mile Lane, Kemplay Foot and Eamont Bridge, all of which are located within 50m of the draft DCO boundary.
- 13.5.4 No residential properties are at risk of demolition.
- 13.5.5 There are three areas of land allocated for housing within the study area of this scheme:
- Land at Carleton Hall Farm: This allocation is approximately 3.8ha in size and is located to the north-east of the existing A66. Approximately 0.0002ha of the allocation lies within the draft DCO boundary (0.006% of the total allocation).
 - Carleton East: This allocation is approximately 9.69ha in size and lies to the north-east of the existing A66. It is not located within the draft DCO boundary.
 - Queen Elizabeth Grammar School Annexe (Ullswater Road): This allocation is approximately 0.58ha in size and lies to the north of the existing A66. It does not lie within the draft DCO boundary.

Development land and businesses

- 13.5.6 In total there are approximately 210 businesses within the study area for this scheme, including three business parks: Skirsgill Business Park, Skirsgill Business Park North and Gillian Way Business Park. Two business properties lie directly within the draft DCO boundary, which are:
- Skirsgill Depot on Skirsgill Lane
 - The Music Centre on Skirsgill Lane
- 13.5.7 There is one employment land allocation within the study area of this scheme. This allocation is 'Skirsgill', located on land adjacent to Skirsgill Depot, and is 3.29ha in size. Around 0.81ha of this land lies within the draft DCO boundary, which is approximately 24% of the total land allocated.
- 13.5.8 No demolitions are anticipated as a result of the construction or operation of this scheme. Small portions of land take are required to accommodate the scheme from multiple receptors including the three business parks, North Lakes Hotel & Spa, Skirsgill Depot Site 1 & Site 2 and Martin's Mini Movals store and premises.

Community land and assets

- 13.5.9 There are numerous community facilities located within the town of Penrith, which the existing A66 provides either direct or indirect access to. Facilities include one nursery (Kiddlywinks Nursery), two primary/pre-schools (North Lakes Primary School and Hunter Hall Primary and Pre-School) and two secondary schools (Ullswater Community College and Queen Elizabeth Grammar School). There is also HIT

- Training (skills training for hotel and catering industries) and Cumbria School of Saddlery.
- 13.5.10 The A66 also provides access to multiple emergency services including Cumbria Fire and Rescue Service Headquarters, North West Ambulance Station, Cumbria Constabulary Police Headquarters, Eden Police Deployment Centre and Penrith Mountain Rescue Team.
- 13.5.11 Primary care facilities include two medical practices (The Lakes Medical Practice, Birbeck Medical Practice) and one hospital (Penrith Community Hospital). There are three dental practices (Ghyllmount Dental Practice, Skirsgill Dental Surgery, Smile Fast), Well Pharmacy (Penrith Health Centre), NHS Primary Care Trust and one Sexual Assault Report Centre (The Bridgeway SARC).
- 13.5.12 Within the study area of this scheme there are multiple open space and recreational facilities including:
- Three open space areas (Carleton Heights Open Space and Play Area, Wetheriggs Open Space and Play Area; and Pategill Open Space)
 - Wetheriggs Country Park
 - Skirsgill Park
 - Penrith Cricket Club
 - Penrith Tennis Club
 - Happy Hooves Riding Centre
 - CrossFit Cumbria
 - Frenchfield Sports Centre
 - Crescent Playing Fields
 - Redhills Golf Course
 - Penrith Rugby Union Football Club
 - Southwaite Green Mill Country Park.
- 13.5.13 There are two residential homes (Winters Park Residential Home, Greengarth Residential Home), one religious facility (Kingdom Hall of Jehovah's Witnesses), charities, Firefighters Rehabilitation Centre, Core Assets Children's Services, Village Hall, and The Play Station (Arts Centre).
- 13.5.14 There are no demolitions of community assets anticipated as part of this scheme. This scheme encroaches into an area of open space (rugby pitch, used by Ullswater Community College). The corner of the playing field area will be required for temporary traffic diversions; however, the rugby pitch itself will be retained.
- 13.5.15 This scheme will also require a small amount of land take from Wetheriggs Country Park. This is along the wooded area adjacent to the existing A66. A small amount of land take will be required from Kingdom Hall of Jehovah's Witnesses. Additionally, a small amount of Skirsgill Park may be required to accommodate this scheme.

Walkers, cyclists and horse riders (WCH)

- 13.5.16 The PRoW in the study area to the north of the draft DCO boundary provide WCH to the south of Penrith, specifically providing access to both the Penrith Industrial Estate and the residential area of Pategill. To the south of the draft DCO boundary, PRoW are largely recreational in nature with limited connections to a larger network of PRoW.
- 13.5.17 Within this scheme, several PRoW can be accessed directly via the A66. These PRoW are also located within the draft DCO boundary:

- FP 321008- the PRoW routes southwards from M6 J40 to the River Eamont but does not provide a connection beyond the river.
 - FP 358008- the footpath provides access from Kemplay Bank towards Penrith via Wetheriggs Lane where it connects with the Penrith to Greystone cycle route. The footpath provides direct access to Ullswater Community College and could be used to access North Lakes School. There are designated crossings at the Kemplay Bank Junction for walkers and cyclists.
 - FP 358006- the footpath routes from the A66 through the residential area of Pategill.
 - FP 358005- The footpath routes eastwards from Kemplay Bank along the River Eamont to Moor Lane. The footpath connects to the NCN 71.
- 13.5.18 The routes are likely to serve a variety of users including local communities who may utilise the PRoW for recreational purposes and to access services and employment.
- 13.5.19 A cycle route runs through M6 Junction 40, and forms part of the Penrith to Greystone cycle route. The regional route is promoted by Visit Eden (managed by Eden District Council) and provides connections to the National Cycle Network and to the wider Lake District area. A proportion of the cycle route is within the draft DCO boundary where it crosses Junction 40 of the M6, via the A66 and A592. There are currently designated crossing points provided at these locations for WCH.
- 13.5.20 The cycle route is likely to serve recreational users, tourists and the local community who could potentially be using the cycle route to access services and employment in Penrith.

Agricultural land holdings

- 13.5.21 This scheme is located to the south of Penrith along the alignment of the existing A66, with surrounding land uses predominantly urban in nature and agricultural land holdings are not prominent within the study area.
- 13.5.22 Known agricultural land holdings within the draft DCO boundary are:
- Leeming – the agricultural holding is currently rented out for pastoral practices with the livestock including sheep and cattle.
 - McKays - the agricultural holding is currently utilised for pastoral practices with the livestock including lambs and sheep.
 - Stampers – the land parcel is currently a grassland utilised by grazing horses.
 - Wilcox - agricultural land mostly rotating wheat, barley, rapeseed and fodder beet. The majority of the land holding is located within the Penrith to Temple Sowerby scheme study area and will be assessed within that scheme only in order to prevent duplicate effects being reported.
 - Jenkinson – the land holding is predominantly a forestry business however the land within the study area is a mixture of both arable and pastoral practices. Crops include rapeseed, barley and wheat whilst the livestock is known to be lamb, sheep and cattle. The majority of the land holding is located within the Penrith to Temple Sowerby scheme study area and will be assessed within that scheme only in order to prevent duplicate effects being reported.
 - Noble – the land parcel is utilised by the Happy Hooves Horse Riding School. As it is a business receptor it will be considered within that section of the assessment only to avoid double counting.

Human health

Determinants of health

- 13.5.23 This scheme is located in a semi-urban area on the southern outskirts of Penrith. Land uses in proximity to the scheme include residential neighbourhoods along Clifford Road and Pategill, a primary school, hospital, fire station, business park, office buildings, a hotel, churches, parks, sports and recreational facilities and a farmer's market. Detailed information on the location and type of green space, community, healthcare, recreational and educational facilities, are provided in the Population baseline above.
- 13.5.24 PRoW within the study area for the M6 Junction 40 to Kemplay Bank scheme are described in the Population baseline above. Recreational routes and routes linking communities on the south side of Penrith with local services and facilities are relevant for the health assessment.
- 13.5.25 Bus services intersect the scheme at Kemplay Bank Roundabout, providing links into Penrith from communities to the south, including routes 508, 106 562 and 563. Additionally, several services run along the A66 linking Penrith with neighbouring settlements to the east and west.
- 13.5.26 There are no AQMA within the M6 Junction 40 to Kemplay Bank scheme study area. Defra background pollutant concentrations and local authority air quality monitoring data has identified that NO₂, PM₁₀ and PM_{2.5} concentrations are well within the relevant air quality objectives, meaning that the ambient air quality in the study area is good. Detailed air quality baseline information is presented in Chapter 5: Air Quality.
- 13.5.27 Noise Important Areas (NIA) are designated by Defra in hotspot locations identified as having high levels of background noise and requiring Noise Action Plans. There are four NIAs identified in the study area (see Chapter 12: Noise and Vibration).
- 13.5.28 Visual receptors within the study area that are relevant for the health assessment include residential receptors on Clifford Road, Penrith, users of the local PRoW network, Wetheriggs Country Park and Happy Hooves Riding Centre. Detailed landscape baseline information is presented in Chapter 10: Landscape and Visual Effects.
- 13.5.29 The section of the A66 within the M6 Junction 40 to Kemplay Bank scheme area had no fatal accidents between 2012 and 2018.

Health profile

- 13.5.30 This section of the route passes through LSOA Eden 003B, Eden 003D and Eden 004G. Table 13-2: M6 Junction 40 to Kemplay Bank - Location of LSOAs by Parish and Ward below shows the location of the LSOAs within Wards and Parishes

Table 13-2: M6 Junction 40 to Kemplay Bank - Location of LSOAs by Parish and Ward

LSOA	Corresponding Parishes	Corresponding Wards
Eden 003B	Penrith Civil Parish	Penrith Pategill
Eden 003D	Penrith Civil Parish	Penrith West Ward
Eden 004G	Penrith Civil Parish	Penrith South Ward

- 13.5.31 Eden 003B and Eden 004G have a below average percentage of under 16s when compared with the national average and a higher than average percentage of people over 65. Eden 003D is close to the national average for both groups.

- 13.5.32 Both Eden 003B and Eden 004G have an above average percentage of people living with disabilities or long-term health problems that limit day to day activities. Eden 003D has a below percentage of people in this group.
- 13.5.33 Eden 003B ranks within the 40% most deprived areas in England, when measured as an average across all indices in the Indices of Multiple Deprivation (IMD). It is in the 30% most deprived areas for employment and the 30% most deprived areas for health and disability.
- 13.5.34 Eden 003D ranks within the 40% least deprived areas in England when measured as an average across all indices in the IMD. It is in the 40% most deprived areas for employment and the 40% most deprived areas for health and disability.
- 13.5.35 Eden 004G ranks within the 10% least deprived areas in England when measured as an average across all indices of the IMD. It is in the 40% least deprived areas for employment and the 40% most deprived areas for health and disability.
- 13.5.36 The under 75s mortality rate from cardiovascular disease in Eden District (61.5 per 100,000) is below the national average (70.4 per 100,000).
- 13.5.37 The under 75s mortality rate from respiratory disease in Eden District (17 per 100,000) is below the national average (34.2 per 100,000).
- 13.5.38 The average life expectancy in Eden District is 80.9 years for males (above the national average of 79.7) and 84.8 years for females (above the national average of 83.4).

Sensitivity

- 13.5.39 Based on the information presented above, the sensitivity of the population within the M6 Junction 40 to Kemplay Bank study area is as follows:
- Environmental conditions: medium sensitivity, based on the characteristics and health status of the population and the existing environment.
 - Severance/accessibility: medium sensitivity, based on the characteristics and health status of the population and the availability of local services and facilities.
- 13.5.40 The following vulnerable groups are present within the study area:
- Older people (over 65s)
 - People in areas of high deprivation with regards to employment
 - People in areas of high deprivation with regards to health and disability

Penrith to Temple Sowerby

Population

Private property and housing

- 13.5.41 This scheme is located to the east of Penrith within a predominantly rural setting. There are approximately 60 residential properties located within the study area which are spread sporadically across the study area.
- 13.5.42 Five properties are located directly within the draft DCO boundary: Foxgloves, 1 and 2 Lightwater Cottages, Barn Owl Cottage and High Barn Cottage.
- 13.5.43 High Barn Cottage will be demolished for the construction of the scheme.
- 13.5.44 There are no housing allocations located within the study area for this scheme.

Development land and businesses

- 13.5.45 In total there are approximately eight businesses within the study area for this scheme. Two business properties lie directly within the draft DCO boundary, which are:
- Llama Karma Kafe located to the immediate south of the A66.
 - Llamas Pyjamas located to the immediate south of the A66.
- 13.5.46 The premises utilised by both businesses are likely to be demolished in order to accommodate this scheme.
- 13.5.47 Fairweather Oak and Phoenix Furniture Restoration are located directly adjacent to the existing A66 at Whinfell. This scheme will require land take from the land plot they are both situated on. No demolitions will be required as a result of this land take.
- 13.5.48 Center Parcs is a key local business located approximately 1km to the south of the draft DCO boundary within Whinfell Forest. No land take or demolition on the site is anticipated. This scheme includes a dedicated junction to provide access to Center Parcs.
- 13.5.49 There are no employment land allocations within the study area of this scheme.

Community land and assets

- 13.5.50 There are two community facilities located within the study area of this scheme, the Brougham Institute and Penrith AFC Amateur Football Club (Frenchfield Sports Centre). The A66 provides direct access to both facilities.
- 13.5.51 There are no demolitions or land take of community land or assets anticipated as part of this scheme.

Walkers, cyclists and horse riders

- 13.5.52 The following PRoW are either partially within the draft DCO boundary or are severed by this scheme.
- NCN 71- The NCN 71 is part of the wider C2C route between Whitehaven and Penrith (Blencow). It continues in a south easterly direction from Penrith via Appleby - in - Westmorland and eventually meets the NCN 65.
 - The Lowther Valley cycle route, promoted by Visit Eden, which heads southwards towards the Lake District.
 - FP 311013- this a Byway Open to All Traffic (BOAT) which commences from the A66 and provides access to St Ninians Church where the by-way terminates. The by-way is likely to be primarily used for access to the church and may also be used for recreation by a small proportion of people.
 - FP311004- is a footpath which routes southwards from the A66 through Center Parcs and the Cliburn Moss Nature Reserve.
- 13.5.53 It is likely that these routes will serve a diverse range of users including local communities, hikers, cyclists and tourists. These routes are all likely to be used for recreation particularly due to the presence of Center Parcs, with the exception of FP 311013 which provides direct access to St Ninians Church.

Agricultural land holdings

- 13.5.54 This scheme is located to the east of Penrith within a predominantly rural setting whereby there are multiple agricultural land holdings. Known agricultural land holdings within the draft DCO boundary are:

- Winderwath Estate - the estate has a wide variety of agricultural practices and has diversified its offering in recent years. Livestock on the holding includes game birds (including pheasants), lambs, cattle and chickens.
- Jenkinson – the land holding is predominantly a forestry business however the land within the study area is a mixture of both arable and pastoral practices. Crops include rapeseed, barley and wheat whilst the livestock sheep and cattle.
- Wilcox - agricultural land mostly rotating wheat, barley, rapeseed and fodder beet.
- Slack – the agricultural holding is one of the largest across the study area of the scheme and spans to both the north and south of the existing A66. The owner currently crosses the A66 up to five times a day during lambing season. The fields are predominantly used for pastoral practices with the livestock including lambs and cattle.
- Lowther Trustees Limited - agricultural land holding believed to be in combined ownership with Melcalfe and British Gypsum. The operation details are currently being collated. The majority of the land holding is located within the Temple Sowerby to Appleby scheme study area and will be assessed within that scheme only in order to prevent duplicate effects being reported.

Human health

Determinants of health

- 13.5.55 This scheme is located in a sparsely population rural area to the to the southeast of Penrith. Land uses in proximity to the scheme include primarily agricultural land, with scattered residential properties and businesses as described in the Population baseline above.
- 13.5.56 PRow within the study area for the Penrith to Temple Sowerby scheme are described in the Population baseline above.
- 13.5.57 Bus services interest the scheme at Penrith to Temple Sowerby, providing links to the communities of Penrith in the west, Eamont Bridge and Temple Sowerby in the east as well as the tourist facility of Centre Parcs. Routes include 104, 506, 563 and 574.
- 13.5.58 There are no AQMA within the Penrith to Temple Sowerby scheme study area. Defra background pollutant concentrations and local authority air quality monitoring data has identified that NO₂, PM₁₀ and PM_{2.5} concentrations are well within the relevant air quality objectives, meaning that the ambient air quality in the study area is good. Detailed air quality baseline information is presented in Chapter 5: Air Quality.
- 13.5.59 NIA are designated by Defra in hotspot locations identified as having high levels of background noise and requiring Noise Action Plans. There are no NIAs identified in the study area (see Chapter 12: Noise and Vibration).
- 13.5.60 Visual receptors within the study area that are relevant for the health assessment include the local PRow and national cycle network users, viewpoints within the communities of Temple Sowerby, Kirby Thore, Long Marton and Crackenthorpe, and users of Whinfell Forest and the wider North Pennines AONB. Detailed baseline information is presented in Chapter 10: Landscape and Visual Effects.
- 13.5.61 The section of the A66 route within the Penrith to Temple Sowerby scheme area had no fatal accidents between 2012 and 2018.

Health profile

13.5.62 This section of the route passes through LSOA Eden 001D and Eden 006D. Table 13-3: Penrith to Temple Sowerby - Location of LSOAs by Parish and Ward below shows the location of the LSOAs within Wards and Parishes

Table 13-3: Penrith to Temple Sowerby - Location of LSOAs by Parish and Ward

LSOA	Corresponding Parishes	Corresponding Wards
Eden 001D	Langwathby Civil Parish Hunsonby Civil Parish Glassonby Civil Parish	Langwathby Ward
Eden 006D	Newbiggin Civil Parish Kirby Thore Civil Parish Temple Sowerby Civil Parish Brougham Civil Parish	Kirkby Thore Ward

- 13.5.63 Both LSOAs have an above average percentage of over 65s when compared to the national average. Eden 001D has a below average of under 16s, whilst Eden 006D has an above average of over 65s when compared to the national average.
- 13.5.64 Both LSOAs have a below average percentage of people living with disabilities or long-term health problems that limit day to day activities.
- 13.5.65 Eden 001D ranks within the 40% least deprived areas in England, when measured as an average across all indices in the IMD. It is in the 20% least deprived areas for employment and the 10% least deprived areas for health and disability.
- 13.5.66 Eden 006D ranks within the 40% least deprived areas in England when measured as an average across all indices of the Indices of Multiple Deprivation (IMD). It is in the 10% least deprived areas for employment and the 10% least deprived areas for health and disability.
- 13.5.67 The under 75s mortality rate from cardiovascular disease in Eden District (61.5 per 100,000) is below the national average (70.4 per 100,000).
- 13.5.68 The under 75s mortality rate from respiratory disease in Eden District (17 per 100,000) is below the national average (34.2 per 100,000).
- 13.5.69 The average life expectancy in Eden District is 80.9 years for males (above the national average of 79.7) and 84.8 years for females (above the national average of 83.4).

Sensitivity

- 13.5.70 Based on the information presented above, the sensitivity of the population within the Penrith to Temple Sowerby study area is as follows:
- Environmental conditions: medium sensitivity, based on the characteristics and health status of the population and the existing environment.
 - Severance/accessibility: medium to high sensitivity, based on the characteristics and health status of the population and the availability of local services and facilities.
- 13.5.71 The following vulnerable groups are present within the study area:
- Older people (over 65s)

Temple Sowerby to Appleby

Population

Private property and housing

- 13.5.72 All route alternatives are located within semi-rural land where concentrations of residential receptors can be found to the north of the existing A66 at Temple Sowerby, to the east at Kirkby Thore and to the south-west at Appleby-in-Westmorland.
- 13.5.73 Table 13-4: Private property and housing comparison for the Temple Sowerby to Appleby Route alternatives below compares the number of residential properties located within the study area, residential properties within the draft DCO boundary, residential properties to be demolished or be subject to land take and housing allocations for each of the alternatives.

Table 13-4: Private property and housing comparison for the Temple Sowerby to Appleby Route alternatives

Private property and housing baseline category	Blue Alternative	Red Alternative	Orange Alternative
Number of residential properties within the study area	1,000	1,000	850
Number of residential properties within the draft DCO boundary	Six - Winthorn House, Lane End, 1 and 2 Midland View, Powis Cottage and Dunelm House.	Eleven - Fell View, 1 and 2 Townend Cottages, High Barn, Winthorn, Lane End, 1 & 2 Midland View, Powis Cottage, Barrow Coombe and Barrow Coombe Bungalow.	Sixteen - Redlands Bank, Barley, 1 and 2 Eden View Cottages, Street House, Eden View Farm, Roma, Bridge End House, 1 and 2 Midland View, Station House, Whistle Barn, Greenacres, Powis Cottage, Barrow Coombe and Barrow Coombe Bungalow.
Number of residential properties at risk of demolition or land take	Two - Winthorn House and Dunelm House.	One – Winthorn	One – Bridge End Farmhouse
Housing allocation name, location, total size and potential area of land within the draft DCO boundary per Route			
Land adjacent to Primary School – approximately 1ha in size and located within Kirkby Thore	0.08ha of the allocation lies within the draft DCO boundary (8.21% of total allocation)	Approximately 0.08ha of the allocation lies within the draft DCO boundary (8.21% of total allocation)	Approximately 0.31ha of the allocation lies within the draft DCO boundary (30.87% of total allocation).
Townhead – approximately 0.6ha in size and located within Kirkby Thore	0.06 of the allocation lies within the draft DCO boundary (9.65% of total allocation)	Approximately 0.6ha of the allocation lies within the draft DCO boundary (100% of total allocation)	Approximately 0.03ha of the allocation lies within the draft DCO boundary (4.2% of total allocation).
Fields at Coal Yard Station - approximately 3.44ha in size and located within Appleby-in-Westmorland	Site allocation is not located within the draft DCO boundary.	Site allocation is not located within the draft DCO boundary.	Site allocation is not located within the draft DCO boundary.
Land to south of Station Road - approximately 4.02ha in size and located	Site allocation is not located within the draft DCO boundary.	Site allocation is not located within the draft DCO boundary.	N/A

Private property and housing baseline category	Blue Alternative	Red Alternative	Orange Alternative
within Appleby-in-Westmorland			
Land at Westmorland Road - approximately 0.49ha in size and located within Appleby-in-Westmorland	Site allocation is not located within the draft DCO boundary.	Site allocation is not located within the draft DCO boundary.	Site allocation is not located within the draft DCO boundary.

Development land and businesses

13.5.74 Table 13-5: Development land and business comparison for the Temple Sowerby to Appleby Alternatives outlines the number of businesses within the study area and draft DCO boundary of each alternative. Development land allocations have been excluded from the table as none were identified within the study area of each alternative.

Table 13-5: Development land and business comparison for the Temple Sowerby to Appleby Alternatives

Development land and business baseline category	Blue Alternative	Red Alternative	Orange Alternative
Number of business properties within the study area	53 – including British Gypsum located north of the draft DCO boundary	53 – including British Gypsum located north of the draft DCO boundary	44 – including British Gypsum located north of the draft DCO boundary
Number of business properties within the draft DCO boundary	3 – Kirkby Thore Industrial Estate, Bridge End Inn, Greenacres Filling Station	2 -Kirkby Thore Industrial Estate, Greenacres Filling Station	4 - United Utilities sewage works, Kirkby Thore Filling Station located on Cross End, Kirkby Thore Industrial Estate, Bridge End Inn
Number of business properties at risk of demolition or land take	3 – Kirkby Thore Industrial Estate, Bridge End Inn, Greenacres Filling Station (all requiring land take from the land parcel they are located on, but will not require any demolition)	2 -Kirkby Thore Industrial Estate, Greenacres Filling Station (both requiring land take from the land parcel they are located on, but will not require any demolition)	4 - United Utilities sewage works, Kirkby Thore Filling Station located on Cross End, Kirkby Thore Industrial Estate, Bridge End Inn (all requiring land take from the land parcel they are located on, but will not require any demolition)

Community land and assets

13.5.75 All route alternatives are located within semi-rural land where concentrations of community receptors can be found to the north of the existing A66 at Temple Sowerby, to the east at Kirkby Thore and to the south west at Appleby-in-Westmorland.

13.5.76 Table 13-6: Community land and assets comparison for the Temple Sowerby to Appleby Alternatives below compares the number of community receptors located within the study area, community receptors within the draft DCO boundary, community receptors to be demolished or be subject to land take for each of the alternatives.

Table 13-6: Community land and assets comparison for the Temple Sowerby to Appleby Alternatives

Community land and assets baseline category	Blue Alternative	Red Alternative	Orange Alternative
Number of community facilities within the study area	31 – including Middle Eden Children’s Centre, Appleby Pre-School, Kirkby Thore Primary School, Temple Sowerby Church of England Primary School, Appleby Primary School, Appleby Grammar School, Temple Sowerby Medical Practice, Appleby Sports Centre, St Michael’s Church, St James’ Church	31– including Middle Eden Children’s Centre, Appleby Pre-School, Kirkby Thore Primary School, Temple Sowerby Church of England Primary School, Appleby Primary School, Appleby Grammar School, Temple Sowerby Medical Practice, Appleby Sports Centre, St Michael’s Church, St James’ Church	26 – including Middle Eden Children’s Centre, Kirkby Thore Primary School, Temple Sowerby Church of England Primary School, Appleby Grammar School, Temple Sowerby Medical Practice, Appleby Sports Centre, St Michael’s Church, St James’ Church
Number of community facilities within the draft DCO boundary	1 – Common Moss (Common Land) Appleby Horse Fair utilises land by Appleby Bypass for the annual fair. This land is within the draft DCO boundary.	1 – Common Moss (Common Land) Appleby Horse Fair utilises land by Appleby Bypass for the annual fair. This land is within the draft DCO boundary.	3 - Common Moss (Common Land), Acorn Bank (National Trust) and Playing Field (Piper Lane) Appleby Horse Fair utilises land by Appleby Bypass for the annual fair. This land is within the draft DCO boundary.
Number of community facilities at risk of demolition or land take	1 – Common Moss (Common Land) Appleby Horse Fair utilises land by Appleby Bypass for the annual fair. This land is within the draft DCO boundary.	1 – Common Moss (Common Land) Appleby Horse Fair utilises land by Appleby Bypass for the annual fair. This land is within the draft DCO boundary.	3 - Common Moss (Common Land), Acorn Bank (National Trust) and Playing Field (Piper Lane) Appleby Horse Fair utilises land by Appleby Bypass for the annual fair. This land is within the draft DCO boundary.

Walkers, cyclists and horse riders

13.5.77 Several of the PRoW at this scheme are short in length and have limited connection to a wider network of PRoW. However, there are several PRoW which either provide a connection to a wider network or are of a long distance along this section of the route. Such routes range from regional cycle route forming part of a wider cycling network to PRoW connecting to a more localised network likely to be used for recreation. This is especially the case in and around Kirkby Thore, Long Marton and to the north of Appleby-on-Westmorland.

13.5.78 The following PRoW are either partially in the draft DCO boundary or are severed by this scheme across all alternatives:

- Eden Valley Ride- regional cycle route promoted by Visit Eden providing connection to NCN 68 to the north of the scheme and NCN 67 to the south of the scheme, both connecting onwards to a wider cycle route network in the area.
- BW 336008- short local bridleway connecting the A66 to Priest Lane .
- BW336018- a short local bridleway connecting from Cross Lane in Kirkby Thorpe to Maiden Way (north of Kirkby Thore).
- FP 336017- local footpath connecting from Cross Lane to Fell Lane where there is connection to a wider PRow network.
- FP 336011- short local footpath from Cross Lane close to Kirkby Thore School to a residential area on Sanderson Croft.
- FP336013- longer recreational route starting from Kirkby Thore routing northwards and connecting to NCN 68.
- FP 341017- local footpath providing a connection from the A66 northwards to Long Marton.
- FP341029 – local footpath, routing northwards from the A66 to Sleastonhow Lane.
- BW 336006- Short bridleway routing north from Sleastonhow Lane.
- BW 341001- longer recreational bridleway routing east to west along the scheme and provides connection to a wider network for footpaths and cycleways.
- BW 317005 and BW 317012- provides connection from Crackenthorpe north to BW 341001.
- FP 371004 and FP 341005 provides connection from the A66 north to BW 341001 and further north to Castrigg Lane.
- FP 317006- provides connection from Crackenthorpe north to BW 341001.

13.5.79 The following PRow are only intersected by the Blue and Orange alternatives:

- FP 368006- a short local footpath routing from Chapel St in Temple Sowerby to Templars court to the south of the village centre.
- FP 336001- short local footpath routing southward from the A66 to the River Eden.
- BW 317011- short local bridleway routing from the A66 to the west of Kirkby Thore to the River Eden.

13.5.80 The following PRow are only intersected by the Red and Orange alternatives:

- BW 317002- routes south from the A66 to Colby.

13.5.81 The following PRow is only intersected by Blue alternative:

- FP 317008- local footpath routing south from the A66 to Chapel Street in Bolton.

13.5.82 It is likely that the PRow will be used by a range of user groups including the local communities for any potential access but largely by hikers, cyclists, horse riders, tourists or individuals in the area for leisure or recreational purposes.

Agricultural land holdings

13.5.83 All route alternatives are located within semi-rural land whereby agricultural land holdings dominate local land use. Known agricultural land holdings within the draft DCO boundary of all alternatives are:

- Winderwath Estate - the estate has a wide variety of agricultural practices and has diversified its offering in recent years. Livestock on the holding includes game birds (including pheasants), lambs, cattle and chickens. The majority of the land holding is located within the Penrith to Temple Sowerby scheme study area and will be assessed within that scheme only in order to prevent duplicate effects being reported.

- Dodd – the land holding has a large pastoral practice with sheep and lambs. There is a lambing shed known to be present on the holding.
- Addison – the land holding is known for pastoral uses with livestock including sheep and cattle. They work together with the Slee holding on either side of Priest lane. They own a range of livestock but predominantly sheep and cattle.
- Slee - the land holding is known for pastoral uses with livestock including sheep and cattle. They work together with the Addison holding on either side of Priest lane.
- Ridley – small agricultural land holding where the operation details are currently being collated.
- Farrell - small agricultural land holding where the operation details are currently being collated.
- Ewbank – agricultural land holding known for arable and pastoral practices.
- Kennedy - agricultural land holding known for arable and pastoral practices.
- Dent – the land holding is a significant dairy practice within the region.
- Nicholson – the agricultural holding is large and some of the fields are rented out to other farmers for grazing livestock. The practices are predominantly pastoral in nature.
- Bell – predominantly arable farming with the crops being mostly barley, rapeseed and cereal crops on seasonal rotation. A large number of livestock are known on the holding including sheep and cattle.
- Taylor - the agricultural holding is predominantly in pastoral use for grazing cattle with the livestock including sheep, chicken and horses.
- Rogerhead Farm – the holding contains 50 acres of grazing land and is a known site for breeding and training racehorses. The land holding has a stable with a capacity for ten horses.
- Metcalfe – agricultural land holding believed to be in combined ownership with the Lowther Trustees Limited and British Gypsum. The operation details are currently being collated.
- Lowther Trustees Limited - agricultural land holding believed to be in combined ownership with Metcalfe and British Gypsum. The operation details are currently being collated.

Human health

13.5.84 The human health baseline is described at District and LSOA level and is relevant to the Blue, Red and Orange alternatives.

Determinants of health

13.5.85 This scheme runs from east of Temple Sowerby, past the villages of Kirkby Thore and Crackenthorpe before concluding on the westerly extent of Appleby-in-Westmorland. The northern part of Kirkby Thore, which includes Kirby Thore Primary School, churches and multiple green spaces, is in proximity to the off-route sections of the scheme.

13.5.86 The A66 then runs mainly through sparsely populated agricultural land with scattered houses and farmsteads, as well as the small village of Crackenthorpe. The village of Appleby-in-Westmorland lies at the eastern extent of this scheme, with land uses including multiple schools, a fire station, a cricket club and a church. Detailed information on the location and type of green space, community, healthcare, recreational and educational facilities are provided in the Population baseline above.

13.5.87 PRoW within the study area for the Temple Sowerby to Appleby scheme is described in the Population baseline above. Recreational routes and routes linking local

communities with local services and facilities are relevant for the health assessment. The 563, 506 and 574 bus routes run along the A66, providing services between settlements along the scheme and into Penrith. The 132 bus route linking Penrith with rural settlements to the south and east also intersects the scheme.

- 13.5.88 There are no AQMA within the Temple Sowerby to Appleby scheme area. Defra background pollutant concentrations and local authority air quality monitoring data has identified that NO₂, PM₁₀ and PM_{2.5} concentrations are well within the relevant air quality objectives, meaning that the ambient air quality in the study area is good. Detailed air quality baseline information is presented in Chapter 5: Air quality.
- 13.5.89 NIA are designated by Defra in hotspot locations identified as having high levels of background noise and requiring Noise Action Plans. There is one NIA within the study area. Detailed noise baseline information is presented in Chapter 12: Noise and Vibration.
- 13.5.90 Visual receptors within the study area that are relevant for the health assessment include residential receptors within the settlements of Temple Sowerby, Kirkby Thore, Crackenthorpe, and Appleby-in-Westmorland, users of the local PRow network and Kirkby Thore and Long Marton primary schools. Detailed baseline information is presented in Chapter 10: Landscape and Visual Effects.
- 13.5.91 The section of the existing A66 route within the Temple Sowerby to Appleby scheme area had three fatal accidents between 2012 and 2018.

Health profile

- 13.5.92 This scheme passes through LSOA Eden 006D and Eden 006E. Table 13-7: Temple Sowerby to Appleby - Location of LSOAs by Parish and Ward below shows the location of the LSOAs within Wards and Parishes

Table 13-7: Temple Sowerby to Appleby - Location of LSOAs by Parish and Ward

LSOA	Corresponding Parishes	Corresponding Wards
Eden 006D	Newbiggin Civil Parish Kirby Thore Civil Parish Temple Sowerby Civil Parish Brougham Civil Parish	Kirkby Thore Ward
Eden 006E	Dufton Civil Parish Milburn Civil Parish Long Marton Civil Parish	Long Marton Ward

- 13.5.93 Eden 006D has a below average percentage of under 16s, whilst Eden 006E has an above average percentage of under 16s when compared to the national average. Both LSOAs have an above national average percentage of over 65s.
- 13.5.94 Both LSOAs have a below average percentage of people living with disabilities or long-term health problems that limit day to day activities.
- 13.5.95 The area of Eden 006D is ranked within the 40% least deprived areas in England when measured as an average across all indices of the IMD. It is in the 10% least deprived areas for employment and the 10% least deprived areas for health and disability.
- 13.5.96 The area of Eden 006E is ranked within the 40% least deprived areas in England when measured as an average across all indices of the IMD. It is in the 10% least deprived areas for employment and the 10% least deprived for health and disability.

- 13.5.97 The under 75s mortality rate from cardiovascular disease in Eden District (61.5 per 100,000) is below the national average (70.4 per 100,000).
- 13.5.98 The under 75s mortality rate from respiratory disease in Eden District (17 per 100,000) is below the national average (34.2 per 100,000).
- 13.5.99 The average life expectancy in Eden District is 80.9 years for males (above the national average of 79.7) and 84.8 years for females (above the national average of 83.4).

Sensitivity

- 13.5.100 Based on the information presented above, the sensitivity of the population within the Temple Sowerby to Appleby study area is as follows:
- Environmental conditions: medium to high sensitivity, based on the characteristics and health status of the population and the existing environment.
 - Severance/accessibility: medium sensitivity, based on the characteristics and health status of the population and the availability of local services and facilities.
- 13.5.101 The following vulnerable groups are present within the study area:
- Older people (people over 65)

Appleby to Brough

Population

Private property and housing

- 13.5.102 All route alternatives are located within semi-rural land where concentrations of residential receptors can be found to the south-west of the existing A66 in Warcop and to the south-east in Brough and Church Brough.
- 13.5.103 Table 13-8: Private property and housing comparison for the Appleby to Brough route alternatives below compares the number of residential properties located within the study area, residential properties within the draft DCO boundary, residential properties to be demolished or be subject to land take and housing allocations for each of the route alternatives.

Table 13-8: Private property and housing comparison for the Appleby to Brough route alternatives

Private property and housing baseline category	Black – Black – Black route	Black – Blue - Black alternative	Black – Black - Orange alternative	Black-Blue-Orange alternative
Number of residential properties within the study area	460	460	570	570
Number of residential properties within the draft DCO boundary	Eleven - Walk Mill, Mains House, Croft Cottage, Eastfieldgate, Hylton Home, Broomrigg House, Station House, Low Broomrigg, Dacre House, High Wood Holme and Thunderstones	Twelve - Walk Mill, Mains House, Croft Cottage, Hylton Home, Broomrigg House, Station House, Low Broomrigg, Dacre House, High Wood Holme, Thunderstones, Toddygill Hall and East Field Gate	Twelve - Walk Mill, Mains House, Croft Cottage, Hylton Home, Broomrigg House, Station House, Low Broomrigg, Dacre House, High Wood Holme, Thunderstones, 21 Lady Anne Drive and Toll Bar Cottage.	Thirteen - Walk Mill, Mains House, Croft Cottage, Eastfieldgate, Hylton Home, Broomrigg House, Station House, Low Broomrigg, Dacre House, High Wood Holme, Thunderstones, 21 Lady Anne Drive and Toll Bar Cottage.
Number of residential properties at risk of demolition or land take	Zero	Two - Toddygill Hall and East Field Gate will experience land take	One - Mains House	One - Mains House
Housing allocation name, location, total size and potential area of land within the draft DCO boundary per Route				
Rowan House - approximately 0.41ha in size and is located within Brough	Site allocation is not located within the draft DCO boundary.	Site allocation is not located within the draft DCO boundary.	Approximately 0.4ha of the allocation lies within the draft DCO boundary (96.43% of the total allocation)	Approximately 0.4ha of the allocation lies within the draft DCO boundary (96.43% of total allocation).

Development land and businesses

13.5.104 Table 13-9: Development land and business comparison for the Appleby to Brough route alternatives outlines the number of businesses within the study area and draft DCO boundary of each route alternative.

13.5.105 There is one employment land allocation within the study area of each route alternative. This allocation is 'Trading Estate and Grand Prix Club', located at Main Street, Brough. This allocation is 2.07ha in size. None of this allocated land lies within the draft DCO boundary of all alternatives and therefore it is assumed this land will not be impacted by any of the route alternatives.

Table 13-9: Development land and business comparison for the Appleby to Brough route alternatives

Private property and housing baseline category	Black – Black – Black route	Black – Blue - Black alternative	Black – Black - Orange alternative	Black-Blue-Orange alternative
Number of business properties within the study area	58 - including Helbeck Quarry	58 - including Helbeck Quarry	65 - including Helbeck Quarry	65 including Helbeck Quarry
Number of business properties within the draft DCO boundary	3 - Café Sixty-Six located off an access road leading to the houses at Coupland; Taylor & Braithwaite located along an access road towards Dyke Nook; and an unnamed business (Apple Tree Barn) located along an access road leading to West View.	3 - Café Sixty-Six located off an access road leading to the houses at Coupland; Taylor & Braithwaite located along an access road towards Dyke Nook; and an unnamed business (Apple Tree Barn) located along an access road leading to West View.	2 - Café Sixty-Six located off an access road leading to the houses at Coupland and Taylor & Braithwaite located along an access road towards Dyke Nook.	2 - Café Sixty-Six located off an access road leading to the houses at Coupland and Taylor & Braithwaite located along an access road towards Dyke Nook.
Number of business properties at risk of demolition or land take	2 – Taylor & Braithwaite, Apple Tree Barn are both located on land parcels that will require land take, however the premises will not be demolished.	2 - Taylor & Braithwaite, Apple Tree Barn are both located on land parcels that will require land take, however the premises will not be demolished.	1 – Taylor & Braithwaite is located on a land parcel that will require land take; however, the premises will not be demolished.	1 - Taylor & Braithwaite is located on a land parcel that will require land take, however the premises will not be demolished.

Community land and assets

- 13.5.106 All route alternatives are located within semi-rural land where concentrations of community receptors can be found to the south-west of the existing A66 in Warcop and to the south-east in Brough and Church Brough.
- 13.5.107 Table 13-10: Community land and assets comparison for the Appleby to Brough route alternatives below compares the number of community receptors located within the study area, community receptors within the draft DCO boundary, community receptors to be demolished or be subject to land take and housing allocations for each of the route alternatives.
- 13.5.108 One key land use is the Ministry of Defence Training Estate at Warcop MOD. It is one of the largest Ministry of Defence camps in the country and contains three weapon ammunition stores and 20 shooting ranges. Due to the nature of its operation, it has specific access requirements. The site is located within the draft DCO boundary of all alternatives but increasingly so when considering the Blue alternative.

Table 13-10: Community land and assets comparison for the Appleby to Brough route alternatives

Community land and assets baseline category	Black – Black – Black route	Black – Blue - Black alternative	Black – Black - Orange alternative	Black-Blue-Orange alternative
Number of community facilities within the study area	19 – including Brough Pre-School and Primary School, Upper Eden Medical Practice, NHS Ambulance Station, Appleby Golf Club, Brough Football Club	19 - including Brough Pre-School and Primary School, Upper Eden Medical Practice, NHS Ambulance Station, Appleby Golf Club, Brough Football Club	20 - including Brough Pre-School and Primary School, Upper Eden Medical Practice, NHS Ambulance Station, Appleby Golf Club, Brough Football Club. There is an additional receptor for this alternative which is a Methodist Chapel located off High Street.	20 - including Brough Pre-School and Primary School, Upper Eden Medical Practice, NHS Ambulance Station, Appleby Golf Club, Brough Football Club. There is an additional receptor for this alternative which is a Methodist Chapel located off High Street.
Number of community facilities within the draft DCO boundary	8 – Warcop Playing Field, Warcop Cemetery, Platts Green (Common Land), Sandford Mire (Common Land), Ketland Common (Common Land), Warcop Training Establishment, Ministry of Defence Helipad, Barn End Caravan Park	8 – Warcop Playing Field, Warcop Cemetery, Platts Green (Common Land), Sandford Mire (Common Land), Ketland Common (Common Land), Warcop Training Establishment, Ministry of Defence Helipad, Barn End Caravan Park	8 – Warcop Playing Field, Warcop Cemetery, Platts Green (Common Land), Sandford Mire (Common Land), Ketland Common (Common Land), Warcop Training Establishment, Ministry of Defence Helipad, Barn End Caravan Park	8 – Warcop Playing Field, Warcop Cemetery, Platts Green (Common Land), Sandford Mire (Common Land), Ketland Common (Common Land), Warcop Training Establishment, Ministry of Defence Helipad, Barn End Caravan Park
Number of community facilities at risk of demolition or land take	8 (all of which will be subject to land take) - Warcop Playing Field, Warcop Cemetery, Platts Green (Common Land), Sandford Mire (Common Land), Ketland Common (Common Land), Warcop Training Establishment, Ministry of Defence helipad, Barn End Caravan Park	8 (all of which will be subject to land take) - Warcop Playing Field, Warcop Cemetery, Platts Green (Common Land), Sandford Mire (Common Land), Ketland Common (Common Land), Warcop Training Establishment, Ministry of Defence helipad, Barn End Caravan Park	8 (all of which will be subject to land take) - Warcop Playing Field, Warcop Cemetery, Platts Green (Common Land), Sandford Mire (Common Land), Ketland Common (Common Land), Warcop Training Establishment, Ministry of Defence helipad, Barn End Caravan Park	8 (all of which will be subject to land take) - Warcop Playing Field, Warcop Cemetery, Platts Green (Common Land), Sandford Mire (Common Land), Ketland Common (Common Land), Warcop Training Establishment, Ministry of Defence helipad, Barn End Caravan Park

Walkers, cyclists and horse riders

13.5.109 Several of the PRow in this area are short in length and have limited connection to a wider network of PRow. However, there are several PRow which either provide a connection to a wider network or are of a long distance along this section of the route. This includes a regional cycle route forming part of a wider cycling network.

13.5.110 There are several PRow that are either partially within the draft DCO boundary or that are severed by the Route alternatives. Impacted PRow range from longer recreational routes to the more localised network in and around the villages of Kirkby Thore, Crackenthorpe and Long Marton.

13.5.111 The following are the PRow either severed by or partially within the draft DCO boundary across all scheme alternatives:

- BW 372024- Bridleway routing from the A66 westwards to Hilton Beck.
- FP 372028- Footpath routing north from the A66 to Lycum Beck.
- FP 372027- Footpath running east to west from the A66 (north of the B6259) to the A66 south of Coupland Beck.
- FP 372022- short local footpath providing connection south from the A66 to the B6259.
- FP 372013- local footpath providing a connection southward from the A66 to Sandford.
- FP 372014- Footpath routing south from the A66 to Shoregill routing to the west of Warcop.
- FP 372021- Footpath routing south from the A66 to Warcop.
- FP 372031- Footpath routing north from the A66 along Hayber Lane connecting to BW350021 on Musgrave Lane.
- FP372019 and BW 372010- short local PRow routing from Crooks Beck (to the east of Warcop) towards Eden Valley Railway.
- FP 371020- short footpath routing from the A66 towards the Eden Valley Railway.
- FP350018- footpath from B6259 to Sleastonhow Lane and providing connection to a longer PRow route.
- BW 350021- Bridleway routing northwards from the A66 along Musgrave Lane towards Hilton.
- BW 309003- routing from Musgrave Lane and the Eden Rivers and Brough Castle regional cycle route to the A66.
- FP 309004 and BW 309031- short PRow connecting from just north of the A66 to BW309003 via an underpass.
- FP 329001- footpath routing north from the A66 to Helbeck Road.

13.5.112 The following PRow are only intersected by the Black – Black - Black route, Black – Black - Orange alternative, and Black – Blue - Black alternative:

- Eden Rivers and Brough Castle- regional circular cycle route from Kirkby Stephen routing through Brough and Brough Castle.
- BW 309009 routing east from Musgrave Lane to Church Brough.
- FP 309011- short local footpath from Musgrave Lane to Castle View.

13.5.113 The following PRow is only intersected by the Black-Blue-Orange alternative and the Black–Black-Orange alternative:

- BW 309032- short bridleway from A66 to Musgrave Lane.

13.5.114 It is likely that the PRoW will be used by range of user groups including the local communities for any potential access but largely by hikers, cyclists, horse riders, tourists or individuals in the area for leisure or recreational purposes

Agricultural land holdings

13.5.115 All route alternatives are located within semi-rural land whereby agricultural land holdings dominate local land uses. Known agricultural land holdings within the draft DCO boundary of all alternatives are:

- Hayllars – this land holding is one of the largest dairy farms in Europe and is a significantly sized holding in the local area. The holding is known for arable and pastoral uses with a large quantity of cows. A large proportion of the holding is located within or adjacent to the draft DCO boundary.
- Herons – the landholding is one of the largest across the project. The holding contains a family run business that is known for arable and pastoral uses with a large quantity of sheep. The holding has also diversified in that it offers holiday cottages whilst a section of the land is used for Brough Hill Fair once per year. The land is also rented from the Ministry of Defence.
- Pattersons – the agricultural holding is a family run business with both arable and pastoral uses. It has large organic chicken shed with accompanying land for the livestock to roam. They also own sheep and hens on the holdings.

Human health

13.5.116 The human health baseline is described at District and LSOA level and is relevant to all alternatives.

Determinants of health

13.5.117 This scheme runs through sparsely populated agricultural land with scattered houses and farmsteads. The village of Sandford lies approximately 800m south of the A66. The village of Warcop lies approximately 300m to the south-east. Warcop Training Camp lies to the north of the village, around 100m from the draft DCO boundary. The village of Brough is adjacent to a dualled section of the A66 and approximately 400m from the proposed dualling and embankment.

13.5.118 PRoW within the study area for the Appleby to Brough scheme are described in the Population baseline above. Recreational routes and routes linking local communities with local services and facilities are relevant for the health assessment.

13.5.119 Bus routes intersecting the scheme include the 563 from Warcop to Penrith, 571 and S4 from Brough to Kirkby Stephen and S6 from Kirkby Stephen to Brough, Warcop and Penrith.

13.5.120 There are no AQMA within the Appleby to Brough study area. Defra background pollutant concentrations and local authority air quality monitoring data has identified that NO₂, PM₁₀ and PM_{2.5} concentrations are well within the relevant air quality objectives, meaning that the ambient air quality in the study area is good. Detailed air quality baseline information is presented in Chapter 5: Air quality.

13.5.121 NIA are designated by Defra in hotspot locations identified as having high levels of background noise and requiring Noise Action Plans. There is one NIA within the study area. Detailed noise baseline information is presented in Chapter 12: Noise and Vibration.

13.5.122 Visual receptors within the study area that are relevant for the health assessment include recreational users of the local PRoW network. The Pennine Journey Long Distance Path and Pennine Way National Trail are also considered relevant to this

scheme. Detailed landscape baseline information is presented in Chapter 10: Landscape and Visual Effects.

13.5.123 The section of the existing A66 route within the Appleby to Brough scheme area had three fatal accidents between 2012 and 2018.

Health profile

13.5.124 This scheme passes through LSOA Eden 007E and Eden 007A. Table 13-11: Appleby to Brough - Location of LSOAs by Parish and Ward below shows the location of the LSOAs within Wards and Parishes

Table 13-11: Appleby to Brough - Location of LSOAs by Parish and Ward

LSOAs	Corresponding Parishes	Corresponding Wards
Eden 007E	Murton Civil Parish Warcop Civil Parish Ormside Civil Parish Hoff Civil Parish Colby Civil Parish	Warcop Ward
Eden 007A	Ravenstondale Civil Parish Crosby Garrett Civil Parish Waitby Civil Parish Soulby Civil Parish Musgrave Civil Parish Brough Civil Parish Helbeck Civil Parish Brough Sowerby Civil Parish Stainmore Civil Parish	Ravenstondale Ward Brough Ward

13.5.125 Both LSOAs have below average proportions of under 16s and above average proportions of over 65s compared to the national average.

13.5.126 Both LSOAs have a below average percentage of people living with disabilities or long-term health problems that limit day to day activities.

13.5.127 The area of Eden 007A is ranked within the 40% most deprived areas in England when measured as an average across all indices of the IMD. It is in the 20% least deprived areas for employment and the 10% least deprived for health and disability.

13.5.128 The area of Eden 007E is ranked within the 40% most deprived areas in England when measured as an average across all indices of the IMD. It is in the 50% least deprived areas for employment and the 30% least deprived for health and disability.

13.5.129 The under 75s mortality rate from cardiovascular disease in Eden District (61.5 per 100,000) is below the national average (70.4 per 100,000).

13.5.130 The under 75s mortality rate from respiratory disease in Eden District (17 per 100,000) is below the national average (34.2 per 100,000).

13.5.131 The average life expectancy in Eden District is 80.9 years for males (above the national average of 79.7) and 84.8 years for females (above the national average of 83.4).

Sensitivity

13.5.132 Based on the information presented above, the sensitivity of the population within the Appleby to Brough study area is as follows:

- Environmental conditions: medium sensitivity, based on the characteristics and health status of the population and the existing environment.
- Severance/accessibility: medium to high sensitivity, based on the characteristics and health status of the population and the availability of local services and facilities.

13.5.133 The following vulnerable groups are present within the study area:

- Older people (people over 65).

Bowes Bypass

Population

Private property and housing

13.5.134 This scheme is located to the north of Bowes along the alignment of the existing A66, with surrounding land uses predominantly rural in nature.

13.5.135 There are approximately 150 residential properties located within the study area of this scheme, the majority of which are located within Bowes. Two properties are located directly within the draft DCO boundary; Stone Bridge Farm and Low Broats, of which the latter will require demolition to accommodate the scheme.

13.5.136 There are no housing allocations located within the study area for this scheme.

Development land and businesses

13.5.137 In total there are approximately 23 businesses within the study area for this scheme. Three business properties lie directly within the draft DCO boundary, which are:

- An unnamed business on Stainmore Road (Mellwaters Barn)
- Ivy Hall Farm Holiday Cottage
- Custom Paint located between Bowes Hall Crossroads West and the A66 Flyover

13.5.138 Hulands Quarry is another notable business in the local area located approximately 100m to the north-east of the scheme. No land take or demolition on the site is anticipated.

13.5.139 There are no employment land allocations within the study area of this scheme.

13.5.140 This scheme will require the demolition of one unnamed business (Mellwaters Barn) and will require land take from two further businesses.

Community land and assets

13.5.141 There are multiple community facilities located within the study area of this scheme, mostly within Bowes Village. Facilities include one pre-school (Bowes Hutchinson Church of England Pre-School) and one primary school (Bowes Hutchinson Church of England Primary School). There are no primary care facilities (such as GP surgeries or dental surgeries) within the study area.

13.5.142 There is one area of open space which is The Annums playground, one church (St Giles Church) and one village hall (Bowes and Gilmonby Village Hall) located within the study area. Bowes and Gilmonby Cemetery is located off Back Lane and an allotment or community growing space is located off the Pennine Way (Bowes Loop).

13.5.143 There are two areas of Common Land, both named Bowes Moor located on either side of the A66, within the draft DCO boundary.

13.5.144 There are no demolitions of community assets anticipated as part of this scheme. This scheme will likely require land take from the two areas of Common Land (Bowes Moor) located within the draft DCO boundary. This scheme will also likely require land take from an allotment or community growing space located off the Pennine Way.

Walkers, cyclists and horse riders

13.5.145 The following PRow are either partially within the draft DCO boundary or are severed by this scheme:

- Bridleway 23 a short bridleway forming part of the Pennine Way (Bowes Loop) routing from the A66 to Clint Lane and provide connection on a wider network of PRow north of the A66.
- FP 18 provides connection from the Pennine Way (Bowes Loop) to Back Lane.
- FP 16 provides connection from the Pennine Way (Bowes Loop) along the River Greta to a wider network PRow.
- NCN 70 which routes through Bowes from Barnard Castle and routes south to the Yorkshire Dales National Park.
- FP 6- Routes from The Street north and west towards the A67 and Boldron and provides connection to a wider network of PRow in the area.

13.5.146 Due to the nature of the local land uses and quantity of PRow locally, it is likely that they are used by a number of user groups including the local communities, walkers, cyclists and tourists.

Agricultural land holdings

13.5.147 This scheme is located in a rural area where agricultural land holdings tend to dominate the local land use. Known agricultural land holdings within the draft DCO boundary are:

- Ivy Hall Farm – a small diverse land holding with a variety of arable and pastoral uses with the livestock being predominantly chickens. The holding has diversified to include a camp site.
- West End Farm – an agricultural holding within the study area known to contain large quantities of livestock.
- Bain – an agricultural land holding within the study area whereby detailed information regarding the farming practices are currently being collated.
- White – an agricultural land holding within the study area whereby detailed information regarding the farming practices are currently being collated.
- Sayer – an agricultural land holding within the study area whereby detailed information regarding the farming practices are currently being collated.
- Tunstall – an agricultural land holding within the study area whereby detailed information regarding the farming practices are currently being collated.
- Hobson – a small agricultural land holding where the agricultural practice is yet to be confirmed. The holding has diversified to include the Old Armoury Campsite.
- Tallentire – an agricultural land holding within the study area whereby detailed information regarding the farming practices are currently being collated.
- Gill – an agricultural land holding within the study area which contains a variety of agricultural practices which are predominantly focussed on pastoral farming with the livestock containing cows and sheep.

- Close – an agricultural land holding within the study area whereby detailed information regarding the farming practices are currently being collated. The holding is believed to contain a weighbridge facility that many local businesses utilise. The holding is the home to a haulage business which buy and sell hay, straw, silage and root crops.
- Wright – an agricultural land holding within the study area whereby detailed information regarding the farming practices are currently being collated. It is believed to focus on pastoral practices with livestock containing hens and chickens.
- Bowes and Romalldkirk Charities land – believed to be rented out for agricultural practices (subject to confirmation).
- Nixon – a large dairy farm within the local area containing livestock including cows.

Human health

Determinants of health

13.5.148 The Bowes Bypass scheme runs immediately north of the village of Bowes, with houses and a primary school adjacent to the draft DCO boundary. The church and village hall lie approximately 50m and 200m from the draft DCO boundary.

13.5.149 PRow within the study area for the Bowes Bypass scheme are described in the Population baseline above. Recreational routes and routes linking local communities with local services and facilities are relevant for the health assessment.

13.5.150 The B66 bus service from Newcastle to Blackpool, which intersects the scheme, provides a local service from Bowes to Barnard Castle and Kirkby Stephen.

13.5.151 There are no AQMA within the Bowes Bypass study area. Defra background pollutant concentrations and local authority air quality monitoring data has identified that NO₂, PM₁₀ and PM_{2.5} concentrations are well within the relevant air quality objectives, meaning that the ambient air quality in the study area is good. Detailed air quality baseline information is presented in Chapter 5: Air Quality.

13.5.152 NIA are designated by Defra in hotspot locations identified as having high levels of background noise and requiring Noise Action Plans. There are no NIA within the study area. Detailed noise baseline information is presented in Chapter 12: Noise and Vibration.

13.5.153 Visual receptors within the study area that are relevant for the health assessment include recreational users of the local PRow network, the Pennine Journey Long Distance Path and National Cycle Network (NCN) Route 70. Detailed landscape baseline information is presented in Chapter 10: Landscape and Visual.

13.5.154 The section of the existing A66 route within the Bowes Bypass scheme area had no fatal accidents between 2012 and 2018.

Health profile

13.5.155 This scheme passes through LSOA of County Durham 065B. Table 13-12: Bowes Bypass - Location of LSOAs by Parish and Ward below shows the location of the LSOA within Wards and Parishes.

Table 13-12: Bowes Bypass - Location of LSOAs by Parish and Ward

LSOA	Corresponding Parishes	Corresponding Wards
County Durham 065B	Bowes Civil Parish Gilmonby Civil Parish	Barnard Castle West Electoral Division

LSOA	Corresponding Parishes	Corresponding Wards
	Scargill Civil Parish Hope Civil Parish Baringham Civil Parish Brignall Civil Parish Boldron Civil Parish Eggleston Abbey Civil Parish Rokeby Civil Parish Wycliffe with Thorpe Civil Parish Hutton Magna Civil Parish Ovington Civil Parish Barforth Civil Parish	

13.5.156 County Durham 065B has a below national average proportion of under 16s and an above national average proportion of over 65s.

13.5.157 County Durham 065B has a below average percentage of people living with disabilities or long-term health problems that limit day to day activities.

13.5.158 The LSOA is ranked within the 50% most deprived areas in England when measured as an average across all indices of the IMD. It is in the 10% least deprived areas for employment and the 20% least deprived areas for health and disability.

13.5.159 The under 75s mortality rate from cardiovascular disease in County Durham (78.9 per 100,000) is above the national average (70.4 per 100,000).

13.5.160 The under 75s mortality rate from respiratory disease in County Durham (43 per 100,000) is above the national average (34.2 per 100,000).

13.5.161 The average life expectancy in County Durham is 78 years for males (below the national average of 79.7) and 81.3 years for females (below the national average of 83.4).

Sensitivity

13.5.162 Based on the information presented above, the sensitivity of the population within the Bowes Bypass study area is as follows:

- Environmental conditions: medium sensitivity, based on the characteristics and health status of the population and the existing environment.
- Severance/accessibility: medium to high sensitivity, based on the characteristics and health status of the population and the availability of local services and facilities.

13.5.163 The following vulnerable groups are present within the study area:

- Older people (people over 65)

Cross Lanes to Rokeby

Population

13.5.164 One singular baseline assessment has been undertaken for all scheme alternatives as the draft DCO boundary has been developed to account for a combined the worst-case scenario. Therefore, the baseline assessment outlined below applies to the Black+Black Route, Blue (Cross Lanes) alternative junction and Red (Rokeby) alternative junction, unless it has been stated otherwise.

Private property and housing

13.5.165 The scheme alternatives are located within rural land where residential receptors lie sporadically around the existing A66 within open countryside. A minor cluster of properties is located at Greta Bridge.

13.5.166 There are approximately 45 residential properties located within the study area of the scheme alternatives.

13.5.167 Five properties are located directly within the draft DCO boundary; Smithy Cottage, Ivy Cottage, The Cottage at the Old Rectory, The Cottage, The Old Rectory. No demolitions or land take will be required to accommodate any of the scheme alternatives.

13.5.168 There are no housing allocations located within the study area for the scheme alternatives.

Development land and business

13.5.169 There are four businesses located within the study area of the scheme alternatives. Only the Cross Lanes Organic Farm Shop is located within the draft DCO boundary of the scheme alternatives. There will be a small portion of land take required from the land parcel the shop is situated on, however, the shop itself will not be demolished.

13.5.170 There are no employment land allocations within the study area of this scheme.

13.5.171 No other businesses will be impacted by demolition or land take and there are no known employment allocations within the study area.

Community land and assets

13.5.172 There are approximately two community facilities located within the study area of the scheme alternatives. These include St Mary's Church and The Old School, both located off The Street. There are no educational or primary care facilities located within the study area of the scheme alternatives.

13.5.173 There are no demolitions or land take of community land or assets anticipated as a result of any of the scheme alternatives.

Walkers, cyclists and horse riders

13.5.174 There are a significant number of PRoW within the study area of this scheme alternatives, many of which form part of a wider network routing to Bernard Castle to the north of the A66 as well as to the west along the River Tees and to the south towards the Yorkshire Dales National Park.

13.5.175 The following PRoW are either partially within the draft DCO boundary or are intersected by all route alternatives:

- FP 9 and 10- these footpaths terminate at the A66 and provide connection northwards towards Barnard Castle as well as to a wider network of PRoW. There is no designated crossing where the PRoW meet the A66.
- FP 5 and 6 (Rokeby)- These footpaths provide a north (FP 5) to south connection (FP 6). To the north the footpath connects to a wider network along River Tees and to the south the footpath provides a connection to Brignall. The footpaths meet at the A66 however, there is no designated crossing, but it is likely that users will informally cross the road.

13.5.176 The following PRoW are only intersected by the Blue and Red alternatives:

- FP 1 and FP7- Routes from the A66 northwards towards Barnard Castle and connects to a larger network of PRoW. To note there is currently no designated crossing where the PRoW meets the A66.
- FP 8 and FP 14- provides an east-west connection from Boldron to a wider network of PRoW in the west that lead towards Barnard Castle and further to the west along the River Tees.
- FP 13- a short footpath providing a shortcut for walkers on Barnard Castle road.

13.5.177 Due to the nature of the PRoW in the area it is likely that most routes are used for leisure as such may be used by local communities, hikers or tourists.

Agricultural land holdings

13.5.178 The proposed scheme alternatives are located rural land where agricultural land holdings are a dominant land use.

13.5.179 Known agricultural land holdings within the draft DCO boundary are:

- The Mortham Estate – a major landowner in the local area who rents out holdings for agricultural purposes. Current tenants include Ewebank Farm, Tutta Beck Farm, Street Side Farm and Rokeby Grange. Detailed information regarding the farming practices of the holding is yet to be confirmed.
- Cross Lanes Organic Farm – a notable holding which is known for its diverse practices which includes a farm shop and café. The holding grows its own organic produce and undertakes pastoral practices with pigs among the livestock.
- Bellas – an agricultural land holding within the study area whereby detailed information regarding the farming practices of the holding are yet to be confirmed but it is believed to contain livestock including sheep.
- Hare – an agricultural land holding within the study area whereby detailed information regarding the farming practices are currently being collated.

Human health

Determinants of health

13.5.180 This scheme is located in a rural area comprising open countryside with scattered residential properties as described in the Population baseline above. Population density in the area is low.

13.5.181 PRoW within the study area for the Cross Lanes to Rokeby scheme are described in the Population baseline above.

13.5.182 Bus route 79 follows the existing A66 on the eastern extent of this scheme. This route provides connection from Barnard Castle in the north to Richmond in the south.

13.5.183 There are no AQMA within the Cross Lanes to Rokeby scheme study area. Defra background pollutant concentrations and local authority air quality monitoring data has identified that NO₂, PM₁₀ and PM_{2.5} concentrations are well within the relevant

air quality objectives, meaning that the ambient air quality in the study area is good. Detailed air quality baseline information is presented in Chapter 5: Air Quality.

13.5.184 NIA are designated by Defra in hotspot locations identified as having high levels of background noise and requiring Noise Action Plans. There are no NIAs identified in the study area (see Chapter 12: Noise and Vibration).

13.5.185 Visual receptors within the study area that are relevant for the health assessment include Rokeby Park and multiple PRow, including multiple connecting the Teesdale Way long distance trail. Detailed landscape baseline information is presented in Chapter 10: Landscape and Visual Effects.

13.5.186 The A66 route within the Cross Lanes to Rokeby scheme area had no fatal accidents between 2012 to 2018.

13.5.187 Health Profile

13.5.188 This section of the route passes through LSOA County Durham 065B. Table 13-13: Cross Lanes to Rokeby - Location of LSOAs by Parish and Ward below shows the location of this LSOA within Wards and Parishes.

Table 13-13: Cross Lanes to Rokeby - Location of LSOAs by Parish and Ward

LSOA	Corresponding Parishes	Corresponding Ward
County Durham 065B	Bowes Civil Parish Gilmonby Civil Parish Scargill Civil Parish Hope Civil Parish Baringham Civil Parish Brignall Civil Parish Boldron Civil Parish Eggleston Abbey Civil Parish Rokeby Civil Parish Wycliffe with Thorpe Civil Parish Hutton Magna Civil Parish Ovington Civil Parish Barforth Civil Parish	Barnard Castle East Electoral Division

13.5.189 County Durham 065B has a lower percentage of under 16s and over 65s when compared to the national average.

13.5.190 County Durham 065B has a below average percentage of people living with disabilities or long-term health problems that limit day to day activities.

13.5.191 LSOA County Durham 065B ranks within the 50% least deprived areas in England when measured as an average across all indices of the Indices of Multiple Deprivation (IMD). It is in the 10% least deprived areas for employment and the 20% least deprived areas for health and disability.

13.5.192 The under 75s mortality rate from cardiovascular disease in County Durham (78.9 per 100,000) compares poorly against the national average (70.4 per 100,000).

13.5.193 The under 75s mortality rate from respiratory disease in County Durham (43 per 100,000) compares poorly against the national average (34.2 per 100,000).

13.5.194 The average life expectancy in County Durham is 78 years for males (below the national average of 79.7) and 81.3 years for females (below the national average of 83.4)

Sensitivity

13.5.195 Based on the information presented above, the sensitivity of the population within the Cross Lanes to Rokeby study area is as follows:

- Environmental conditions: medium sensitivity, based on the characteristics and health status of the population and the existing environment.
- Severance/accessibility: medium to high sensitivity, based on the characteristics and health status of the population and the availability of local services and facilities.

13.5.196 No vulnerable groups have been identified as having above average prevalence within the study area for this scheme.

Stephen Bank to Carkin Moor

Population

Private property and housing

13.5.197 This scheme is located within rural land where concentrations of residential receptors can be found to the north east of the existing A66 within West Layton.

13.5.198 There are approximately 50 residential properties located within the study area for this scheme, the majority of which are located within West Layton. No properties are located within the draft DCO boundary and no demolitions or land take will be required to accommodate this scheme.

13.5.199 There are no housing allocations located within the study area for this scheme.

Development land and businesses

13.5.200 In total, there are approximately 11 businesses within the study area for this scheme. Carkin Moor Quarry is located off Carkin Moor Road. This scheme will require a small portion of land take from the land parcel at which the quarry is situated.

13.5.201 There are no employment land allocations within the study area of this scheme.

Community land and assets

13.5.202 There are approximately four community facilities located within the study area of this scheme, including two tennis courts in Hartforth and two caravan parks (Fox Hall Caravan Park off New Lane, Browson Bank off Dick Scot Lane). There are no educational, primary care, or religious facilities located within the study area of this scheme.

13.5.203 There are no demolitions or land take of community land or assets associated with this scheme.

Walkers, cyclists and horse riders

13.5.204 The PRow largely run from north to south over the existing A66 (where there are no designated crossings) and most of these PRow provide connections to a wider geography. They help to connect the surrounding towns and villages including Caldwell, Forcet and Hutton Magna to the north of the A66 and Ravensworth, Gayles and Kirkby Hall in the south.

13.5.205 The following PRow are either partially within the draft DCO boundary or are severed by this scheme:

- Bridleway 12- provides a connection northward from the A66 towards Hutton Magna where there is connection to a wider PRow network.
- FP 20.72/1/1- a short footpath providing connection from the A66 to Collier Lane.
- FP 20.55/1/1- provides a connection to the south of the A66 to a wider PRow network towards Dalton and Ravensworth.
- FP 20.23/8/1- provides a connection to the north of the A66 to West Lane where there is access to a wider PRow network. There is also another footpath that users may continue their journey on from this footpath to the south of the A66, however there are currently no designated crossings on the A66.
- Bridleway 20.55/6/1- provides a connection south of the A66 to the village of Ravensworth where there is also access to a wider PRow network.
- Bridleway 20.23/5/1- provides a connection northward to Moor Lane and the village of East Layton and users are also able to access a longer bridleway route on Limerick Lane.
- Bridleway 20.30/2/1 a shorter bridleway providing a connection between the A66 and B6247. There are no apparent connections to a wider PRow network.
- Bridleway 20.33/17/2 – shorter bridleway providing connection from Warrener Lane to Comfort Lane where a wider PRow network can be accessed.

13.5.206 It is likely that the PRow will be used by a diverse range of user groups including the local communities and horse riders due the presence of bridleways. However, it is likely that they are used largely by hikers, cyclists, tourists or individuals in the area for leisure or recreational purposes.

Agricultural land holdings

13.5.207 This scheme is located in a rural area where agricultural land holdings are a dominant land use. Known agricultural land holdings within the draft DCO boundary are:

- Mainsgill Farm – a large agricultural holding in the local area which employs approximately 50 local staff whilst supporting multiple local businesses with its produce. The holding itself is diverse with a mixture of arable and pastoral uses which includes sheep and livestock as well as llamas and camels.

Human health

Determinants of health

13.5.208 This scheme runs through sparsely populated agricultural land with scattered houses and farmsteads. The village of West Layton lies to the north, with a garden centre and hotel approximately 250m of the road and houses beyond. The village of Ravensworth lies approximately 1km south of the road.

13.5.209 PRow within the study area for the Stephen Bank to Carking Moor scheme are described in the Population baseline above. Recreational routes and routes linking local communities with local services and facilities are relevant for the health assessment.

13.5.210 The 79 bus route intersects the scheme, providing services between Barnard Castle, West Layton, Rokeby and Greta Bridge.

13.5.211 There are no AQMA within the Stephen Bank to Carkin Moor study area. Defra background pollutant concentrations and local authority air quality monitoring data has identified that NO₂, PM₁₀ and PM_{2.5} concentrations are well within the relevant air quality objectives, meaning that the ambient air quality in the study area is good. Detailed air quality baseline information is presented in Chapter 5: Air Quality.

13.5.212 NIA are designated by Defra in hotspot locations identified as having high levels of background noise and requiring Noise Action Plans. There is one NIA within the study area. Detailed noise baseline information is presented in Chapter 12: Noise and Vibration.

13.5.213 Key identified visual receptors within the Stephen Bank to Carkin Moor Scheme include recreational users of the local PRoW network, community resources including the Fox Hall Inn and Mainsgill Farm Shop and scattered residential properties and farmsteads. Detailed landscape baseline information is presented in Chapter 10: Landscape and Visual Effects.

13.5.214 The section of the existing A66 within the Stephen Bank to Carkin Moor scheme area had one fatal accident between 2012 to 2018.

Health profile

13.5.215 This scheme passes through LSOA Richmondshire 001C and Richmondshire 001F. Table 13-14: Stephen Bank to Carking Moor - Location of LSOAs by Parish and Ward below shows the location of this LSOA within Wards and Parishes.

Table 13-14: Stephen Bank to Carking Moor - Location of LSOAs by Parish and Ward

LSOA	Corresponding Parishes	Corresponding Wards
Richmondshire 001C	Ravensworth Civil Parish Kirkby Hill Civil Parish Gayles Civil Parish Gilling with Hartforth and Sedbury Civil Parish Aske Civil Parish Whashton Civil Parish	Gilling West Ward
Richmondshire 001F	Eppleby Civil Parish Caldwell Civil Parish Stanwick St John Civil Parish Forcett Civil Parish West Layton Civil Parish East Layton Civil Parish Carkin Civil Parish	Melsonby Ward

13.5.216 Both LSOAs have a below national average percentage of under 16s and an above national average percentage of over 65s.

13.5.217 Both LSOAs have a below national average of people living with disabilities or long-term health problems that limit day to day activities.

13.5.218 The area of Richmondshire 001C is ranked within the 40% least deprived areas in England when measured as an average across all indices of the IMD. It is in the 20% least deprived areas for employment and the 30% least deprived areas for health deprivation and disability.

13.5.219 The area of Richmondshire 001F is ranked within 30% least deprived areas in England when measured as an average across all indices of the IMD. It is in the 20% least deprived areas for employment and the 10% least deprived for health deprivation and disability.

13.5.220 The under 75s mortality rate from cardiovascular disease in Richmondshire (58.0 per 100,000) is below the national average (70.4 per 100,000).

13.5.221 The under 75s mortality rate from respiratory disease in Richmondshire (24.0 per 100,000) is below the national average (34.2 per 100,000).

13.5.222 The average life expectancy in Richmondshire is 81.2 years for males (above the national average of 79.7) and 84.2 years for females (above the national average of 83.4).

Sensitivity

13.5.223 Based on the information presented above, the population within the Stephen Bank to Carkin Moor study area is considered to have the following levels of sensitivity with regard to environmental conditions and severance/ accessibility respectively:

- Environmental conditions: medium sensitivity, based on the existing environment and health status of the population.
- Severance/ accessibility: medium to high sensitivity, based on the location and access to services and facilities.

13.5.224 The following vulnerable groups have been identified as having above average prevalence within the relevant LSOAs and may also be present within the study area for this scheme:

- Older people (people over 65).

A1(M) Junction 53 Scotch Corner

Population

Private property and housing

13.5.225 This scheme is located within semi-rural land where concentrations of residential receptors can be found to the east of the existing A66 within Middleton Tyas.

13.5.226 There are approximately 40 residential properties located within the study area for this scheme. No properties are located within the draft DCO boundary and no demolitions or land take will be required to accommodate the scheme.

13.5.227 There are no housing allocations located within the study area for this scheme.

Development land and businesses

13.5.228 In total, there are approximately 23 businesses within the study area for this scheme. No business properties lie directly within the draft DCO boundary and as such it is not anticipated that any will be demolished.

13.5.229 There is a 'Strategic Direction of Growth', as identified by Richmondshire planning policy, within the study area. This 'Strategic Direction of Growth' policy directs future development toward Catterick (to the south of Scotch Corner). The strategic area is 45.2ha in total, however none of this land lies within the draft DCO boundary. It is therefore assumed that no land take of the site will be required.

Community land and assets

13.5.230 There are no community facilities located within the study area of this scheme.

Walkers, cyclists and horse riders

13.5.231 No PRoW are either intersected by the scheme or within the draft DCO boundary. It is likely that the routes in the surrounding area are used for recreational purposes.

Agricultural land holdings

13.5.232 This scheme is located within semi-rural land where the Scotch Corner Services are located to the north and the A1(M) bisects the scheme. There are no known agricultural land holdings within the draft DCO boundary that could be at risk of land loss or demolition.

Human Health

Determinants of health

13.5.233 This scheme is located in a rural and semi-rural area to the west of the village of Middleton Tyas. Land uses in proximity to the scheme include primarily agricultural land, with residential properties and businesses as described in the Population baseline above.

13.5.234 PRoW within the study area for the A1(M) Junction 53 Scotch Corner scheme are described in the Population baseline above.

13.5.235 Bus services intersect the scheme at A1(M) Junction 53 Scotch Corner, providing links between Scotch Corner, Darlington, Catterick, Colburn, Scotton and Haughton Road, including routes X26, X27, 831 and 34.

13.5.236 There are no AQMA within the A1(M) Junction 53 Scotch Corner scheme study area. Defra background pollutant concentrations and local authority air quality monitoring data has identified that NO₂, PM₁₀ and PM_{2.5} concentrations are well within the relevant air quality objectives, meaning that the ambient air quality in the study area is good. Detailed air quality baseline information is presented in Chapter 5: Air Quality.

13.5.237 NIA are designated by Defra in hotspot locations identified as having high levels of background noise and requiring Noise Action Plans. There are no NIAs identified in the study area (see Chapter 12: Noise and Vibration).

13.5.238 There are no visual receptors within the study area that are relevant for the health assessment. Detailed landscape baseline information is presented in Chapter 10: Landscape and Visual Effects.

13.5.239 The A66 route within the A1(M) Junction 53 Scotch Corner scheme area had no fatal accidents between 2012 to 2018.

Health profile

13.5.240 This section of the route passes through LSOA Richmondshire 001E. Table 13-15: A1(M) Junction 53 Scotch Corner - Location of LSOAs by Parish and Ward below shows the location of Richmondshire 001E within Wards and Parishes.

Table 13-15: A1(M) Junction 53 Scotch Corner - Location of LSOAs by Parish and Ward

LSOA	Corresponding Parishes	Corresponding Wards
Richmondshire 001E	Middleton Tyas Civil Parish Moulton Civil Parish	Croft & Middleton Tyas Ward

13.5.241 Richmondshire 001E has a lower percentage of under 16s and a higher percentage of over 65s when compared to the national average.

13.5.242 Richmondshire 001E has a higher percentage of people living with disabilities or long-term health problems that limit day to day activities compared to the national average.

13.5.243 Richmondshire 001E ranks within the 20% least deprived areas in England, when measured as an average across all indices in the IMD. It is in the 20% least deprived areas for employment and the 10% least deprived areas for health and disability.

13.5.244 The under 75s mortality rate from cardiovascular disease in Richmondshire (58.0 per 100,000) is below the national average (70.4 per 100,000).

Sensitivity

13.5.245 Based on the information presented above, the overall population within the A1(M) Junction 53 Scotch Corner study area is considered to have the following levels of sensitivity with regard to environmental conditions and severance/ accessibility respectively:

- Environmental conditions: medium sensitivity, based on the existing environment and health status of the population.
- Severance/ accessibility: medium sensitivity, based on the location and access to services and facilities.

13.5.246 Vulnerable groups that are particularly prevalent within the population include:

- Older people (over 65s)

13.6 Potential Impacts

Construction

Population

Private property and housing

13.6.1 Potential impacts on residential properties and land receptors are:

- Demolition of residential properties
- Loss or reduction of access to residential properties
- Loss of land associated with residential property
- Loss of or impacts on land allocated for housing growth

Development land and businesses

13.6.2 Potential impacts on development land and businesses, including the potential impacts on residential properties and land receptors, are:

- Construction effects on commercial property and business receptors (including tourism businesses).
- Change in attributes of business receptors (such as accessibility).
- Loss of or impacts on land allocated or identified for employment/business growth.
- During the peak tourism season, when occupancy rates are generally higher, the potential additional requirements for long-term accommodation could place increased pressure on local businesses within the tourism sector. This may result in construction workers that are not local to the area having to access accommodation in the wider region. This is not anticipated to result in a significant effect on businesses and communities and could lead to minor beneficial effects by increasing the spend in local communities in terms of accommodation occupancy rates and use of services in the hospitality sector.

Community land and assets

13.6.3 Potential impacts on community land and assets are:

- Construction effects on community facilities such as village halls, schools and religious premises.
- Construction effects on tourism and recreational facilities within the vicinity of the project, including direct effects on the receptor as well as indirect effects associated with any impacts on users of the receptors (such as amenity or perceived effects).
- Potential effects on other land (such as open space land) during construction.
- Physical access to healthcare services is not anticipated to be affected by the project during the construction phase as access will remain in place but temporary diversions could increase journey times. Construction workers are unlikely to add significant additional pressures on local service as many of them are likely to stay registered with their local home practice (if working outside of their home region) or already registered locally if they are from the local area. Any accidents or emergencies requiring local services are likely to result in negligible effects given the nature and anticipated duration of the construction phase.

Walkers, cyclists and horse riders

13.6.4 Potential impacts during construction include:

- Permanent land-take associated with the footprint of the project which may affect PRow and walking and cycling routes.
- Temporary land take, closure or diversion of PRow and walking and cycling routes during construction.
- Temporary disruption to PRow during construction resulting in severance or increased journey times to access community facilities.

Agricultural land and holdings

13.6.5 The principal potential impacts on agricultural land holdings are likely to occur during the construction of the project.

13.6.6 Construction impacts on agricultural land holdings largely relate to land temporarily or permanently required for the project. This could permanently reduce the resource of arable land and fertile soil in the study area.

13.6.7 There is also a potential for the construction of the project to impact upon access to agricultural land holdings. In instances where severance is temporary, there may still be longer term effects if the viability of assets becomes undermined through reduced usage during the construction period.

13.6.8 Other potential construction impacts to agricultural activity will include the deposition of dust on sensitive crops; disruption to drainage, irrigation and water supply systems; unintentional pollution of soil and water courses; spread of injurious weeds to adjacent agricultural land from soil and material stockpiles; and construction noise.

Human health

Environmental conditions relevant to human health

13.6.9 During construction, the population in the study area may be exposed to environmental impacts including noise, dust, visual and lighting impacts and the presence of construction traffic, including HGVs. These impacts on the environmental amenity of residential neighbourhoods and community assets may potentially affect the health of local people through:

- Temporary negative effects on mental wellbeing, including annoyance, stress and reduced quality of life.

- Temporary adverse impacts on sleep disturbance from noise and lighting, where night-time working is required.
- Temporary indirect negative effects on mental and physical health arising from changes in behaviour, such as reductions in the use of outside space.

Severance, accessibility and the ability of communities to access community land

13.6.10 There is a potential for temporary increases in local journey times by car and public transport (bus), resulting from temporary traffic delays, road closures and diversions. Journey times for walkers and cyclists may be increased by temporary closure and diversion of PRoW during construction. These severance impacts may potentially affect the health of local people through:

- Reduction in the accessibility and use of local shops and services (including healthcare), leading to temporary negative effects on wellbeing and quality of life.
- Reduction in the accessibility and use of public open space, sport and leisure facilities, leading to a temporary decrease in the physical and mental health benefits associated with physical activity, social interaction and contact with nature (negative effect).
- Increased journey times between communities, leading to negative wellbeing effects associated with reduced opportunities for social interaction.
- Reduction in the use of PRoW, leading to a temporary decrease in the physical and mental health benefits of physical activity (negative effect).

13.6.11 At the route wide level, the construction phase may increase employment opportunities through the creation of direct construction jobs and increased demand for local suppliers and facilities such as shops and cafés. This will have a potential positive effect on the physical and mental health of people in the study area, through improved earnings and opportunities for employment and training.

Operation

Population

Private property; community land and assets and development land and businesses

13.6.12 Operation of the project should not require any further land from residential or private properties, community land and assets as well as development land and businesses located within the study area.

13.6.13 Changes to the local environment could occur, such as changes to the local noise environment or sense of tranquillity.

13.6.14 Under the assumption that access will be reinstated or enhanced it is likely that the project will result in beneficial impacts due to enhanced accessibility and a general reduction in congestion across the A66 and associated local road network.

Walkers, cyclists and horse riders

13.6.15 Potential impacts during operation of the project include:

- Reducing severance and improving connectivity and local travel patterns through provision of new walking and cycling routes.
- Improvements to the safety of existing WCH routes within the study area.
- Changes to journey times for WCHs accessing community resources, through the provision of new WCH routes, connections and crossing provisions.

Agricultural land and holdings

13.6.16 Other than potentially improving accessibility to agricultural land holdings, no potentially new or additional impacts are likely during operation.

Human Health

Environmental conditions relevant to human health

13.6.17 During operation, the population in the study area may be exposed to both increased and decreased levels of traffic noise at sensitive receptors including residential properties, schools, community facilities and open spaces. This may give rise to potential effects on health and wellbeing, including:

- Positive and negative effects on annoyance and sleep disturbance.
- Positive and negative effects on quality of life and mental wellbeing associated with the enjoyment of inside and outside space.

13.6.18 Potentially significant beneficial effects have been identified, resulting from decreases in NO₂ concentrations at locations along the existing A66 where traffic is diverted on the new route further away from sensitive receptors. This may give rise to potential effects on health and wellbeing including:

- Positive effects on respiratory health, particularly for vulnerable people such as children and people with existing health conditions.
- Positive effects on mental wellbeing due to reduced concern and anxiety in relation to the potential effects of traffic emissions.

13.6.19 The presence of the new road infrastructure may result in adverse visual and lighting impacts on sensitive receptors such as residential properties, open space, schools and community facilities. This may give rise to potential effects on health and wellbeing including:

- Negative effects on sleep disturbance as a result of lighting impacts.
- Negative effects on quality of life associated with changes in neighbourhood amenity and the perceived quality of the local environment.
- Indirect negative effects on mental and physical health arising from changes in behaviour, such as reductions in the level of walking and cycling or use of green spaces.

Severance, accessibility and the ability of communities to access community land

13.6.20 Reduced congestion along the A66 as a result of the project will improve journey times for local traffic. This may give rise to potential effects on health and wellbeing including:

- Improved accessibility and use of local shops and services (including healthcare), leading to positive effects on wellbeing and quality of life.
- Improved accessibility of employment sites leading to increased opportunities for employment and earnings, and associated improvements in quality of life and the ability to make healthier choices.
- Shorter commuting times, leading to positive effects on quality of life.
- Improved accessibility of public open space, sport and leisure facilities, leading to increases in the physical and mental health benefits associated physical activity, social interaction and contact with nature (positive effect).

13.6.21 Increases in local journey times due to the permanent stopping up and diversion of local roads and PRow. This may give rise to potential effects on health and wellbeing including:

- Reduction in the accessibility and use of local shops and services (including healthcare), leading to negative effects on wellbeing and quality of life.
- Reduction in the accessibility and use of public open space, sport and leisure facilities, leading to a decrease in the physical and mental health benefits associated physical activity, social interaction and contact with nature (negative effect).
- Increased journey times between communities, leading to negative wellbeing effects associated with reduced opportunities for social interaction.
- Reduction in the use of PRoW, leading to a temporary decrease in the physical and mental health benefits of physical activity.

13.7 Design, Mitigation and Enhancement Measures

Route wide

- 13.7.1 The project will be designed to minimise the land required temporarily and permanently. The right to compensation and methods/procedures for assessing appropriate levels of compensation will be undertaken in accordance with the Compensation Code. Appropriate consultation with landowners, occupiers and agents will continue as the project develops to manage and reduce impact on property owners as far as practicably possible.
- 13.7.2 The following mitigation hierarchy has been applied during the design process and will continue to be considered during the design, with the aim of reducing significant adverse effects:
- Avoidance and prevention: identifying alternatives that avoid the requirement to compulsorily purchase property, land and assets; identifying alternatives that avoid introducing or worsening severance and avoid reducing WCH provision and/or increasing journey times.
 - Reduction: minimising impacts on property, land and assets by selecting route alignments that avoid land take from the most sensitive receptors/aspects of receptors, thereby maintaining viability; altering route alignments to minimise severance to communities and disruption to WCH provision.
 - Remediation: where it is not possible to avoid or reduce a significant adverse effect, for example community sports pitches must be acquired to facilitate construction, provide equivalent facilities as close to the original location as possible, for example replacement Common Land or business premises.
- 13.7.3 Where possible, the design will continue to consider and develop opportunities to enhance the WCH network. Likewise, the design will investigate opportunities to enhance accessibility to and from local agricultural land holdings where appropriate.

Construction mitigation and enhancement

- 13.7.4 An Environmental Management Plan (EMP) will be prepared before any construction work commences. The EMP will include any mitigation identified or residual effects to be further addressed. A draft EMP will be submitted with the DCO, and an outline of what it will include is set out in Appendix 4.1: Outline of Environmental Management Plan.
- 13.7.5 The EMP will set out the procedures to be followed to ensure that impacts from noise, dust, lighting and construction traffic are reduced as far as reasonably practicable, to minimise impacts on local communities. It will include specified working hours and construction traffic routes. Requirements for appropriate notifications and signage in relation to temporary road closures and diversions will be set out.

- 13.7.6 The EMP will outline an appropriate induction to be given to ensure contractors act considerately in relation to local residents and businesses, particularly for any works that may be programmed to take place at night, or in relation to the transportation of construction equipment or waste material, to reduce construction related nuisance. It will include procedures for notifying local communities in advance of planned construction activities and set out a strategy for liaising with local communities, including responding to any complaints.
- 13.7.7 To minimise disruption to WCH provisions, temporary diversions will be put in place where necessary, together with appropriate signage. This will be carried out in consultation with the local highway authority and other interested stakeholders. Information about temporary closures and diversions will help to reduce inconvenience caused to users of PRoW.
- 13.7.8 Construction mitigation that may be necessary in relation to farm businesses may include:
- The reinstatement of land required on a temporary basis following construction.
 - The accommodation of harvesting periods in the construction programme where possible to account for potential crop loss.
 - Maintenance of farm access points where possible and reinstating these as soon as possible.
 - Minimising impacts of dust and noise on crops and livestock.
 - Minimise crop loss as far as possible by giving advanced warning of works to enable farmers to plan for potential field rotations.
 - Minimise impacts upon field drainage during the design phase by liaising with farmers to understand the needs of their agricultural practices.
- 13.7.9 The contractor will define the requirements relating to traffic management during the construction phase and this will consider access to residential areas, community facilities and well as businesses to reduce severance and disruption to local traffic movements.

Operational mitigation and enhancement

- 13.7.10 Detailed mitigation in relation to the environmental impacts of new road infrastructure and changes in traffic movements on local residents, businesses and sensitive community receptors is set out in the relevant assessment chapters. This includes Chapter 5: Air Quality, Chapter 10: Landscape and Visual Effects and Chapter 12: Noise and Vibration.
- 13.7.11 The need for additional signage beyond typical highway signage, for example to tourism assets such as Center Parcs and the Yorkshire Dales National Park or the Ministry of Defence helipad, will be discussed with Highways England and the Local Authorities as the design process continues.
- 13.7.12 In accordance with Section 131 of the Planning Act 2008, Highways England will propose areas of replacement land in exchange for the Common Land being compulsorily acquired. "Replacement land" is defined in Section 131(12) as land which is:
- Not less in area than the order land (the area proposed to be acquired)
 - No less advantageous to the persons, if any, entitled to rights of common or other rights
 - No less advantageous to the public.
- 13.7.13 The potential replacement of Common Land would meet the requirements of section 131. Whilst the replacement land is still under consideration, there is the potential

for the replacement land to be greater in size and more accessible to users than that which is lost. If larger or more accessible replacement land was able to be secured, that has the potential to help to increase open space and amenity land over and above the existing baseline. Any such measures will be incorporated into the final design and assessed within the ES, where practicable.

Appleby to Brough

13.7.14 The Ministry of Defence playing field and helipad, are both required for all alternatives. Relocation of the two has been discussed with the Ministry of Defence and an alternative site to the south of the Scheme, located off Castlehill Road, has been proposed. This site is likely to include a parking area, pavilion and storage shed; however, the details are still to be confirmed with the Ministry of Defence.

13.8 Assessment of the Likely Significant Effects

Route wide assessment

Population

13.8.1 The route wide assessment considers any effects likely to arise across all schemes and considers these effects cumulatively across the project.

Private property and housing – construction assessment

13.8.2 Residential receptors will be close to construction activities and may experience moderate adverse impacts as a result of construction related nuisance. This will be due to the change in tranquillity and access for the receptors.

13.8.3 Should the construction phase of the individual schemes coincide, there could be a cumulative effect of the disruption which cumulatively could increase the adverse impact upon private property and housing at a route wide level.

13.8.4 It should be noted that there is ongoing analysis in order to quantifying the sensitivity of the private property and housing baseline. This is being undertaken in line with *DMRB LA 112*. As such it is not possible at this stage to state the likely significance of effect, although they may be significant. The potential effects will be assessed and reported within the ES, where required.

Private property and housing – operation assessment

13.8.5 It is anticipated that some beneficial impacts are likely to be experienced by receptors that live in close proximity to and/or rely on the A66, as a result of the improved connectivity. The potential effects will be assessed and reported within the ES, where required.

Development land and businesses – construction assessment

13.8.6 During construction, it is anticipated that the project may temporarily disrupt access and result in amenity effects on assets where these lie in proximity to construction activities. The resulting effects will range from slight to large adverse, which may be significant.

13.8.7 Should the construction phase of the individual schemes coincide, there could be a cumulative effect of the disruption which cumulatively could increase the adverse impact upon development land and businesses at a route wide level. The effects could be significant and will be assessed fully within the ES.

Development land and businesses – operation assessment

13.8.8 It is anticipated that some beneficial impacts are likely to be experienced by receptors that rely on the A66 for access to businesses, due to the improvements in the road network. This is likely to result in a minor effect, which is not significant.

Community land and assets – construction assessment

13.8.9 During construction, it is anticipated that the project may temporarily disrupt access and result in amenity effects on assets where these lie in proximity to construction activities. This is likely to result in minor adverse effects at a scheme level.

13.8.10 Should the construction phase of the individual schemes coincide, there could be a cumulative effect of the disruption which cumulatively could increase the adverse impact upon community land and assets at a route wide level. The effects could be significant and will be assessed fully within the ES.

Community land and assets – operation assessment

13.8.11 During operation, it is anticipated that some beneficial impacts are likely to be experienced by receptors that rely on the A66 for access to community facilities, due to the improvements in the road network. This is likely to result in a minor effect, which is not significant.

Walkers, cyclists and horse-riders – construction assessment

13.8.12 During construction it is anticipated that the project may result in some adverse effects on amenity for WCH utilising the PRow network, due to the potential volume of construction traffic using roads and compounds within the study area. Temporary diversions will be required for PRow in close proximity to construction activities. This is likely to result in a negligible to major adverse effect on a scheme level.

13.8.13 Should the construction phase of the individual schemes coincide, there could be a cumulative effect of the disruption which cumulatively could increase the adverse impact, which will be assessed within the ES.

Walkers, cyclists and horse-riders – operation assessment

13.8.14 During operation, it is anticipated that the project may result in beneficial effects for some PRow where safer crossing points will be established, including provision of WCH provisions at new junctions. This is likely to result in a minor beneficial effect.

Agricultural land holdings – construction assessment

13.8.15 Construction of the project will result in adverse effects on agricultural holdings due to the extent of land take from agricultural land holdings across all of the schemes. The agricultural land holdings are also likely to have their access disrupted during construction.

13.8.16 The impact at a routewide level is not yet known and will be confirmed in the ES subject to finalisation of the design and completion of the agricultural land holdings assessment, but the effects are likely to be major adverse and therefore significant.

Agricultural land holdings – operation assessment

13.8.17 With the objectives of the project being to improve connectivity it is assumed that agricultural land holdings could experience beneficial effects at a routewide level. The improved connectivity could enable their products to be transported with greater ease. Equally it could also allow them to access their holdings more easily due to the provision of formal accesses across the project.

13.8.18 The impact at a routewide level is not yet known and will be confirmed in the ES subject to finalisation of the design and completion of the agricultural land holdings assessment, but the effects are likely to be minor beneficial.

Table 13-16: Routewide likely significant effects (Population)

Receptor	Potential Impacts (Construction)	Potential Impacts (Operation)	Design, Mitigation and Enhancement Measures	Likely Significant Effect Following Mitigation?
Private property and housing	Temporary disruption to access and adverse effects on amenity due to construction activities Note – ongoing analysis to quantify sensitivity of private property and housing baseline.	Improvements to A66 network and access to private property and housing	The EMP will manage and mitigate effects relating to access, disruption and nuisance.	Construction – Potentially (adverse). Due to ongoing analysis, it is not possible to state the likely significance of effect, although they may be likely. This will be reported within the ES where required.
Development land and businesses	Temporary disruption to access and adverse effects on amenity due to construction activities	Improvements to A66 network and access to businesses	The EMP will manage and mitigate effects relating to access, disruption and nuisance.	Construction – Yes (adverse)
Community land and assets	Temporary disruption to access and adverse effects on amenity due to construction activities	Improvements to A66 network and access to community facilities	The EMP will manage and mitigate effects relating to access, disruption and nuisance.	Construction – Yes (adverse)
Walkers, cyclists and horse-riders	Construction traffic and compounds impacting on amenity of PRow, temporary diversions	Safer crossings and additional WCH provisions	The EMP will manage and mitigate effects relating to access, disruption and nuisance.	Construction – Yes (adverse) No
Agricultural land holdings	Loss of agricultural holdings land, disruption to access	Improvements to A66 network and access to some holdings	The EMP will manage and mitigate effects relating to access, disruption and nuisance. The ES will include full agricultural land	Construction – Yes (adverse)

Receptor	Potential Impacts (Construction)	Potential Impacts (Operation)	Design, Mitigation and Enhancement Measures	Likely Significant Effect Following Mitigation?
			holdings assessment, including land holding interviews to further understand impacts	

Human health

Access to employment – construction assessment

13.8.19 A range of jobs will be generated during the construction programme. This will include unskilled and skilled construction jobs as well as engineering, planning and management professionals. The majority of professional and skilled workers are likely to come from outside the local area, with jobs available to the local population likely to comprise mainly low-skilled or unskilled positions. Individuals from within the study area who gain employment on the construction of the project may experience positive health effects including improved mental health and increased ability to access healthy lifestyle choices through increased income. There is a potential for long-term benefits to health and wellbeing through training and improved future employment prospects. Individuals who are currently unemployed or in low-paid or insecure employment will have the highest potential for health benefits. The total number of construction jobs, and the proportion of jobs likely to be available to the local community, are not known at this stage and therefore the health effect is assessed as neutral.

13.8.20 New spend within the local economy by construction workers is likely to benefit local businesses such as accommodation, retail and hospitality. While this is likely to be relatively small when compared with overall spend in the area, it could benefit local businesses for the duration of the construction programme. Increased spend in these sectors may lead to increased employment opportunities and incomes, leading to positive health effects. The scale of indirect employment has not been quantified and therefore the health effects are assessed as neutral.

Access to employment – operational assessment

13.8.21 Chapter 2 sets out the Project Objectives which include an objective to ‘seek to improve access to services and jobs for local road users and the local community’. During operation, communities within the study area are likely to benefit from shorter, more reliable journey times.¹⁶ Existing severance between the settlements along the routes resulting from congestion at peak times and occasional major disruption in the event of lane closures on the single carriageway sections will be reduced. This aims to support the growth of local businesses and improve commuting times for workers within the study area who travel to work in private vehicles or by public transport (bus) on the A66 and surrounding local road network. This has the potential to lead to improved access to employment and associated improvements to quality of life. Due to uncertainty at this stage about the scale of local employment and economic benefits, the health effect is assessed as neutral.

¹⁶ A66 Northern Trans-Pennine Project, Economic Appraisal Package, PCF Stage 2. Highways England (January 2020)

13.8.22 The likely health outcomes during construction and operation are summarised in Table 13-17: Route-wide – Likely health outcomes (construction) and Table 13-18: Route-wide – Likely health outcomes (operation) below.

Table 13-17: Route-wide – Likely health outcomes (construction)

Receptor	Sensitivity	Potential Impacts	Design, Mitigation and Enhancement Measures	Likely Health Outcomes Following Mitigation
Individuals within the communities along the route of the project	Medium	Opportunities for employment during the construction phase	None	Neutral
Individuals within the communities along the route of the project	Medium	Potential for increased earnings due to increased spend in the local economy during construction	None	Neutral

Table 13-18: Route-wide – Likely health outcomes (operation)

Receptor	Sensitivity	Potential Impacts	Design, Mitigation and Enhancement Measures	Likely Health Outcomes Following Mitigation?
Communities along the route of the project	Medium	Improved journey time reliability leading to business benefits and shorter commuting times	None	Neutral

M6 Junction 40 to Kemplay Bank

13.8.23 The effects have been assessed following consideration of the potential impact outlined in Section 13.5 and the mitigation measures in Section 13.6.

Population

Private property and housing – construction assessment

13.8.24 Residential receptors will be close to construction activities and may experience moderate adverse impacts as a result of construction related nuisance. This will be due to the change in tranquillity and access for the receptors.

13.8.25 It should be noted that there is ongoing analysis in order to quantifying the sensitivity of the private property and housing baseline. This is being undertaken in line with *DMRBLA 112*. As such it is not possible at this stage to state the likely significance of effect, although they may be significant. The potential effects will be assessed and reported within the ES, where required.

13.8.26 There are no properties located within the draft DCO boundary and no land take or demolitions will be required to accommodate the scheme. As a result, no significant effects are determined as a result of demolitions or land take.

13.8.27 One housing allocation lies within the draft DCO boundary; Land at Carleton Hall, which has a high sensitivity due to its size. Approximately 0.006% (0.0002ha) of the allocation lies within the draft DCO boundary which will be lost due to land take. The impact is negligible as the loss of land is very minor and is unlikely to prevent the housing allocation from being delivered. The resulting effects will be slight and not significant.

Private property and housing – operation assessment

13.8.28 It is acknowledged that during operation, the scheme would generally bring accessibility benefits in the wider area given the strategic importance of this section of the A66 and the reduced congestion and improved network resilience and safety that the scheme would deliver. This would result in a minor beneficial impact.

13.8.29 It should be noted that there is ongoing analysis in order to quantifying the sensitivity of the private property and housing baseline. This is being undertaken in line with *DMRBLA 112*. As such it is not possible at this stage to state the likely significance of effect, although they may be significant. The potential effects will be assessed and reported within the ES, where required.

Development land and businesses – construction assessment

13.8.30 Development land and business will be close to construction activities and may experience adverse impacts as a result of construction related nuisance. The sensitivity of the development land and businesses within the study area range from low to high as it is unlikely that any are larger than 5ha in size. The impact will be moderate adverse due to the change in tranquillity and access for the receptors. The resulting effects will therefore range from slight to large adverse, which may be significant.

13.8.31 This scheme will require minor land take from a number of businesses including Skirsgill Business Park, Skirsgill Business Park North and Gillian Way Business Park. Minor land take will also be required from other businesses including North Lakes Hotel & Spa, Skirsgill Depot Site 1 & 2 and Martin's Mini Movals store. The businesses have a medium sensitivity as despite the site being between one and five hectares, there are alternative provisions in the local area.

- 13.8.32 Although these receptors may be subject to land take and have access disrupted during construction, as the changes to operating conditions will not compromise overall viability of the business the impact will be minor adverse. The effects will therefore be slight, which is not significant.
- 13.8.33 One employment land allocation lies within the draft DCO boundary; Skirsgill Depot, which has a high sensitivity due to its size. Approximately 24% (0.81ha) of the allocation lies within the draft DCO boundary which will be lost due to land take. The impact will be minor adverse as it is likely that the allocation could still function for its intended purpose. The resulting effects will be moderate, which is significant, in order to ensure that the worst case scenario has been assessed.

Development land and businesses – operation assessment

- 13.8.34 During the operation of the scheme and its access arrangements, it is not considered that the development land and businesses identified within the study area would experience significant adverse effects, given access would be maintained to all receptors.
- 13.8.35 Some beneficial effects are likely to be experienced by businesses that rely upon access to the highway network and/or benefit from people travelling through the area. Operation of the scheme is therefore considered to lead to a minor beneficial impact for business receptors, which are of medium sensitivity. This would lead to a slight effect, which would not be significant.

Community land and assets – construction assessment

- 13.8.36 Construction of the scheme will be close to community land assets which may experience adverse impacts as a result of construction related nuisance. The sensitivity of the community land and assets within the study area will range from low to very high due to the availability of alternative facilities being in the local or wider local authority area. The impact will be moderate adverse due to the change in tranquillity and access for the receptors. The resulting effects will therefore range from slight to very large, which may be significant.
- 13.8.37 There are no demolitions of community assets anticipated with regards to this scheme. It is anticipated that a small portion of land take will be required from an area of open space (rugby pitch, Ullswater Community College) during construction to allow for temporary traffic diversions. The rugby pitch is of a medium sensitivity as it is only used during term time and the impact is anticipated to be minor, as the land take will affect the standoff areas and not the pitch itself. As such the effects are slight, which are not significant.
- 13.8.38 A portion of land take will be required from Wetheriggs Country Park, along the woodland edge adjacent to the existing A66. Additionally, a portion of land take is anticipated within Skirsgill Park. Both open spaces are of a very high sensitivity as they are likely to be used on a daily basis. However, the permanent land take required for the scheme is anticipated to be minor in comparison to the total size of the open spaces. As such the impact will be minor adverse which will be a moderate effect, which is significant. A slight effect has not been assigned in order to ensure that the worst case scenario has been assessed.
- 13.8.39 A portion of land take will be required from council owned land, that is currently occupied by the Happy Hooves Riding Centre. For the purposes of assessing the worst case scenario the receptor is of a very high value due to its likely daily use. During the construction of the scheme there will likely be large temporary adverse effects due to the associated noise and disruption. This could potentially leave the Centre unable to operate as the animals may be sensitive to such changes which

will affect users of the site. The impact will be major adverse as the Centre may not be usable during the construction phase, which will result in very large effects. Equally the size of the area required for mitigation planting could have a long term permanent effect on the viability of the Centre. The impact will be major adverse with the effects being very large, which is significant.....

- 13.8.40 A minor portion of land take is anticipated from the Kingdom Hall of Jehovah's Witnesses; however, no demolition will be required. For the purposes of assessing the worst case scenario the receptor is of a very high value due to its likely daily use. The impact is likely to be permanent adverse and minor, which will result in a large effect, which is significant under the worst case scenario assessment.

Community land and assets – operation assessment

- 13.8.41 It is possible that environmental mitigation around community land and assets could offer benefits to the receptors. For example, it could improve existing screening and vegetation for the users over and above the existing baseline. The detailed design is not yet known, and it is likely that such effects will not be greater than slight beneficial, which is not significant. However, the potential effects will be individually assessed and reported within the ES, where required.
- 13.8.42 During operation, the scheme is anticipated to lead to improvements in travel conditions. This would be particularly beneficial at peak times during summer months when congestion is often experienced, which could help remove a perceived barrier to accessibility, with associated benefits in terms of access to community facilities in the study area. The detailed design is not yet known, and it is likely that such effects will not be greater than slight beneficial, which is not significant. However, the potential effects will be individually assessed and reported within the ES, where required.

Walkers cyclists and horse riders – construction assessment

- 13.8.43 There is the potential for likely significant effects upon WCH as a result of the construction phase whereby PRoW could be impacted as a result of temporary closures and diversions due to direct land take, severance of PRoW and the provision of access routes. The impacts are likely to range from minor to major adverse however the full detail of temporary diversions is not yet known. The sensitivity of the existing WCH provisions range from low to very high due to the varied nature of their status ranging from local use to national trails.
- 13.8.44 As such there is the potential for effects to range from negligible to major adverse, which may be significant. Upon receipt of the final design for the ES, all potential effects will be assessed on an individual basis for WCH provisions.

Walkers cyclists and horse riders – operation assessment

- 13.8.45 The provision of new and realigned PRoW, alongside additional formal crossing points across the A66, is expected to impact on journey times and local travel patterns for WCH. Appropriate provisions for WCH are being incorporated into the design of the project, with the objectives of enabling safer crossing points across the A66 and maintaining or enhancing (where possible) the existing connectivity between PRoW, local roads and communities.
- 13.8.46 Under the requirement to assess the worst case scenario there is the potential for minor to major beneficial and adverse impacts as the full detail of permanent diversions is not yet known. The sensitivity of the existing WCH provisions range from low to very high due to the varied nature of their status ranging from local use to national trails.

13.8.47 As such there is the potential for effects to range from negligible to major positive and adverse, which may be significant. Upon receipt of the final design for the ES, all potential effects will be assessed on an individual basis for WCH provisions.

Agricultural land holdings – construction assessment

13.8.48 In line with *DMRB LA 112* the effects will be focused on the loss of or damage to key characteristics, features or elements of the agricultural holding and potential effect of this change on viability (such as removal or substantial amendment to access or acquisition of land).

13.8.49 Due to the absence of detailed agricultural land holdings assessments, the preliminary assessment is based on worst case assumptions in regard to the potential construction phase effects upon agricultural land holdings. Subsequently in order to assess a worst-case scenario, it is assumed that all agricultural land holdings within the draft DCO boundary, as identified in Section 13.5, will experience significant adverse effects.

13.8.50 Likely significant effects will occur where the assessment has identified that land take will be required either temporarily or permanently for the construction of the project. Areas of agricultural land are likely to be required to accommodate working areas, construction compounds and laydown areas, for short term use which could have a short term temporary significant effect. The potential implications on farm viability are yet to be assessed; however, it is expected that temporary land take could adversely affect the current operations and farming regimes of some agricultural farm units.

13.8.51 A conservative approach has been taken to the assessment of significant effects upon agricultural land holdings, to ensure a worst case scenario has been assessed, however, upon completion of the detailed Agricultural Land Holdings assessment, the assessment can be refined and the conclusions on significant effects reported in the ES may change and be reduced in significance. Likewise, where significant effects are identified they will be assessed on a scheme by scheme basis within the ES.

Agricultural land holdings – operation assessment

13.8.52 With the objectives of the project being to improve connectivity it is assumed that agricultural land holdings could experience beneficial effects as a result. The improved connectivity could enable their products to be transported with greater ease. Equally it could also allow them to access their holdings more easily due to the provision of formal accesses across the project. The impact of scheme benefits is not yet known and will be confirmed in the ES subject to finalisation of the design and completion of the agricultural land holdings assessment. The potential effects will be individually assessed and fully reported within the ES, where required.

Table 13-19: M6 Junction 40 to Kemplay Bank - likely significant effects (Population)

Receptor	Potential Impacts (Construction)	Potential Impacts (Operation)	Design, Mitigation and Enhancement Measures	Likely Significant Effect Following Mitigation?
Residential receptors within the study area	Construction related nuisance and disruption to access	Improved connectivity and accessibility.	The EMP will include construction and diversion measures to minimise disruption to the receptors.	Construction: No Operation: No
Development land and businesses	Construction may temporarily disrupt access for the businesses located within and immediately adjacent to the draft DCO boundary.	Improved connectivity for local businesses which improves access and logistics. The possibility to attract businesses to the area and enable developments to succeed.	The EMP will include construction and diversion measures to minimise disruption to the receptors.	Construction: No Operation: No
Community land and assets	Construction could temporarily disrupt access and result in amenity effects on assets where these lie in proximity to construction activities.	Improved screening and vegetation for the users over and above the existing baseline which enhances its attractiveness and usability Improved connectivity and accessibility.	The EMP will include construction and diversion measures to minimise disruption to the receptors.	Construction: No Operation: No
Walkers Cyclists and Horse Riders	Severance of PRoW and other WCH provisions due to the land required for the construction of the project.	Potential for additional formal crossing points across the A66, and improvements to WCH journey times, in some cases. Potential for increased journey times dependent	Further design refinement is required to minimise the temporary and permanent diversions. Where suitable diversions are not possible crossing provisions will be considered for inclusion in the design. .	Construction: Yes (adverse) Operation: Yes (adverse and/or beneficial)

Receptor	Potential Impacts (Construction)	Potential Impacts (Operation)	Design, Mitigation and Enhancement Measures	Likely Significant Effect Following Mitigation?
		upon the permanent scheme design.		
Agricultural land holdings	The loss of or damage to key characteristics, features or elements of the agricultural holding and potential effect of this change on viability	Improved for connectivity for local businesses which improves access and logistics.	Further design review to determine alterations to alignment to seek retention of this land	Construction: Yes (adverse) Operation: No
Skirsgill employment allocation, at land adjacent to Skirsgill Depot	Permanent loss of 0.81ha of the allocation, which is approximately 24% of the total land allocated.	Improved connectivity for local businesses which improves access and logistics. The possibility to attract businesses to the area and enable developments to succeed.	Further design review to minimise land take where possible.	Construction: Yes (adverse) Operation: No
Kingdom Hall of Jehovah's Witnesses	There is potential for a small amount of permanent land take required	Improved connectivity and accessibility.	The EMP will include construction and diversion measures to minimise access disruption to this receptor.	Construction: Yes (adverse) Operation: No
Rugby Pitch, Ullswater Community College	There is potential for a portion of permanent land take for construction of the scheme.	Improved screening and vegetation for the users over and above the existing baseline which enhances its attractiveness and usability Improved connectivity and accessibility.	The EMP will include construction management measures to minimise disruption to this receptor.	Construction: No Operation: No

Receptor	Potential Impacts (Construction)	Potential Impacts (Operation)	Design, Mitigation and Enhancement Measures	Likely Significant Effect Following Mitigation?
Wetheriggs Country Park	It is anticipated that a portion of land take will be permanently required for construction of the scheme, including the woodland edge of the park to be felled.	Improved connectivity and accessibility.	The EMP will include construction and diversion measures to minimise access disruption to this receptor.	Construction: Yes(adverse) Operation: No
Skirsgill Park	It is anticipated that a portion of land take will be required. This potentially could affect access to this section of the park.	Improved screening and vegetation for the users over and above the existing baseline which enhances its attractiveness and usability Improved connectivity and accessibility.	The EMP will include construction and diversion measures to minimise access disruption to this receptor. Further review of landscape and ecological mitigation to minimise land take from Skirsgill Park.	Construction: Yes (adverse) Operation: No
Happy Hooves Riding Centre	It is anticipated that a portion of land take will be permanently required, including land leased and owned by the occupier – Happy Hooves Riding Centre. Construction nuisance and disruption could impact the Centre’s ability to function due to the effects upon the animal. Both could permanently impact the operational viability of the Centre.	N/A	Further review of landscape and ecological mitigation to minimise land take from Happy Hooves Riding Centre. If this is not possible consultation with the landowner and tenant will identify if relocation of the premises is required.	Construction: Yes (adverse) Operation: No

Human health

Environmental conditions – construction assessment

- 13.8.53 There are residential areas and community resources close to the scheme, including areas of high deprivation (30% most deprived) for employment, health and disability. These areas include above average numbers of people who may be vulnerable to health effects. Older people, who are also prevalent within the study area, may be more vulnerable as they are more likely to suffer from existing health conditions. Based on a review of health and demographic baseline data, the population in the M6 Junction 40 to Kemplay Bank study area is considered to have medium to high sensitivity to health effects from environmental impacts.
- 13.8.54 The Air Quality Assessment (Chapter 5: Air Quality) has identified a large construction dust risk potential for high-sensitivity receptors within 100m of the draft DCO boundary. Residents on Clifford Road, Carleton Hall Road and Pategill Park will therefore be at risk of adverse impacts from dust nuisance. However, requirements for dust mitigation set out in Chapter 5: Air Quality are considered to remove any significant impacts and therefore the health effect is assessed as neutral.
- 13.8.55 At time of writing, due to the stage of the design, finalised construction and mass haul traffic data were not available. However, as reported in Chapter 5: Air Quality, a review of preliminary mass haul calculations indicates that the construction of the project is likely to generate significant HGV movements. Increased HGV movements are likely to give rise to negative effects on mental wellbeing due to a perceived reduction in the quality of the living environment and concerns about air quality and road safety.
- 13.8.56 As described in Chapter 12: Noise and Vibration, a full construction assessment of likely significant noise effects cannot be undertaken at this stage. Activities with the potential to generate significant noise effects are listed in Chapter 12: Noise and Vibration and residential properties on Clifford Road, Pategill Road, Carleton Hall Road and Carleton Hall Gardens in Penrith are likely to be impacted temporarily by construction noise. There are likely to be negative effects on wellbeing, including increased annoyance and reduced enjoyment of outside space. Those affected will include residents of impacted properties and people from the wider community who regularly use local footpaths and public spaces such as Wetheriggs Country Park and the Carleton Heights, Wetheriggs and Pategill Open Spaces.
- 13.8.57 Chapter 10: Landscape and Visual Effects, has identified a major visual impact on residential properties on Clifford Road and users of Wetheriggs Country Park and moderate impacts on users of PRow to the south of the A66, due to vegetation loss. Residents at the western end of Clifford Road will also experience impacts due to views of construction on Ullswater Road. Local residents are likely to experience negative wellbeing effects due to reduced satisfaction with their living environment as a result of combined visual and noise impacts. People who regularly use Wetheriggs Country Park and the affected PRow may experience reduced enjoyment of these resources and in some cases may be deterred from using them, resulting in reduced physical activity and access to green space.
- 13.8.58 It is not currently known whether any 24h construction activities will be required, which may lead to temporary sleep disturbance due to noise and lighting. It is assumed that lighting will be sensitively designed in accordance with the relevant standards to ensure that negative effects are minimised as far as practicable. However, at this stage, based on the proximity to receptors, likely negative effects

on wellbeing are identified for residents on Clifford Road, Carleton Hall Road and Pategill Park due to potential sleep disturbance.

Severance and accessibility – construction assessment

- 13.8.59 The study area includes rural communities who rely on the local road network to access services and facilities in Penrith. Areas of high deprivation for employment, health and disability will include above average numbers of people who may be vulnerable to reduced accessibility of services and facilities. Older people, who are prevalent within the study area, may be more vulnerable as they are more likely to suffer from existing health conditions and to depend on local services. The sensitivity of the population to severance and accessibility impacts is assessed as medium to high.
- 13.8.60 Direct (land take or demolition) impacts on community land and assets are described in the Population assessment above. There are no direct impacts that will prevent community resources from being accessed and used during the construction period.
- 13.8.61 Additional construction traffic and temporary lane closures during the construction of the underpass at Kemplay Bank are likely to cause some traffic delays during the construction period. Kemplay Bank Roundabout is adjacent to Penrith Hospital and Penrith Community Fire and Ambulance Station. Delays may result in increased journey times for vehicles, including ambulances, travelling to Penrith Hospital from the south via the A6, A66 and the A686 Carleton Avenue, and for emergency vehicles exiting the Community Fire and Ambulance Station directly onto the roundabout. This may result in a negative health effect resulting from temporarily increased emergency response times, affecting residents in Penrith and the surrounding rural communities. Negative effects on wellbeing may also arise from concern about potential delays to emergency vehicles, causing increased stress for some individuals within the community.
- 13.8.62 Access to shops and community facilities in Penrith by car or public transport (bus) from Eamont Bridge, Brougham and other rural communities to the south of the town may be disrupted periodically during the construction phase by traffic delays on Kemplay Bank Roundabout. This will affect access to facilities such as the Lakes Medical Practice, Penrith Leisure Centre and Ullswater Community College. Advanced notification of likely delays will enable people to allow additional journey time. While this may cause stress and annoyance, it is considered that the level of delay is unlikely to deter journeys to essential services.
- 13.8.63 The construction of the extended underpass from Carleton Avenue to the Police and Fire site (to the south of the A66) may result in temporary closure and diversion of the pedestrian route, which links the residential community to the north of Carleton Avenue with Carleton Hall Park to the south of the A66. This will temporarily restrict access to the park for residents in this area, leading to a negative effect on health due to reduced opportunities for physical activity, access to green space and social interaction.

Environmental conditions – operational assessment

- 13.8.64 The project will affect local air quality and levels of traffic noise through changes in traffic flow, speed and fleet composition. The Air Quality Assessment (Chapter 5: Air Quality) has identified small increases and decreases in NO_x and PM₁₀ concentrations at receptors close to the affected road network. Predicted concentrations will exceed the air quality objective for NO₂ as a result of the project at two residential receptors on Ullswater Road in Penrith. However, as the air quality across the study area is good and the number of sensitive receptors experiencing

changes in air quality is low, no significant air quality impacts have been identified in Chapter 5: Air Quality. Therefore, the health effect is assessed as neutral.

- 13.8.65 The noise and vibration assessment (Chapter 12: Noise and Vibration) has identified significant adverse effects on noise at 117 residential properties, most of which are located on Clifford Road, Pategill Park and Carleton Road. Those affected by adverse noise impacts will include residents of impacted properties and people from the wider community who regularly use local footpaths and public spaces such as Wetheriggs Country Park and the open space at Pategill. Negative wellbeing effects will include increased annoyance, reduced enjoyment of outside space and changes in the perception of the quality of the local living environment
- 13.8.66 The landscape and visual assessment (Chapter 10: Landscape and Visual Effects) has identified moderate adverse impacts on properties along Clifford Road and users of Wetheriggs Country Park during the first year of operation when planting will not yet be established, reducing to a minor impact over 15 years as planting becomes established. In the early stages of operation, visual impacts combined with increased traffic noise are likely to lead to negative wellbeing effects for local residents due to reduced satisfaction with their living environment. In the longer term, as vegetation becomes established and people get used to the presence of the new infrastructure and changes in traffic flows, negative wellbeing impacts will be reduced to neutral.
- 13.8.67 It is assumed that lighting will be sensitively designed in accordance with the relevant standards to ensure that negative effects are minimised as far as practicable. Since the M6 Junction 40 to Kemplay Bank scheme does not include any off-line highway sections, the health effects associated with lighting are assessed as neutral.

Severance and accessibility – operational assessment

- 13.8.68 During operation, traffic flows around Kemplay Bank Roundabout are likely to improve, leading to shorter and more reliable journey times. For communities on the south side of Penrith and the nearby settlements of Earmont Bridge and Brougham, this may improve access to local shops, services and facilities by car and public transport (bus). The extent of existing delays is not currently known and therefore any positive effects on health associated with reduced severance cannot be assessed at this stage.
- 13.8.69 The likely health outcomes during construction and operation are summarised in Table 13-20: M6 Junction 40 to Kemplay Bank - likely significant effects - construction (health) and Table 13-21 below.

Table 13-20: M6 Junction 40 to Kemplay Bank - likely significant effects - construction (health)

Receptor (including sensitivity)	Sensitivity	Potential Impacts	Design, Mitigation and Enhancement Measures	Likely Health Outcomes Following Mitigation
Residents on Clifford Road, Carleton Hall Road and Pategill Park	Medium to high	Construction dust	Dust mitigation requirements set out in Chapter 5: Air Quality	Neutral
Suburban and rural communities located close to construction traffic routes (locations not yet known)	Unknown	Increased HGV movements on the local road network Reduction in the quality of the living environment and concerns about air quality and road safety	Traffic management measures to be included in the ES	Negative effect on quality of life and wellbeing
Residents on Clifford Road, Pategill Road, Carleton Hall Road and Carleton Hall Gardens Users of local footpaths, Wetheriggs Country Park, Carleton Heights, Wetheriggs and Pategill Open Spaces	Medium to high	Construction noise (day-time)	Noise mitigation requirements set out in Chapter 12: Noise and Vibration	Negative effects
Residents on Clifford Road, users of local footpaths and Wetheriggs Country Park	Medium to high	Visual impact of vegetation clearance and construction activities	Visual mitigation requirements set out in Chapter 10: Landscape and Visual Effects	Negative
Residents on Clifford Road, Carleton Hall Road and Pategill Park	Medium to high	Night-time construction lighting and noise	Visual and noise mitigation requirements set out in Chapters 10 and 12	Negative
Residents to the south of Penrith	Medium to high	Temporary traffic delays at Kemplay Bank Roundabout affecting journeys to Penrith Hospital, and emergency vehicles exiting the Community Fire and Ambulance Station	The EMP will include construction and diversion measures to minimise access disruption	Negative

Receptor (including sensitivity)	Sensitivity	Potential Impacts	Design, Mitigation and Enhancement Measures	Likely Health Outcomes Following Mitigation
Residents to the south of Penrith	Medium to high	Temporary traffic delays at Kemplay Bank Roundabout reducing access by car/bus to community facilities in Penrith	The EMP will include construction and diversion measures to minimise access disruption	Negative
Residents to the north of Carleton Avenue	Medium to high	Temporary disruption of pedestrian access to Carleton Hall Park via the Carleton Avenue underpass.	The EMP will include construction and diversion measures to minimise access disruption	Negative

Table 13-21: M6 Junction 40 to Kemplay Bank - likely significant effects - operational (health)

Receptor	Sensitivity	Potential Impacts	Design, Mitigation and Enhancement Measures	Likely Health Outcomes Following Mitigation
Residents close to the affected road network	Medium to high	Small increases and decreases in NOx and PM10 concentrations	None	Neutral
Residents on Clifford Road, Pategill Park and Carleton Road, users of local footpaths, Wetheriggs Country Park and Pategill Open Space	Medium to high	Increased traffic noise	Noise mitigation requirements set out in Chapter 12: Noise and Vibration	Negative effect on quality of life and wellbeing.
Residents on Clifford Road and users of Wetheriggs Country Park	Medium to high	Visual impact of vegetation clearance and new road infrastructure	Visual mitigation requirements set out in Chapter 10: Landscape and Visual Effects	Negative effect on quality of life and wellbeing.
Residents on Clifford Road	Medium to high	Increased light pollution and glare from road lighting	Compliance with relevant standards for lighting design	Neutral
Residents to the south of Penrith	Medium to high	Improved access to community facilities due to improved traffic flows around Kemplay Bank Roundabout	None	Positive effect on quality of life and wellbeing

Penrith to Temple Sowerby

Population

Private property and housing – construction assessment

- 13.8.70 Residential receptors will be close to construction activities and may experience adverse impacts as a result of construction related nuisance. The impact will be moderate due to the change in tranquillity and access for the receptors. High Barn Cottage will also be demolished in order to accommodate the scheme.
- 13.8.71 It should be noted that there is ongoing analysis in order to quantifying the sensitivity of the private property and housing baseline. This is being undertaken in line with *DMRB LA 112*. As such it is not possible at this stage to state the likely significance of effect, although they may be significant. The potential effects will be assessed and reported within the ES, where required.

Private property and housing – operation assessment

- 13.8.72 The likely significant effects upon private property and housing during operation for this scheme are the same as those reported for the M6 Junction 40 to Kemplay Bank scheme, see paragraphs **Error! Reference source not found.** to 13.8.29.

Development land and businesses – construction assessment

- 13.8.73 The likely significant effects upon development land and businesses for all alternatives during construction are the same as those reported for the M6 Junction 40 to Kemplay Bank scheme, see paragraph 13.8.30.
- 13.8.74 In addition to this, as a result of works to widen the carriageway, which will affect the parking space available to the business, the Llama Karma Kafe and Llamas Pyjamas businesses will close, and the land associated with them will be acquired by Highways England. Both businesses have a medium sensitivity, due to the size of their land being less than one hectare. The magnitude of impact is therefore major adverse, and the resulting effects are large which is significant, in order to account for assessing the worst case scenario.
- 13.8.75 Following consultation with the landowner at Llama Karma Kafe, an agreement in principle has been reached regarding the acquisition of the land. As a result of the agreement in principle and through the application of professional judgement the impact is downgraded to minor adverse, with the resulting effects being slight, which is not significant.
- 13.8.76 This scheme will require minor land take from Fairweather Oak and Phoenix Furniture Restoration which are located directly adjacent to the existing A66 at Whinfall. The businesses have a medium sensitivity due to their size. Although these receptors may be subject to land take, it is anticipated to be a minor adverse impact as the changes to operating conditions will not compromise the overall viability of the businesses. The resulting effects are slight, which is not significant.
- 13.8.77 The construction works in the area are major and there could be significant disruption to the local network which could restrict visitor access to Center Parcs. The site is a key business and tourist destination in the local region and has a very high sensitivity. Whilst the impacts could be managed through the EMP it is possible that there will be minor adverse impacts due to access disruption which could deter visitors. The impacts will be temporary and adverse resulting in a moderate effect, which is significant.

Development land and businesses – operational assessment

- 13.8.78 The likely significant effects upon development and businesses for this scheme are the same as those reported for the M6 Junction 40 to Kemplay Bank scheme, see paragraphs 13.8.34 to 13.8.35.
- 13.8.79 In addition to this a major compact grade-separated junction will be constructed at Center Parcs to connect this facility with the new alignment of the A66. This will improve access to Center Parcs and the local road network. The junction will cater for all movements on and off the A66, making it easier and safer for users to join the main highway and preventing tail backs at peak times. Center Parcs is of a very high sensitivity due to its size and the improvements to access will represent a minor beneficial impact which will be a moderate effect, which is significant.

Community land and assets – construction assessment

- 13.8.80 Construction of the scheme will be close to community land assets which may experience adverse impacts as a result of construction related nuisance. The sensitivity of the community land and assets within the study area will range from low to high due to the availability of alternative facilities being in the local or wider local authority area. The impact will be moderate adverse due to the change in tranquillity and access for the receptors. The resulting effects will therefore range from slight to large, which may be significant.
- 13.8.81 There are no demolitions or land take associated with this scheme. Therefore, there are no likely significant effects anticipated for community land and assets with regards to this scheme.

Community land and assets – operation assessment

- 13.8.82 The likely significant effects upon community land and assets for operation are the same as those reported for the M6 Junction 40 to Kemplay Bank scheme, see paragraphs 13.8.41 to 13.8.42.

Walkers, Cyclists and Horse-riders – construction and operation assessment

- 13.8.83 The likely significant effects upon WCH for construction and operation are the same as those reported for the M6 Junction 40 to Kemplay Bank scheme, see paragraphs 13.8.43 to 13.8.47.

Agricultural land holdings – construction and operation assessment

- 13.8.84 The likely significant effects upon agricultural land holdings for this scheme are the same as those reported for the M6 Junction 40 to Kemplay Bank scheme, see paragraphs 13.8.48 to 13.8.52.

Table 13-22: Penrith to Temple Sowerby (Center Parcs) - likely significant effects (population)

Receptor	Potential Impacts (Construction)	Potential Impacts (Operation)	Design, Mitigation and Enhancement Measures	Likely Significant Effect Following Mitigation?
Residential receptors within the study area	Construction related nuisance and disruption to access	Improved connectivity and accessibility.	The EMP will include construction and diversion measures to minimise disruption to the receptors.	Construction: No Operation: No
Development land and businesses	Construction may temporarily disrupt access for the businesses located within and immediately adjacent to the draft DCO boundary.	Improved connectivity for local businesses which improves access and logistics. The possibility to attract businesses to the area and enable developments to succeed.	The EMP will include construction and diversion measures to minimise disruption to the receptors.	Construction: No Operation: No
Community land and assets	Construction could temporarily disrupt access and result in amenity effects on assets where these lie in proximity to construction activities.	Improved screening and vegetation for the users over and above the existing baseline which enhances its attractiveness and usability Improved connectivity and accessibility.	The EMP will include construction and diversion measures to minimise disruption to the receptors.	Construction: No Operation: No
Walkers Cyclists and Horse Riders	Severance of PRow and other WCH provisions due to the land required for the construction of the project.	Potential for additional formal crossing points across the A66, and improvements to WCH journey times, in some cases. Potential for increased journey times dependent upon the permanent scheme design.	Further design refinement is required to minimise the temporary and permanent diversions. Where suitable diversions are not possible crossing provisions will be considered for inclusion in the design.	Construction: Yes (adverse) Operation: Yes (adverse and/or beneficial)

Receptor	Potential Impacts (Construction)	Potential Impacts (Operation)	Design, Mitigation and Enhancement Measures	Likely Significant Effect Following Mitigation?
Agricultural land holdings	The loss of or damage to key characteristics, features or elements of the agricultural holding and potential effect of this change on viability	Improved for connectivity for local businesses which improves access and logistics.	Further design review to determine alterations to alignment to seek retention of this land	Construction: Yes (adverse) Operation: No
High Barn Cottage	Direct acquisition and demolition of the property as a result of construction of the mainline for this scheme.	N/A	N/A	Construction: Potentially (adverse). Due to ongoing analysis, it is not possible to state the likely significance of effect, although they may be likely. This will be reported within the ES where required.
Llama Karma Kafe and Llama Pyjamas	The receptor will be demolished due to the construction of the scheme.	N/A	An agreement in principle between Highways England and the landowner has been reached, whereby the land will be acquired prior to construction.	No
Fairweather Oak and Phoenix Furniture Restoration	There is potential that permanent land take will be required for the construction of the scheme	N/A	The EMP will include construction and diversion measures to minimise access disruption to this receptor.	Construction: No
Center Parcs Whinfell Forest	Disruption to the local road network due to the construction of the scheme may impact visitors accessing the facility.	Improved access due to the provision of a new junction.	The EMP will include construction and diversion measures to minimise access disruption to this receptor.	Construction: Yes (adverse) Operation: Yes (beneficial)

Human health

Environmental conditions – construction assessment

- 13.8.85 The Penrith to Temple Sowerby area has a low population density. Older people, who are prevalent within the study area, may be more vulnerable as they are more likely to suffer from existing health conditions. Based on a review of health and demographic baseline data, the Penrith to Temple Sowerby area is considered to have medium sensitivity to health effects from environmental impacts.
- 13.8.86 The Air Quality Assessment (Chapter 5: Air Quality) has identified a large construction dust risk potential for high-sensitivity receptors within 100m of the draft DCO boundary. Residents at Whinfall Park, High Barn and Whinfall House will therefore be at risk of adverse impacts on wellbeing from dust nuisance. Requirements for dust mitigation set out in Chapter 5 are considered to remove any significant impacts and therefore the health effects are assessed as neutral.
- 13.8.87 At time of writing, due to the stage of the design, finalised construction and mass haul traffic data were not available. However, as reported in Chapter 5: Air Quality, a review of preliminary mass haul calculations indicates that the construction of the project is likely to generate significant HGV movements. Due to low population density, the health effects of increased HGV movements within the Penrith to Temple Sowerby area are assessed as neutral.
- 13.8.88 As described in Chapter 12: Noise and Vibration, a full construction assessment of likely significant noise effects cannot be undertaken at this stage. Activities with the potential to generate significant noise effects are listed in Chapter 12: Noise and Vibration. The noise and vibration assessment identifies potential significant effects at residential properties including houses on Moor Lane, Lightwater, Whinfall Park, High Barn and Whinfall House. There are likely to be negative effects on the wellbeing of residents in the study areas including increased annoyance and reduced enjoyment of outside space.
- 13.8.89 Chapter 10: Landscape and Visual Effects has identified significant visual construction effects on residents in properties at Moor Lane, Lightwater, Whinfall Park, Lane End. Those affected may experience reduced enjoyment of views from their properties. There are no impacts on settlements or community resources, and the number of individual properties affected is low, therefore the health effect is assessed as neutral.
- 13.8.90 It is not currently known whether any 24h construction activities will be required, which may lead to temporary sleep disturbance due to noise and lighting. At this stage, based on the nature of the works and proximity to receptors, the likely health effects are assessed as neutral.

Severance and accessibility – construction assessment

- 13.8.91 The study area comprises rural communities who rely on the local road network to access services and facilities in Penrith. Older people, who are prevalent within the study area, may be more vulnerable as they are more likely to suffer from existing health conditions, to use local services and to depend on public transport. The sensitivity of the Penrith to Temple Sowerby population to severance and accessibility impacts is assessed as medium to high.
- 13.8.92 Direct (land take or demolition) impacts on community land and assets are described in the Population assessment above. There are no direct impacts that will prevent community resources from being accessed and used during the construction period.

- 13.8.93 As described in the route-wide assessment of impacts on WCH, there is a potential for PRoW to be impacted as a result of temporary closures and diversions due to direct land take and the provision of diversions. Such impacts will have the potential to affect access to green space, opportunities for physical activity and the ability to access community resources by active travel, resulting in impacts on health and wellbeing. Due to the low population density in the Penrith to Temple Sowerby study area, the likely health effects associated with impacts on PRoW is considered to be neutral.
- 13.8.94 Additional construction traffic and temporary lane closures during the dualling of the A66 is likely to cause some traffic delays along this single carriageway stretch of road during the construction period. This could also affect the local road network due to delays at junctions with the A66 and traffic taking alternative routes. The extent of any delays is not known, and traffic management measures will be implemented during construction to minimise any adverse impacts as far as possible. Advanced notification of likely delays will enable people to allow additional journey time. Temporary traffic disruption is likely to reduce access to community facilities, shops and services in Penrith for rural communities travelling by private vehicle or public transport (bus). Traffic disruption may deter some people from travelling to access services and facilities. Although the number of people deterred from travelling is likely to be low, this is likely to cause a negative health, particularly for older people. Stress and annoyance caused by traffic disruption is also likely to cause a temporary negative effect on wellbeing.

Environmental conditions – operational assessment

- 13.8.95 The project has the potential to affect local air quality and levels of traffic noise through changes to road alignment traffic flow, speed and fleet composition. The Air Quality Assessment (Chapter 5: Air Quality) has identified small increases and decreases in NO_x and PM₁₀ concentrations at receptors close to the affected road network. However, as the air quality across the study area is good and the number of sensitive receptors experiencing changes in air quality is low, no significant air quality impacts have been identified for the Penrith to Temple Sowerby area in Chapter 5: Air Quality. Therefore, the health effect is assessed as neutral.
- 13.8.96 Significant adverse and beneficial effects on operational traffic noise have been identified in the noise and vibration assessment (Chapter 12: Noise and Vibration), as follows:
- Adverse effects on 12 residential receptors.
 - Beneficial effects on 4 residential receptors.
 - A beneficial effect on one non-residential receptor
- 13.8.97 There will be beneficial effects on a small number of residents in areas where levels of traffic noise will be reduced, although the health effect is assessed as neutral due to the small number of properties affected by noise reductions. Negative effects on wellbeing may arise from an increase in the number of people experiencing annoyance due to noise and the perception of the quality of the local living environment for some people in the affected properties.
- 13.8.98 The landscape and visual assessment (Chapter 10: Landscape and Visual Effects) has identified significant visual impacts in the first year of operation at one property on Moor Lane, a group of properties at Foxgloves and Lightwater Cottages, three cottages at Whinfell Park and five properties at Lane End. There are no visual impacts identified within settlements or at community resources. The affected rural residents may experience negative effects on wellbeing due to reduced enjoyment of views from their properties and a reduction in quality of life. In the longer term, as

vegetation becomes established and people get used to the presence of new infrastructure, the visual impacts will be reduced. The effect on wellbeing for residents of the affected properties is assessed as negative.

- 13.8.99 At this stage of the design there is not sufficient detail to enable an assessment of the health effects of lighting. It is assumed that lighting will be sensitively designed in accordance with the relevant standards to ensure that negative effects are minimised as far as possible. Due to the small number of properties in proximity to the alignment, and the presence of the existing A66, the likely health effect associated with amenity and sleep disturbance is assessed as neutral.

Severance and accessibility – operational assessment

- 13.8.100 During operation, traffic flows will improve along the dualled A66 leading to shorter, more reliable journey times. Local severance issues where the local road network intersects with the A66, causing delays and road safety issues, will be reduced. This is likely to improve access to community facilities, shops and services in Penrith for rural communities travelling by private vehicle or public transport (bus). This will lead to a range of benefits by reducing stress for travellers and enabling greater access to the benefits of community resources, such as social interaction, access to essential services, green space, sport and leisure. This is assessed as a positive health effect.
- 13.8.101 Significant visual impacts are predicted on rural PRoW, which may reduce enjoyment of these resources and in some cases deter their use. However, it is considered that alternative routes will be used by recreational users, enabling continued access to green space and physical activity. The health effect of visual impacts on PRoW is assessed as neutral.
- 13.8.102 The likely health outcomes during construction and operation are summarised in Table 13-23: Penrith to Temple Sowerby - likely significant effects - construction (health) and Table 13-24: Penrith to Temple Sowerby - likely significant effects - operational (health) below.

Table 13-23: Penrith to Temple Sowerby - - likely significant effects - construction (health)

Receptor (including sensitivity)	Sensitivity	Potential Impacts	Design, Mitigation and Enhancement Measures	Likely Health Outcomes Following Mitigation
Residents on Whinfell Park, High Barn and Whinfell House	Medium	Construction dust	Dust mitigation requirements set out in Chapter 5: Air Quality	Neutral
Communities located close to construction traffic routes (locations not yet known)	Unknown	Increased HGV movements on the local road network	Details of traffic management measures to be included in the ES.	Neutral
Residents on Moor Lane, Lightwater, Whinfell Park, High Barn and Whinfell House	Medium	Construction noise (day-time)	Noise mitigation requirements set out in Chapter 12: Noise and Vibration	Negative effect on quality of life and wellbeing
Residents on Moor Lane, Lightwater, Whinfell Park, Lane End	Medium	Visual impact of vegetation clearance and construction activities	Visual mitigation requirements set out in Chapter 10: Landscape and Visual Effects	Neutral
Rural communities located close to construction works in the Penrith to Temple Sowerby study area	Medium	Night-time construction lighting and noise	Visual mitigation requirements set out in Chapter 10: Landscape and Visual Effects	Neutral
Users of rural PRoW in the Penrith to Temple Sowerby study area	Medium to high	Temporary PRoW disruption	The EMP will include construction and diversion measures to minimise access disruption	Neutral
Residents in the Penrith to Temple Sowerby study area	Medium to high	Temporary traffic delays affecting access from rural communities to Penrith.	The EMP will include construction and diversion measures to minimise access disruption	Negative effect on quality of life and wellbeing

Table 13-24: Penrith to Temple Sowerby - likely significant effects - operational (health)

Receptor	Sensitivity	Potential Impacts	Design, Mitigation and Enhancement Measures	Likely Health Outcomes Following Mitigation?
Residents close to the affected road network	Medium	Small increases and decreases in NOx and PM10 concentrations	None	Neutral
Residents close to the affected road network	Medium	Increased traffic noise	Noise mitigation requirements set out in Chapter 12: Noise and Vibration	Negative effect on quality of life and wellbeing
Residents and users of non – residential receptors close to the affected road network	Medium	Decreased traffic noise	None	Neutral
Residents on Moor Lane, Foxgloves and Lightwater Cottages, Whinfell Park and Lane End	Medium	Visual impact of vegetation clearance and new road infrastructure	Visual mitigation requirements set out in Chapter 10: Landscape and Visual Effects	Negative effect on quality of life and wellbeing
Residents close to the Penrith to Temple Soweby alignment	Medium	Increased light pollution and glare from road lighting	Compliance with relevant standards for lighting design	Neutral
Residents in the Penrith to Temple Sowerby study area	Medium to high	Improved access to community facilities shops and services in Penrith for rural communities.	None	Positive effect on quality of life and wellbeing
Users of rural PRoW the Penrith to Temple Sowerby study area	Medium	Visual impacts on rural PRoW	Visual mitigation requirements set out in Chapter 10: Landscape and Visual Effects	Neutral

Temple Sowerby to Appleby

Population

All routes

Private property and housing – operation assessment

13.8.103 The likely significant effects upon private property and housing during operation for this scheme are the same as those reported for the M6 Junction 40 to Kemplay Bank scheme, see paragraphs **Error! Reference source not found.** to 13.8.29.

Development land and assets – operational assessment

13.8.104 The likely significant effects upon development and businesses for all routes are the same as those reported for the M6 Junction 40 to Kemplay Bank scheme, see paragraphs 13.8.34 to 13.8.35.

13.8.105 In addition to this, all routes propose a new junction which will be provided at Main Street to the north east of Kirkby Thore. The junction will maintain the key local connection onto the A66 and also provide private access to the British Gypsum plant, a very high sensitivity site. This will be a minor beneficial impact upon the business through the provision of a bespoke access route whereby the HGV vehicles do not have to navigate through Kirkby Thore, which will have a moderate effect, which is significant.

Community land and assets – operation assessment

13.8.106 The likely significant effects upon community land and assets for the operation of all routes are the same as those reported for the M6 Junction 40 to Kemplay Bank Roundabout scheme, see paragraphs 13.8.41 to 13.8.42.

Walkers, cyclists and horse-riders – construction and operation assessment

13.8.107 The likely significant effects upon WCH for construction and operation are the same as those reported for the M6 Junction 40 to Kemplay Bank scheme, see paragraphs 13.8.43 to 13.8.47.

Agricultural land holdings – construction and operation assessment

13.8.108 The likely significant effects upon agricultural land holdings for this scheme are the same as those reported for the M6 Junction 40 to Kemplay Bank scheme, see paragraphs 13.8.48 to 13.8.52.

Blue alternative

Private property and housing – construction assessment

13.8.109 Residential receptors will be close to construction activities and may experience adverse impacts as a result of construction related nuisance. The impact will be moderate adverse due to the change in tranquillity and access for the receptors. Winthorn House and Dunelm House will be demolished in order to accommodate the Blue alternative.

13.8.110 It should be noted that there is ongoing analysis in order to quantifying the sensitivity of the private property and housing baseline. This is being undertaken in line with *DMRBLA 112*. As such it is not possible at this stage to state the likely significance of effect, although they may be significant. The potential effects will be assessed and reported within the ES, where required.

13.8.111 Two housing allocations lie within the draft DCO boundary: Land adjacent to primary school and Townhead, which have a high and medium sensitivity respectively. Approximately 8.21% (0.08ha) of the Land adjacent to primary school allocation lies

within the draft DCO boundary and 9.65% (0.06ha) of the Townhead allocation lies within the draft DCO boundary.

13.8.112 The land take from Land adjacent to primary school is determined to be a minor adverse impact due to the minor loss of land, which will result in a moderate effect, in order to ensure that the worst case scenario has been assessed.

13.8.113 The land take from Townhead is determined to be a minor adverse impact as it will not compromise the viability of the allocation, which will result in a slight effect.

Development land and assets – construction assessment

13.8.114 The likely significant effects upon development land and businesses during construction are the same as those reported for the M6 Junction 40 to Kemplay Bank scheme, see paragraph 13.8.30.

13.8.115 In addition to this, the Blue alternative will require minor land take from Kirkby Thore Industrial Estate and Greenacres Filling Station both of which are of a medium sensitivity due to their size. Although the receptors are subject to land take the impacts are anticipated to be minor adverse and will not impact upon their operational viability. As such the effects are slight, which is not significant.

Community land and assets – construction assessment

13.8.116 Construction of the scheme will be close to community land assets which may experience adverse impacts as a result of construction related nuisance. The sensitivity of the community land and assets within the study area will range from low to high due to the availability of alternative facilities being in the local or wider local authority area. The impact will be moderate adverse due to the change in tranquillity and access for the receptors. The resulting effects will therefore range from slight to very large, which may be significant.

13.8.117 There are no demolitions associated with the Blue alternative. However, a portion of land take will be required at Fair Hill (off Appleby Bypass), which is used annually by Appleby Horse Fair. The site is of a medium sensitivity as it is likely to be used on a weekly basis when considering an average annual usage. The impact is anticipated to be minor as the site could still be used during construction and operation. The resulting effects will be slight adverse, which is not significant.

13.8.118 The Blue alternative will also require land take from an area of Common Land (Common Moss, Temple Sowerby). The site is of a high sensitivity as it could be used on a daily basis. The impact is anticipated to be minor adverse as the site could still be used during construction and operation. The resulting effects will be moderate which is significant, when assessing the worst case scenario.

Table 13-25: Temple Sowerby to Appleby Blue alternative - likely significant effects (population)

Receptor	Potential Impacts (Construction)	Potential Impacts (Operation)	Design, Mitigation and Enhancement Measures	Likely Significant Effect Following Mitigation?
Residential receptors within the study area	Construction related nuisance and disruption to access	Improved connectivity and accessibility.	The EMP will include construction and diversion measures to minimise disruption to the receptors.	Construction: No Operation: No
Development land and businesses	Construction may temporarily disrupt access for the businesses located within and immediately adjacent to the draft DCO boundary.	Improved connectivity for local businesses which improves access and logistics. The possibility to attract businesses to the area and enable developments to succeed.	The EMP will include construction and diversion measures to minimise disruption to the receptors.	Construction: No Operation: No
Community land and assets	Construction could temporarily disrupt access and result in amenity effects on assets where these lie in proximity to construction activities.	Improved screening and vegetation for the users over and above the existing baseline which enhances its attractiveness and usability Improved connectivity and accessibility.	The EMP will include construction and diversion measures to minimise disruption to the receptors.	Construction: No Operation: No
Walkers Cyclists and Horse Riders	Severance of PRoW and other WCH provisions due to the land required for the construction of the project.	Potential for additional formal crossing points across the A66, and improvements to WCH journey times, in some cases. Potential for increased journey times dependent upon the permanent scheme design.	Further design refinement is required to minimise the temporary and permanent diversions. Where suitable diversions are not possible crossing provisions will be considered for inclusion in the design. .	Construction: Yes (adverse) Operation: Yes (adverse and/or beneficial)

Receptor	Potential Impacts (Construction)	Potential Impacts (Operation)	Design, Mitigation and Enhancement Measures	Likely Significant Effect Following Mitigation?
Agricultural land holdings	The loss of or damage to key characteristics, features or elements of the agricultural holding and potential effect of this change on viability	Improved for connectivity for local businesses which improves access and logistics.	Further design review to determine alterations to alignment to seek retention of this land	Construction: Yes (adverse) Operation: No
Winthorn House	Direct acquisition and demolition of the property as a result of construction of the mainline for this alternative.	N/A	N/A	Construction: Potentially (adverse). Due to ongoing analysis, it is not possible to state the likely significance of effect, although they may be likely. This will be reported within the ES where required.
Dunelm House	Direct acquisition and demolition of the property as a result of construction of the mainline for this alternative.	N/A	N/A.	Construction: Potentially (adverse). Due to ongoing analysis, it is not possible to state the likely significance of effect, although they may be likely. This will be reported within the ES where required.
Appleby Horse Fair	Potential for a portion of land to be required permanently for construction of the scheme.	N/A	Further design review to determine alterations to alignment to seek retention of this land	Construction: No
Common Moss	Potential for a portion of land to be required for this scheme during construction.	N/A	Further design review to determine alterations to alignment to seek retention of this land	Construction: Yes (adverse)

Red alternative

Private property and housing – construction assessment

- 13.8.119 Residential receptors will be close to construction activities and may experience adverse impacts as a result of construction related nuisance. The impact will be moderate adverse due to the change in tranquillity and access for the receptors. Winthorn House will be demolished in order to accommodate the Red alternative.
- 13.8.120 It should be noted that there is ongoing analysis in order to quantifying the sensitivity of the private property and housing baseline. This is being undertaken in line with *DMRB LA 112*. As such it is not possible at this stage to state the likely significance of effect, although they may be significant. The potential effects will be assessed and reported within the ES, where required.
- 13.8.121 Two housing allocations lie within the draft DCO boundary: Land adjacent to primary school and Townhead, which have a high and medium sensitivity respectively. Approximately 8.21% (0.08ha) of the Land adjacent to primary school allocation lies within the draft DCO boundary whilst all of the Townhead allocation lies within the draft DCO boundary.
- 13.8.122 The land take from Land adjacent to primary school is determined to be a minor adverse impact due to the partial loss of land, which will result in a moderate effect, in order to ensure that the worst case scenario has been assessed.
- 13.8.123 The land take from Townhead is determined to be a major adverse impact as due to the complete loss of the allocated land, which will result in a large effect, in order to ensure that the worst case scenario has been assessed.

Development land and assets – construction assessment

- 13.8.124 The likely significant effects upon development land and businesses during construction are the same as those reported for the M6 Junction 40 to Kemplay Bank scheme, see paragraph 13.8.30.
- 13.8.125 In addition to this, the Red alternative will require minor land take from Kirkby Thore Industrial Estate and Greenacres Filling Station both of which are of a medium sensitivity due to their size. Although the receptors are subject to land take the impacts are anticipated to be minor adverse and will not impact upon their operational viability. As such the effects are slight, which are not significant.

Community land and assets – construction assessment

- 13.8.126 The likely significant effects upon community land and assets for the Red alternative during construction is the same as those reported for the Blue alternative, see paragraphs 13.8.116 to 13.8.118.

Table 13-26: Temple Sowerby to Appleby Red alternative - likely significant effects (population)

Receptor	Potential Impacts (Construction)	Potential Impacts (Operation)	Design, Mitigation and Enhancement Measures	Likely Significant Effect Following Mitigation?
Residential receptors within the study area	Construction related nuisance and disruption to access	Improved connectivity and accessibility.	The EMP will include construction and diversion measures to minimise disruption to the receptors.	Construction: No Operation: No
Development land and businesses	Construction may temporarily disrupt access for the businesses located within and immediately adjacent to the draft DCO boundary.	Improved connectivity for local businesses which improves access and logistics. The possibility to attract businesses to the area and enable developments to succeed.	The EMP will include construction and diversion measures to minimise disruption to the receptors.	Construction: No Operation: No
Community land and assets	Construction could temporarily disrupt access and result in amenity effects on assets where these lie in proximity to construction activities.	Improved screening and vegetation for the users over and above the existing baseline which enhances its attractiveness and usability Improved connectivity and accessibility.	The EMP will include construction and diversion measures to minimise disruption to the receptors.	Construction: No Operation: No
Walkers Cyclists and Horse Riders	Severance of PRoW and other WCH provisions due to the land required for the construction of the project.	Potential for additional formal crossing points across the A66, and improvements to WCH journey times, in some cases. Potential for increased journey times dependent upon the permanent scheme design.	Further design refinement is required to minimise the temporary and permanent diversions. Where suitable diversions are not possible crossing provisions will be considered for inclusion in the design. .	Construction: Yes (adverse) Operation: Yes (adverse and/or beneficial)

Receptor	Potential Impacts (Construction)	Potential Impacts (Operation)	Design, Mitigation and Enhancement Measures	Likely Significant Effect Following Mitigation?
Agricultural land holdings	The loss of or damage to key characteristics, features or elements of the agricultural holding and potential effect of this change on viability	Improved for connectivity for local businesses which improves access and logistics.	Further design review to determine alterations to alignment to seek retention of this land	Construction: Yes (adverse) Operation: No
Winthorn House	Direct acquisition and demolition of the property as a result of construction of the mainline for this alternative.	N/A	N/A	Construction: Potentially (adverse). Due to ongoing analysis, it is not possible to state the likely significance of effect, although they may be likely. This will be reported within the ES where required.
Townhead housing allocation	Entire allocation lies within the draft DCO boundary and will be required for the construction of the scheme.	N/A	Further design review to minimise land take where possible.	Construction: Yes (adverse)
Appleby Horse Fair	Potential for a portion of land to be required permanently for construction of the scheme.	N/A	Further design review to determine alterations to alignment to seek retention of this land	Construction: No
Common Moss	Potential for a portion of land to be required for this scheme during construction.	N/A	Further design review to determine alterations to alignment to seek retention of this land	Construction: Yes (adverse)

Orange alternative

Private property and housing – construction assessment

- 13.8.127 Residential receptors will be close to construction activities and may experience adverse impacts as a result of construction related nuisance. The impact will be moderate due to the change in tranquillity and access for the receptors. Bridge End Farmhouse will be demolished in order to accommodate the Orange alternative.
- 13.8.128 It should be noted that there is ongoing analysis in order to quantifying the sensitivity of the private property and housing baseline. This is being undertaken in line with *DMRB LA 112*. As such it is not possible at this stage to state the likely significance of effect, although they may be significant. The potential effects will be assessed and reported within the ES, where required.
- 13.8.129 Two housing allocations lie within the draft DCO boundary: Land adjacent to primary school and Townhead, which have a high and medium sensitivity respectively. Approximately 30.87% (0.31ha) of the Land adjacent to primary school allocation lies within the draft DCO boundary whilst approximately 4.2% (0.03ha) of the Townhead allocation lies within the draft DCO boundary.
- 13.8.130 The land take from Land adjacent to primary school is determined to be a moderate adverse impact due to the partial loss of land, which will result in a large effect, in order to ensure that the worst case scenario has been assessed.
- 13.8.131 The land take from Townhead is determined to be a minor adverse impact as it will not compromise the viability of the allocation, which will result in a slight effect.

Development land and assets – construction assessment

- 13.8.132 The likely significant effects upon development land and businesses during construction are the same as those reported for the M6 Junction 40 to Kemplay Bank scheme, see paragraph 13.8.30.
- 13.8.133 In addition to this, the Orange alternative will require minor land take from - United Utilities sewage works, Kirkby Thore Filling *Station* located on Cross End, Kirkby Thore Industrial Estate, Bridge End Inn all of which are of a medium sensitivity due to their size. Although the receptors are subject to land take the impacts are anticipated to be minor adverse and will not impact upon their operational viability. As such the effects are slight, which are not significant.

Community land and assets – construction assessment

- 13.8.134 Construction of the scheme will be close to community land assets which may experience adverse impacts as a result of construction related nuisance. The sensitivity of the community land and assets within the study area will range from low to very high due to the availability of alternative facilities being in the local or wider local authority area. The impact will be moderate adverse due to the change in tranquillity and access for the receptors. The resulting effects will therefore range from slight to very large, which may be significant.
- 13.8.135 There are no demolitions associated with this alternative. This alternative will require land take from National Trust site (Acorn Bank), an area of Common Land (Common Moss, Temple Sowerby) and Piper Lane Recreational Ground. The receptors are likely to be of a very high value and used on daily basis. The impact is likely to be minor adverse as the land take is minor in comparison to the total size of the community assets; and the areas will still potentially be usable although their amenity value will have decreased. The effects are therefore likely to be large, which is

significant. A moderate effect has not been assigned in order to ensure that the worst case scenario has been assessed.

- 13.8.136 It should be noted that the land required from Acorn Bank and Common Moss is to facilitate the inclusion of a PRoW within the design. Following further design refinement for the ES, the effects may not be reported as significant if the design integrates the PRoW into the local landscape.

Table 13-27: Temple Sowerby to Appleby Orange alternative - likely significant effects (population)

Receptor	Potential Impacts (Construction)	Potential Impacts (Operation)	Design, Mitigation and Enhancement Measures	Likely Significant Effect Following Mitigation?
Residential receptors within the study area	Construction related nuisance and disruption to access	Improved connectivity and accessibility.	The EMP will include construction and diversion measures to minimise disruption to the receptors.	Construction: No Operation: No
Development land and businesses	Construction may temporarily disrupt access for the businesses located within and immediately adjacent to the draft DCO boundary.	Improved connectivity for local businesses which improves access and logistics. The possibility to attract businesses to the area and enable developments to succeed.	The EMP will include construction and diversion measures to minimise disruption to the receptors.	Construction: No Operation: No
Community land and assets	Construction could temporarily disrupt access and result in amenity effects on assets where these lie in proximity to construction activities.	Improved screening and vegetation for the users over and above the existing baseline which enhances its attractiveness and usability Improved connectivity and accessibility.	The EMP will include construction and diversion measures to minimise disruption to the receptors.	Construction: No Operation: No
Walkers Cyclists and Horse Riders	Severance of PRoW and other WCH provisions due to the land required for the construction of the project.	Potential for additional formal crossing points across the A66, and improvements to WCH journey times, in some cases. Potential for increased journey times dependent upon the permanent scheme design.	Further design refinement is required to minimise the temporary and permanent diversions. Where suitable diversions are not possible crossing provisions will be considered for inclusion in the design.	Construction: Yes (adverse) Operation: Yes (adverse and/or beneficial)

Receptor	Potential Impacts (Construction)	Potential Impacts (Operation)	Design, Mitigation and Enhancement Measures	Likely Significant Effect Following Mitigation?
Agricultural land holdings	The loss of or damage to key characteristics, features or elements of the agricultural holding and potential effect of this change on viability	Improved for connectivity for local businesses which improves access and logistics.	Further design review to determine alterations to alignment to seek retention of this land	Construction: Yes (adverse) Operation: No
Bridge End Farmhouse	Direct acquisition and demolition of the property as a result of construction of the mainline for this alternative.	N/A	N/A	Construction: Potentially (adverse). Due to ongoing analysis, it is not possible to state the likely significance of effect, although they may be likely. This will be reported within the ES where required.
Land adjacent to primary school allocation	Approximately 30% of this allocation lies within the draft DCO boundary, temporary land take will be required for the construction of the scheme.	N/A	Further design review to minimise land take where possible.	Construction: Yes (adverse)
Acorn Bank (National Trust)	Potential for a portion of land to be required for this scheme during construction.	N/A	Further design review to determine alterations to alignment to seek retention of this land or integrate the PRoW into the local landscape	Construction: Yes (adverse)
Common Moss	Potential for a portion of land to be required for this scheme during construction.	N/A	Further design review to determine alterations to alignment to seek retention of this land or integrate the PRoW into the local landscape	Construction: Yes (adverse)

Receptor	Potential Impacts (Construction)	Potential Impacts (Operation)	Design, Mitigation and Enhancement Measures	Likely Significant Effect Following Mitigation?
Piper Lane Recreational ground	Potential for a portion of land to be required for this scheme during construction.	N/A	Further design review to determine alterations to alignment to seek retention of this land	Construction: Yes (adverse)

Human health

Environmental conditions – construction assessment

- 13.8.137 There are residential areas and community resources, including a primary school, close to the scheme alternatives at Kirkby Thore. Children and older people, who are prevalent within the study area, may be particularly vulnerable as they are more likely to suffer from existing health conditions. Based on a review of health and demographic data, the Temple Sowerby to Appleby area is considered to have medium to high sensitivity to health effects from environmental impacts.
- 13.8.138 The Air Quality Assessment (Chapter 5: Air Quality) has identified a large construction dust risk potential for high-sensitivity receptors within 100m of the draft DCO boundary. Residents on Chapel Thorpe Street, Priest Lane, Dunfell View and within Kirkby Thore and Crackenthorpe, as well as staff and pupils at Kirkby Thore Primary School and Temple Sowerby C of E Primary School, will therefore be at risk of adverse impacts on wellbeing from dust nuisance. Requirements for dust mitigation set out in Chapter 5: Air Quality are considered to remove any significant impacts and therefore the health effects are assessed as neutral.
- 13.8.139 At time of writing, due to the stage of the design, finalised construction and mass haul traffic data were not available. However, as reported in Chapter 5: Air Quality, a review of preliminary mass haul calculations indicates that the construction of the project is likely to generate significant HGV movements. Increased HGV movements have are likely to give rise to negative effects on mental wellbeing due to a perceived reduction in the quality of the living environment and concerns about air quality and road safety.
- 13.8.140 As described in Chapter 12: Noise and Vibration, a full construction assessment of likely significant noise effects cannot be undertaken at this stage. Activities with the potential to generate significant noise effects are listed in Chapter 12: Noise and Vibration. Residential properties on Main Street, Cross Street, Dunfell View, Townhead Garth, Sanderson Croft, The Sands, Bongate and Roman Road are likely to be impacted temporarily by construction noise. Those affected will include residents of impacted properties, as well as people from the local community who may be exposed to noise in the public realm. Noise impacts are also identified at a number of rural properties throughout the scheme. There are likely to be negative effects on wellbeing including increased annoyance and reduced enjoyment of outside space.
- 13.8.141 Chapter 10: Landscape and Visual Effects has identified major visual impacts on residential properties of Kirkby Thore and Spital Farms, as well as properties between Low Moor and Kirkby Thore for all three route alternatives. Those affected will include residents of impacted properties and others from the local community who may experience adverse visual impacts within the public realm. Local people are likely to experience negative wellbeing effects due to reduced satisfaction with their living environment due to the combination of noise and visual impacts.
- 13.8.142 It is not currently known whether any 24h construction activities will be required, which may lead to temporary sleep disturbance due to noise and lighting. At this stage, based on the nature of the works and proximity to receptors, it is considered that there is a potential for negative health effects at Kirkby Thore.

Severance and accessibility – construction assessment

- 13.8.143 The study area includes rural communities who rely on the local road network to access services and facilities in local centres such as Kirkby Thore and Appleby-in-

Westmoreland. Older people, who are prevalent within the study area, may be more vulnerable as they are more likely to suffer from existing health conditions, to use local services and to depend on public transport. The sensitivity of the population to severance and accessibility impacts is assessed as medium to high.

- 13.8.144 Direct (land take or demolition) impacts on community land and assets are described in the Population assessment above. There are no direct impacts that will prevent community resources from being accessed and used during the construction period.
- 13.8.145 As described in the route-wide assessment of impacts on WCH, there is a potential for PRow to be impacted as a result of temporary closures and diversions due to direct land take and the provision of diversions. Such impacts will have the potential to affect access to green space, opportunities for physical activity and the ability to access community resources by active travel, resulting in negative effects on health and wellbeing.
- 13.8.146 Additional construction traffic and temporary lane closures during the dualling of the A66 is likely to cause some traffic delays along this single carriageway stretch of road during the construction period. This could also affect the local road network due to delays at junctions with the A66 and traffic taking alternative routes. The extent of any delays is not known, and traffic management measures will be implemented during construction to minimise any adverse impacts as far as possible. Advanced notification of likely delays will enable people to allow additional journey time. Temporary traffic disruption is likely to reduce access to community facilities, shops and services in the settlements along the route via private vehicles or public transport (bus), particularly for rural communities. . Traffic disruption may deter some people from travelling to access services and facilities. Although the number of people deterred from travelling is likely to be low, this is likely to cause a negative health effect, particularly for older people. Stress and annoyance caused by traffic disruption is also likely to cause a temporary negative effect on wellbeing.

Environmental conditions – operational assessment

- 13.8.147 The project will affect local air quality and levels of traffic noise through changes to road alignment, traffic flow, speed and fleet composition. The Air Quality Assessment (Chapter 5: Air Quality) has identified small increases and decreases in NO_x and PM₁₀ concentrations at receptors close to the affected road network. However, as the air quality across the study area is good and the number of sensitive receptors experiencing changes in air quality is low, no significant air quality impacts have been identified in Chapter 5: Air Quality. Therefore, the health effect is assessed as neutral.
- 13.8.148 Significant adverse effects on noise associated with the three route alternatives have been identified in the noise and vibration assessment (Chapter 12: Noise and Vibration), as follows:
- Blue alternative: 276 residential receptors, mainly in central Kirkby Thore and Appleby-in-Westmorland, as well as four non-residential receptors near Kirkby Thore and 26 PRow located close to the scheme.
 - Red alternative: 167 residential receptors, mainly in Kirkby Thore, as well as four non-residential receptors near Kirkby Thore and 26 PRow located close to the scheme.
 - Orange alternative: 20 residential receptors, mainly located to the north of the existing A66 and at Kirkby Thore Bridge End, as well as three non-residential receptors near Kirkby Thore and 21 PRow located close to the scheme.

13.8.149 Significant beneficial effects on noise associated with the three route alternatives have been identified in the Noise and Vibration assessment, as follows:

- Blue alternative: 121 residential receptors, mainly along the existing A66 alignment at Kirkby Thore and Crackenthorpe, as well as eight non-residential receptors near Kirkby Thore and Crackenthorpe and three PRow located close to the scheme.
- Red alternative: 178 residential receptors, mainly located near to the Main Street or Cross Street in Kirkby Thore and throughout Crackenthorpe, as well as seven non-residential receptors in Kirkby Thore and Crackenthorpe and four PRow located close to the scheme.
- Orange alternative: 61 residential receptors, mainly located near to the existing A66 and at Crackenthorpe, as well as four non-residential receptors in Crackenthorpe and one PRow located close to the scheme.

13.8.150 Those affected by adverse or beneficial noise impacts will include residents of affected properties, users of affected community resources and people from the local community who will experience changes in the level of noise within the public realm. Both negative and positive effects on wellbeing will arise from changes in the number of people experiencing annoyance due to noise, the level of enjoyment of outside space and the perception of the quality of the local living environment.

13.8.151 The landscape and visual assessment (Chapter 10: Landscape and Visual Effects) has identified major adverse visual impacts on the community of Kirkby Thore for all three alternatives, and impacts ranging from minor to major on individual rural properties along the length of the scheme for all three alternatives. All three alternatives will have major visual impacts on PRow at Kirkby Thore and rural areas to the east; at Temple Sowerby the Blue and Red alternatives will have moderate impacts on PRow and the Orange alternative will have minor impacts. Impacts will reduce over time as planting becomes established and people become accustomed to new infrastructure; however, impacts at Kirkby Thore will remain major for the Orange alternative and moderate for the Blue and Red alternatives at Year 15. Impacts on a number of rural residential properties will also remain moderate at Year 15, with some locations remaining major adverse for the Orange alternative.

13.8.152 In the early stages of operation, visual impacts combined with increased traffic noise are likely to lead to negative wellbeing effects for local residents due to reduced satisfaction with their living environment. In the longer term, as vegetation becomes established and people get used to the presence of the new infrastructure and changes in traffic flows, negative wellbeing impacts will be reduced but negative effects on wellbeing at Kirkby Thore and some rural locations will remain.

13.8.153 At this stage of the design there is not sufficient detail to enable an assessment of the health effects of lighting. It is assumed that lighting will be sensitively designed in accordance with the relevant standards to ensure that negative effects are minimised as far as practicable. However, at this stage, based on the proximity of the three alternatives to receptors in Kirkby Thore, likely negative effects on wellbeing are identified due to potential sleep disturbance.

Severance and accessibility – operational assessment

13.8.154 During operation, traffic flows will improve along the A66 and de-trunked sections of the existing single-carriageway alignment leading to shorter, more reliable journey times. Local severance issues where the local road network intersects with the A66, causing delays and road safety issues, will be reduced. This is likely to improve access to local shops, services and facilities by car and public transport (bus) for communities throughout the scheme area, particularly in and around Kirkby Thore.

This will lead to a range of benefits by reducing stress for travellers and enabling greater access to the benefits of community resources, such as social interaction, access to essential services, green space, sport and leisure. This is assessed as a positive health effect.

- 13.8.155 The landscape and visual assessment has identified significant visual impacts on rural PRoW., The amenity value of footpaths to the north and east of Kirkby Thore will be affected by traffic noise and visual impacts from the blue and red alternatives, which may reduce enjoyment of these resources and in some cases deter their use. This is assessed as a negative health and wellbeing effect due to a potential reduction in opportunities for physical activity and access to green space.
- 13.8.156 The likely health outcomes during construction and operation are summarised in Table 13-28: Temple Sowerby to Appleby - likely significant effects - construction (health) and Table 13-29: Temple Sowerby to Appleby - likely significant effects - operational (health) below. The assessment applies to all alternative routes unless stated.

Table 13-28: Temple Sowerby to Appleby - likely significant effects - construction (health)

Receptor (including sensitivity)	Sensitivity	Potential Impacts	Design, Mitigation and Enhancement Measures	Likely Health Outcomes Following Mitigation
Residents on Chapel Thorpe Street, Priest Lane, Dunfell View and within Kirkby Thore and Crackenthorpe, staff and pupils at Kirkby Thore Primary School and Temple Sowerby Church of England Primary School	Medium to high	Construction dust	Dust mitigation requirements set out in Chapter 5: Air Quality	Neutral
Communities located close to construction traffic routes (locations not yet known)	Unknown	Increased HGV movements on the local road network	Details of traffic management measures to be included in the ES.	Neutral
Residents on Main Street, Cross Street, Dunfell View, Townhead Garth, Sanderson Croft, The Sands, Bongate and Roman Road and users of community facilities close to the scheme	Medium	Construction noise (day-time)	Noise mitigation requirements set out in Chapter 12: Noise and Vibration	Negative effect on quality of life and wellbeing
Residents of properties in Kirkby Thore, Spital Farmsand between Low Moor and Kirkby Thore	Medium	Visual impact of vegetation clearance and construction activities	Visual mitigation requirements set out in Chapter 10: Landscape and Visual Effects	Negative effect on quality of life and wellbeing
Communities located close to construction works, including residents of Kirkby Thore	Medium	Night-time construction lighting and noise	Visual mitigation requirements set out in Chapter 10: Landscape and Visual Effects	Negative effect on quality of life and wellbeing

Receptor (including sensitivity)	Sensitivity	Potential Impacts	Design, Mitigation and Enhancement Measures	Likely Health Outcomes Following Mitigation
Users of PRoW in and around Kirkby Thore	Medium	Temporary PRoW disruption	The EMP will include construction and diversion measures to minimise access disruption	Negative effect on quality of life and wellbeing
Residents in rural areas within the Temple Sowerby to Appleby study area	Medium	Temporary traffic delays affecting access from rural communities to services and facilities	The EMP will include construction and diversion measures to minimise access disruption	Negative effect on quality of life and wellbeing

Table 13-29: Temple Sowerby to Appleby - likely significant effects - operational (health)

Receptor	Sensitivity	Potential Impacts	Design, Mitigation and Enhancement Measures	Likely Health Outcomes Following Mitigation?
Residents and users of community facilities close to the affected road network	Medium to high	Small increases and decreases in NOx and PM10 concentrations	None	Neutral
Residents and users of community facilities close to the scheme and the affected road network, particularly in Kirkby Thore	Medium to high	Increased traffic noise	Noise mitigation requirements set out in Chapter 12: Noise and Vibration	Negative effect on quality of life and wellbeing
Residents and users of community facilities close to the existing A66 alignment	Medium	Decreased traffic noise	None	Positive effect on quality of life and wellbeing
Residents and users of community facilities in the study area, particularly in Kirkby Thore	Medium	Visual impact of vegetation clearance and new road infrastructure	Visual mitigation requirements set out in Chapter 10: Landscape and Visual Effects	Negative effect on quality of life and wellbeing
Residents close to the Temple Soweby to Appleby alignment, particularly in Kirkby Thore	Medium	Increased light pollution and glare from road lighting	Compliance with relevant standards for lighting design	Negative effect on health and wellbeing due to sleep disturbance

Receptor	Sensitivity	Potential Impacts	Design, Mitigation and Enhancement Measures	Likely Health Outcomes Following Mitigation?
Residents in the Temple Sowerby to Appleby study area	Medium to high	Improved access to community facilities shops and services for rural communities due to improved traffic flows on the A66.	None	Positive effect on quality of life and wellbeing
Users of PRow in and around Kirkby Thore and Crackenthorpe	Medium	Visual impacts on rural PRow	Visual mitigation requirements set out in Chapter 10: Landscape and Visual Effects	Negative effect on health and wellbeing

Appleby to Brough

Population

All Alternatives

Private property and housing – operation assessment

13.8.157 The likely significant effects upon private property and housing during operation for this scheme are the same as those reported for the M6 Junction 40 to Kemplay Bank scheme, see paragraphs **Error! Reference source not found.** to 13.8.29.

Development land and assets – operational assessment

13.8.158 The likely significant effects upon development and businesses for all alternatives are the same as those reported for the M6 Junction 40 to Kemplay Bank scheme, see paragraphs 13.8.34 to 13.8.35.

13.8.159 All alternatives will also provide a new dedicated access to Café Sixty-Six, a medium sensitivity receptor due to its size. This could improve access to the business for customers with the impact considered to be a minor beneficial change. This would lead to a slight effect, which would not be significant

Community land and assets – construction assessment

13.8.160 All alternatives will require full land take of a recreational field used by the Ministry of Defence, at Warcop including a Ministry of Defence helipad. All alternatives will require additional permanent land take from the Ministry of Defence. The receptors are of very high sensitivity, as alternatives are only available outside the local planning authority area. The impact will be major adverse due to the lack of substitutability with the effects therefore being very large, which is significant.

13.8.161 However, both the recreational field and helipad are to be re-provided to the south of the existing A66 by way of mitigation. The replacement helipad will need to be operational prior to the closure of the existing asset. This will ensure that significant effects are avoided as the re-provided services will be operational prior to the closing of the existing field and helipad.

13.8.162 All alternatives will require permanent land take from three areas of Common Land including Platts Green, Sandford Mire and Ketland Common. The areas are of a medium sensitivity as it is likely they are used on a weekly basis. The impact is anticipated to be minor adverse. This is due to the fact that the land is required for environmental mitigation and it is assumed that through an appropriate design the land will continue to function as common land. The resulting effects will be slight, which is not significant.

13.8.163 At Ketland Common the permanent land take will be to facilitate the construction of the scheme provision of environmental mitigation. The area of land take from Ketland Common is minor and there are opportunities adjacent to the site to provide replacement land, which are assumed to be readily available to mitigate the minor loss of land. As such the impact is also anticipated to be minor adverse and the resulting effects will be slight, which is not significant.

13.8.164 All alternatives will require temporary land take from Barn End Caravan Park (behind Taylor & Braithwaite) to provide a haulage route during construction. The site is of a medium sensitivity as on average across a calendar year, taking account of high and low tourism seasons, it is likely to be used on a weekly basis. The impact is anticipated to be moderate adverse upon the Caravan Park as it could still be used during construction, but it will be disrupted. The resulting effects will be moderate adverse, which is significant.

Community land and assets – operation assessment

13.8.165 The likely significant effects upon community land and assets for all alternatives during operation are the same as those reported for the M6 Junction 40 to Kemplay Bank Roundabout scheme, see paragraphs 13.8.41 to 13.8.42.

13.8.166 In addition to this, the relocated Ministry of Defence recreational field and helipad, will be situated to the south of the existing A66. During operation it is possible that users of the site may not know how it is accessed or that it has in fact been relocated. The receptor is of very high sensitivity and the impact could be major adverse which will lead to very large effects, which is significant. However, with suitable mitigation such as appropriate signage and liaisons with the users of the site prior to its relocation such impacts could be reduced to negligible adverse with only slight effects, which is not significant.

Walkers, cyclists and horse-riders – operation assessment

13.8.167 The likely significant effects upon WCH during, for all alternatives during operation, are the same as those reported for the M6 Junction 40 to Kemplay Bank scheme, see paragraphs 13.8.45 to 13.8.47.

Agricultural land holdings – construction and operation assessment

13.8.168 The likely significant effects upon agricultural land holdings for this scheme are the same as those reported for the M6 Junction 40 to Kemplay Bank scheme, see paragraphs 13.8.48 to 13.8.52.

Black – Black - Black route

Private property and housing – construction assessment

13.8.169 The likely significant effects upon private property and housing during operation for this scheme are the same as those reported for the M6 Junction 40 to Kemplay Bank scheme, see paragraphs 13.8.24 to 13.8.26.

13.8.170 There are no properties or housing allocations located within the draft DCO boundary and no land take or demolitions will be required to accommodate the scheme. As a result, no significant effects are determined.

Development land and businesses – construction assessment

13.8.171 The likely significant effects upon development land and businesses for the Black-Black-Black route during construction are the same as those reported for the M6 Junction 40 to Kemplay Bank scheme, see paragraph 13.8.30.

13.8.172 In addition, the Black – Black - Black-Black-Black Route will require minor land take from a number of businesses including Taylor Braithwaite (located along an access road towards Dyke Nook) and an unnamed business (Apple Tree Barn, located along an access road leading to West View), both of which are of a medium sensitivity due to their size. The land take is only deemed to be a minor adverse impact as the changes to operating conditions will not compromise overall viability of the businesses. The effects are therefore slight, which is not significant.

13.8.173 Café Sixty-Six, a medium sensitivity receptor due to its size, will require a new permanent dedicated access to the café as a result of the Black-Black-Black – Black - Black route. This will require permanent land take which will result in a minor adverse impact with a slight effect, which is not significant. The impact is deemed to be minor as the land loss will result in a minor amendment to the access arrangements and will not compromise the overall viability of the business.

Walkers, cyclists and horse-riders – construction assessment

- 13.8.174 There is the potential for likely significant effects upon WCHs as a result of the construction phase whereby by PRow could be impacted as a result of temporary closures and diversions due to direct land take, severance of PRow and the provision of access routes.
- 13.8.175 Bridleway BW 350/021 has a medium sensitivity in line with *DMRB LA 112* as it is largely a recreational route where alternative routes could be sought. The bridleway will be permanently diverted by 960m during the construction phase due to the construction of the scheme. Permanent diversion of this bridleway is assessed to have a major adverse impact, which is of moderate significance. A large significant effect is not anticipated as the Bridleway is not a national or regional trail. Similarly, users of the Bridleway are likely to committed to a long recreational walk, as opposed to using it for commuting purposes.

Table 13-30: Appleby to Brough (Warcop) Black-Black-Black route - likely significant effects (population)

Receptor	Potential Impacts (Construction)	Potential Impacts (Operation)	Design, Mitigation and Enhancement Measures	Likely Significant Effect Following Mitigation?
Residential receptors within the study area	Construction related nuisance and disruption to access	Improved connectivity and accessibility.	The EMP will include construction and diversion measures to minimise disruption to the receptors.	Construction: No Operation: No
Development land and businesses	Construction may temporarily disrupt access for the businesses located within and immediately adjacent to the draft DCO boundary.	Improved connectivity for local businesses which improves access and logistics. The possibility to attract businesses to the area and enable developments to succeed.	The EMP will include construction and diversion measures to minimise disruption to the receptors.	Construction: No Operation: No
Community land and assets	Construction could temporarily disrupt access and result in amenity effects on assets where these lie in proximity to construction activities.	Improved screening and vegetation for the users over and above the existing baseline which enhances its attractiveness and usability Improved connectivity and accessibility.	The EMP will include construction and diversion measures to minimise disruption to the receptors.	Construction: No Operation: No
Walkers Cyclists and Horse Riders	Severance of PRow and other WCH provisions due to the land required for the construction of the project.	Potential for additional formal crossing points across the A66, and improvements to WCH journey times, in some cases. Potential for increased journey times dependent upon the permanent scheme design.	Further design refinement is required to minimise the temporary and permanent diversions. Where suitable diversions are not possible crossing provisions will be considered for inclusion in the design.	Construction: Yes (adverse) Operation: Yes (adverse and/or beneficial)

Receptor	Potential Impacts (Construction)	Potential Impacts (Operation)	Design, Mitigation and Enhancement Measures	Likely Significant Effect Following Mitigation?
Agricultural land holdings	The loss of or damage to key characteristics, features or elements of the agricultural holding and potential effect of this change on viability	Improved for connectivity for local businesses which improves access and logistics.	Further design review to determine alterations to alignment to seek retention of this land	Construction: Yes (adverse) Operation: No
Café Sixty-Six	Loss of land as a result of the construction of a new dedicated access. There will be associated construction disruption whilst the works are completed.	Improved access arrangements to the business	Access and disruption will be managed by the EMP.	Construction: No Operation: No
Ministry of Defence Recreational Field	Loss of recreational field – direct acquisition of land for the scheme.	N/A	A replacement recreational field has been proposed and discussed with the Ministry of Defence, accessed off Castlehill Road.	Construction: No Operation: No
Ministry of Defence	Potential permanent loss of land - – direct acquisition of land for the scheme	N/A	Further design review to minimise land take where possible.	Construction: Yes (adverse)
Ministry of Defence Helipad	Loss of use/access during construction	Different landing location. No anticipated impacts during operation.	A replacement helipad has been proposed. The replacement will need to be operational prior to the closure of the existing helipad. Appropriate signage and consultation should be undertaken to ensure users of the site are aware of the new operational access arrangements.	Construction: No Operation: No
Platts Green (Common Land)	Potential for a portion of land to be required permanently.	N/A	Further design review to seek the retention of this land or the creation of a design which	Construction: No

Receptor	Potential Impacts (Construction)	Potential Impacts (Operation)	Design, Mitigation and Enhancement Measures	Likely Significant Effect Following Mitigation?
			encompasses the area and does not alter its functioning as common land	
Sandford Mire (Common Land)	Potential for a portion of land to be required permanently.	N/A	Further design review to seek the retention of this land or the creation of a design which encompasses the area and does not alter its functioning as common land	Construction: No
Ketland Common (Common Land)	Potential for a portion of land to be required permanently.	N/A	Further design review to determine alterations to alignment to seek retention of this land or provision of replacement land adjacent to it's existing location	Construction: No
Barn End Caravan Park	Loss of use/access during construction as area to be used as a temporary haulage route	No anticipated impacts during operation	Access and disruption will be managed by the EMP. Further design review to determine alterations to alignment/mitigation to seek retention of this land	Construction: No Operation: No
BW 350/021	Bridleway will be severed by the draft DCO boundary.	N/A	Permanent diversion to The Gatehouse Overbridge required resulting in a 960m diversion travelling east on old A66 and then West on new local road.	Construction: Yes (adverse)

Black–Blue-Black alternative

Private property and housing – construction assessment

13.8.176 Residential receptors will be close to construction activities and may experience adverse impacts as a result of construction related nuisance. The impact will be moderate due to the change in tranquillity and access for the receptors. Toddygill Hall and East Field Gate will experience some form of land take in order to accommodate the Black – -Blue-Black - Black alternative.

13.8.177 It should be noted that there is ongoing analysis in order to quantifying the sensitivity of the private property and housing baseline. This is being undertaken in line with *DMRB LA 112*. As such it is not possible at this stage to state the likely significance of effect, although they may be significant. The potential effects will be assessed and reported within the ES, where required.

Development land and businesses – construction assessment

13.8.178 The likely significant effects upon development land and businesses for the Black-Blue-Black alternative during construction are the same as those reported for the Black-Black-Black route, see paragraph 13.8.171 to 13.8.173.

Walkers, cyclists and horse-riders – construction assessment

13.8.179 There is the potential for likely significant effects upon WCHs as a result of the construction phase whereby by PRow could be impacted as a result of temporary closures and diversions due to direct land take, severance of PRow and the provision of access routes.

13.8.180 Bridleway BW 350/021 has a medium sensitivity in line with *DMRB LA 112* as it is largely a recreational route where alternative routes could be sought. The bridleway will be permanently diverted by 960m during the construction phase due to the construction of the scheme. Permanent diversion of this bridleway is assessed to have a major adverse impact, which is of moderate significance. A large significant effect is not anticipated as the Bridleway is not a national or regional trail. Similarly users of the Bridleway are likely to committed to a long recreational walk, as opposed to using it for commuting purposes.

Table 13-31: Appleby to Brough (Warcop) Black –Blue - Black alternative - likely significant effects (population)

Receptor	Potential Impacts (Construction)	Potential Impacts (Operation)	Design, Mitigation and Enhancement Measures	Likely Significant Effect Following Mitigation?
Residential receptors within the study area	Construction related nuisance and disruption to access	Improved connectivity and accessibility.	The EMP will include construction and diversion measures to minimise disruption to the receptors.	Construction: No Operation: No
Development land and businesses	Construction may temporarily disrupt access for the businesses located within and immediately adjacent to the draft DCO boundary.	Improved connectivity for local businesses which improves access and logistics. The possibility to attract businesses to the area and enable developments to succeed.	The EMP will include construction and diversion measures to minimise disruption to the receptors.	Construction: No Operation: No
Community land and assets	Construction could temporarily disrupt access and result in amenity effects on assets where these lie in proximity to construction activities.	Improved screening and vegetation for the users over and above the existing baseline which enhances its attractiveness and usability Improved connectivity and accessibility.	The EMP will include construction and diversion measures to minimise disruption to the receptors.	Construction: No Operation: No
Walkers Cyclists and Horse Riders	Severance of PRoW and other WCH provisions due to the land required for the construction of the project.	Potential for additional formal crossing points across the A66, and improvements to WCH journey times, in some cases. Potential for increased journey times dependent upon the permanent scheme design.	Further design refinement is required to minimise the temporary and permanent diversions. Where suitable diversions are not possible crossing provisions will be considered for inclusion in the design.	Construction: Yes (adverse) Operation: Yes (adverse and/or beneficial)

Receptor	Potential Impacts (Construction)	Potential Impacts (Operation)	Design, Mitigation and Enhancement Measures	Likely Significant Effect Following Mitigation?
Agricultural land holdings	The loss of or damage to key characteristics, features or elements of the agricultural holding and potential effect of this change on viability	Improved for connectivity for local businesses which improves access and logistics.	Further design review to determine alterations to alignment to seek retention of this land	Construction: Yes (adverse) Operation: No
Café Sixty-Six	Loss of land as a result of the construction of a new dedicated access. There will be associated construction disruption whilst the works are completed.	Improved access arrangements to the business	Access and disruption will be managed by the EMP.	Construction: No Operation: No
Toddygill Hall	There is potential for permanent land take will be required for the construction of the scheme	N/A	The EMP will include construction and diversion measures to minimise access disruption to this receptor.	Construction: The potential effects will be assessed and reported within the ES.
East Field Gate	There is potential for permanent land take will be required for the construction of the scheme	N/A	The EMP will include construction and diversion measures to minimise access disruption to this receptor.	Construction: The potential effects will be assessed and reported within the ES.
Ministry of Defence Recreational Field	Loss of recreational field – direct acquisition of land for the scheme.	N/A	A replacement recreational field has been proposed and discussed with Ministry of Defence, accessed off Castlehill Road.	Construction: No Operation: No

Receptor	Potential Impacts (Construction)	Potential Impacts (Operation)	Design, Mitigation and Enhancement Measures	Likely Significant Effect Following Mitigation?
Ministry of Defence	Potential permanent loss of land - direct acquisition of land for the scheme	N/A	Further design review to minimise land take where possible.	Construction: Yes (adverse)
Ministry of Defence Helipad	Loss of use/access during construction	Different landing location. No anticipated impacts during operation.	A replacement helipad has been proposed. The replacement will need to be operational prior to the closure of the existing helipad. Appropriate signage and consultation should be undertaken to ensure users of the site are aware of the new operational access arrangements.	Construction: No Operation: No
Platts Green (Common Land)	Potential for a portion of land to be required permanently.	N/A	Further design review to seek the retention of this land or the creation of a design which encompasses the area and does not alter its functioning as common land	Construction: No
Sandford Mire (Common Land)	Potential for a portion of land to be required permanently.	N/A	Further design review to seek the retention of this land or the creation of a design which encompasses the area and does not alter its functioning as common land	Construction: No
Ketland Common (Common Land)	Potential for a portion of land to be required permanently.	N/A	Further design review to determine alterations to alignment to seek retention of this land or provision of replacement land adjacent to it's existing location	Construction: No
Barn End Caravan Park	Loss of use/access during construction as area to be used as a temporary haulage route	No anticipated impacts during operation	Access and disruption will be managed by the EMP. Further design review to determine alterations to alignment/mitigation to seek retention of this land	Construction: No Operation: No

Receptor	Potential Impacts (Construction)	Potential Impacts (Operation)	Design, Mitigation and Enhancement Measures	Likely Significant Effect Following Mitigation?
BW 350/021	Bridleway will be severed by the draft DCO boundary.	N/A	Permanent diversion to The Gatehouse Overbridge required resulting in a 960m diversion travelling east on old A66 and then West on new local road.	Construction: Yes (adverse)

Black-Black-Orange alternative

Private property and housing – construction assessment

- 13.8.181 Residential receptors will be close to construction activities and may experience adverse impacts as a result of construction related nuisance. The impact will be moderate due to the change in tranquillity and access for the receptors. Mains House will be demolished in order to accommodate the Black – Black - Orange alternative at the eastern end.
- 13.8.182 It should be noted that there is ongoing analysis in order to quantifying the sensitivity of the private property and housing baseline. This is being undertaken in line with *DMRB LA 112*. As such it is not possible at this stage to state the likely significance of effect, although they may be significant. The potential effects will be assessed and reported within the ES, where required.
- 13.8.183 One housing allocation lies within the draft DCO boundary; Rowan House, which has a medium sensitivity. Approximately 96.43% (0.4ha) of the allocation lies within the draft DCO boundary which will be lost due to land take. The impact is major adverse and is a very large effect, which is significant.

Development land and businesses – construction assessment

- 13.8.184 The likely significant effects upon development land and businesses for the Black-Black-Orange Alternative during construction are the same as those reported for the M6 Junction 40 to Kemplay Bank scheme, see paragraph 13.8.30.
- 13.8.185 In addition, the Black–Black- Orange alternative at the eastern end will require minor land take at Taylor Braithwaite (located along an access road towards Dyke Nook) which is of a medium sensitivity due to its size. The land take is only deemed to be a minor impact as the changes to operating conditions will not compromise overall viability of the business. The effect is therefore slight, which is not significant.
- 13.8.186 Café Sixty-Six, a medium sensitivity receptor due to its size, will require a new permanent dedicated access to the café as a result of the Black – -Black - -Orange alternative. This will require permanent land take which will result in a minor adverse impact with a slight effect, which is not significant. The impact is deemed to be minor as the land loss will result in a minor amendment to the access arrangements and will not compromise the overall viability of the business.

Walkers, cyclists and horse-riders – construction and operation assessment

- 13.8.187 The likely significant effects upon WCH for construction and operation are the same as those reported for the M6 Junction 40 to Kemplay Bank scheme, see paragraphs 13.8.43 to 13.8.47.

Table 13-32: Appleby to Brough (Warcop) Black – Black - Orange alternative - likely significant effects (population)

Receptor	Potential Impacts (Construction)	Potential Impacts (Operation)	Design, Mitigation and Enhancement Measures	Likely Significant Effect Following Mitigation?
Residential receptors within the study area	Construction related nuisance and disruption to access	Improved connectivity and accessibility.	The EMP will include construction and diversion measures to minimise disruption to the receptors.	Construction: No Operation: No
Development land and businesses	Construction may temporarily disrupt access for the businesses located within and immediately adjacent to the draft DCO boundary.	Improved connectivity for local businesses which improves access and logistics. The possibility to attract businesses to the area and enable developments to succeed.	The EMP will include construction and diversion measures to minimise disruption to the receptors.	Construction: No Operation: No
Community land and assets	Construction could temporarily disrupt access and result in amenity effects on assets where these lie in proximity to construction activities.	Improved screening and vegetation for the users over and above the existing baseline which enhances its attractiveness and usability Improved connectivity and accessibility.	The EMP will include construction and diversion measures to minimise disruption to the receptors.	Construction: No Operation: No
Walkers Cyclists and Horse Riders	Severance of PRow and other WCH provisions due to the land required for the construction of the project.	Potential for additional formal crossing points across the A66, and improvements to WCH journey times, in some cases. Potential for increased journey times dependent	Further design refinement is required to minimise the temporary and permanent diversions. Where suitable diversions are not possible crossing provisions will be considered for inclusion in the design.	Construction: Yes (adverse) Operation: Yes (adverse and/or beneficial)

Receptor	Potential Impacts (Construction)	Potential Impacts (Operation)	Design, Mitigation and Enhancement Measures	Likely Significant Effect Following Mitigation?
		upon the permanent scheme design.		
Agricultural land holdings	The loss of or damage to key characteristics, features or elements of the agricultural holding and potential effect of this change on viability	Improved for connectivity for local businesses which improves access and logistics.	Further design review to determine alterations to alignment to seek retention of this land	Construction: Yes (adverse) Operation: No
Café Sixty-Six	Loss of land as a result of the construction of a new dedicated access. There will be associated construction disruption whilst the works are completed.	Improved access arrangements to the business	Access and disruption will be managed by the EMP.	Construction: No Operation: No
Mains House	Direct acquisition and demolition of the property as a result of construction of the mainline for this scheme.	N/A	N/A	Construction: Potentially (adverse). Due to ongoing analysis, it is not possible to state the likely significance of effect, although they may be likely. This will be reported within the ES where required.
Rowan House housing allocation	Majority of the allocation (96%) lies within the draft DCO boundary and there is potential for construction activities to take place directly within this land.	N/A	Further design review to minimise land take where possible.	Construction: Yes

Receptor	Potential Impacts (Construction)	Potential Impacts (Operation)	Design, Mitigation and Enhancement Measures	Likely Significant Effect Following Mitigation?
Ministry of Defence Recreational Field	Loss of recreational field – direct acquisition of land for the scheme.	N/A	A replacement recreational field has been proposed and discussed with Ministry of Defence, accessed off Castlehill Road.	Construction: No Operation: No
Ministry of Defence	Potential permanent loss of land -- direct acquisition of land for the scheme	N/A	Further design review to minimise land take where possible.	Construction: Yes (adverse)
Ministry of Defence Helipad	Loss of use/access during construction	Different landing location. No anticipated impacts during operation.	A replacement helipad has been proposed. The replacement will need to be operational prior to the closure of the existing helipad. Appropriate signage and consultation should be undertaken to ensure users of the site are aware of the new operational access arrangements.	Construction: No Operation: No
Platts Green (Common Land)	Potential for a portion of land to be required permanently.	N/A	Further design review to seek the retention of this land or the creation of a design which encompasses the area and does not alter its functioning as common land	Construction: No
Sandford Mire (Common Land)	Potential for a portion of land to be required permanently.	N/A	Further design review to seek the retention of this land or the creation of a design which encompasses the area and does not alter its functioning as common land	Construction: No
Ketland Common (Common Land)	Potential for a portion of land to be required permanently.	N/A	Further design review to determine alterations to alignment to seek retention of this land or provision of replacement land adjacent to it's existing location	Construction: No

Receptor	Potential Impacts (Construction)	Potential Impacts (Operation)	Design, Mitigation and Enhancement Measures	Likely Significant Effect Following Mitigation?
Barn End Caravan Park	Loss of use/access during construction as area to be used as a temporary haulage route	No anticipated impacts during operation	Access and disruption will be managed by the EMP. Further design review to determine alterations to alignment/mitigation to seek retention of this land	Construction: No Operation: No

Black - Blue - Orange alternative

Private property and housing – construction assessment

13.8.188 Residential receptors will be close to construction activities and may experience adverse impacts as a result of construction related nuisance. The impact will be moderate due to the change in tranquillity and access for the receptors. Mains House will be demolished in order to accommodate the Black-Blue-Orange alternative.

13.8.189 It should be noted that there is ongoing analysis in order to quantifying the sensitivity of the private property and housing baseline. This is being undertaken in line with *DMRBLA 112*. As such it is not possible at this stage to state the likely significance of effect, although they may be significant. The potential effects will be assessed and reported within the ES, where required.

13.8.190 One housing allocation lies within the draft DCO boundary; Rowan House, which has a medium sensitivity. Approximately 96.43% (0.0.4ha) of the allocation lies within the draft DCO boundary which will be lost due to land take. The impact is major adverse and is a very large effect, which is significant.

Development land and businesses – construction assessment

13.8.191 The likely significant effects upon development land and businesses for the Black-Blue-Orange alternative during construction is the same as those reported for the Orange alternative, see paragraph 13.8.184 to 13.8.186.

Walkers, cyclists and horse-riders – construction and operation assessment

13.8.192 The likely significant effects upon WCH for construction and operation are the same as those reported for the M6 Junction 40 to Kemplay Bank scheme, see paragraphs 13.8.43 to 13.8.47.

Table 13-33: Appleby to Brough (Warcop) Black - Blue - Orange alternative - likely significant effects (population)

Receptor	Potential Impacts (Construction)	Potential Impacts (Operation)	Design, Mitigation and Enhancement Measures	Likely Significant Effect Following Mitigation?
Residential receptors within the study area	Construction related nuisance and disruption to access	Improved connectivity and accessibility.	The EMP will include construction and diversion measures to minimise disruption to the receptors.	Construction: No Operation: No
Development land and businesses	Construction may temporarily disrupt access for the businesses located within and immediately adjacent to the draft DCO boundary.	Improved connectivity for local businesses which improves access and logistics. The possibility to attract businesses to the area and enable developments to succeed.	The EMP will include construction and diversion measures to minimise disruption to the receptors.	Construction: No Operation: No
Community land and assets	Construction could temporarily disrupt access and result in amenity effects on assets where these lie in proximity to construction activities.	Improved screening and vegetation for the users over and above the existing baseline which enhances its attractiveness and usability Improved connectivity and accessibility.	The EMP will include construction and diversion measures to minimise disruption to the receptors.	Construction: No Operation: No
Walkers Cyclists and Horse Riders	Severance of PRow and other WCH provisions due to the land required for the construction of the project.	Potential for additional formal crossing points across the A66, and improvements to WCH journey times, in some cases. Potential for increased journey times dependent upon the permanent scheme design.	Further design refinement is required to minimise the temporary and permanent diversions. Where suitable diversions are not possible crossing provisions will be considered for inclusion in the design.	Construction: Yes (adverse) Operation: Yes (adverse and/or beneficial)

Receptor	Potential Impacts (Construction)	Potential Impacts (Operation)	Design, Mitigation and Enhancement Measures	Likely Significant Effect Following Mitigation?
Agricultural land holdings	The loss of or damage to key characteristics, features or elements of the agricultural holding and potential effect of this change on viability	Improved for connectivity for local businesses which improves access and logistics.	Further design review to determine alterations to alignment to seek retention of this land	Construction: Yes (adverse) Operation: No
Café Sixty-Six	Loss of land as a result of the construction of a new dedicated access. There will be associated construction disruption whilst the works are completed.	Improved access arrangements to the business	Access and disruption will be managed by the EMP.	Construction: No Operation: No
Mains House	Direct acquisition and demolition of the property as a result of construction of the mainline for this scheme.	N/A	N/A	Construction: Potentially (adverse). Due to ongoing analysis, it is not possible to state the likely significance of effect, although they may be likely. This will be reported within the ES where required.
Rowan House housing allocation	Majority of the allocation (96%) lies within the draft DCO boundary and there is potential for construction activities to take place directly within this land.	N/A	Further design review to minimise land take where possible.	Construction: Yes

Receptor	Potential Impacts (Construction)	Potential Impacts (Operation)	Design, Mitigation and Enhancement Measures	Likely Significant Effect Following Mitigation?
Ministry of Defence Recreational Field	Loss of recreational field – direct acquisition of land for the scheme.	N/A	A replacement recreational field has been proposed and discussed with Ministry of Defence, accessed off Castlehill Road.	Construction: No Operation: No
Ministry of Defence	Potential permanent loss of land – direct acquisition of land for the scheme	N/A	Further design review to minimise land take where possible.	Construction: Yes (adverse)
Ministry of Defence Helipad	Loss of use/access during construction	Different landing location. No anticipated impacts during operation.	A replacement helipad has been proposed. The replacement will need to be operational prior to the closure of the existing helipad. Appropriate signage and consultation should be undertaken to ensure users of the site are aware of the new operational access arrangements.	Construction: No Operation: No
Platts Green (Common Land)	Potential for a portion of land to be required permanently.	N/A	Further design review to seek the retention of this land or the creation of a design which encompasses the area and does not alter its functioning as common land	Construction: No
Sandford Mire (Common Land)	Potential for a portion of land to be required permanently.	N/A	Further design review to seek the retention of this land or the creation of a design which encompasses the area and does not alter its functioning as common land	Construction: No
Ketland Common (Common Land)	Potential for a portion of land to be required permanently.	N/A	Further design review to determine alterations to alignment to seek retention of this land or provision of replacement land adjacent to it's existing location	Construction: No

Receptor	Potential Impacts (Construction)	Potential Impacts (Operation)	Design, Mitigation and Enhancement Measures	Likely Significant Effect Following Mitigation?
Barn End Caravan Park	Loss of use/access during construction as area to be used as a temporary haulage route	No anticipated impacts during operation	Access and disruption will be managed by the EMP. Further design review to determine alterations to alignment/mitigation to seek retention of this land	Construction: No Operation: No

Human health (all alternatives)

Environmental conditions – construction assessment

- 13.8.193 The Appleby to Brough area has a low population density. Older people, who are prevalent within the study area, may be more vulnerable as they are more likely to suffer from existing health conditions. Based on a review of health and demographic baseline data, the Appleby to Brough area is considered to have medium sensitivity to health effects from environmental impacts.
- 13.8.194 The Air Quality Assessment (Chapter 5: Air Quality) has identified a large construction dust risk potential for high-sensitivity receptors within 100m of the draft DCO boundary. Residents on Lady Anne Drive, Pembroke Close, Castle Park, Croft Close, Castle View, B6259 Warcop, Warcop Training Camp and properties in Appleby in Westmorland will therefore be at risk of adverse impacts on wellbeing from dust nuisance. Requirements for dust mitigation set out in Chapter 5: Air Quality are considered to remove any significant impacts and therefore the health effects are assessed as neutral.
- 13.8.195 At time of writing, due to the stage of the design, finalised construction and mass haul traffic data were not available. However, as reported in Chapter 5: Air Quality, a review of preliminary mass haul calculations indicates that the construction of the project is likely to generate significant HGV movements. Increased HGV movements are likely to give rise to negative effects on mental wellbeing due to a perceived reduction in the quality of the living environment and concerns about air quality and road safety.
- 13.8.196 As described in Chapter 12: Noise and Vibration, a full construction assessment of likely significant noise effects cannot be undertaken at this stage. Activities with the potential to generate significant noise effects are listed in Chapter 12: Noise and Vibration. Residential properties on Lady Anne Drive and Pembroke Close in Brough are likely to be impacted temporarily by construction noise. Those affected will include residents of impacted properties and others from the local community who may experience increased noise in the public realm. Noise impacts are also identified at a number of rural properties throughout the scheme. There are likely to be negative effects on wellbeing, including increased annoyance and reduced enjoyment of outside space.
- 13.8.197 Chapter 10: Landscape and Visual Effects, has identified major visual impacts from all three alternatives on residential receptors in rural areas along the scheme. Those affected may experience effects such as reduced enjoyment of views from their properties. There are no impacts on settlements or community resources, and the number of individual properties affected is low, therefore the health effect is assessed as neutral.
- 13.8.198 It is not currently known whether any 24h construction activities will be required, which may lead to temporary sleep disturbance due to noise and lighting. At this stage, based on the nature of the works and proximity to receptors, the likely health effects are assessed as neutral.

Severance and accessibility – construction assessment

- 13.8.199 The study area comprises rural communities who rely on the local road network to access services and facilities in local centres such as Appleby-in-Westmoreland. Older people, who are prevalent within the study area, may be more vulnerable as they are more likely to suffer from existing health conditions, to use local services

and to depend on public transport. The sensitivity of the Appleby to Brough population to severance and accessibility impacts is assessed as medium to high.

- 13.8.200 Direct (land take or demolition) impacts on community land and assets are described in the Population assessment above. There are no direct impacts that will prevent community resources from being accessed and used during the construction period.
- 13.8.201 As described in the route-wide assessment of impacts on WCH, there is a potential for PRow to be impacted as a result of temporary closures and diversions due to direct land take and the provision of diversions. Such impacts will have the potential to affect access to green space, opportunities for physical activity and the ability to access community resources by active travel, resulting in impacts on health and wellbeing. Due to the low population density in the Appleby to Brough study area, the likely health effects associated with impacts on PRow is considered to be neutral.
- 13.8.202 Additional construction traffic and temporary lane closures during the dualling of the A66 is likely to cause some traffic delays along this single carriageway stretch of road during the construction period. This could also affect the local road network due to delays at junctions with the A66 and traffic taking alternative routes. The extent of any delays is not known, and traffic management measures will be implemented during construction to minimise any adverse impacts as far as possible. Advanced notification of likely delays will enable people to allow additional journey time. Temporary traffic disruption is likely to reduce access to community facilities, shops and services in local centres such as Appleby-in-Westmoreland, for rural communities travelling by private vehicle or public transport (bus). Traffic disruption may deter some people from travelling to access services and facilities; although the number of people deterred from travelling is likely to be low, this is likely to cause a negative health effect due to the high sensitivity of the population, which includes a high proportion of older people. Stress and annoyance caused by traffic disruption is also likely to cause a temporary negative effect on wellbeing.

Environmental conditions – operational assessment

- 13.8.203 The project will affect local air quality and levels of traffic noise through changes to road alignment traffic flow, speed and fleet composition. The Air Quality Assessment (Chapter 5: Air Quality) has identified small increases and decreases in NO_x and PM₁₀ concentrations at receptors close to the affected road network. However, as the air quality across the study area is good and the number of sensitive receptors experiencing changes in air quality is low, no significant air quality impacts have been identified in Chapter 5: Air Quality. Therefore, the health effect is assessed as neutral.
- 13.8.204 Significant adverse effects on noise associated with the three route alternatives have been identified in the noise and vibration assessment (Chapter 12: Noise and Vibration), as follows:
- Black-Black-Black route: 58 residential receptors, mainly located near the existing A66 in Warcop and Brough, as well as 6 non-residential receptors near Warcop and 27 PRow located close to the scheme.
 - Black-Blue-Black alternative: 42 residential receptors within Brough and along the existing A66, as well as one non-residential receptor and 31 PRow located close to the scheme.
 - Black-Black-Orange alternative: 75 residential receptors, mainly in Warcop and Brough, as well as three non-residential receptors and 31 PRow located close to the scheme.

- Black-Blue-Orange alternative: 42 residential receptors, mainly along the existing A66 at Warcop and Brough, as well as two non-residential receptors close to the route.
- 13.8.205 Significant beneficial effects on noise associated with the three route alternatives have been identified in the Noise and Vibration assessment, as follows:
- Black-Black-Black route: five residential receptors located close to the existing A66.
 - Black-Blue-Black alternative: seven residential receptors located close to the existing A66 as well as two non-residential receptors and three PRow located close to the scheme.
 - Black-Black-Orange alternative: nine residential receptors located close to the existing A66 as well as one non-residential receptors and three PRow located close to the scheme.
 - Black-Blue-Orange alternative: Nine residential and one non- residential receptor, located West of Brough and along the existing A66.
- 13.8.206 There will be beneficial effects on wellbeing for a small number of residents in areas where levels of traffic noise will be reduced, although the health effect is assessed as neutral due to the small number of properties affected by noise reductions.
- 13.8.207 Those affected by adverse noise impacts will include residents of affected properties, users of affected community resources and people from the local community who will experience changes in the level of noise within the public realm. Negative effects on wellbeing will arise from an increase in the number of people experiencing annoyance due to noise, the level of enjoyment of outside space and the perception of the quality of the local living environment.
- 13.8.208 The landscape and visual assessment (Chapter 10: Landscape and Visual Effects) has identified minor to major operational visual impacts from all three alternatives on individual residential receptors in rural areas along the scheme. The affected residents may experience reduced enjoyment of views from their properties, in some cases combined with increased traffic noise. In the longer term, as vegetation becomes established and people get used to the presence of new infrastructure, the visual impacts will be reduced. There are no visual impacts identified within settlements or community resources and the number of individual properties affected is low, therefore the health effect is assessed as neutral.
- 13.8.209 At this stage of the design there is not sufficient detail to enable an assessment of the health effects of lighting. It is assumed that lighting will be sensitively designed in accordance with the relevant standards to ensure that negative effects are minimised as far as possible. Due to the small number of properties in proximity to the alignment, and the presence of the existing A66, the likely health effect associated with amenity and sleep disturbance is assessed as neutral.

Severance and accessibility – operational assessment

- 13.8.210 During operation, traffic flows will improve along the dualled A66 leading to shorter, more reliable journey times. Local severance issues where the local road network intersects with the A66, causing delays and road safety issues, will be reduced. This is likely to improve access to community facilities, shops and services in local centres such as Appleby-in-Westmoreland, for rural communities travelling by private vehicle or public transport (bus). This will lead to a range of benefits by reducing stress for travellers and enabling greater access to the benefits of community resources, such as social interaction, access to essential services, green space, sport and leisure. This is assessed as a positive health effect.

- 13.8.211 Significant visual impacts are predicted on rural PRow, which may reduce enjoyment of these resources and in some cases deter their use. However, it is considered that alternative routes will be used by recreational users, enabling continued access to green space and physical activity. The health effect of visual impacts on PRow is assessed as neutral.
- 13.8.212 The likely health outcomes during construction and operation are summarised in Table 13-34: Appleby to Brough - likely significant effects - construction (health) and Table 13-35: Appleby to Brough - likely significant effects - operational (health) below. The assessment applies to all alternative routes unless stated.

Table 13-34: Appleby to Brough - likely significant effects - construction (health)

Receptor (including sensitivity)	Sensitivity	Potential Impacts	Design, Mitigation and Enhancement Measures	Likely Health Outcomes Following Mitigation
Residents on Lady Anne Drive, Pembroke Close, Castle Park, Croft Close, Castle View, B6259 Warcop, Warcop Training Camp and properties in Appleby in Westmorland	Medium	Construction dust	Dust mitigation requirements set out in Chapter 5: Air Quality	Neutral
Communities located close to construction traffic routes (locations not yet known)	Unknown	Increased HGV movements on the local road network	Details of traffic management measures to be included in the ES.	Neutral
Residents on Lady Anne Drive and Pembroke Close in Brough	Medium	Construction noise (day-time)	Noise mitigation requirements set out in Chapter 12: Noise and Vibration	Negative effect on quality of life and wellbeing
Residents in rural areas along the scheme	Medium	Visual impact of vegetation clearance and construction activities	Visual mitigation requirements set out in Chapter 10: Landscape and Visual Effects	Neutral
Rural communities located close to construction works in the Appleby to Brough study area	Medium	Night-time construction lighting and noise	Visual mitigation requirements set out in Chapter 10: Landscape and Visual Effects	Neutral
Users of PRow in the Cross Lanes to Rokeby study area	Medium	Temporary PRow disruption	The EMP will include construction and diversion measures to minimise access disruption	Neutral
Residents in the Appleby to Brough study area	Medium to high	Temporary traffic delays affecting access from rural communities to services and facilities	The EMP will include construction and diversion measures to minimise access disruption	Negative effect on quality of life and wellbeing

Table 13-35: Appleby to Brough - likely significant effects - operational (health)

Receptor	Sensitivity	Potential Impacts	Design, Mitigation and Enhancement Measures	Likely Following Mitigation?
Residents close to the affected road network	Medium	Small increases and decreases in NOx and PM10 concentrations	None	Neutral
Residents close to the affected road network, particularly in Warcop and Brough	Medium	Increased traffic noise	Noise mitigation requirements set out in Chapter 12: Noise and Vibration	Negative effect on quality of life and wellbeing
Residents close to the affected road network	Medium	Decreased traffic noise	None	Neutral
Residents in rural areas along the route alternatives	Medium	Visual impact of vegetation clearance and new road infrastructure	Visual mitigation requirements set out in Chapter 10: Landscape and Visual Effects	Neutral
Residents close to the route alternatives	Medium	Increased light pollution and glare from road lighting	Compliance with relevant standards for lighting design	Neutral
Residents in the Appleby to Brough study area	Medium to high	Improved access to community facilities shops and services centres such as Appleby-in Westmoreland	None	Positive effect on quality of life and wellbeing
Users of PRoW in the Cross Lanes to Rokeby study area	Medium to high	Visual impacts on rural PRoW	Visual mitigation requirements set out in Chapter 10: Landscape and Visual Effects	Neutral

Bowes Bypass

Population

Private property and housing – construction assessment

13.8.213 Residential receptors will be close to construction activities and may experience adverse impacts as a result of construction related nuisance. The impact will be moderate due to the change in tranquillity and access for the receptors. Low Broats will also be demolished in order to accommodate the scheme.

13.8.214 It should be noted that there is ongoing analysis in order to quantifying the sensitivity of the private property and housing baseline. This is being undertaken in line with *DMRB LA 112*. As such it is not possible at this stage to state the likely significance of effect, although they may be significant. The potential effects will be assessed and reported within the ES, where required.

Private property and housing – operation assessment

13.8.215 The likely significant effects upon private property and housing during operation for this scheme are the same as those reported for the M6 Junction 40 to Kemplay Bank scheme, see paragraphs **Error! Reference source not found.** to 13.8.29.

Development land and businesses – construction assessment

13.8.216 The likely significant effects upon development land and businesses for all alternatives during construction are the same as those reported for the M6 Junction 40 to Kemplay Bank scheme, see paragraph 13.8.30.

13.8.217 In addition, the scheme will require the direct acquisition and demolition of an unnamed business on Stainmore Road (Mellwaters Barn), which is deemed to have a medium sensitivity, due to its size. The impact upon the business is major adverse due to the land acquisition resulting in the loss of the business. For the purposes of assessing the worst case scenario the resulting effects will be large, which is significant.

13.8.218 This scheme will require minor land take from Ivy Hall Farm Holiday Cottage and Custom Paint (located between Bowes Hall Crossroads West and the A66 Flyover). The businesses have a medium sensitivity due to their size. Although these receptors may be subject to land take, it is anticipated to be minor adverse impact as the changes will not compromise the viability of the businesses. The effects are therefore slight, which is not significant.

Development land and businesses – operational assessment

13.8.219 The likely significant effects upon development and businesses for all alternatives are the same as those reported for the M6 Junction 40 to Kemplay Bank scheme, see paragraphs 13.8.34 to 13.8.35.

Community land and assets – construction assessment

13.8.220 Construction of the scheme will be close to community land assets which may experience adverse impacts as a result of construction related nuisance. The sensitivity of the community land and assets within the study area will range from low to very high due to the availability of alternative facilities being in the local or wider local authority area. The impact will be moderate adverse due to the change in tranquillity and access for the receptors. The resulting effects will therefore range from slight to very large, which may be significant.

13.8.221 The scheme will also require land take from two areas of Common Land (both named Bowes Moor) located on either side of the existing A66, both of which are of medium

sensitivity. For the purposes of assessing the worst case scenario it is assumed that the land will be required permanently, and the moderate adverse impact will likely result in a moderate effect, which is significant.

13.8.222 The scheme will also likely require land take from an allotment or community growing space located off the Pennine Way. The allotments are likely to be used on a daily basis and therefore be of a very high sensitivity. For the purposes of assessing the worst case scenario, the moderate adverse impacts associated with the land take will likely result in a very large effect, which is significant.

Community land and assets – operation assessment

13.8.223 The likely significant effects upon community land and assets for during operation are the same as those reported for the M6 Junction 40 to Kemplay Bank scheme, see paragraphs 13.8.41 to 13.8.42.

Walkers, cyclists and horse-riders – construction and operation assessment

13.8.224 The likely significant effects upon WCH for construction and operation are the same as those reported for the M6 Junction 40 to Kemplay Bank scheme, see paragraphs 13.8.43 to 13.8.47.

Agricultural land holdings – construction and operation assessment

13.8.225 The likely significant effects upon agricultural land holdings for this scheme are the same as those reported for the M6 Junction 40 to Kemplay Bank scheme, see paragraphs 13.8.48 to 13.8.52.

Table 13-36: Bowes Bypass (A66/A67) - likely significant effects (population)

Receptor	Potential Impacts (Construction)	Potential Impacts (Operation)	Design, Mitigation and Enhancement Measures	Likely Significant Effect Following Mitigation?
Residential receptors within the study area	Construction related nuisance and disruption to access	Improved connectivity and accessibility.	The EMP will include construction and diversion measures to minimise disruption to the receptors.	Construction: No Operation: No
Development land and businesses	Construction may temporarily disrupt access for the businesses located within and immediately adjacent to the draft DCO boundary.	Improved connectivity for local businesses which improves access and logistics. The possibility to attract businesses to the area and enable developments to succeed.	The EMP will include construction and diversion measures to minimise disruption to the receptors.	Construction: No Operation: No
Community land and assets	Construction could temporarily disrupt access and result in amenity effects on assets where these lie in proximity to construction activities.	Improved screening and vegetation for the users over and above the existing baseline which enhances its attractiveness and usability Improved connectivity and accessibility.	The EMP will include construction and diversion measures to minimise disruption to the receptors.	Construction: No Operation: No
Walkers Cyclists and Horse Riders	Severance of PRow and other WCH provisions due to the land required for the construction of the project.	Potential for additional formal crossing points across the A66, and improvements to WCH journey times, in some cases. Potential for increased journey times dependent	Further design refinement is required to minimise the temporary and permanent diversions. Where suitable diversions are not possible crossing provisions will be considered for inclusion in the design..	Construction: Yes (adverse) Operation: Yes (adverse and/or beneficial)

Receptor	Potential Impacts (Construction)	Potential Impacts (Operation)	Design, Mitigation and Enhancement Measures	Likely Significant Effect Following Mitigation?
		upon the permanent scheme design.		
Agricultural land holdings	The loss of or damage to key characteristics, features or elements of the agricultural holding and potential effect of this change on viability	Improved for connectivity for local businesses which improves access and logistics.	Further design review to determine alterations to alignment to seek retention of this land	Construction: Yes (adverse) Operation: No
Low Broats	Direct acquisition and demolition of the property as a result of construction of the mainline for this route.	N/A	N/A	Construction: Potentially (adverse). Due to ongoing analysis, it is not possible to state the likely significance of effect, although they may be likely. This will be reported within the ES where required.
Unnamed business - Mellwaters Barn	Direct acquisition and demolition of the property as a result of construction of the mainline for this route.	Improved connectivity for local businesses which improves access and logistics. The possibility to attract businesses to the area and enable developments to succeed.	N/A	Construction: Yes (adverse)
Custom Paint	Potential loss of use/access of land during construction	Improved connectivity for local businesses which improves access and logistics. The possibility	Further design review to determine alterations to alignment to seek retention of this land	Construction: No Operation: No

Receptor	Potential Impacts (Construction)	Potential Impacts (Operation)	Design, Mitigation and Enhancement Measures	Likely Significant Effect Following Mitigation?
		to attract businesses to the area and enable developments to succeed.		
Ivy Hall Farm Holiday Cottage	Potential loss of use/access of land during construction	Improved connectivity for local businesses which improves access and logistics. The possibility to attract businesses to the area and enable developments to succeed.	Further design review to determine alterations to alignment to seek retention of this land	Construction: No Operation: No
Bowes Moor	Potential loss of use/access of land during construction	Improved screening and vegetation for the users over and above the existing baseline which enhances its attractiveness and usability	No proposals currently. However further design refinement will be assessed within the ES where mitigation through avoidance will be investigated. to determine alterations to alignment/mitigation to seek retention of this land.	Construction: Yes (adverse) Operation: No
Allotment/Community growing Space	Potential loss of use/access of land during construction	Improved connectivity and accessibility.		Construction: Yes (adverse) Operation: No

Human health

Environmental conditions – construction assessment

- 13.8.226 There are residential areas and community facilities, including a primary school, in Bowes. Older people, who are prevalent within the study area, may be vulnerable as they are more likely to suffer from existing health conditions. Based on a review of health and demographic data and the low population density, the Bowes Bypass area is considered to have medium to high sensitivity to health effects from environmental impacts.
- 13.8.227 The Air Quality Assessment (Chapter 5: Air Quality) has identified a large construction dust risk potential for high-sensitivity receptors within 100m of the draft DCO boundary. Residents on The Street, the community of Bowes and Bowes Hutchinson Church of England Primary School will therefore be at risk of adverse impacts on wellbeing from dust nuisance. Requirements for dust mitigation set out in Chapter 5: Air Quality are considered to remove any significant impacts and therefore the health effects are assessed as neutral.
- 13.8.228 At time of writing, due to the stage of the design, finalised construction and mass haul traffic data were not available. However, as reported in Chapter 5: Air Quality, a review of preliminary mass haul calculations indicates that the construction of the project is likely to generate significant HGV movements. Increased HGV movements are likely to give rise to negative effects on mental wellbeing due to a perceived reduction in the quality of the living environment and concerns about air quality and road safety.
- 13.8.229 As described in Chapter 12: Noise and Vibration, a full construction assessment of likely significant noise effects cannot be undertaken at this stage. Activities with the potential to generate significant noise effects are listed in Chapter 12: Noise and Vibration. The noise assessment has not identified any sensitive receptors likely to be impacted by construction noise associated with this scheme, and the health effects are therefore assessed as neutral.
- 13.8.230 Chapter 10: Landscape and Visual Effects, has identified a major visual impact on a small number of residential properties in Bowes, although the majority of the village is screened from views of the scheme. Some residents in these properties may experience reduced satisfaction with their living environment. However, the overall effect on wellbeing is assessed as neutral.
- 13.8.231 It is not currently known whether any 24h construction activities will be required, which may lead to temporary sleep disturbance due to noise and lighting. At this stage, based on the nature of the works and proximity to receptors, the health effects of lighting are assessed as neutral.

Severance and accessibility – construction assessment

- 13.8.232 The community in and around Bowes relies on the local road network to access services and facilities in larger centres such as Barnard Castle. Older people, who are prevalent within the study area, may be more vulnerable as they are more likely to suffer from existing health conditions, to use local services and to depend on public transport. The sensitivity of the Bowes Bypass population to severance and accessibility impacts is assessed as medium to high.
- 13.8.233 Direct (land take or demolition) impacts on community land and assets are described in the Population assessment above. Direct impacts are identified on Bowes Moor and an allotment or community growing space located off the Pennine Way. The impact on Bowes Moor is considered unlikely to affect access to green space for the

community since it will form a small proportion of the total area. However, the impact on the allotments is likely to result in a negative effect on health and wellbeing due to reduced access to green space and outdoor leisure activities.

13.8.234 As described in the route-wide assessment of impacts on WCH, there is a potential for PRoW to be impacted as a result of temporary closures and diversions due to direct land take and the provision of diversions. Such impacts will have the potential to affect access to green space, opportunities for physical activity and the ability to access community resources by active travel. This is assessed as a negative effect on health and wellbeing.

13.8.235 Additional construction traffic and temporary lane closures during the dualling of the A66 is likely to cause some traffic delays around the A66/A67 junction. The extent of any delays is not known, and traffic management measures will be implemented during construction to minimise any adverse impacts as far as possible. Advanced notification of likely delays will enable people to allow additional journey time. Temporary traffic disruption could potentially reduce access to community facilities, shops and services in Bowes and Barnard Castle for rural communities travelling by private vehicle or public transport (bus). This is likely to cause stress and annoyance, and in some cases may deter from travelling to access services and facilities. This is assessed as a negative effect on health and wellbeing.

Environmental conditions – operational assessment

13.8.236 The project will affect local air quality and levels of traffic noise through changes in traffic flow, speed and fleet composition.

13.8.237 The Air Quality Assessment (Chapter 5: Air Quality) has identified small increases and decreases in NO_x and PM₁₀ concentrations at receptors close to the affected road network. However, as the air quality across the study area is good and the number of sensitive receptors experiencing changes in air quality is low, no significant air quality impacts have been identified in Chapter 5: Air Quality. Therefore the health effect is assessed as neutral.

13.8.238 The noise and vibration assessment (Chapter 12: Noise and Vibration) has identified significant adverse effects on noise at ten residential properties, located in rural areas close to the existing A66. No significant beneficial effects are identified. Residents of the affected properties may experience negative effects on wellbeing such as increased annoyance and reduced enjoyment of outside space. There are no noise impacts identified within settlements or community resources and therefore the health effect is assessed as neutral.

13.8.239 The landscape and visual assessment (Chapter 10: Landscape and Visual Effects) has identified minor visual impacts on a small number of rural PRoW and residential properties in rural areas and on the outskirts of Bowes, although the majority of the village is screened from views of the scheme. Health and wellbeing effects resulting from visual impacts on PRoW, residential and other community receptors are assessed as neutral.

13.8.240 At this stage of the design there is not sufficient detail to enable an assessment of the health effects of lighting. It is assumed that lighting will be sensitively designed in accordance with the relevant standards to ensure that negative effects are minimised as far as practicable. Since the village of Bowes is largely screened from any visual impacts, the health effects from lighting are assessed as neutral.

Severance and accessibility – operational assessment

- 13.8.241 During operation, traffic flows will improve along the dualled A66 Bowes Bypass and the A66/A67 junction leading to shorter, more reliable journey times. This is likely to improve access to community facilities, shops and services in local centres such as Bowes and Barnard Castle, for rural communities travelling by private vehicle or public transport (bus). This will lead to a range of benefits by reducing stress for travellers and enabling greater access to the benefits of community resources, such as social interaction, access to essential services, green space, sport and leisure. This is assessed as a positive health effect
- 13.8.242 The likely health outcomes during construction and operation are summarised in Table 13-37: Bowes Bypass - likely significant effects - construction (health) and Table 13-38: Bowes Bypass - likely significant effects - operational (health) below.

Table 13-37: Bowes Bypass - likely significant effects - construction (health)

Receptor (including sensitivity)	Sensitivity	Potential Impacts	Design, Mitigation and Enhancement Measures	Likely Health Outcomes Following Mitigation
Residents on The Street, the community of Bowes and Bowes Hutchinson Church of England Primary School	Medium to high	Construction dust	Dust mitigation requirements set out in Chapter 5: Air Quality	Neutral
Communities close to construction traffic routes (locations not yet known)	Unknown	Increased HGV movements on the local road network	Details of traffic management measures to be included in the ES.	Neutral
Residents and users of community facilities in the Bowes Bypass study area	Medium to high	Construction noise (day-time) (no significant impacts identified in Chapter 12: Noise and Vibration)	Noise mitigation requirements set out in Chapter 12: Noise and Vibration	Neutral
Residents in the Bowes Bypass study area	Medium	Visual impact of vegetation clearance and construction activities	Visual mitigation requirements set out in Chapter 10: Landscape and Visual Effects	Neutral
Rural communities located close to construction works in the Bowes Bypass study area	Medium	Night-time construction lighting and noise	Visual mitigation requirements set out in Chapter 10: Landscape and Visual Effects	Neutral
Users of allotments / community growing space	Medium	Direct impact on allotments / community growing space	Mitigation as set out in Population assessment	Negative effect on quality of life and wellbeing
Users of PRoW in the Bowes Bypass area	Medium	Temporary PRoW disruption	The EMP will include construction and diversion measures to minimise access disruption	Negative effect on quality of life and wellbeing
Residents in the Bowes Bypass study area	Medium to high	Temporary traffic delays affecting access from rural communities to services and facilities.	The EMP will include construction and diversion measures to minimise access disruption	Negative effect on quality of life and wellbeing

Table 13-38: Bowes Bypass - likely significant effects - operational (health)

Receptor	Sensitivity	Potential Impacts	Design, Mitigation and Enhancement Measures	Likely Health Outcomes Following Mitigation?
Residents and users of community facilities close to the affected road network	Medium to high	Small increases and decreases in NOx and PM10 concentrations	None	Neutral
Residents and users of community facilities close to the affected road network	Medium to high	Increased traffic noise	Noise mitigation requirements set out in Chapter 12: Noise and Vibration	Neutral
Residents in the Bowes Bypass study area	Medium	Visual impact of vegetation clearance and new road infrastructure	Visual mitigation requirements set out in Chapter 10: Landscape and Visual Effects	Neutral
Residents close to the Bowes Bypass alignment	Medium	Increased light pollution and glare from road lighting	Compliance with relevant standards for lighting design	Neutral
Residents in the Bowes Bypass study area	Medium to high	Improved access to community facilities shops and services.	None	Positive effect on quality of life and wellbeing

Cross Lanes to Rokeby

Population

All Alternatives

Private property and housing – construction assessment

13.8.243 The likely significant effects upon private property and housing during operation for this scheme are the same as those reported for the M6 Junction 40 to Kemplay Bank scheme, see paragraphs 13.8.24 to 13.8.26.

13.8.244 There are no properties or housing allocations located within the draft DCO boundary and no land take or demolitions will be required to accommodate the scheme. As a result, no significant effects are determined.

13.8.245 It should be noted that the land take required for the Black+Black option is the smallest of the three alternatives. As such the likely significant effects for this option would be the least.

Private property and housing – operation assessment

13.8.246 The likely significant effects upon private property and housing during operation for this scheme are the same as those reported for the M6 Junction 40 to Kemplay Bank scheme, see paragraphs **Error! Reference source not found.** to 13.8.29.

Development land and businesses – construction assessment

13.8.247 The likely significant effects upon development land and businesses for all alternatives during construction are the same as those reported for the M6 Junction 40 to Kemplay Bank scheme, see paragraph 13.8.30.

13.8.248 In addition, all alternatives will require minor land take from the Cross Lanes Organic Farm Shop, but the business will not require demolition. The business has a high sensitivity due to its size. Although it is subject to land take the impacts are anticipated to be minor adverse as the changes to operating conditions will not compromise overall viability of the business. Under the requirements to assess the worst case scenario the impacts of the land loss will result in a moderate adverse effect, which is significant.

Development land and businesses – operational assessment

13.8.249 The likely significant effects upon development and businesses for all alternatives are the same as those reported for the M6 Junction 40 to Kemplay Bank scheme, see paragraphs 13.8.34 to 13.8.35.

Community land and assets – construction assessment

13.8.250 Construction of all alternatives will be close to community land assets which may experience adverse impacts as a result of construction related nuisance. The sensitivity of the community land and assets within the study area is high due to alternative facilities only being available in the wider local planning authority area. The impact will be moderate adverse due to the change in tranquillity and access for the receptors. The resulting effects will therefore be large, which is significant.

13.8.251 There are no demolitions or land take associated with any alternative. Therefore, there are no likely significant effects anticipated for community land and assets with regards all of the alternatives.

Community land and assets – operation assessment

13.8.252 The likely significant effects upon community land and assets for all alternatives during operation are the same as those reported for the M6 Junction 40 to Kemplay Bank scheme, see paragraphs 13.8.41 to 13.8.42.

Walkers, cyclists and horse-riders – construction and operation assessment

13.8.253 The likely significant effects upon WCH for construction and operation are the same as those reported for the M6 Junction 40 to Kemplay Bank scheme, see paragraphs 13.8.43 to 13.8.47.

Agricultural land holdings – construction and operation assessment

13.8.254 The likely significant effects upon agricultural land holdings for this scheme are the same as those reported for the M6 Junction 40 to Kemplay Bank scheme, see paragraphs 13.8.48 to 13.8.52.

13.8.255 It should be noted that the land take required for the Black+Black option is the smallest of the three alternatives. As such the construction likely significant effects for this option would be the least.

Table 13-39: Cross Lane to Rokeby - likely significant effects (population)

Receptor	Potential Impacts (Construction)	Potential Impacts (Operation)	Design, Mitigation and Enhancement Measures	Likely Significant Effect Following Mitigation?
Residential receptors within the study area	Construction related nuisance and disruption to access	Improved connectivity and accessibility.	The EMP will include construction and diversion measures to minimise disruption to the receptors.	Construction: No Operation: No
Development land and businesses	Construction may temporarily disrupt access for the businesses located within and immediately adjacent to the draft DCO boundary.	Improved connectivity for local businesses which improves access and logistics. The possibility to attract businesses to the area and enable developments to succeed.	The EMP will include construction and diversion measures to minimise disruption to the receptors.	Construction: No Operation: No
Community land and assets	Construction could temporarily disrupt access and result in amenity effects on assets where these lie in proximity to construction activities.	Improved screening and vegetation for the users over and above the existing baseline which enhances its attractiveness and usability Improved connectivity and accessibility.	The EMP will include construction and diversion measures to minimise disruption to the receptors.	Construction: No Operation: No
Walkers Cyclists and Horse Riders	Severance of PRow and other WCH provisions due to the land required for the construction of the project.	Potential for additional formal crossing points across the A66, and improvements to WCH journey times, in some cases. Potential for increased journey times dependent upon the permanent scheme design.	Further design refinement is required to minimise the temporary and permanent diversions. Where suitable diversions are not possible crossing provisions will be considered for inclusion in the design.	Construction: Yes (adverse) Operation: Yes (adverse and/or beneficial)
Agricultural land holdings	The loss of or damage to key characteristics, features or elements of the agricultural	Improved for connectivity for local businesses which improves access and logistics.	Further design review to determine alterations to alignment to seek retention of this land	Construction: Yes (adverse) Operation: No

Receptor	Potential Impacts (Construction)	Potential Impacts (Operation)	Design, Mitigation and Enhancement Measures	Likely Significant Effect Following Mitigation?
	holding and potential effect of this change on viability			
Cross Lanes Organic Farm Shop	Potential permanent loss of land – direct acquisition of land for the scheme	Improved connectivity for local businesses which improves access and logistics. The possibility to attract businesses to the area and enable developments to succeed.	Further design review to minimise land take where possible.	Construction: Yes (adverse) Operation: No

Human health

Environmental conditions – construction assessment

- 13.8.256 The Cross Lanes to Rokeby area has a low population density. No vulnerable groups have been identified as having above average prevalence within the study area for this scheme. Based on a review of health and demographic data, the Cross Lanes to Rokeby area is considered to have medium sensitivity to health effects from environmental impacts.
- 13.8.257 The Air Quality Assessment (Chapter 5: Air Quality) has identified a large construction dust risk potential for high-sensitivity receptors within 100m of the draft DCO boundary. Several rural properties close to the alignment and residents at the Street and Moorhouse Lane will therefore be at risk of adverse impacts on wellbeing from dust nuisance. Requirements for dust mitigation set out in Chapter 5 are considered to remove any significant impacts and therefore the health effects are assessed as neutral.
- 13.8.258 At time of writing, due to the stage of the design, finalised construction and mass haul traffic data were not available. However, as reported in Chapter 5: Air Quality, a review of preliminary mass haul calculations indicates that the construction of the project is likely to generate significant HGV movements. Due to low population density, the health effects of increased HGV movements within the Cross Lanes to Rokeby area are assessed as neutral.
- 13.8.259 As described in Chapter 12: Noise and Vibration, a full construction assessment of likely significant noise effects cannot be undertaken at this stage. Activities with the potential to generate significant noise effects are listed in Chapter 12: Noise and Vibration. The noise and vibration assessment identifies potential significant effects at residential properties including houses near Cross Lanes and Rokeby including The Cottage, Cross Lanes Farm, Ivy Cottage, Smithy Cottage, Street Side Farm, Birk House, Keepers Cottage, Tutta Beck Cottages and Farm, The Old Rectory, Ewebank Farm, Tack Room Cottage, and The Grove. There are likely to be negative effects on the wellbeing of residents in the study areas including increased annoyance and reduced enjoyment of outside space.
- 13.8.260 Chapter 10: Landscape and Visual Effects has identified significant visual construction effects on residents in properties west and east of Tutta Beck Farm, users of PRow west of Cross Lane and north and south of A66 and users of Rokeby Park RPG (Red alternative only), Church of St. Mary (Black alternative only) and Cross Lanes Organic Farm (Black and Blue alternative only). Those affected may experience reduced enjoyment of views from their properties thereby experiencing a reduction in quality of life. People who regularly use Rokeby Park RPG, Church of St. Mary, Cross Lanes Organic Farm and affected PRow may experience reduced enjoyment of these resources and may be deterred from using them, resulting in reduced physical activity and access to green space. The effect on wellbeing is assessed as negative.
- 13.8.261 It is not currently known whether any 24h construction activities will be required, which may lead to temporary sleep disturbance due to noise and lighting. At this stage, based on the nature of the works and proximity to receptors, the likely health effects are assessed as neutral.

Severance and accessibility – construction assessment

- 13.8.262 The study area comprises rural communities who rely on the local road network to access services and facilities in centres outside the study area. The sensitivity of the population to severance and accessibility impacts is assessed as medium to high.

- 13.8.263 Direct (land take or demolition) impacts on community land and assets are described in the Population assessment above. There are no direct impacts that will prevent community resources from being accessed and used during the construction period.
- 13.8.264 As described in the route-wide assessment of impacts on WCH, there is a potential for PRoW to be impacted as a result of temporary closures and diversions due to direct land take and the provision of diversions. Such impacts will have the potential to affect access to green space, opportunities for physical activity and the ability to access community resources by active travel, resulting in impacts on health and wellbeing. Due to the low population density in the Cross Lanes to Rokeby study area, the likely health effects associated with impacts on PRoW is considered to be neutral.
- 13.8.265 Additional construction traffic and temporary lane closures during the dualling of the A66 is likely to cause some traffic delays along this single carriageway stretch of road during the construction period. This could also affect the local road network due to delays at junctions with the A66 and traffic taking alternative routes. The extent of any delays is not known, and traffic management measures will be implemented during construction to minimise any adverse impacts as far as possible. Advanced notification of likely delays will enable people to allow additional journey time. Temporary traffic disruption is likely to reduce access to community facilities, shops and services in Barnard Castle for rural communities travelling by private vehicle or public transport (bus). Traffic disruption may deter some people from travelling to access services and facilities, although the number of people deterred from travelling is likely to be low. Traffic disruption is also likely to cause stress and annoyance. This is assessed as a negative effect on wellbeing.

Environmental conditions – operational assessment

- 13.8.266 The project has the potential to affect local air quality and levels of traffic noise through changes to road alignment traffic flow, speed and fleet composition. The Air Quality Assessment (Chapter 5: Air Quality) has identified small increases and decreases in NO_x and PM₁₀ concentrations at receptors close to the affected road network. However, as the air quality across the study area is good and the number of sensitive receptors experiencing changes in air quality is low, no significant air quality impacts have been identified for the Cross Lanes to Rokeby area in Chapter 5: Air Quality. Therefore, the health effect is assessed as neutral.
- 13.8.267 Significant adverse and beneficial effects on operational traffic noise have been identified in the noise and vibration assessment (Chapter 12: Noise and Vibration), as follows:
- Black Cross Lanes – Black Rokeby:
 - Adverse effects on 225 residential receptors.
 - Beneficial effects on 216 residential receptors.
 - Adverse effects on 12 non-residential receptors.
 - Beneficial effects on 64 non-residential receptors.
 - Black Cross Lanes – Red Rokeby:
 - Adverse effects on 14 residential receptors.
 - Beneficial effects on 39 residential receptors.
 - An adverse effect on one non-residential receptor.
 - Beneficial effects on four non-residential receptors.
 - Blue Cross Lanes – Black Rokeby:

- Adverse effects on 195 residential receptors.
- Beneficial effects on 219 residential receptors.
- Adverse effects on 8 non-residential receptors.
- Beneficial effects on 65 non-residential receptors.

- Blue Cross Lanes – Red Rokeby:

- Adverse effects on 16 residential receptors.
- Beneficial effects on 32 residential receptors.
- An adverse effect on one non-residential receptor.
- Beneficial effects on four non-residential receptors.

13.8.268 Those affected by adverse or beneficial noise impacts will include residents of affected properties, users of affected community resources and people from the local community who will experience changes in the level of noise within the public realm. Both negative and positive effects on wellbeing will arise from changes in the number of people experiencing annoyance due to noise, the level of enjoyment of outside space and the perception of the quality of the local living environment.

13.8.269 The landscape and visual assessment (Chapter 10: Landscape and Visual Effects) has identified significant visual impacts in the first year of operation at residential properties located west and east of Tutta Beck Farm, users of PRow west of Cross Lane and north and south of the A66 and users of Rokeby Park RPG (Red alternative only), Church of St. Mary (Black alternative only) and Cross Lanes Organic Farm (Black and Blue alternative). The affected rural residents may experience reduced enjoyment of views from their properties thereby experiencing a reduction in quality of life. People who regularly use Rokeby Park RPG, Church of St. Mary, Cross Lanes Organic Farm and affected PRow may experience reduced enjoyment of these resources and may be deterred from using them, resulting in reduced physical activity and access to green space. In the longer term, as vegetation becomes established and people get used to the presence of new infrastructure, the visual impacts will be reduced. The effect on wellbeing is assessed as negative.

13.8.270 At this stage of the design there is not sufficient detail to enable an assessment of the health effects of lighting. It is assumed that lighting will be sensitively designed in accordance with the relevant standards to ensure that negative effects are minimised as far as possible. Due to the small number of properties in proximity to the alignment, and the presence of the existing A66, the likely health effect associated with amenity and sleep disturbance is assessed as neutral.

Severance and accessibility – operational assessment

13.8.271 During operation, traffic flows will improve along the dualled A66 leading to shorter, more reliable journey times. Local severance issues where the local road network intersects with the A66, causing delays and road safety issues, will be reduced. This is likely to improve access to community facilities, shops and services in Barnard Castle for rural communities travelling by private vehicle or public transport (bus). This will lead to a range of benefits by reducing stress for travellers and enabling greater access to the benefits of community resources, such as social interaction, access to essential services, green space, sport and leisure. This is assessed as a positive health effect.

13.8.272 Significant visual impacts are predicted on rural PRow, which may reduce enjoyment of these resources and in some cases deter their use. However, it is considered that alternative routes will be used by recreational users, enabling continued access to green

space and physical activity. The health effect of visual impacts on PRow is assessed as neutral.

13.8.273 The likely health outcomes during construction and operation are summarised in Table 13-40: Cross Lanes to Rokeby – Likely Health Outcomes (Construction) and Table 13-41: Cross Lanes to Rokeby – Likely Health Outcomes (Operation) below. The assessment applies to all alternative routes unless stated.

Table 13-40: Cross Lanes to Rokeby – Likely Health Outcomes (Construction)

Receptor	Sensitivity	Potential Impacts	Design, Mitigation and Enhancement Measures	Likely Health Outcomes Following Mitigation
Residents of rural properties close to the alignment and residents at the Street and Moorhouse Lane	Medium	Construction dust	Dust mitigation requirements set out in Chapter 5: Air Quality	Neutral
Communities located close to construction traffic routes (locations not yet known)	Unknown	Increased HGV movements on the local road network	Details of traffic management measures to be included in the ES.	Neutral
Residents on Cross Lanes and Rokeby including The Cottage, Cross Lanes Farm, Ivy Cottage, Smithy Cottage, Street Side Farm, Birk House, Keepers Cottage, Tutta Beck Cottages and Farm, The Old Rectory, Ewebank Farm, Tack Room Cottage, and The Grove	Medium	Construction noise (day-time)	Noise mitigation requirements set out in Chapter 12: Noise and Vibration	Negative effect on quality of life and wellbeing
Residents west and east of Tutta Beck Farm, users of PRow west of Cross Lane and north and south of A66 and users of Rokeby Park RPG (Red alternative only), Church of St. Mary (Black alternative only) and Cross Lanes Organic Farm (Black and Blue alternative only)	Medium	Visual impact of vegetation clearance and construction activities	Visual mitigation requirements set out in Chapter 10: Landscape and Visual Effects	Negative effect on quality of life and wellbeing
Rural communities located close to construction works in the Cross Lanes to Rokeby study area	Medium	Night-time construction lighting and noise	Visual mitigation requirements set out in Chapter 10: Landscape and Visual Effects	Neutral
Users of PRow in the Cross Lanes to Rokeby study area	Medium to high	Temporary PRow disruption	The EMP will include construction and diversion measures to	Neutral

Receptor	Sensitivity	Potential Impacts	Design, Mitigation and Enhancement Measures	Likely Health Outcomes Following Mitigation
			minimise access disruption	
Residents in the Penrith to Temple Sowerby study area	Medium to high	Temporary traffic delays affecting access from rural communities to Bernard Castle.	The EMP will include construction and diversion measures to minimise access disruption	Negative effect on quality of life and wellbeing

Table 13-41: Cross Lanes to Rokeby – Likely Health Outcomes (Operation)

Receptor	Sensitivity	Potential Impacts	Design, Mitigation and Enhancement Measures	Likely Health Outcomes Following Mitigation?
Residents close to the affected road network	Medium	Small increases and decreases in NOx and PM10 concentrations	None	Neutral
Residents close to the affected road network	Medium	Increased traffic noise	Noise mitigation requirements set out in Chapter 12: Noise and Vibration	Negative effect on quality of life and wellbeing
Residents and users of non – residential receptors close to the affected road network	Medium	Decreased traffic noise	None	Positive effect on quality of life and wellbeing
Residents west and east of Tutta Beck Farm, users of ProW west of Cross Lane and north and south of the A66 and users of Rokeby Park RPG (Red alternative only), Church of St. Mary (Black	Medium	Visual impact of vegetation clearance and new road infrastructure	Visual mitigation requirements set out in Chapter 10: Landscape and Visual Effects	Negative effect on quality of life and wellbeing

Receptor	Sensitivity	Potential Impacts	Design, Mitigation and Enhancement Measures	Likely Health Outcomes Following Mitigation?
alternative only) and Cross Lanes Organic Farm (Black and Blue alternative)				
Residents close to the Cross Lanes to Rokeby alignment	Medium	Increased light pollution and glare from road lighting	Compliance with relevant standards for lighting design	Neutral
Residents in the Cross Lanes to Rokeby study area	Medium to high	Improved access to community facilities shops and services in Bernard Castle for rural communities.	None	Positive effect on quality of life and wellbeing
Users of PRoW in the Cross Lanes to Rokeby study area	Medium to high	Visual impacts on rural PRoW	Visual mitigation requirements set out in Chapter 10: Landscape and Visual Effects	Neutral

Stephen Bank to Carkin Moor

Population

Private property and housing – construction assessment

13.8.274 The likely significant effects upon private property and housing during operation for this scheme are the same as those reported for the M6 Junction 40 to Kemplay Bank scheme, see paragraphs 13.8.24 to 13.8.26.

13.8.275 There are no properties or housing allocations located within the draft DCO boundary and no land take or demolitions will be required to accommodate the scheme. As a result, no significant effects are determined.

Private property and housing – operation assessment

13.8.276 The likely significant effects upon private property and housing during operation for this scheme are the same as those reported for the M6 Junction 40 to Kemplay Bank scheme, see paragraphs **Error! Reference source not found.** to 13.8.29.

Development land and businesses – construction assessment

13.8.277 The likely significant effects upon development land and businesses for construction are the same as those reported for the M6 Junction 40 to Kemplay Bank scheme, see paragraph 13.8.30.

13.8.278 In addition to this the scheme will require minor land take from Carkin Moor Quarry, which has a high sensitivity due to its size. The business itself will not require demolition and it is anticipated that it can remain operational with a minor adverse impact due to the loss of land, which will result in a slight effect, which is not significant. A moderate significant effect is not anticipated as the business will likely remain operational at its current capacity.

Development land and businesses – operational assessment

13.8.279 The likely significant effects upon development and businesses for this scheme are the same as those reported for the M6 Junction 40 to Kemplay Bank scheme, see paragraphs 13.8.34 to 13.8.35.

Community land and assets – construction assessment

13.8.280 Construction of the scheme will be close to community land assets which may experience adverse impacts as a result of construction related nuisance. The sensitivity of the community land and assets within the study area will range from low to very high due to the availability of alternative facilities being in the local or wider local authority area. The impact will be moderate adverse due to the change in tranquillity and access for the receptors. The resulting effects will therefore range from slight to very large, which may be significant.

13.8.281 There are no demolitions or land take associated with this scheme that could impact upon community land and asset. As such there are no demolitions or land take associated with this scheme for community land and assets.

Community land and assets – operation assessment

13.8.282 The likely significant effects upon community land and assets for this scheme are the same as those reported for the M6 Junction 40 to Kemplay Bank scheme, see paragraphs 13.8.41 to 13.8.42.

Walkers, cyclists and horse-riders – construction assessment

13.8.283 There is the potential for likely significant effects upon WCHs as a result of the construction phase whereby by PRow could be impacted as a result of temporary closures and diversions due to direct land take, severance of PRow and the provision of access routes.

13.8.284 Bridleway BW 20.23/5/1 has a medium sensitivity in line with *DMRB LA 112* as it is largely a recreational route where alternative routes could be sought. The bridleway will be permanently diverted by 925m during the construction phase due to the construction of the scheme. The impact will be major adverse and will result in a moderate adverse effect, which is significant. A large significant effect is not anticipated as the Bridleway is not a national or regional trail. Similarly, users of the Bridleway are likely to committed to a long recreational walk, as opposed to using it for commuting purposes.

13.8.285 Footpath FP 20.23/8/1 has a medium sensitivity in line with *DMRBLA 112* as it is largely a recreational route, where alternative routes could be sought. The bridleway will be permanently diverted by 1.4km during the construction phase due to the construction of the scheme. The impact will be major adverse and will result in a moderate adverse effect, which is significant. A large significant effect is not anticipated as the Footpath is not a national or regional trail. Similarly, users of the Footpath are likely to committed to a long recreational walk, as opposed to using it for commuting purposes.

Walkers, cyclists and horse-riders – operation assessment

13.8.286 The likely significant effects upon WCH during operation are the same as those reported for the M6 Junction 40 to Kemplay Bank scheme, see paragraphs 13.8.45 to 13.8.47.

Agricultural land holdings – construction and operation assessment

13.8.287 The likely significant effects upon agricultural land holdings for this scheme are the same as those reported for the M6 Junction 40 to Kemplay Bank scheme, see paragraphs 13.8.48 to 13.8.52.

Table 13-42: Stephen Bank to Carkin Moor - likely significant effects (population)

Receptor	Potential Impacts (Construction)	Potential Impacts (Operation)	Design, Mitigation and Enhancement Measures	Likely Significant Effect Following Mitigation?
Residential receptors within the study area	Construction related nuisance and disruption to access	Improved connectivity and accessibility.	The EMP will include construction and diversion measures to minimise disruption to the receptors.	Construction: No Operation: No
Development land and businesses	Construction may temporarily disrupt access for the businesses located within and immediately adjacent to the draft DCO boundary.	Improved connectivity for local businesses which improves access and logistics. The possibility to attract businesses to the area and enable developments to succeed.	The EMP will include construction and diversion measures to minimise disruption to the receptors.	Construction: No Operation: No
Community land and assets	Construction could temporarily disrupt access and result in amenity effects on assets where these lie in proximity to construction activities.	Improved screening and vegetation for the users over and above the existing baseline which enhances its attractiveness and usability Improved connectivity and accessibility.	The EMP will include construction and diversion measures to minimise disruption to the receptors.	Construction: No Operation: No
Walkers Cyclists and Horse Riders	Severance of PRoW and other WCH provisions due to the land required for the construction of the project.	Potential for additional formal crossing points across the A66, and improvements to WCH journey times, in some cases. Potential for increased journey times dependent upon the permanent scheme design.	Further design refinement is required to minimise the temporary and permanent diversions. Where suitable diversions are not possible crossing provisions will be considered for inclusion in the design.	Construction: Yes (adverse) Operation: Yes (adverse and/or beneficial)
Agricultural land holdings	The loss of or damage to key characteristics, features or elements of the agricultural	Improved for connectivity for local businesses which improves access and logistics.	Further design review to determine alterations to alignment to seek retention of this land	Construction: Yes (adverse) Operation: No

Receptor	Potential Impacts (Construction)	Potential Impacts (Operation)	Design, Mitigation and Enhancement Measures	Likely Significant Effect Following Mitigation?
	holding and potential effect of this change on viability			
FP 20.23/8/1	Footpath will be severed by the draft DCO boundary	N/A	Footpath will be permanently diverted during the construction phase by 1.4km due to the construction of the scheme.	Construction: Yes (adverse)
BW 20.23/5/1	Bridleway will be severed by the draft DCO boundary	N/A	Bridleway will be permanently diverted during the construction phase by 925m due to the construction of the scheme.	Construction: Yes (adverse)

Human health

Environmental conditions – construction assessment

- 13.8.288 The Stephen Bank to Carkin Moor area has a low population density. Older people, who are prevalent within the study area, may be more vulnerable as they are more likely to suffer from existing health conditions. Based on a review of health and demographic baseline data, the Stephen Bank to Carkin Moor area is considered to have medium sensitivity to health effects from environmental impacts.
- 13.8.289 The Air Quality Assessment (Chapter 5: Air Quality) has identified a large construction dust risk potential for high-sensitivity receptors within 100m of the draft DCO boundary. There are no sensitive receptors within 100m of the scheme and therefore the health effects are assessed as neutral.
- 13.8.290 At time of writing, due to the stage of the design, finalised construction and mass haul traffic data were not available. However, as reported in Chapter 5: Air Quality, a review of preliminary mass haul calculations indicates that the construction of the project is likely to generate significant HGV movements. Increased HGV movements have the potential to give rise to negative effects on mental wellbeing due to a perceived reduction in the quality of the living environment and concerns about air quality and road safety. Due to the low population density in the Stephen Bank to Carkin Moor area the health effect is assessed as neutral.
- 13.8.291 As described in Chapter 12: Noise and Vibration, a full construction assessment of likely significant noise effects cannot be undertaken at this stage. Activities with the potential to generate significant noise effects are listed in Chapter 12 and residential properties within West Layton and East Layton are likely to be impacted temporarily by increased annoyance and reduced enjoyment of outdoor space due to construction noise. This is assessed as a negative effect on quality of life and wellbeing.
- 13.8.292 Chapter 10: Landscape and Visual Effects, has identified visual impacts on rural residential along the scheme. There are no impacts on settlements or community resources and as such the health effect from visual impacts is assessed as neutral.
- 13.8.293 It is not currently known whether any 24h construction activities will be required, which may lead to temporary sleep disturbance due to noise and lighting. Due to the small number of properties in proximity to the alignment, and the presence of the existing A66, the likely health effect associated with amenity and sleep disturbance is assessed as neutral.

Severance and accessibility – construction assessment

- 13.8.294 The study area comprises rural communities who rely on the local road network to access services and facilities in centres outside the study area. Older people, who are prevalent within the study area, may be more vulnerable as they are more likely to suffer from existing health conditions, to use local services and to depend on public transport. The sensitivity of the Stephen Bank to Carkin Moor population to severance and accessibility impacts is assessed as medium to high.
- 13.8.295 Direct (land take or demolition) impacts on community land and assets are described in the Population assessment above. There are no direct impacts that will prevent community resources from being accessed and used during the construction period.
- 13.8.296 As described in the route wide assessment of impacts on WCH, there is a potential for PRow to be impacted as a result of temporary closures and diversions due to direct land take and the provision of diversions. Such impacts will have the potential to affect access

to green space, opportunities for physical activity and the ability to access community resources by active travel, resulting in impacts on health and wellbeing. Due to the low population density in the Stephen Bank to Carking Moor study area, the likely health effects associated with impacts on PRoW is considered to be neutral.

- 13.8.297 Additional construction traffic and temporary lane closures during the dualling of the A66 is likely to cause some traffic delays at along this single carriageway stretch of road during the construction period. This could also affect the local road network due to delays at junctions with the A66 and traffic taking alternative routes. The extent of any delays is not known, and traffic management measures will be implemented during construction to minimise any adverse impacts as far as possible. Advanced notification of likely delays will enable people to allow additional journey time. Temporary traffic disruption is likely to reduce access to community facilities, shops and services in for rural communities travelling by private vehicle or public transport (bus). Traffic disruption may deter some people from travelling to access services and facilities, although the number of people deterred from travelling is likely to be low. Traffic disruption is also likely to cause stress and annoyance. This is assessed as a negative effect on wellbeing.

Environmental conditions – operational assessment

- 13.8.298 The project will affect local air quality and levels of traffic noise through changes in traffic flow, speed and fleet composition.
- 13.8.299 The Air Quality Assessment (Chapter 5: Air Quality) has identified small increases and decreases in NO_x and PM₁₀ concentrations at receptors close to the affected road network. However, as the air quality across the study area is good and the number of sensitive receptors experiencing changes in air quality is low, no significant air quality impacts have been identified in Chapter 5: Air Quality. Therefore, the health effect is assessed as neutral.
- 13.8.300 The noise and vibration assessment (Chapter 12: Noise and Vibration) has identified significant adverse effects on noise at 31 residential properties and significant beneficial effects at eight residential properties located near the A66 and at West Layton.. Residents of the affected properties may experience negative effects on wellbeing such as increased annoyance and reduced enjoyment of outside space. The health effects of operational noise are assessed as negative.
- 13.8.301 The landscape and visual assessment (Chapter 10: Landscape and Visual Effects) has identified moderate and major visual impacts on individual residential properties in rural areas throughout the study area. The affected residents may experience negative wellbeing impacts such as reduced enjoyment of views from their properties, in some cases combined with increased traffic noise. In the longer term, as vegetation becomes established and people get used to the presence of new infrastructure, negative wellbeing impacts will be reduced.
- 13.8.302 At this stage of the design there is not sufficient detail to enable an assessment of the health effects of lighting. It is assumed that lighting will be sensitively designed in accordance with the relevant standards to ensure that negative effects are minimised as far as practicable.
- 13.8.303 At this stage of the design there is not sufficient detail to enable an assessment of the health effects of lighting. It is assumed that lighting will be sensitively designed in accordance with the relevant standards to ensure that negative effects are minimised as far as possible. Due to the small number of properties in proximity to the alignment, and the presence of the existing A66, the likely health effect associated with amenity and

sleep disturbance is assessed as neutral. Severance and accessibility – operational assessment

- 13.8.304 During operation, traffic flows on the dualled A66 are likely to improve, leading to shorter and more reliable journey times. The communities in the study area are remote from community facilities, shops and services, and are likely to travel to settlements outside the study area to access these resources. The operation of the scheme is therefore likely to improve access to shops, services and facilities by car and public transport (bus) for communities in the study area. This will lead to a range of benefits by reducing stress for travellers and enabling greater access to the benefits of community resources, such as social interaction, access to essential services, green space, sport and leisure. This is assessed as a positive health effect.
- 13.8.305 Significant visual impacts are predicted on rural PRoW, which may reduce enjoyment of these resources and in some cases deter their use. However, it is considered that alternative routes will be used by recreational users, enabling continued access to green space and physical activity. Therefore, the health effect is assessed as neutral.
- 13.8.306 The likely health outcomes during construction and operation are summarised in Table 13-43: Stephen Bank to Carkin Moor - likely significant effects - construction (health) and Table 13-44: Stephen Bank to Carkin Moor - likely significant effects - operational (health) below.

Table 13-43: Stephen Bank to Carkin Moor - likely significant effects - construction (health)

Receptor (including sensitivity)	Sensitivity	Potential Impacts	Design, Mitigation and Enhancement Measures	Likely Health Outcomes Following Mitigation
Residents in the Stephen Bank to Carkin Moor study area	Medium	Construction dust (no receptors within 100m of scheme)	Dust mitigation requirements set out in Chapter 5: Air Quality	Neutral
Communities located close to construction traffic routes (locations not yet known)	Unknown	Increased HGV movements on the local road network	Details of traffic management measures to be included in the ES.	Neutral
Residents in West Layton and East Layton	Medium	Construction noise (day-time)	Noise mitigation requirements set out in Chapter 12: Noise and Vibration	Negative effect on quality of life and wellbeing
Residents in the Stephen Bank to Carkin Moor study area	Medium	Visual impact of vegetation clearance and construction activities (no significant impacts)	Visual mitigation requirements set out in Chapter 10: Landscape and Visual Effects	Neutral
Residents in the Stephen Bank to Carkin Moor study area	Medium	Night-time construction lighting and noise	Visual mitigation requirements set out in Chapter 10: Landscape and Visual Effects	Neutral
Users of PRoW in the Stephen Bank to Carkin Moor study area	Medium	Temporary PRoW disruption	The EMP will include construction and diversion measures to minimise access disruption	Neutral
Residents in the Stephen Bank to Carking Moor study area	Medium to high	Temporary traffic delays affecting access from rural communities to services and facilities	The EMP will include construction and diversion measures to minimise access disruption	Negative effect on quality of life and wellbeing

Table 13-44: Stephen Bank to Carkin Moor - likely significant effects - operational (health)

Receptor	Sensitivity	Potential Impacts	Design, Mitigation and Enhancement Measures	Likely Significant Effect Following Mitigation
Residents close to the affected road network	Medium	Small increases and decreases in NOx and PM10 concentrations	None	Neutral
Residents in and around West Layton	Medium	Increased traffic noise	Noise mitigation requirements set out in Chapter 12: Noise and Vibration	Negative effect on quality of life and wellbeing
Residents of rural properties in the Stephen Bank to Carkin Moor area	Medium	Visual impact of vegetation clearance and new road infrastructure	Visual mitigation requirements set out in Chapter 10: Landscape and Visual Effects	Negative effect on quality of life and wellbeing
Residents close to the Cross Lanes to Rokeby alignment	Medium	Increased light pollution and glare from road lighting	Compliance with relevant standards for lighting design	Neutral
Residents in the Cross Lanes to Rokeby study area	Medium to high	Improved traffic flows leading to access to services and facilities for rural communities	None	Positive effect on quality of life and wellbeing

A1(M) Junction 53 Scotch Corner

Population

Private property and housing – construction assessment

13.8.307 The likely significant effects upon private property and housing during operation for this scheme are the same as those reported for the M6 Junction 40 to Kemplay Bank scheme, see paragraphs 13.8.24 to 13.8.26.

13.8.308 There are no properties or housing allocations located within the draft DCO boundary and no land take or demolitions will be required to accommodate the scheme. As a result, no significant effects are determined.

Private property and housing – operation assessment

13.8.309 The likely significant effects upon private property and housing during operation for this scheme are the same as those reported for the M6 Junction 40 to Kemplay Bank scheme, see paragraphs **Error! Reference source not found.** to 13.8.29.

Development land and businesses – construction assessment

13.8.310 The likely significant effects upon development land and businesses for construction are the same as those reported for the M6 Junction 40 to Kemplay Bank scheme, see paragraph 13.8.30.

13.8.311 In addition to this there is a 'Strategic Direction of Growth' area, as identified by Richmondshire planning policy, within the study area. The site will have a very high sensitivity as it is 45ha in size. The site is due to be developed as part of the Scotch Corner Designer Outlet village. As the construction timings between the two projects are not known, the effects will be assessed in detail within the ES.

Development land and businesses – operation assessment

13.8.312 The likely significant effects upon development land and businesses for this scheme are the same as those reported for the M6 Junction 40 to Kemplay Bank scheme, see paragraphs 13.8.34 to 13.8.35.

13.8.313 The potential for improved access to the 'Strategic Direction of Growth' which is due to be developed as part of the Scotch Corner Designer Outlet village will also be subject to minor beneficial impacts, as a result of improved local access. Given the very high sensitivity of the receptors the resulting effects would be moderate beneficial which is significant, in order to ensure that the worst case scenario has been assessed.

Community land and assets – construction and operation assessment

13.8.314 There are no community facilities located within the study area of this scheme. As such there are no demolitions or land take associated with this scheme for community land and assets. As a result, there are no significant effects anticipated.

Walkers, cyclists and horse riders – construction and operation assessment

13.8.315 No PRoWs are either intersected by the scheme or within the draft DCO boundary. As a result, there are no significant effects anticipated.

Agricultural land holdings – construction and operation assessment

13.8.316 There are no known agricultural land holdings within the draft DCO boundary that could be at risk of land loss or demolition. As a result, there are no significant effects anticipated.

Table 13-45: A1(M) Junction 53 Scotch Corner - likely significant effects (population)

Receptor	Potential Impacts (Construction)	Potential Impacts (Operation)	Design, Mitigation and Enhancement Measures	Likely Significant Effect Following Mitigation?
Residential receptors within the study area	Construction related nuisance and disruption to access	Improved connectivity and accessibility.	The EMP will include construction and diversion measures to minimise disruption to the receptors.	Construction: No Operation: No
Development land and businesses	Construction may temporarily disrupt access for the businesses located within and immediately adjacent to the draft DCO boundary.	Improved connectivity for local businesses which improves access and logistics. The possibility to attract businesses to the area and enable developments to succeed.	The EMP will include construction and diversion measures to minimise disruption to the receptors.	Construction: No Operation: No
Strategic Direction of Growth Area – Scotch Corner Designer Outlet Village	Construction may temporarily disrupt access to the site which could affect construction workers on the site or operational users of the site.	Improved connectivity for local businesses which improves access and logistics. The possibility to attract businesses to the area and enable developments to succeed.	The EMP will include construction and diversion measures to minimise disruption to the receptors.	Construction: To be assessed in the ES Operation: Yes

Human health

Environmental conditions – construction assessment

- 13.8.317 The A1(M) junction 53 to Scotch Corner area has a low population density. Older people, who are prevalent within the study area, may be more vulnerable as they are more likely to suffer from existing health conditions. Based on a review of health and demographic baseline data, the area is considered to have medium sensitivity to health effects from environmental impacts.
- 13.8.318 The Air Quality Assessment (Chapter 5: Air Quality) has identified a large construction dust risk potential for high-sensitivity receptors within 100m of the draft DCO boundary. Residents at Middleton Tyas Lane will therefore be at risk of adverse impacts on wellbeing from dust nuisance. Requirements for dust mitigation set out in Chapter 5: Air Quality are considered to remove any significant impacts and therefore the health effects are assessed as neutral.
- 13.8.319 At time of writing, due to the stage of the design, finalised construction and mass haul traffic data were not available. However, as reported in Chapter 5: Air Quality, a review of preliminary mass haul calculations indicates that the construction of the project is likely to generate significant HGV movements. Due to low population density, the health effects of increased HGV movements within the A1 (M) Junction 53 Scotch Corner area are assessed as neutral.
- 13.8.320 As described in Chapter 12: Noise and Vibration, a full construction assessment of likely significant noise effects cannot be undertaken at this stage. Activities with the potential to generate significant noise effects are listed in Chapter 12: Noise and Vibration. The noise and vibration assessment identifies no potential significant effects at sensitive receptors therefore, the health effects of increased noise within the A1(M) Junction 53 Scotch Corner area are assessed as neutral.
- 13.8.321 Chapter 10: Landscape and Visual Effects has identified no significant visual construction effects on properties, settlements or community resources, therefore the health effect is assessed as neutral.
- 13.8.322 It is not currently known whether any 24h construction activities will be required, which may lead to temporary sleep disturbance due to noise and lighting. At this stage, based on the nature of the works and proximity to receptors, the likely health effects are assessed as neutral.

Severance and accessibility – construction assessment

- 13.8.323 The study area comprises rural communities who rely on the local road network to access services and facilities in Middleton Tyas and larger centres outside the study area. Older people, who are prevalent within the study area, may be more vulnerable as they are more likely to suffer from existing health conditions, to use local services and to depend on public transport. The sensitivity of the A1(M) Junction 53 Scotch Corner population to severance and accessibility impacts is assessed as medium to high.
- 13.8.324 Direct (land take or demolition) impacts on community land and assets are described in the Population assessment above. There are no direct impacts that will prevent community resources from being accessed and used during the construction period.
- 13.8.325 As described in the route-wide assessment of impacts on WCH, there is a potential for PRoW to be impacted as a result of temporary closures and diversions due to direct land take and the provision of diversions. Such impacts will have the potential to affect access to green space, opportunities for physical activity and the ability to access community

resources by active travel, resulting in impacts on health and wellbeing. Due to the low population density in the A1(M) Junction 53 Scotch Corner study area, the likely health effects associated with impacts on PRoW is considered to be neutral.

13.8.326 Additional construction traffic and temporary lane closures during the dualling of the A66 is likely to cause some traffic delays along this single carriageway stretch of road during the construction period. This could also affect the local road network due to delays at junctions with the A66 and traffic taking alternative routes. The extent of any delays is not known, and traffic management measures will be implemented during construction to minimise any adverse impacts as far as possible. Advanced notification of likely delays will enable people to allow additional journey time. Temporary traffic disruption is likely to reduce access to community facilities, shops and services in Middleton Tyas for rural communities travelling by private vehicle or public transport (bus). Traffic disruption may deter some people from travelling to access services and facilities; although the number of people deterred from travelling is likely to be low. Traffic disruption is also likely to cause stress and annoyance. This is assessed as a negative effect on wellbeing.

Environmental conditions – operational assessment

13.8.327 The project has the potential to affect local air quality and levels of traffic noise through changes to road alignment traffic flow, speed and fleet composition. The Air Quality Assessment (Chapter 5: Air Quality) has identified small increases and decreases in NO_x and PM₁₀ concentrations at receptors close to the affected road network. However, as the air quality across the study area is good and the number of sensitive receptors experiencing changes in air quality is low, no significant air quality impacts have been identified for the A1(M) Junction 53 Scotch Corner area in Chapter 5: Air Quality. Therefore, the health effect is assessed as neutral.

13.8.328 Significant adverse and beneficial effects on operational traffic noise have been identified in the noise and vibration assessment (Chapter 12: Noise and Vibration), as follows:

- Adverse effects on 12 residential receptors.
- An adverse effect on one non-residential receptor.

13.8.329 Negative effects on wellbeing are likely to arise from an increase in the number of people experiencing annoyance due to noise and the perception of the quality of the local living environment.

13.8.330 The landscape and visual assessment (Chapter 10: Landscape and Visual Effects) has identified no significant visual impacts in the first year of operation on properties, settlements or community resources, therefore the health effect is assessed as neutral.

13.8.331 At this stage of the design there is not sufficient detail to enable an assessment of the health effects of lighting. It is assumed that lighting will be sensitively designed in accordance with the relevant standards to ensure that negative effects are minimised as far as possible. Due to the small number of properties in proximity to the alignment, and the presence of the existing A66, the likely health effect associated with amenity and sleep disturbance is assessed as neutral.

Severance and accessibility – operational assessment

13.8.332 During operation, traffic flows will improve along the dualled A66 leading to shorter, more reliable journey times. Local severance issues where the local road network intersects with the A66, causing delays and road safety issues, will be reduced. This is likely to improve access to community facilities, shops and services in Middleton Tyas for rural

communities travelling by private vehicle or public transport (bus). This will lead to a range of benefits by reducing stress for travellers and enabling greater access to the benefits of community resources, such as social interaction, access to essential services, green space, sport and leisure. This is assessed as a positive health effect.

13.8.333 Significant visual impacts are predicted on rural PRow, which may reduce enjoyment of these resources and in some cases deter their use. However, it is considered that alternative routes will be used by recreational users, enabling continued access to green space and physical activity. The health effect of visual impacts on PRow is assessed as neutral.

13.8.334 The likely health outcomes during construction and operation are summarised in Table 13-46: A1(M) Junction 53 Scotch Corner – Likely Health Outcomes (Construction) and Table 13-47: A1(M) Junction 53 Scotch Corner – Likely Health Outcomes (Operation) below.

Table 13-46: A1(M) Junction 53 Scotch Corner – Likely Health Outcomes (Construction)

Receptor	Sensitivity	Potential Impacts	Design, Mitigation and Enhancement Measures	Likely Health Outcomes Following Mitigation
Residents at Middleton Tyas Lane	Medium	Construction dust	Dust mitigation requirements set out in Chapter 5: Air Quality	Neutral
Suburban and rural communities located close to construction traffic routes (locations not yet known)	Unknown	Increased HGV movements on the local road network	Details of traffic management measures to be included in the ES.	Neutral
Rural communities located close to construction works in the A1(M) Junction 53 Scotch Corner study area	Medium	Night-time construction lighting and noise	Visual mitigation requirements set out in Chapter 10: Landscape and Visual Effects	Neutral
Users of PRow in the A1(M) Junction 53 Scotch Corner study area	Medium	Temporary PRow disruption	The EMP will include construction and diversion measures to minimise access disruption	Neutral
Residents in the A1(M) Junction 53 Scotch Corner study area	Medium to high	Temporary traffic delays affecting access from rural communities to Middleton Tyas.	The EMP will include construction and diversion measures to minimise access disruption	Negative

Table 13-47: A1(M) Junction 53 Scotch Corner – Likely Health Outcomes (Operation)

Receptor	Sensitivity	Potential Impacts	Design, Mitigation and Enhancement Measures	Likely Health Outcomes Following Mitigation
Residents close to the affected road network	Medium	Small increases and decreases in NOx and PM10 concentrations	None	Neutral
Residents and users of non-residential receptors close to the affected road network	Medium	Increased traffic noise	Noise mitigation requirements set out in Chapter 12: Noise and Vibration	Negative effect on quality of life and wellbeing
Residents close to the A1(M) Junction 53 Scotch Corner alignment	Medium	Increased light pollution and glare from road lighting	Compliance with relevant standards for lighting design	Neutral
Residents in the A1(M) Junction 53 Scotch Corner study area	Medium to high	Improved access to community facilities shops and services in Middleton Lyas for rural communities.	None	Positive effect on quality of life and wellbeing
Users of PRow in the A1(M) Junction 53 Scotch Corner study area	Medium	Visual impacts on rural PRow	Visual mitigation requirements set out in Chapter 10: Landscape and Visual Effects	Neutral

13.9 Monitoring

- 13.9.1 No monitoring measures have been identified at this stage for the project on a scheme-by-scheme basis or at a route wide level. Should monitoring be required as a result of the full assessment then it will be proposed and included within the ES.
- 13.9.2 Monitoring of air quality, visual and noise impacts reported in Chapters 5: Air Quality, Chapter 10: Landscape and Visual Effects and Chapter 12: Noise and Vibration are relevant to the human health assessment.