A12 Chelmsford to A120 widening scheme TR010060

6.1 ENVIRONMENTAL STATEMENT CHAPTER 13 POPULATION AND HUMAN HEALTH

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ENVIRONMENTAL STATEMENT
CHAPTER 13 POPULATION AND HUMAN HEALTH

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A. Introduction

13.1 Topic introduction

13.1.1 This chapter presents the information required by the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (as amended) to be provided in the Environmental Statement for the proposed A12 Chelmsford to A120 widening scheme (the proposed scheme) in respect of population and human health.

13.1.2 This chapter provides an assessment of the interrelated aspects of population and human health in accordance with the Design Manual for Roads and Bridges (DMRB) LA 112 Population and Human Health (Highways England, 2020a). It provides an assessment of the likely significant physical impacts of the proposed scheme on land use and accessibility (Part B of this chapter), followed by an assessment of the potential effects on population health (Part C of this chapter), during construction and operation of the proposed scheme. Part D of this chapter provides the overall conclusions.

13.1.3 The land use and accessibility assessment addresses the matters of private (residential) property and housing; community land and assets; development land and businesses; agricultural landholdings; and access for walkers, cyclists and horse riders.

13.1.4 The human health assessment addresses potential effects on population health linked to impacts on several determinants of health. Further details of the scope of assessment are set out in Section 13.12 of this chapter.

13.1.5 This chapter is supported by the following figures [TR010060/APP/6.2]:

- Figure 13.1: Population and Human Health Context
- Figure 13.2: Land Use and Accessibility Impacts
- Figure 13.3: Human Health Baseline and Impacts

13.1.6 This chapter is supported by the following appendices of the Environmental Statement [TR010060/APP/6.3]:

- Appendix 13.1: Human Health Literature Review and Evidence
- Appendix 13.2: Stakeholder Engagement and Scoping for Human Health
- Appendix 13.3: Land Use and Accessibility Assessment Tables
- Appendix 13.4: Mental Wellbeing Impact Assessment
- Appendix 13.5: Legislative and Policy Framework for Population and Human Health

13.2 Competent expert evidence

13.2.1 This assessment has been undertaken and reported by a team of competent population and human health specialists. The competent expert responsible for the assessment is an Associate Director, Chartered Environmentalist, full member of the Institute of Environmental Management and Assessment (IEMA), and associate of the Faculty of Public Health, who has an MSc in Environmental Management and has recently completed a Master of Public Health degree (December 2021). The competent expert has over 19 years' experience of undertaking population and human health-related assessments for major infrastructure and linear projects, including highways, for which the process of Environmental Impact Assessment has been required.

13.3 Legislative and policy framework

13.3.1 The legislative and policy framework relevant to the assessment of population and human health is set out in Appendix 13.5 of the Environmental Statement [TR010060/APP/6.3].

B. Land use and accessibility

13.4 Land use and accessibility assessment methodology

Assessment scope

13.4.1 Table 13.1 sets out the scope of the land use and accessibility assessment as identified in the Environmental Scoping Report (Highways England, 2020b).

Table 13.1 Scope of assessment for land use and accessibility

Matter	Scoped in – construction	Scoped in – operation
Private property and housing	✓	✓
Community land and assets	✓	✓
Development land and business	✓	✓
Agricultural landholdings	✓	✓
Walkers, cyclists and horse riders	✓	✓

General approach for land use and accessibility

13.4.2 The approach to the assessment follows DMRB LA 112 (Highways England, 2020a). Effects are assessed for the construction phase and the first year of operation.

13.4.3 The focus of this assessment is on identifying whether the existing function of the land use or access would be changed by the physical impact of the proposed scheme. Where the function of a land use or accessibility asset is predicted to be impacted on, consideration is then given to the overall effect this would have on a community by community basis, with the exception of agricultural land use which is assessed in relation to the entire study area. Refer to Section 13.5 in this chapter for information on assumptions and limitations.

Baseline and evaluation of resources

13.4.4 The process of assessment has involved identifying the baseline land use and accessibility resources that could potentially be affected. Since this assessment relates to land use, the focus has been on identifying those land use assets that would potentially be physically impacted by the proposed scheme, or where the direct access to those assets would be physically affected. A high number of land use and accessibility assets have been identified which coincide with the Order Limits and are therefore at risk of being physically impacted on. These are listed in Appendix 13.3 of the Environmental Statement [TR010060/APP/6.3]. The assets (with the exception of agricultural landholdings) have been organised by community to enable a better geographical contextualisation of where impacts are likely to occur. The identification of the baseline communities has been informed by parish boundaries, and some nearby settlements have been grouped where it is considered likely there are shared land use and accessibility assets or substantial interaction between residents within the communities.

13.4.5 Each land use and accessibility asset has been assigned a value, guided by the criteria set out in Table 13.2, which is derived from DMRB LA 112 (Highways England, 2020a). Interpretation notes have been added against some criteria to explain how the DMRB LA 112 criteria have been interpreted for this assessment.

Table 13.2 Value/sensitivity criteria for land use and accessibility

Value (sensitivity)	Typical descriptors
Very high	Private property and housing 1) existing private property or land allocated for housing located in a local authority area where the number of households are expected to increase by >25% by 2041 (Office for National Statistics (ONS) data); and/or 2) existing housing and land allocated for housing (e.g. strategic housing sites) covering >5ha and/or >150 houses. Interpretation note: 2043 ONS projections have been used as ONS projections have been updated since DMRB LA 112 was published.
	Community land and assets Community land and assets where there is a combination of the following: 1) complete severance between communities and their land/assets, with little/no accessibility provision; 2) alternatives are only available outside the local planning authority area; 3) the level of use is very frequent (daily); and 4) the land and assets are used by the majority (>=50%) of the community.
	Development land and businesses Existing employment sites (excluding agriculture) and land allocated for employment (e.g. strategic employment sites) covering >5ha.
	Agricultural landholdings 1) areas of land in which the enterprise is wholly reliant on the spatial relationship of land to key agricultural infrastructure; and 2) access between land and key agricultural infrastructure is required on a frequent basis (daily). Interpretation note: For the purposes of this assessment, this has been interpreted to mean agricultural holdings which are dependent on very regular access between fields and agricultural infrastructure throughout the year, for example dairy farms.

Value (sensitivity)	Typical descriptors
	Walkers, cyclists and horse riders 1) national trails and routes likely to be used for both commuting and recreation that record frequent (daily) use. Such routes connect communities with employment land uses and other services with a direct and convenient walker, cyclist, and horse rider route. Little or no potential for substitution. 2) routes regularly used by vulnerable travellers such as the elderly, school children and people with disabilities, who could be disproportionately affected by small changes in the baseline due to potentially different needs. 3) rights of way for walkers, cyclists, and horse riders crossing roads at grade with >16,000 vehicles per day.
High	Private property and housing 1) private property or land allocated for housing located in a local planning authority area where the number of households are expected to increase by 16–25% by 2041 (ONS data); and/or 2) existing housing and land allocated for housing (e.g. strategic housing sites) covering >1–5ha and/or >30–150 houses. Interpretation note: 2043 ONS projections have been used as ONS projections have been updated since DMRB LA 112 was published.
	Community land and assets 1) there is substantial severance between community and assets, with limited accessibility provision; 2) alternative facilities are only available in the wider local planning authority area; 3) the level of use is frequent (weekly); and 4) the land and assets are used by the majority (>=50%) of the community. Interpretation note: Point 2 has been interpreted to mean locations where alternatives are available only by travel to other settlements/areas.
	Development land and businesses Existing employment sites (excluding agriculture) and land allocated for employment (e.g. strategic employment sites) covering >1–5ha.
	Agricultural landholdings 1) areas of land in which the enterprise is dependent on the spatial relationship of land to key agricultural infrastructure; and 2) access between land and key agricultural infrastructure is required on a frequent basis (weekly). Interpretation note: For the purposes of this assessment, these criteria are being interpreted as farm holdings dependent on access to extensive land to maintain high productivity, for example extensive arable farms.

Value (sensitivity)	Typical descriptors
	Walkers, cyclists and horse riders 1) regional trails and routes (e.g. promoted circular walks) likely to be used for recreation and to a lesser extent commuting, that record frequent (daily) use. Limited potential for substitution; and/or 2) rights of way for walkers, cyclists, and horse riders crossing roads at grade with >8,000–16,000 vehicles per day.
Medium	Private property and housing 1) houses or land allocated for housing located in a local authority area where the number of households are expected to increase by >6–15% by 2041 (ONS data); and/or 2) existing housing and land allocated for housing (e.g. strategic housing sites) covering <1ha and/or <30 houses. Interpretation note: 2043 ONS projections have been used as ONS projections have been updated since DMRB LA 112 was published.
	Community land and assets 1) there is severance between communities and their land/assets but with existing accessibility provision; 2) limited alternative facilities are available at a local level within adjacent communities; 3) the level of use is reasonably frequent (monthly); and 4) the land and assets are used by the majority (>=50%) of the community.
	Development land and businesses Existing employment sites (excluding agriculture) and land allocated for employment (e.g. strategic employment sites) covering <1ha.
	Agricultural landholdings 1) areas of land in which the enterprise is partially dependent on the spatial relationship of land to key agricultural infrastructure; and 2) access between land and key agricultural infrastructure is required on a reasonably frequent basis (monthly).
	Walkers, cyclists and horse riders 1) public rights of way (PRoWs) and other routes close to communities which are used for recreational purposes (e.g. dog walking), but for which alternative routes can be taken. These routes are likely to link to a wider network of routes to provide options for longer, recreational journeys; and/or 2) rights of way for walkers, cyclists, and horse riders crossing roads at grade with >4,000–8,000 vehicles per day.
Low	Private property and housing Proposed housing development on unallocated sites providing housing with planning permission or in the planning process.

Value (sensitivity)	Typical descriptors
	Community land and assets 1) limited existing severance between community and assets, with existing full Equality Act 2010 compliant accessibility provision; 2) alternative facilities are available at a local level within the wider community; 3) the level of use is infrequent (monthly or less frequent); and 4) the land and assets are used by the minority (<=50%) of the community.
	Development land and businesses Proposed development on unallocated sites providing housing with planning permission or in the planning process.
	Agricultural landholdings 1) areas of land which the enterprise is not dependent on the spatial relationship of land to key agricultural infrastructure; and 2) access between land and key agricultural infrastructure is required on an infrequent basis (monthly or less frequent).
	Walkers, cyclists and horse riders 1) routes which have fallen into disuse through past severance, or which are scarcely used because they do not currently offer a meaningful route for either utility or recreational purposes; and/or 2) rights of way for walkers, cyclists and horse riders crossing roads at grade with <4,000 vehicles per day.
Negligible	Private property and housing N/A
	Community land and assets 1) no or limited severance or accessibility issues; 2) alternative facilities are available within the same community; 3) the level of use is very infrequent (a few occasions yearly); and 4) the land and assets are used by the minority (<=50%) of the community.
	Development land and businesses N/A
	Agricultural landholdings Areas of land which are infrequently used on a non-commercial basis.
	Walkers, cyclists and horse riders N/A

Assessing magnitude of impacts

13.4.6 The magnitude (scale) of impacts on land use and accessibility assets has been determined using the criteria in Table 13.3, which is derived from DMRB LA 112 (Highways England, 2020a). The assessment has considered whether the integrity or function of the asset would be lost or compromised, or whether impacts would be noticeable but not result in any change to the viability of that land use or accessibility asset.

Table 13.3 Magnitude criteria for land use and accessibility

Magnitude	Typical descriptors
Major	Private property and housing, community land and assets, development land and businesses, and agricultural landholdings: 1) Loss of resource and/or quality and integrity of resource; severe damage to key characteristics, features or elements. e.g. direct acquisition and demolition of buildings and direct development of land to accommodate highway assets. 2) Introduction (adverse) or removal (beneficial) of complete severance with no/full accessibility provision. Walkers, cyclists, horse riders*: >500m increase (adverse) or decrease (beneficial) in walking, cycling and horse-riding journey length.
Moderate	Private property and housing, community land and assets, development land and businesses, and agricultural landholdings: 1) Partial loss of or damage to key characteristics, features or elements, e.g. partial removal or substantial amendment to access or acquisition of land compromising viability of property, businesses, community assets or agricultural holdings. 2) Introduction (adverse) or removal (beneficial) of severe severance with limited or moderate accessibility provision. Walkers, cyclists, horse riders*: >250m–500m increase (adverse) or decrease (beneficial) in walking, cycling and horse-riding journey length.

Magnitude	Typical descriptors
Minor	Private property and housing, community land and assets, development land and businesses, and agricultural landholdings: 1) A discernible change in attributes, quality or vulnerability; minor loss of, or alteration to, one (maybe more) key characteristics, features or elements, e.g. amendment to access or acquisition of land resulting in changes to operating conditions that do not compromise overall viability of property, businesses, community assets or agricultural holdings. 2) Introduction (adverse) or removal (beneficial) of severance with adequate accessibility provision. Walkers, cyclists, horse riders*: >50m–250m increase (adverse) or decrease (beneficial) in walking, cycling and horse-riding journey length.
Negligible	Private property and housing, community land and assets, development land and businesses, and agricultural landholdings: 1) Very minor loss or detrimental alteration to one or more characteristics, features or elements, e.g. acquisition of non-operational land or buildings not directly affecting the viability of property, businesses, community assets or agricultural holdings. 2) Very minor introduction (adverse) or removal (beneficial) of severance with ample accessibility provision. Walkers, cyclists, horse riders*: <50m increase (adverse) or decrease (beneficial) in walking, cycling and horse-riding journey length.
No change	No loss or alteration of characteristics, features, elements or accessibility; no observable impact in either direction.
*Note: The assessment of impacts on walkers, cyclists and horse riders has also considered changes in the availability, quality and standard of provision for walkers, cyclists and horse riders as well as severance and accessibility provision. For example, where a cycle track has been widened to meet a more modern standard, or where past severance of a PRoW has been removed, this is regarded as beneficial. A narrative is provided in the assessment to support the judgement of magnitude assessed.	

Assessing the significance of effects

13.4.7 The general approach to assessing the significance of effects is set out in Chapter 5: Environmental assessment methodology, of the Environmental Statement [TR010060/APP/6.1] based on DMRB LA 104 Environmental Assessment and Monitoring (Highways England, 2020c) and relates to whether or not effects are considered material in the decision-making process.

13.4.8 Paragraphs 3.13 and 3.14 of DMRB LA 112 state that '*The significance of effect shall be derived by combining the assigned value (sensitivity) of receptors with the magnitude of change arising from a project, in accordance with LA 104*' and that the '*significance of effect shall be determined for each element of the land*

and accessibility sub topic (e.g. private property and housing, development land and businesses etc) affected by a project.' (Highways England, 2020a).

13.4.9 This requirement of DMRB LA 112 has been interpreted by the assessor to mean that, although there may be a major impact on a particular land use and accessibility asset, which would be greatly significant to the owners/users of that asset, this does not imply significance at a decision-making level, as there may be sufficient alternative resource to serve overall community needs. The assessment of significance has therefore considered the combined effect of identified impacts on each land use and accessibility matter (see Table 13.1 above). To do this, the magnitude criteria in Table 13.3 have been used to guide the decision as to:

- whether the characteristics of each land use and accessibility resource for each assessed community has been lost, partially lost or damaged, discernibly changed or altered in some minor way
- severance has been introduced or removed, and whether accessibility has been adequately provided for in the design or mitigation proposals
- whether the viability of walking, cycling and horse-riding routes for the community overall would be compromised or improved through changes in distance, quality or accessibility

13.4.10 After considering the overall magnitude of the identified impacts on the integrity of each community's overall land use and accessibility matter, together with the value of the various affected assets, the judgement of likely significant effects on land use and accessibility has then been assessed using the significance matrix provided in Table 5.3 of Chapter 5: Environmental assessment methodology, of the Environmental Statement [TR010060/APP/6.1], which is derived from DMRB LA 104 (Highways England, 2020c). The interpretation of the assessment criteria to assign an overall level of significance has involved a degree of professional judgement as to whether an effect is likely to be material in the decision-making process and hence significant in terms of DMRB LA 104. In the case of this land use and accessibility assessment, the judgement has considered whether:

- several resources are affected to the extent that effects are noticeable at a community level (rather than individual level)
- the function of a land use and accessibility resource, such as factors required to support a population (for example services, employment, recreation, local economy, community cohesion), are likely to be lost, severely degraded or greatly enhanced

13.4.11 The rationale for the level of significance assigned is set out for each assessment made. Refer to Appendix 13.3 of the Environmental Statement [TR010060/APP/6.3] for the full assessment. The main land use and accessibility assessment points are set out in Section 13.10 of this chapter.

Timescales

13.4.12 Land use and accessibility effects are reported for construction and for the first year of operation.

13.4.13 The following terms are used to describe the duration of impacts: transient impacts are those that would typically last up to two days, such as disruption caused in the case of a weekend road closure; short-term impacts are those lasting up to six months; medium-term impacts are those lasting six months to five years; and long-term impacts are those lasting more than five years.

13.4.14 Temporary impacts are those which would not be permanent, such as land take during the construction phase that would be returned to the landowner on completion of the works. It should be noted that, in some cases, impacts described as temporary could last for several months or even the duration of the construction phase.

13.5 Assessment assumptions and limitations

13.5.1 This assessment has been undertaken assuming a reasonable worst-case basis afforded by the proposed limits of deviation. While the lateral limits of deviation (as shown on the Works Plans [TR010060/APP/2.2]) may result in the proposed scheme being closer to some receptors or resources, it is not considered this would result in a greater level of significance than provided in this assessment.

13.5.2 The assessment addresses only the direct impacts and effects of the proposed scheme on land use in relation to land take, severance and changes to accessibility. The assessment does not draw conclusions on the viability of any individual businesses, including farm businesses, that may be affected by changes in land or access from the proposed scheme. Such matters would relate to the relevant margins that support the businesses and any impacts on business viability would require direct negotiation between the interested parties and their representatives. Instead, the assessment presents effects in relation to whether the current land use can feasibly be maintained in light of impacts such as land take or alterations to access.

13.5.3 The right to compensation for affected landowners, together with the methods and procedures for ascertaining the appropriate levels of any compensation due, is decided in relation to the compensation code, which is outside of the scope of this Environmental Impact Assessment process. Information on the status of the Applicant's negotiations with other parties' interests is set out in the Statement of Reasons [TR010060/APP/4.1].

13.5.4 All measurements are approximate and do not reflect details of final negotiations relating to land acquisition.

13.5.5 Any impacts on individual properties do not necessarily constitute a significant community effect. The assessment considers significance in terms of the overall effect on the land use resource as a whole.

13.5.6 This land use assessment does not assess the potential impacts on business viability from indirect effects such as changes in footfall due to changes in levels of through-traffic through some settlements. This issue has, however, been

considered in relation to the Mental Wellbeing Impact Assessment (see Appendix 13.4 of the Environmental Statement [TR010060/APP/6.3]). Business viability is dependent on many factors beyond the influence of the proposed scheme, including market conditions. In relation to the land use and accessibility assessment it is assumed that any business and employment land not directly impacted by the footprint of the proposed scheme would remain, albeit the nature of businesses may change over time in response to factors such as supply and demand.

13.5.7 The use of the Strava (2022) Global Heatmap to inform cycling and running activity in the area has the limitation that it is likely to be a selective group of cyclists and runners who use the app. The app is likely used more by very keen and more competitive cyclists and runners and may not reflect the activities of occasional cyclists and runners, family rides with younger children or short regular commutes. Nevertheless, the app is widely used and provides an indication of routes regularly used and routes which tend to be avoided. Other sources of data have also been used to support the assessment including the Outdoor Recreation Valuation tool (ORVal) (Day and Smith, 2018), which provides usage data for some recreational assets, and Ordnance Survey mapping to indicate proximity of receptors that would likely access the resource.

13.6 Study area

13.6.1 The study area for land use and accessibility is the Order Limits plus a buffer of 500m as set out in DMRB LA 112 (Highways England, 2020a). The Order Limits contain the proposed scheme, including proposed borrow pits and site compounds. This study area is deemed sufficient to identify the potential direct impacts on land use and accessibility, including the main access points for land use resources.

13.6.2 A wider context has been applied to inform the baseline understanding of the sensitivity of routes within the study area used by walkers, cyclists and horse riders that could potentially be affected by the proposed scheme. For cyclists and horse riders, consideration is given to possible origins and destinations of up to 10km from the Order Limits of the proposed scheme, while a distance of up to 2km is considered for regular walking journeys. The consideration of this wider context is deemed sufficient to provide insight into the likely purpose of journeys that cross the footprint of the proposed scheme since typical regular walking distances are up to 2km, while cycle commutes are typically up to 10km (Department for Transport, 2017). It is also considered sufficient to capture the context for horse riders and long-distance walkers who would typically travel more than 2km as part of a recreational journey.

13.7 Baseline conditions

Baseline sources

13.7.1 Key sources used to inform the understanding of baseline conditions are set out in Table 13.4. In addition, information from landowners' questionnaires has informed the agricultural baseline and assessment.

Table 13.4 Sources for the baseline conditions

Data source	Baseline information obtained
Braintree District Council Local Plan: Publication Draft June 2017	Development allocations and planning policies
Braintree District Cycling Action Plan – Draft, January 2018 (Essex Highways, 2018)	Local cycling priorities
Chelmsford Cycling Action Plan, March 2017 (Essex Highways, 2017)	Local cycling priorities
Chelmsford Local Plan, Full Council Version, May 2020	Development allocations and planning policies
Colchester Emerging Local Plan 2017 – 2033	Development allocations and planning policies
Essex County Council Rights of Way Improvement Plan, 2009	PRoW priorities
Essex Highways Interactive PRoW Map	PRoWs
Information on agricultural landholdings, businesses and other landowners from the developer's land agents	Landholdings data
Maldon District Approved Local Development Plan 2014 – 2029	Development allocations and planning policies
Office of Rail and Road	Railway station usage data
Ordnance Survey 1:25,000 mapping	Spatial data including regional trails
Ordnance Survey AddressBase Plus vector map data	Data on numbers of residential properties in the study area and other community facilities
Ordnance Survey National Cycle Network Map	National cycle network data
ORVal (Day and Smith, 2018)	Visitor numbers for certain recreational assets (where data available)
Strava (2022) Global Heatmap	Data on patterns of cycle use
The Propensity to Cycle Tool: An open source online system for sustainable transport planning (Lovelace *et al*. 2017)	Data on patterns of cycle use

Baseline information

13.7.2 The locations of land use and accessibility assets in the baseline are indicated on Figure 13.1 [TR010060/APP/6.2]. An overview of the baseline conditions in this respect is set out below.

Private property and housing

13.7.3 The main settlements along and around the A12 corridor are Chelmsford, Boreham, Hatfield Peverel, Witham, Rivenhall End, Kelvedon, Tiptree, Feering, Marks Tey and Copford. The city of Colchester is within 2km of the easternmost point of the study area, Maldon is located within 6km to the south-east, and Braintree within 10km north of the study area. The populations of these settlements, based on 2011 census data, are set out in Table 13.5.

13.7.4 There are many farms, country homes and cottages located close to the A12 in the open countryside. The closest residential areas to the existing A12 are in Rivenhall End (Oak Road and Foxmead), Hatfield Peverel and Marks Tey (residential properties along Old London Road and London Road). There are 198 residential houses located within 20m of the existing A12 highway boundary. There are seven residential properties (houses) within the area covered by the Order Limits and 12,266 within the land use and accessibility study area. There are also individual residential properties and businesses along the corridor that directly access the A12, including on the slip roads at junction 25 (Marks Tey interchange).

Table 13.5 Settlements and usual resident population

Settlement	Distance from land use and access study area	Population size
Chelmsford	Partially within the study area (easternmost extents of Chelmsford only), central Chelmsford is approximately 2.9km west of the study area	111,511
Boreham	Within the study area	3,244
Hatfield Peverel	Within the study area	3,950
Braintree	Approximately 8km north of the study area	53,477
Maldon	Approximately 6km south-east of the study area	21,462
Witham	Partially within the study area (southern and eastern parts of the settlement)	25,353
Rivenhall End (parish-level data)	Within the study area	742
Kelvedon	Partially within the study area (central and southern parts of the settlement)	5,322
Feering	Within the study area	2,035
Tiptree	Approximately 1km south-east of the study area	9,182
Marks Tey	Partially within the study area (central and southern parts of the settlement)	2,551

Settlement	Distance from land use and access study area	Population size
Copford	Within the study area	1,689
Colchester	Outskirts within 2km east of the study area, central Colchester is approximately 6km from the study area	121,859

Notes. Information is from the National Census 2011 and represents the usual resident population for built-up areas, with the exception of Rivenhall End, Feering, Marks Tey and Copford where parish-level data have been used.

13.7.5 The larger settlements of Chelmsford, Colchester and Braintree are likely to provide places of employment for a sizeable proportion of residents within the study area and attract regular commuting journeys by various modes across the study area.

13.7.6 Socio-demographic and health data for communities within the land use and access study area is provided below in the human health baseline Section 13.15).

13.7.7 There are several housing allocations in the emerging local plans for Chelmsford, Braintree and Colchester. The Chelmsford Local Plan has recently been adopted, so weight can be given to the allocations within the plan. There are also submitted planning applications for housing for most of the allocations, meaning there is committed development. Table 13.6 includes housing allocations and applications within the study area which coincide with the Order Limits or require access directly from the highway within the Order Limits.

Table 13.6 Housing allocations and applications coinciding with the Order Limits

Allocation/ application	Location	Number of residential properties	Notes
Chelmsford planning application ref: 09/01314/EIA.	Greater Beaulieu Park, White Hart Lane, Springfield, Chelmsford	3,600	Approved planning permission in place. Under construction.
Braintree Publication Draft Local Plan (2017) and Braintree planning applications (refs 17/00341/OUT; 17/00973/FUL; and 16/02096/OUT)	Hatfield Peverel	224	Redevelopment of former Arla Foods dairy site and adjacent site at Bury Farm. Planning permission granted. Currently under construction (known as Hatfield Grove and Bury Farm housing estates).

Allocation/ application	Location	Number of residential properties	Notes
Braintree planning application ref: 16/02156/OUT and planning application ref: 20/00906/REM.	Land north-east of Gleneagles Way, Hatfield Peverel	100	Outline permission for residential development. Application 16/02156/OUT granted after appeal. 20/00906/REM permission granted for 100 dwellings.
Braintree planning application ref: 19/01896/OUT. Braintree Publication Draft Local Plan (2017)	Land north of Wood End Farm, Witham	400	Strategic growth location (South West Witham Lodge Farm), planning application submitted (decision pending).
Braintree planning application ref: 15/00430/OUT	Land Adjacent to Lodge Farm Hatfield Road, Witham	524	Strategic growth location (South West Witham Lodge Farm), planning permission granted.
Braintree planning application ref: 17/01979/OUT.	Land at Cranes Lane, Kelvedon	Up to 125	Planning application submitted (pending consideration).
Braintree Publication Draft Local Plan (2017)	Land at Feering	750	Strategic growth location.
Braintree Publication Draft Local Plan (2017)	Land off Inworth Road, Feering	40	Strategic growth location.

13.7.8 Of the four local authority areas which intersect the land use and access study area, three have a projected increase in household numbers between 2018 and 2043 which are above the average for both Essex (15.0%) and England (13.9%). These are Chelmsford (16.7%), Maldon (16.8%) and Colchester (18.3%) (ONS, 2020). The same ONS data projects that Braintree District would see an increase of only 11.8%. However, in response to the Preliminary Environmental Information Report (Highways England, 2021), a representative of Braintree District Council (2021a) has advised that the council considers the ONS projections to be an underestimate and that actual growth is substantially greater. The adopted Braintree Local Plan Section 1 (Braintree District Council, 2021b) has planned for higher rates of growth. The council has advised that the population growth rate will be around 20% for Braintree District. This assessment has taken into account Braintree District Council's advice and considers the higher growth rate, which reflects a similar growth rate to those projected for the neighbouring districts.

13.7.9 Areas projected to experience greater increases in the number of households over the coming 20 years may be more affected by losses of existing residential properties and any reduction in land available for future housing as they are at increased risk of housing scarcity.

Community land and assets

13.7.10 Community land and assets include land, buildings and infrastructure which provide a service or resource to a community, for example open spaces, village greens, village halls, healthcare and education facilities. Community land and assets play an important role in supporting healthy communities and social networks.

13.7.11 There are various community facilities throughout the study area, including schools, care homes, dentists, doctors' surgeries, public houses, post offices, convenience stores and supermarkets located in the settlements within the study area. The locations of community land and assets are indicated on Figure 13.1 [TR010060/APP/6.2].

13.7.12 Table 13.7 sets out the number of community land and assets which abut or coincide with the Order Limits, or which are accessed directly from roads within the Order Limits. These are the facilities with the most potential to be impacted by the proposed scheme.

13.7.13 No green belt land, registered common land or open access land has been identified within the study area.

Table 13.7 Community land and assets which touch or coincide with the Order Limits, or are accessed from roads within the Order Limits

Asset	Location	Baseline notes
Sports and recreation grounds		
Boreham recreation ground	Main Road, Boreham	Site includes a playing field, basketball court and children's playground. This is the principal recreational space serving the Boreham community and will be used daily. It is estimated this asset has 51,695 visits per year (Day and Smith, 2018).
Children's playground	Dukes Wood Close, off Main Road, Boreham	Neighbourhood play space serving young children in the immediate neighbourhood. Although this may be used daily, Boreham recreation ground is within walking distance (<500m) as an alternative resource.
Fishing lakes (used by local angling clubs)	140m south of the existing A12 corridor, east of Hatfield Peverel. Accessed off Wickham Bishop Road, Hatfield Peverel.	Fishing lakes used by local angling clubs. The northernmost fishing lake abuts the Order Limits. This is a facility for an angling syndicate and plays a role in opportunities for local recreation. There are other fishing lakes in the wider area, including Colemans Cottage (see below).
Benton Hall Golf & Country Club	Blue Mills Road, Witham	Golf club with gym and sports facilities. Likely to serve private members from Witham and neighbouring communities of Wickham Bishops, Hatfield Peverel and further afield. Other nearby golf facilities are at Braxted Park and Rivenhall Oaks.
Witham Hockey and Cricket Club	Maldon Road, Witham	Club house shared between hockey and cricket club. Cricket grounds abut Maldon Road which is within the Order Limits. However, a brick wall separates the grounds from the road. Hockey matches are played elsewhere in Witham on an all-weather pitch. This facility provides important social facilities for sports members in the community as well as hosting other community events. It is estimated this asset has 36,768 visits per year (Day and Smith, 2018).
Colemans Cottage Fishery	Little Braxted Lane, near Witham	Fishing lakes with tea rooms and pods/caravan pitches. These lakes abut the existing A12 corridor and the Order Limits. This is a private facility but plays a role in opportunities for local recreation. There are other fishing lakes in the wider area (see above).

Asset	Location	Baseline notes
Kelvedon recreation ground	The Chase, Kelvedon	Playing field and tennis courts. Accessed via The Chase which is off B1024 High Street within the Order Limits. Recreation ground itself is 85m away from Order Limits. This is the principal recreational space serving the Kelvedon community. It is estimated this asset has 20,502 visits per year (Day and Smith, 2018).
Marks Tey recreation ground	Old London Road, Marks Tey	Playing fields, skatepark, children's playground and basketball court. Access to the ground's car park is partially within Order Limits and the grounds abut the Order Limits. This is the principal recreational space serving the Marks Tey community. It is estimated this asset has 11,697 visits per year (Day and Smith, 2018).
Queensbury Avenue playground	Queensbury Avenue, Marks Tey	Location abuts Order Limits which cover part of Marks Tey car boot sale site. Sites separated by hedgerow. It is estimated this asset has 29,060 visits per year (Day and Smith, 2018).
Common land, open green space, allotments		
Allotments	Henry Dixon Road, Rivenhall End	Allotments abut the A12 London Road at Rivenhall End, which is within the Order Limits. There is a waiting list for allotments in this parish, suggesting high local demand for this resource.
Allotments	High Street, Kelvedon	Allotments accessed via B1024 High Street, Kelvedon. There is a waiting list for allotments in this parish, suggesting high local demand for this resource.
Bridge Meadow	B1024 Feering Hill, Kelvedon	Public park abuts B1024 Feering Hill which is within the Order Limits.
Whetmead Local Nature Reserve	Between the existing A12 corridor and confluence with River Brain and River Blackwater, east of Witham	Nature reserve which can be reached by residents of Witham via an underpass beneath the A12, alongside the River Brain. This underpass provides for the Witham River Walk which is an area of open space designated as a green corridor which runs through Witham either side of the River Brain and is accessible by foot from central Witham. The nature reserve and river walk are partially within the Order Limits. It is estimated this asset has 64,097 visits per year (Day and Smith, 2018).

Asset	Location	Baseline notes
Blackwater Rail Trail Country Park	Passes parallel to Maldon Road underneath the A12 approximately 500m west of the River Brain underpass, Witham.	This linear park follows the route of a disused railway track through part of Witham. It includes a local cycle route. The park partially coincides with the Order Limits. It is estimated this asset has 58,620 visits per year (Day and Smith, 2018). Since this facility is primarily a walking/cycling route, it is addressed in the 'Walkers, cyclists and horse riders' subsection below.
Areas of open green space within Witham	Adjacent to Gershwin Boulevard, Olivers Drive, Market Lane and Freebournes Road. Witham	There are several areas of amenity grassland and planting in and around the housing and industrial estates in Witham which offer informal recreation and visual amenity.
Education and healthcare facilities		
Hatfield Peverel Dental Surgery	Arundel House, The Street, Hatfield Peverel	Dental surgery located along a street which is within the Order Limits.
Chipping Hill Primary School, Witham	Owers Road, Witham	Primary school serving the relatively new housing estate in the southern area of Witham.
St Dominic's Nursing Home	Church Street, Kelvedon	Accessed from B1024 London Road, which is within the Order Limits.
Kelvedon & Feering Health Centre	46 High Street, Kelvedon	GP practice serving approximately 7,800 patients from Kelvedon and the surrounding area. The nearby Brimpton House GP practice has now merged with the Kelvedon & Feering Health Centre. Located on High Street, which is within the Order Limits.
Mid Essex Dental Care	215-217 High Street, Kelvedon	Dentist located along the B1024, which is within the Order Limits.
Zero Three Care Homes LLP	B1024 London Road, Feering	Care home which abuts the Order Limits near the existing junction with the A12.
The Laurels Nursing Home	Station Road, Marks Tey	Accessed via Station Road, which is within the Order Limits.

Asset	Location	Baseline notes
Penny Meadow Life Skills Development Centre	B1408 London Road, Marks Tey	Centre supporting young adults with learning difficulties. Accessed via London Road, which is within the Order Limits.
Community centres and places of worship		
Boreham Village Hall	Main Road, Boreham	Located adjacent to the recreation ground. Accessed off Main Road, which is within the Order Limits.
Church of Jesus Christ of Latter-day Saints	Pantile Close, off B1018 Maldon Road, Witham	Located just south of the existing A12. Access and car park within the Order Limits.
St Mary Immaculate & The Holy Archangels Catholic Church	Church Street, Kelvedon	Church and grounds abut the Order Limits close to the B1024, St Mary's Square in Kelvedon.
Kelvedon United Reformed Church	B1024 High Street, Kelvedon	Accessed via the B1024 which is within the Order Limits. Car park access via New Road.
The Institute, Kelvedon	B1024 High Street, Kelvedon	Hall used by local clubs and activities. Accessed via the B1024, which is within the Order Limits.
Cemetery	B1024 High Street, Kelvedon	Former Quakers burial ground. Not in use since 1963.
All Saints Church	B1023 Inworth Road, Inworth	Grounds coincide with the Order Limits on Inworth Road.
Marks Tey Parish Hall	Old London Road, Marks Tey	Hall used by local clubs and activities, as well as Parish Council. Accessed via Old London Road, which is within the Order Limits.

Asset	Location	Baseline notes
Transport hubs		
Hatfield Peverel railway station	Station Road, Hatfield Peverel	This station is on the Great Eastern Main Line and serves the villages of Hatfield Peverel and Nounsley, providing public transport access to destinations such as Chelmsford and London. In the year 2019/20 the station had 425,000 entries/exits per year (Office of Rail and Road, 2022).
Marks Tey railway station	Station Road, Marks Tey	This station is on the Great Eastern Main Line and serves Marks Tey. In 12 months (2019/20) the station had 606,914 entries/exits (Office of Rail and Road, 2022).

Development land and business

13.7.14 Larger areas of business in the study area include the Springfield Business Park on the north-east side of Chelmsford close to junction 19 (Boreham interchange). Within this area, there is a variety of retail and commercial assets including a large supermarket, retail outlets and distribution depots. Also located near junction 19 are the Boreham service station, a Premier Inn hotel and a public house.

13.7.15 Boreham Industrial Estate is located off Waltham Road within 20m of the A12 corridor, separated by the Great Eastern Main Line. There is no direct access from this industrial estate to the A12 trunk road.

13.7.16 Springfield Industrial Estate and Boreham Industrial Estate, as well as the business park included within the Greater Beaulieu Park proposals, all have potential to generate walking and cycling journeys to and from the communities of Springfield and Chelmer Village in Chelmsford and from Boreham. Further detail regarding existing walking and cycling provision at these locations is given in the 'Walkers, cyclists and horse riders' subsection below.

13.7.17 There is a large area (approximately 90 hectares) of industrial and commercial use along the south-eastern edge of Witham abutting the northern side of the A12 corridor. Within this area is a sewage treatment works as well as offices, builders' merchants, warehousing, distribution and manufacturing units. The industrial estate is connected to the A12 via junction 22 (Colemans interchange). There is a 6.8-hectare employment allocation in the Braintree Publication Draft Local Plan (Braintree District Council, 2017) for an extension to this industrial estate. The majority of walking and cycling journeys to and from this area are likely to arise from residential areas to the north within Witham, although Rivenhall End is within walking distance and Hatfield Peverel, Wickham Bishops and Kelvedon are within a reasonable cycle commuting distance. Further detail regarding provision for walkers and cyclists along the existing A12 and adjoining roads is provided in the 'Walkers, cyclists and horse riders' subsection below.

13.7.18 A hotel, service station, car dealership and retailer all have direct access onto the A12 in Rivenhall End. The Essex County Fire and Rescue Headquarters at Rivenhall End also has direct access onto the A12. There is a 3.3-hectare allocation for special employment land to support the fire and rescue services at this location set out in the Braintree Publication Draft Local Plan (Braintree District Council, 2017).

13.7.19 Threshelfords Business Park in Kelvedon is located approximately 120m north of the A12. It does not have direct access onto the A12, so traffic to and from this site is likely to regularly travel through the Feering village centre to access the A12 via junction 24 (Kelvedon North interchange), which could create difficult traffic conditions for pedestrians, including schoolchildren, to negotiate at peak times. However, since the business park mainly comprises offices, it is unlikely to generate much in the way of heavy goods vehicle traffic.

13.7.20 There are several other individual businesses with direct access onto the A12 along the A12 corridor through the study area. There is a hotel and service station some 450m east of junction 24 and there are several shops and

businesses located around junction 25. These include a food retailer, post office and hotel.

13.7.21 Figure 13.1 [TR010060/APP/6.2] shows the locations of employment allocations and business-related planning applications in the study area.

Agricultural landholdings

13.7.22 The area is generally used for arable farming with pockets of other farming types. There are a number of large commercial plots (over 100ha in size) along the route. Smaller plots are located at either end of the study area and around the fringes of the towns and villages.

13.7.23 Thirty agricultural landholdings have been identified which coincide with the Order Limits and are therefore at risk of land take or direct impacts on access. The locations of agricultural landholdings are indicated on Figure 13.2 [TR010060/APP/6.2].

13.7.24 Agricultural landowners likely to be affected by the proposals were contacted to provide information about their landholdings. This information is reported where relevant in the baseline column of Table A.21 in Appendix 13.3 of the Environmental Statement [TR010060/APP/6.3].

13.7.25 In summary, 18 of the 30 identified agricultural landholdings are predominantly in arable production, while 10 comprise permanent pasture. There are two willow plantations. Three of the agricultural landholdings are now covered by development planning applications or allocations for housing or mixed use development, and so land use change for these landholdings is anticipated as part of the future baseline. The baseline column of Table A.21 in Appendix 13.3 [TR010060/APP/6.3] provides information on any other identified agricultural uses within these landholdings and any existing issues of severance. For example, one of the willow plantations (agricultural landholding ref. 21) is severed by the existing A12 in the baseline, while the landholder for agricultural landholding ref. 20 has identified that access to/from the landholding is difficult due to busy traffic conditions on the B1024 London Road.

Walkers, cyclists and horse riders

13.7.26 Walkers and cyclists can be considered as two types - those who walk or cycle as part of an active travel journey (e.g. as part of a regular commute or to access services); and those who are walking or cycling for recreational purposes. The first type will typically be more interested in an efficient, convenient route, while the second type would be more interested in the recreational amenity of the route. Equestrian activity is dominated by recreational horse riding and therefore horse riders are assumed to be recreational unless there is clear evidence otherwise.

13.7.27 Although walkers, cyclists and horse riders are not prohibited from using the A12, the current road is not suitable for this type of use for the majority of the length due to high traffic volumes and speeds. Therefore, the A12 is a barrier for walkers, cyclists and horse riders in many locations.

13.7.28 There are approximately 15km of footways and cycleways between junctions 19 and 25 that run parallel to the A12 and provide alternative access along the corridor. These include the following:

- Hatfield Peverel to Witham: footways between junction 20b (Hatfield Peverel North interchange) and junction 21 (Witham South interchange).
- Witham to Kelvedon: shared-use footway/cycleway between junction 22 and junction 23 (Kelvedon South interchange) on the north-west side of the carriageway. Footway on the south-east side of the carriageway.
- Kelvedon to Marks Tey: shared-use footway/cycleway on the north-west side of the carriageway. Footway on the south-east side of the carriageway.

13.7.29 These routes are not continuous and the volume and speed of traffic on the A12 can act as a disincentive to their use as there is limited physical segregation provided. They are also relatively narrow, unclear, inconsistently marked and poorly signed. Nevertheless, evidence from the Strava (2022) Global Heatmap webpage suggests high cycle use between Chelmsford and Colchester, with many cyclists generally following the existing A12 but taking the B1389 through Witham and the B1024 through Kelvedon. The route also appears to be regularly used by runners.

13.7.30 There are three dedicated cycle routes that cross the existing A12:

- National Cycle Network (NCN) Route 50 is a regional route which starts in Rickling Green and is routed in a south-easterly direction towards Wickham Bishops where it connects with NCN Route 1. NCN Route 50 is an on-road route which crosses the A12 via the Terling Hall Road overbridge. The Strava (2022) Global Heatmap indicates it is heavily used by both cyclists and runners/walkers.
- NCN Route 16 starts in Birchanger near Stansted and finishes in Great Totham where it connects with NCN Route 1. NCN Route 16 is a predominantly on-road route which crosses the A12 at junction 22 via Colemans Bridge. The cycle route links with Witham railway station and therefore may be an important route for commuters. The Strava (2022) Global Heatmap indicates it is heavily used by cyclists both south of the A12 and to Colemans Bridge, but then cyclists appear to use the B1389 and B1018 more to travel through Witham itself, rather than continue along NCN Route 16 along Motts Lane within Witham. This indicates that many cyclists deem the railway bridge at Eastways too inconvenient compared to other routes.
- A local traffic-free route in Witham passes under the A12 via a designated combined cycle/footpath (the Blackwater Trail) using the old Maldon Branch railway line. It links two residential areas, Witham and Wickham Bishops, which are divided by the A12. This links with NCN Route 16. Evidence from the Strava (2022) Global Heatmap suggests that more cyclists use the parallel Maldon Road (B1018), indicating that the Blackwater Trail may generally be used recreationally.

13.7.31 Minor roads with footways traverse the A12 via overbridges or underbridges at several locations and are important for providing connectivity across the A12. These include Main Road (Boreham interchange); Waltham Road (east of Boreham); Terling Hall Road (between Boreham and Hatfield Peverel); Bury Lane, Station Road and the junction 20b slip road at Hatfield Peverel; Maldon Road and Blackwater Lane (Witham); Henry Dixon Road (Rivenhall End); and Maldon Road, Ewell Hall Chase and Inworth Road (B1023) (Kelvedon).

13.7.32 The baseline review has considered the PRoWs and other routes which cross or meet the A12 within the study area. The wider context has then been checked to make assumptions on the likely reasons for people using these routes. Tables A.4, A.8, A.12, A.16 and A.20 in Appendix 13.3 of the Environmental Statement [TR010060/APP/6.3] provide lists and a baseline summary of the PRoWs and other routes likely to be used by walkers, cyclists and horse riders which coincide with the Order Limits, organised according to the parishes within which the PRoWs and routes are located.

13.7.33 Over 30 PRoWs have been identified which meet or cross the A12 within the study area and there are extensive networks of PRoWs north and south of the A12. However, in the past some PRoWs have been severed by past highway schemes. For example, the bridleway near junction 19 on Paynes Lane (PRoW 213_45) south of the A12 is severed from PRoW 213_23 north of the A12. As a consequence, the bridleway shows very little evidence of use and is considered to be low value as a result. A public footpath (FP 213_25 and FP 2013_24) some 420m east of Paynes Lane is also severed north–south by the existing A12 with no indication of current use as a result. Immediately south of Witham, there are two footpath routes (PRoW 121_95 between Olivers Drive and Maldon Road, and PRoW 121_103 between Colemans Farm lakes and Freebournes Road) which cross the existing A12 at grade. There are breaks in the central reservation barrier and footpath signage on the A12 for both of these footpaths. However, the four lanes of high-speed traffic makes crossing this road extremely hazardous and the vast majority of people would not risk these crossings. The footpath entry points on each side of the carriageway are heavily overgrown, indicating they are not used, and the footpaths are currently of low value as a resource due to this severance.

13.7.34 Most PRoWs are likely to be used for recreational purposes, although some footpaths within settlements such as Witham, Kelvedon and Marks Tey may be used for active travel journeys by walkers and cyclists.

13.7.35 Eleven riding schools have been identified within 10km of the study area, the nearest of which is at Tiptree, approximately 3.7km south of the study area. Some of the farms in the area also have stables. There is a livery at Ewell Hall Farm and stables near Stonefields Farm Shop off B1023, Kelvedon. There is therefore potential for horse riders to use the lanes and bridleways which cross the A12 and who may be potentially affected by the proposed scheme. However, it is noted that there are very few bridleways in the study area, the vast majority of PRoWs being public footpaths.

Future baseline

13.7.36 The future baseline will likely be characterised by continued population growth within and around the study area as more of the residential development allocations get built out. For example, a further 3,000 households are expected at North East Chelmsford, which is just outside the land use and access study area but may result in a larger population interacting with the land use and access study area.

13.7.37 The COVID-19 pandemic that has affected the UK may influence future trends for land use and accessibility. For example, there may be a long-term increase in people working from home. Some people may switch from the use of public transport to walking, cycling or using their own cars due to concern about communicable diseases. There may be a further increase in cycling levels, which have been increasing in England since 1993 (Cycling UK, 2022). In addition, people may have an increased preference for outdoor recreation where social distancing is easier than in indoor leisure and recreation venues.

13.7.38 The level of occurrence of these types of behaviour change will depend on the trajectory of the pandemic and individual responses to their experience of (e.g. heightened anxiety or concern), which is uncertain.

Value and sensitivity of receptors

Land use and accessibility

13.7.39 All land use and accessibility receptors within the baseline have been assigned a value using criteria in DMRB LA 112 (Highways England, 2020a) (see Table 13.2 in Section 13.4 of this chapter). The value for all assessed receptors in the study area is set out in Tables A.1 to A.21 in Appendix 13.3 of the Environmental Statement [TR010060/APP/6.3].

13.7.40 Table 13.8 summarises the value of key example receptors, i.e. those with the most potential to be affected by the proposed scheme because of their proximity to the Order Limits.

Table 13.8 Value of receptors in the study area for land use and accessibility

Value	Land use and accessibility element	Key examples within the study area
Very high	Private property and housing	There are no local authorities in the study area where numbers of households are expected to increase by more than 25% by 2043 based on ONS projections.
		Examples of existing housing covering >5ha and/or >150 houses include Chelmer Village and Springfield in Chelmsford; Boreham; Hatfield Peverel; Witham; Rivenhall End; Kelvedon; Feering; Marks Tey; and Copford.
	Community land and assets	Key examples in the study area include the following: • Hatfield Peverel Dental Surgery, Hatfield Peverel • St Dominic's Nursing Home, Kelvedon • Kelvedon & Feering Health Centre, Kelvedon • Mid Essex Dental Care, Kelvedon • Zero Three Care Homes, Feering • The Laurels Nursing Home, Marks Tey • Penny Meadow Life Skills Development Centre, Marks Tey • Chipping Hill Primary School
	Development land and business	Springfield Industrial Estate, Chelmsford; Eastways Industrial Estate, Witham; Colemans Quarry, Witham.
	Walkers, cyclists and horse riders	Key examples in the study area include the following: • East–west footways and shared-use paths along the existing A12 • NCN Route 50 (Terling Hall Road) • Footway along B1137 between Boreham and Hatfield Peverel • Station Road, Hatfield Peverel • B1018 Maldon Road, Witham • NCN Route 16 (Little Braxted Lane, Witham) • Dobbies Lane, Marks Tey

Value	Land use and accessibility element	Key examples within the study area
High	Private property and housing	Housing in all districts in the study area is valued as high. (Based on mid-2018 to mid-2043 projections, households in Colchester, Maldon and Chelmsford are projected to increase 18.3%, 16.8% and 16.7% respectively (ONS 2020). Advice from Braintree District Council is that growth rates for Braintree are expected to exceed 20% [though it should be noted that the household projects reported in the Scoping Report and PEIR have been reduced in the latest ONS dataset used for this assessment]).
	Community land and assets	Key examples in the study area include the following: • Boreham recreation ground • Boreham Village Hall • Witham Hockey and Cricket Club • Whetmead Nature Reserve, Witham • Allotments at Henry Dixon Road, Rivenhall End • Kelvedon recreation ground • Allotments at High Street, Kelvedon • The Institute, Kelvedon • Marks Tey recreation ground • Marks Tey Parish Hall • Churches in the study area are also valued as high
	Agricultural landholdings	Large arable farms throughout the study area.
	Development land and business	Key examples in the study area include the following: • Site Ref: RIVE 362 and RIVE 363. Policy Ref: Policy LPP 2, Braintree Draft Local Plan, Extension to Eastways Industrial Estate • Site Ref: RIVE 364. Policy Ref: LPP 4, Braintree Draft Local Plan, Kelvedon • Threshelfords Business Park, Feering • Prested Hall, Feering; unnamed business park located on Inworth Road south of the A12

Value	Land use and accessibility element	Key examples within the study area
	Walkers, cyclists and horse riders	Examples include the following: • FP 234_17 and FP 234_18 (Springfield) • Generals Lane, Boreham • Waltham Road/Porter's Park Bridge, Boreham • B1137 Wellington Road Bridge, Hatfield Peverel • Footway alongside northbound A12 carriageway between Hatfield Peverel and Witham • Maldon Road and Highfields Lane near Kelvedon • B1023 Inworth Road • Easthorpe Road • Existing footway along northbound side of existing A12 (Kelvedon to Marks Tey) • FP 92_30 (Kelvedon)
Medium	Private property and housing	Examples throughout study area.
	Community land and assets	Examples include the following: • Children's playground at Dukes Wood Close, off Main Road, Boreham • Lakeland Fishery and Yurts near Hatfield Peverel • Colemans Cottage Fishery near Witham • Benton Hall Golf & Country Club, near Witham • Blackwater Rail Trail, Witham • Bridge Meadow, Kelvedon • Queensbury Avenue playground, Marks Tey
	Development land and business	Small businesses throughout the study area such as garages, cafes and public houses.
	Agricultural landholdings	Various smaller agricultural landholdings and land used as pasture.
	Walkers, cyclists and horse riders	Several PRoWs and other routes throughout study area.
Low	Private property and housing	Examples throughout study area.

Value	Land use and accessibility element	Key examples within the study area
	Community land and assets	Area of greenspace south of Gershwin Boulevard and Olivers Drive, Witham. Former Quakers burial ground, Kelvedon (not in use since 1963).
	Development land and business	Within the study area there are various small businesses which operate from private homes or mobile units and likely to have <5 employees. These businesses are likely to be adaptable in terms of site and location.
	Walkers, cyclists and horse riders	• Paynes Lane/BR 213_23 and BR 213_45 (Boreham) • FP 213_24 and FP 213_25 (Boreham) • FP 213_21 (Boreham) • FP 121_95 (Witham) • FP 121_103 (Witham) • FP 105_46 (Rivenhall End) • FP 105_36 (Rivenhall End)
Negligible	Community land and assets	None identified.
	Agricultural landholdings	None identified.

13.8 Potential impacts

Construction

Private property and housing

13.8.1 Construction of the proposed scheme would lead to permanent loss of land from some residential premises and permanent loss of some properties, although efforts have been made to limit the impacts on residential dwellings. There are seven residential properties within the Order Limits that would be at risk of demolition, land take and/or severe exposure to construction noise and disruption of access that would potentially make them uninhabitable. Furthermore, there are a number of residential gardens and driveways which coincide with the Order Limits. Properties most at risk include the following:

- Houses which are located close to the Bury Lane Bridge, Station Road Bridge and Wellington Road Bridge in Hatfield Peverel, where land and access is at risk due to space required for construction activities associated with the bridge replacements

- Houses along Maldon Road south of the A12 in Witham, where several gardens are within the Order Limits and where land and access is at risk due to space required for construction activities associated with Olivers Bridge and Benton Bridge
- Two residential properties to the east of Rivenhall End which would potentially be permanently lost to the footprint of the proposed scheme
- Some other isolated properties with gardens or accesses that could be directly impacted by the footprint of the proposed scheme.

13.8.2 Temporary disruption of access to residential dwellings would also occur from elements of the proposed scheme where online widening, improvements to existing junctions, construction of new junctions, or utility diversions are proposed.

Community land and assets

13.8.3 Construction of the proposed scheme would cause temporary disruption of access to community facilities from elements of the proposed scheme where online widening, improvements to existing junctions, construction of new junctions, or utility diversions are proposed. There is also potential temporary loss of some community land for construction laydown areas, such as an area of green space near Olivers Drive, Witham.

Development land and business

13.8.4 There are commercial premises identified within the Order Limits which have potential to be impacted by the proposed scheme. There would be temporary and permanent loss of some areas of land allocated for employment and commercial premises to allow for the construction footprint of the proposed scheme, particularly within Witham and Feering. This includes one business premises in Feering which is at risk of demolition due to the footprint of the proposed scheme.

13.8.5 Construction of the proposed scheme would cause temporary disruption of access to businesses from elements of the proposed scheme where online widening, improvements to existing junctions, construction of new junctions, or utility diversions are proposed.

13.8.6 There would also be potential disruption to businesses from construction noise and vibration.

Agricultural landholdings

13.8.7 There would be permanent and temporary loss of agricultural land from the construction footprint of the proposed scheme, including land required for borrow pits. Thirty agricultural landholdings have been identified within the Order Limits which are potentially at risk.

13.8.8 Temporary severance or access difficulties to some agricultural landholdings would also occur, particularly where new offline sections of road are proposed.

Walkers, cyclists and horse riders

13.8.9 The construction footprint of the proposed scheme, including associated haul roads, would require the diversion and temporary closure of PRoWs throughout the study area, with associated impacts on local outdoor recreation and access. There would also be loss of amenity during construction from factors such as dust, noise and visual intrusion.

Operation

Private property and housing

13.8.10 The majority of land and property loss would occur during the construction phase and is not considered to be an operational effect even though it would be permanent. However, in some cases, housing acquired prior to construction would be made available again after construction.

13.8.11 Impacts on access to residential areas or individual properties would occur as a result of changes in local road alignments and de-trunking of the existing A12.

Community land and assets

13.8.12 Potential impacts on community land and assets would be similar to impacts on private property and housing and would arise from changes in accessibility related to local road alignments and traffic conditions.

Development land and business

13.8.13 Potential impacts on employment land and businesses would be similar to impacts on private property and housing and would arise from changes in accessibility related to changes in local road alignments and traffic conditions.

Agricultural landholdings

13.8.14 There is potential for permanent severance of some agricultural landholdings which consist of land located to the north and south of the existing A12 or proposed bypass routes, for example agricultural landholdings south of A12 London Road between Feering and Marks Tey.

Walkers, cyclists and horse riders

13.8.15 Potential beneficial impacts on access for walkers, cyclists and horse riders would occur where the proposed scheme addresses issues of past severance, poor accessibility and inadequate cycleway and footway provision. Improvements in access would help more people access public transport hubs and bus stops. Improvements to footway and cycleway provision would improve amenity for active travellers, for example through increasing segregation from fast traffic and heavy goods vehicles.

13.8.16 PRoWs or other routes temporarily severed by the proposed scheme would be reinstated, with no new operational severance. Diversions and closures of existing PRoWs would be required, with new routes being provided to access existing or proposed new crossing points.

13.9 Design, mitigation and enhancement measures

13.9.1 This section sets out design, mitigation and enhancement proposals for potential impacts on land use and accessibility. Section 13.17 of this chapter sets out mitigation proposals for potential impacts on human health. This includes some measures for issues relating to local amenity, which is also of relevance to land use and accessibility assets.

Embedded (design) mitigation

13.9.2 The environment team has worked in close collaboration with the infrastructure design team to avoid or reduce environmental impacts through the proposed scheme design. This is referred to as embedded (or design) mitigation. Chapter 3: Assessment of alternatives, of the Environmental Statement [TR010060/APP/6.1] details the design alternatives that have been considered, including the environmental factors which have influenced the decision making.

13.9.3 The design for all elements of the proposed scheme has limited land take from existing residential, business, community and agricultural assets as far as practicable. This has taken into account representations made by landowners and would help to reduce land use change.

13.9.4 Embedded mitigation measures include new, improved and replacement provision for walkers, cyclists and horse riders as shown on the Streets, Rights of Way and Access Plans [TR010060/APP/2.6] and described in Chapter 2: The proposed scheme, of the Environmental Statement [TR010060/APP/6.1]. All permanent diversions for walkers, cyclists and horse riders are shown on the Streets, Rights of Way and Access Plans [TR010060/APP/2.6]. The proposals for walkers, cyclists and horse riders have sought so far as practicable to not only mitigate affected routes but to provide improved routes for active travel for utility journeys and leisure purposes. The proposals have sought to make these as coherent, direct, safe, comfortable, and attractive as possible, in line with the objectives set out in LTN 1/20 Cycle Infrastructure Design (Department for Transport, 2020), which is relevant for all walking, cycling and horse-riding infrastructure. This would help support and provide continued opportunities for active travel and access to outdoor recreation.

Standard mitigation

13.9.5 Standard mitigation would occur as a matter of course due to legislative requirements or standard sector practices.

13.9.6 Standard mitigation is included in the Register of Environmental Actions and Commitments (REAC), within the first iteration of the Environmental Management Plan (EMP) [TR010060/APP/6.5] which forms part of the DCO submission (refer to Chapter 5: Environmental assessment methodology, of the Environmental Statement [TR010060/APP/6.1]). Relevant standard mitigation for this aspect is summarised below.

13.9.7 A Community Liaison Manager would be appointed to address local concerns during the construction phase. Appropriate mechanisms to communicate with local residents would be set up to highlight potential periods of disruption through the construction phase.

13.9.8 An Agricultural Liaison Officer would be appointed prior to construction for ongoing engagement about practical matters with affected agricultural landowners, tenants and their agents.

13.9.9 For residential properties, businesses, development land, community assets and agricultural landholdings where access would be directly affected during construction, an appropriate alternative temporary or permanent access would be provided where practicable. In a small number of cases where this may not be practicable, support would be provided for occupiers who may need to find alternative accommodation. The Compensation Code would apply to interests affected.

13.9.10 All land acquired on a temporary basis would be reinstated to its previous condition in accordance with the provisions of Article 39 of the draft DCO (subject to the exceptions in that Article). A record of condition of land to be temporarily used for the proposed scheme would be undertaken pre-construction. This would provide the baseline conditions, against which appropriate reinstatement would be measured.

13.9.11 The Principal Contractor would be required to set method statements for biosecurity, protection of farm assets, and soil management, prior to construction, and to follow agreed method statements during construction.

13.9.12 Where land is required which could be classed as open space, the loss would be replaced by equivalent or better provision in terms of quantity and quality in a suitable location. Several areas of potential replacement land have been identified in Witham, Copford and Marks Tey. Locations of replacement land are indicated on Figure 13.2 [TR010060/APP/6.2] but refer to the Land Plans [TR010060/APP/2.7] and Replacement Land Statement [TR010060/APP/7.9] for greater detail.

13.9.13 The construction activities would be planned to limit requirements for PRoW, footway and cycleway closures or diversions during the construction phase, where practicable. Essential diversions of PRoW, footways and cycleways for Health and Safety requirements are identified in the Outline Construction Traffic Management Plan [TR010060/APP/7.7].

13.9.14 Temporary diversion routes would be provided around areas of works or nearby PRoWs where practicable and would be appropriately signed. Diversion routes would be suitable for all potential users of the existing provision (for example, where a bridleway is severed, the diversion route provided would be suitable for walkers, cyclists and horse riders). The proposed temporary diversion routes and closures are set out in the Outline Construction Traffic Management Plan [TR010060/APP/7.7].

13.9.15 Where closure of a PRoW is required during construction, and no local diversion can be provided, appropriate signage would be supplied at each end of the PRoW closure to ensure the public are informed. Where relevant (for example FP 90_34 (Hatfield Peverel)) this would include provision of signage at the access points for PRoWs to ensure the public do not have a wasted journey where they need to turn back on themselves part way along the PRoW at the point of closure.

13.9.16 Traffic management measures as documented in the Outline Construction Traffic Management Plan [TR010060/APP/7.7], would be implemented to ensure safe access along roads within the site where necessary. The construction works would be phased such that disruption to access is reduced, with full road closures restricted to nights and weekends wherever practicable and feasible.

Additional mitigation

13.9.17 The National Policy Statement for National Networks (NNNPS) (Department for Transport, 2014), sets out some requirements for mitigation, for example for potential severance and for the loss of open space. Relevant requirements of the NNNPS are set out in Appendix 13.5: Legislative and Policy Framework for Population and Human Health [TR010060/APP/6.3].

13.9.18 Bury Lane Bridge and Station Road Bridge are expected to be closed for six months each, but the closures would be phased so that one bridge would be open while work takes place on the other. This is to limit the disruption to residents and maintain access for emergency vehicles, refuse collection vehicles, delivery vehicles and other critical services.

13.9.19 The following measures are proposed to mitigate the potential severance that would be caused in Hatfield Peverel by works to Bury Lane and Station Road Bridges and to maintain access to Hatfield Peverel Train Station.

- Provision of a temporary car park (Station Road closure only)
- A temporary link between the temporary car park and the station
- Temporary vehicular, pedestrian and cyclist connection between the Hatfield Grove and Bury Farm Estates
- Temporary pedestrian and cycle bridge across the A12 (Station Road closure only)
- Signed traffic diversion (Station Road closure only)
- Provision of a shuttle bus service (Station Road closure only)
- Phased construction so that access is always possible across either Bury Lane Bridge or Station Road Bridge

13.9.20 The following paragraphs summarise each of the measures. Reference should be made to the Outline Construction Traffic Management Plan [TR010060/APP/7.7] for further detail on each measure.

13.9.21 The temporary car park would be provided east of the existing Hatfield Peverel Station. The car park would provide replacement parking provision for those traveling from the south who cannot otherwise access the current Station car parks without using the signed diversion route. Additional parking capacity would also be provided for local residents. The car park would also provide facilities for the shuttle bus service, taxis, and where necessary, train replacement bus services. Although cyclists would still be able to access the existing station facilities, additional secure bicycle storage would be provided.

Access to the car park would be via a temporary road connecting to a realigned B1137. This would be shared with access to the Junction 20A main Construction Compound.

13.9.22 The existing private road heading east from the exit of the station towards current fields would be used temporarily. Its primary purpose would be as a pedestrian/cycle route between the station and temporary car park, so vehicular access would be restricted to essential vehicles only (emergency services, Network Rail, shuttle bus service, refuse collections and Royal Mail). Construction traffic would be prohibited from using the route.

13.9.23 A restricted use temporary vehicular, pedestrian and cycle route would be provided between the two estates (Bury Farm and Hatfield Grove). Planning conditions have required that the two estates are not linked to prevent 'rat-running'. The existing pedestrian link between the two estates would be modified so that when enabled during the closure of Station Road vehicles could also use this route. This route would only be for the benefit of:

- Residents of properties on Station Road, Terling Road and Hatfield Road north of the A12 but south of the turn with Witham Road,
- Residents of properties in the existing Pines estate and other roads off of Station Road to the north of the A12
- Residents of properties in the new Hatfield Grove estate
- Carers supporting residents in properties identified above
- Emergency Services
- Royal Mail
- Refuse Collection providers

13.9.24 Parking restrictions would be in place on the diversion route. It should be noted that residents have off-road parking, so the impact on residents would be relatively limited.

13.9.25 When Station Road bridge is closed a control system would be in place to ensure that only those identified above are able to use the route between Hatfield Grove and Bury Farm Estates. It is anticipated that an automated number plate recognition (ANPR) system supported by barriers across the road would be used to restrict the access. This would ensure that permitted vehicles could rapidly pass through the control point without causing delays or nuisance to nearby properties. Automated systems would also be less intrusive for nearby residents than manned control points. It is not considered likely that 'rat running' would be such a potential issue when Bury Lane is closed due to the cul-de-sac nature of the Bury Farm Estate area.

13.9.26 A temporary bridge across the A12 with associated temporary surfacing would be provided to create a temporary pedestrian and cycle route across the A12, linking Swan Close with Station Road. A surface would be provided that is suitable for pedestrian and cyclist use. Gradients and material selection would consider those with accessibility needs, including mobility scooters. Low level

lighting would be provided to provide for a safe route but without intruding on the adjacent property on Station Road.

13.9.27 The proposed signed traffic diversion for vehicular traffic would use roads that are narrow in places due to the limited options in the rural countryside north of Hatfield Peverel. The diversion route is 12 kilometres and it is expected that it would take 14 to 22 minutes to travel, dependent upon the time of travel.

13.9.28 A shuttle bus service would be provided to support those with accessibility needs and would run between the temporary car park and Hatfield Peverel train station. The shuttle service would run for the hours that the train station is operational.

13.9.29 Vehicles used would have the necessary adaptations to support those with accessibility needs and drivers of the service would be appropriately trained in how to support the individual as well as how to safely and securely transport any mobility aids that they have.

13.9.30 For those identified as vulnerable or of having particular accessibility needs (within the areas with restricted access due to the Station Road closure), the Community Liaison Manager would develop bespoke plans with those individuals to meet their particular needs.

13.9.31 When Wellington Bridge is closed a temporary two way link road would be constructed between the new southern dumbbell at Junction 21 to Junction 20b southbound off-slip to the B1137 (The Street (D's Café Diner)), Hatfield Peverel. Wellington Bridge would not be closed until this link road is sufficiently operational.

13.9.32 The link would provide for vehicular traffic, including public transport, pedestrian and cycle routes between Hatfield Peverel and Witham. It would also provide vehicular connection to the A12.

13.9.33 A Hatfield Peverel access forum would also be established. The aim of this forum is to minimise the impacts on the local community and businesses.

13.9.34 Further detail on all these measures is set out in the Outline Construction Traffic Management Plan [TR010060/APP/7.7].

Enhancement

13.9.35 As identified under 'Embedded mitigation' the proposed scheme includes some new and improved walking, cycling and horse-riding routes. This includes widening of some routes to make these as coherent, direct, safe, comfortable, and attractive as possible, and to meet modern standards of inclusive access, in line with the objectives set out in LTN 1/20 Cycle Infrastructure design (Department for Transport, 2020) which is relevant for all walking, cycling and horse-riding infrastructure. The net result of the proposals would be enhanced walking, cycling and horse-riding provision.

13.9.36 Further options for enhancements are being investigated as part of the landscape and biodiversity proposals. This could include improved public access to green space, capturing multipurpose benefits. There may also be opportunities for public realm improvements in areas subject to de-trunking of the existing A12. However, these proposals are not currently agreed and if

brought forward, would likely be through discrete projects outside the proposed scheme (i.e. not included in the DCO application) and are therefore not considered in the assessment of likely significant effects.

13.10 Assessment of likely significant effects

13.10.1 The detailed assessment of 'land use and accessibility' accompanying this chapter is set out in Appendix 13.3 of the Environmental Statement [TR010060/APP/6.3] which sets out impacts identified for specific land use and accessibility assets. The following assessment summarises the predicted effects on each matter covered by the land use and accessibility assessment. The assessment is generally set out by community, which allows for a clearer understanding of how effects are distributed across the study area and how some communities are affected more than others. The assessment of effects on agricultural land use has not been set out by community as some landowners have land which covers more than one community.

Construction

Private property and housing

13.10.2 Appendix 13.3 of the Environmental Statement [TR010060/APP/6.3] sets out the full assessment of impacts on each private property and housing asset identified. Figure 13.2 [TR010060/APP/6.2] shows the locations of residential properties affected by direct acquisition, permanent land take and temporary land take.

Boreham

13.10.3 No significant effects on private property and housing, including residential development land, have been identified for the community of Boreham (see Table A.1 in Appendix 13.3 of the Environmental Statement [TR010060/APP/6.3]). Impacts on private property and housing in this community relate to indirect impacts on access during construction, such as where the proposed new A12 alignment would sever existing lanes and access tracks. However, alternative access arrangements would be provided where practicable and any disruption is expected to be temporary and intermittent. Therefore, overall, the effect on residential land use for Boreham is assessed as **neutral**.

Hatfield Peverel

13.10.4 Hatfield Peverel is the community where the most impacts on residential land use are anticipated from the proposed scheme (see Table A.5 in Appendix 13.3 of the Environmental Statement [TR010060/APP/6.3]). Direct land take from 10 residential properties would be required during construction. For four of these properties, there would be temporary land take during the construction phase. Five houses would be permanently acquired, while one house would be temporarily acquired (with the occupier/s temporarily rehoused during the construction phase). These impacts are to facilitate the demolition of Bury Lane Bridge and Station Road Bridge and their subsequent replacements. Furthermore, access would be disrupted for all residents north of the A12 in Hatfield Peverel while Bury Lane Bridge and Station Road Bridge replacement

works take place, and a further two properties south of the A12 would have their access temporarily disrupted. Over 400 properties (including some currently under construction) would experience impacts on access associated with the replacements of Bury Lane Bridge and Station Road Bridge. These works would be phased to limit the disruption to the community and maintain access for emergency vehicles, refuse collection vehicles, delivery vehicles and other critical services. Nevertheless, there would be inconvenience and disruption of a moderate magnitude during this time, which could indirectly impact on day-to-day living conditions, although overall residential viability would not be compromised by these impacts on access with proposed mitigation in place. Overall, the significance of effect on residential land use in Hatfield Peverel during construction is assessed as **large adverse.**

Witham and Rivenhall End

13.10.5 Twelve residential properties within the communities of Witham and Rivenhall End (combined) would experience direct land take from the proposed scheme (see Table A.9 in Appendix 13.3 of the Environmental Statement [TR010060/APP/6.3]). This includes the demolition of two houses ('Badger' and 'Hare Lodge') in Rivenhall End which are within the footprint of the proposed scheme. The other properties most affected are located in the neighbourhood south of Olivers Bridge in Witham, on Maldon Road and Pantile Close. Eight of these properties would experience partial or a substantial permanent loss of garden area to facilitate construction activities.

13.10.6 While these impacts affect a small minority of residential properties in the area (12 out of 4,924 properties within the Witham part of the study area), the effect is considered to be noticeable, particularly in the neighbourhood south of Olivers Bridge, where access to several properties would also be affected during the construction phase. Overall, the significance of effect for residential viability of private property and housing in the Witham and Rivenhall End community is assessed as **moderate adverse** during construction.

Kelvedon, Feering and Inworth

13.10.7 No significant effects on private property and housing, including residential development land, have been identified for the communities of Kelvedon, Feering and Inworth (see Table A.13 in Appendix 13.3 of the Environmental Statement [TR010060/APP/6.3]). Impacts on private property and housing in these communities relate to indirect impacts on access during construction, such as where the proposed new A12 alignment would sever existing lanes and access tracks. However, the proposed works would be phased in such a way that alternative access arrangements would be constructed before existing accesses are prevented. Therefore, overall, the effects on residential land use for these communities are assessed as **neutral**.

Marks Tey, Copford and Easthorpe

13.10.8 For the combined communities of Marks Tey, Copford and Easthorpe, only one residential property would be directly impacted on by construction of the proposed scheme, as part of the garden would be permanently acquired (see Table A.17 in Appendix 13.3 of the Environmental Statement [TR010060/APP/6.3]). Other impacts on residential land use would be indirect

due to impacts on access arrangements. However, overall residential viability of all properties in this area is expected to be maintained during construction and so the significance of effect on overall private property and housing in this area is assessed to be **slight adverse** during construction.

Community land and assets

Boreham

13.10.9 No direct impacts on community land and assets have been identified for the community of Boreham (see Table A.2 in Appendix 13.3 of the Environmental Statement [TR010060/APP/6.3]) and so the overall significance is assessed to be **neutral**.

Hatfield Peverel

13.10.10 For Hatfield Peverel, no direct impacts on community assets are predicted (see Table A.6 in Appendix 13.3 of the Environmental Statement [TR010060/APP/6.3]). However, there would be impacts on access to community assets due to the impacts on connectivity north to south of the A12 in Hatfield Peverel associated with the Station Road Bridge and Bury Lane Bridge demolition and replacement proposals. There is considerable interaction between access effects on community land and assets, and the effects on walkers, cyclists and horse riders reported below. With the proposed mitigation, impacts on assets such as the Hatfield Peverel railway station are predicted to be of moderate magnitude. However, given the importance of the railway station to the community, and the interaction of impacts on pedestrians and cyclists and their access to wider facilities within Hatfield Peverel, the overall significance of effect on community land and assets in Hatfield Peverel during construction is considered **large adverse**.

Witham and Rivenhall End

13.10.11 The communities of Witham and Rivenhall End are where the most impacts on community land use are anticipated from the proposed scheme (see Table A.10 in Appendix 13.3 of the Environmental Statement [TR010060/APP/6.3]). In particular, there would be a moderate adverse significant effect on the community who use the Church of Latter-day Saints, should they depend on vehicular access to the venue, due to the temporary occupation of the car park during the construction phase. Since most construction activities would not take place on Sunday, it is not anticipated that there would be any significant effect on the use and function of the church during its main worship times. However, it is uncertain how impacts to the car park may affect activities on other days of the week.

13.10.12 A moderate adverse impact is also predicted for people who use the Whetmead Nature Reserve due to the marginal loss of open space north of the River Brain and the intermittent closure of the main footpath to the nature reserve during construction. There would also be a slight loss of open space from the works to widen Benton Bridge on the Blackwater Rail Trail, and from A12 widening proposals affecting strips of vegetated land south of Gershwin Boulevard and east of Freebournes Road, although these losses are not likely to be particularly noticeable in these contexts due to their limited scale and value. All open space

lost would be replaced with equivalent or better provision (see Section 13.9 of this chapter for standard mitigation). In addition, there are a number of other minor adverse impacts on community assets due to impacts on access via roads affected by the proposed scheme construction, as well as potential encroachment onto part of a golf course from the gas main diversion proposals. Although standard mitigation would include ensuring access is maintained (in the case of Whetmead via a considerable diversion), a degree of inconvenience for the community over the duration of the construction phase is likely. Overall, the significance of effect on community land and assets as a whole for the Witham and Rivenhall End community is assessed to be **moderate adverse** during construction due to the widespread potential disruption and potential to discourage use of some assets as a consequence of the inconvenience caused.

Kelvedon, Feering and Inworth

13.10.13 The main impacts on community land and assets identified for Kelvedon, Feering and Inworth relate to the Essex County Fire and Rescue Service Headquarters just outside of Kelvedon, and the All Saints Church in Inworth (see Table A.14 in Appendix 13.3 of the Environmental Statement [TR010060/APP/6.3]). A minor adverse magnitude of impact is anticipated on the Essex County Fire and Rescue Service Headquarters due to proposed changes in access to the premises from the proposed scheme. Although this is a very high sensitivity asset, these changes are not anticipated to have a significant effect on the function of that asset and the ability to serve the communities across Essex. The impact on All Saints Church in Inworth relates to marginal encroachment onto the church grounds from localised widening works on Inworth Road, which is assessed as minor magnitude for that asset. The impacts on community land use and assets relate to quite different types of community assets, in different locations and relate to the construction phase. Most other community land and assets would be unaffected. On this basis, the overall impact on community land and assets in the Kelvedon, Feering and Inworth communities is assessed as **slight adverse** during construction.

Marks Tey, Copford and Easthorpe

13.10.14 Impacts on community land and assets in Marks Tey mainly relate to the potential disruption and inconvenience of access to facilities due the scale and duration of proposed works for the new arrangement for junction 25 (see Table A.18 in Appendix 13.3 of the Environmental Statement [TR010060/APP/6.3]). Given that minor adverse magnitude impacts are anticipated on four of the five community assets identified within or in close proximity to the Order Limits, the overall significance of effect on community land and assets is assessed to be **moderate adverse** during construction, as there is potential that the level of disruption may dissuade some use of facilities in the community. There are also some small areas of land take affecting land which meets the definition of open space, which would be replaced via standard mitigation proposals (see Section 13.9 of this chapter). These impacts on open space are not considered to be a notable community effect due to the limited value of each asset, the scale of impact and the requirement to replace the land to be lost (see Table A.18 in Appendix 13.3 of the Environmental Statement [TR010060/APP/6.3]).

Development land and business

13.10.15 Tables A.3, A.7, A.11, A.15 and A.19 in Appendix 13.3 of the Environmental Statement [TR010060/APP/6.3] set out the full assessment of direct land use impacts on development land and business.

Boreham

13.10.16 No significant impacts on employment land or business land in the Boreham parish have been identified. Although there are areas of marginal encroachment onto sites around the junction 19 works, none of this encroachment is considered likely to affect the business function of the land use or prevent access (see Table A.3 in Appendix 13.3 of the Environmental Statement [TR010060/APP/6.3]). There would be impacts on the Chelmsford car boot sale site due to a construction haul road, which may limit use of that site on a short to medium-term basis. The car boot sale site is seasonal (March to November) and operates at weekends, so it is anticipated that the scale of impact in terms of business and employment in the community would be moderate adverse. There may be impacts on amenity to local businesses due to noise, dust and traffic disruption but this is not likely to be of a level that would notably affect business use. The overall significance of effect on business and employment land use in the local community is **slight adverse**.

Hatfield Peverel

13.10.17 Within Hatfield Peverel there are several businesses, particularly located along The Street. Most of these are not expected to be directly impacted on by the proposed scheme. However, they may experience a degree of disruption due to traffic management during construction, and particularly while the bridges at Bury Lane, Station Road and Wellington Road are replaced. Where businesses are directly impacted, as set out in Table A.7 in Appendix 13.3 of the Environmental Statement [TR010060/APP/6.3], the proposed scheme would have mostly minor impacts on the direct accesses of the businesses, which may cause temporary interruptions, but overall access would be maintained where practicable. In one case, a sole trader based at a residential address identified for permanent acquisition has been identified. The compensation code will be applied to any claim for compensation that may arise from the relocation or cessation of the business and it is not anticipated that the business could not be relocated. Businesses directly affected are relatively small and do not employ many people (e.g. mobile café and mobile disco operator), and therefore the overall significance of effect on employment land and business during construction is assessed to be **slight adverse**.

Witham and Rivenhall End

13.10.18 There are several areas of employment in and around Witham and Rivenhall End, including the Western Industrial and Eastways Industrial Estate in south-east Witham (see Table A.11 in Appendix 13.3 of the Environmental Statement [TR010060/APP/6.3]), which would potentially be affected by traffic management during construction. There are also some small areas of encroachment onto business land, but this is relatively limited and unlikely to affect the function of that business, with the exception of the Colemans Farm Quarry and aggregate business which would be substantially encroached upon

by the proposed scheme footprint. There is a planning application (planning ref: 19/01980/FUL) in place for a change of use for land at Benton Hall Golf Club to include 18 holiday caravans and other commercial leisure uses. There is potential for the gas main diversion to conflict with the development proposal for the Golf Club land. This may constrain layout options for the holiday caravan site. Given the scale of employment locations in the community, during construction the significance of disruption effect on business is assessed to be **moderate adverse**.

Kelvedon, Feering and Inworth

13.10.19 Significant adverse effects on two businesses in this community area have been identified (see Table A.15 in Appendix 13.3 of the Environmental Statement [TR010060/APP/6.3]). In particular, it has been assumed for the purposes of the environmental assessment, one civil engineering business premises (Barconn Limited) on Inworth Road would be acquired to allow for widening work of the A12 at Park Bridge. The project team continue to investigate whether acquisition can be limited so as to allow some or all of the business to remain, but for the purposes of this assessment it has been assumed the business will no longer be able to operate from its current site. The compensation code will be applied to any claim for compensation that may arise. The access and grounds and setting of Prested Hall, which is used as a wedding venue as well as hotel and health club, would also be affected. It has been assumed for the purposes of the environmental assessment that this would be disruptive to the business. Relatively few other businesses have been identified which would be directly impacted and no significant impacts on employment allocations or planning applications have been identified. Installation of cabling and utility diversions through Kelvedon High Street may cause some disruption but this is not likely to be notably different from general maintenance activities in urban areas. Owing to the scale of impact on two particular businesses, but noting most other businesses would be unaffected, the significance of effect during construction is assessed to be overall **moderate adverse** for development land and business during construction.

Marks Tey, Copford and Easthorpe

13.10.20 The large-scale construction activities associated with proposals for junction 25 are likely to cause temporary traffic-related disruption in the short to medium-term to businesses in Marks Tey, of which there are several (see Table A.19 in Appendix 13.3 of the Environmental Statement [TR010060/APP/6.3]). In addition, there would be a loss of part (circa 30%) of the Marks Tey car boot sale site. The proposed new alignment of the A12 would result in construction activity being in very close proximity to a recording studio at Wishingwell Farm on the outskirts of Marks Tey. This business is currently in a relatively isolated rural location, so the introduction of construction noise would potentially affect the function of the business. Overall, the scale of construction activities in and around Marks Tey is assessed as likely to have a **moderate adverse** effect on employment. In most cases, it is likely that businesses would continue to function, but there is a risk of delay, or loss of amenity for customers, depending on the sensitivity of the business. No significant impact on development land has been identified.

Agricultural landholdings

13.10.21 Effects on each agricultural landholding are reported in Table A.21 of Appendix 13.3 of the Environmental Statement [TR010060/APP/6.3].

13.10.22 Chapter 10: Geology and soils, of the Environmental Statement [TR010060/APP/6.1] provides an assessment of effects on the agricultural soil resource.

13.10.23 In terms of agricultural businesses, major adverse magnitude impacts have been assessed for three landholdings in terms of land take, while 14 would have moderate adverse magnitude impacts. In some cases, land required for the proposed scheme would result in permanent loss of entire fields. Approximately 504ha of arable farmland would be lost to the proposed scheme during the construction phase, of which 395ha would be permanently lost. There would be remaining viable agricultural land at most landholdings affected, but the scale of loss and high value of agricultural assets means the overall effect is significant for the study area. On a county-wide basis, there were 552 cereal farms in Essex in 2019/20 (Defra, 2020) so this impact affects approximately 3% of the cereal farm businesses in Essex, and approximately 0.5% of agricultural land use (assuming an average farm size 140.2ha (Defra, 2020)).

13.10.24 Given the importance of agricultural production as a resource, and the pressure on agricultural land in the region, this is assessed to be a **large adverse** significant effect.

Walkers, cyclists and horse riders

13.10.25 Appendix 13.3 of the Environmental Statement [TR010060/APP/6.3]) sets out the full assessment of impacts on walkers, cyclists and horse riders. Since there are very few bridleways within the study area, most impacts on PRoWs are likely to affect walkers and cyclists only. There is potential for effects on all walkers, cyclists and horse riders where country lanes and bridleways are impacted by the proposed scheme. Figure 13.2 [TR010060/APP/6.2] shows the locations of significant impacts on routes used by walkers, cyclists and horse riders (i.e. where an impact on an individual route is assessed to be of moderate or higher significance). For detail on temporary diversions of PRoWs, pedestrian and cycle routes, reference should be made to the Construction Phase Plans, which are available in Volume 2 of the DCO application [TR010060/APP/2.15]). The following assessment summarises the effects on the walking, cycling and horse-riding resource at a community level.

Boreham

13.10.26 During construction, there would be major disruption to walking and cycling routes across Boreham Bridge and Generals Lane Roundabout. This would affect the Chelmsford to Boreham cycle route and also a route between Springfield Industrial Estate and the new Beaulieu Park district of Chelmsford. Access via diversion routes would be provided throughout the construction phase, but this may require walkers and cyclists to cross and take less direct routes. Since these routes are likely used as regular active travel commute routes, this is likely to cause inconvenience and delay, and would likely affect a

lot of people on a daily basis. Bridleway 213_45 would be closed to allow for use as a construction laydown area, while bridleway 213_23 would be used as a haul road. However, the impacts on these bridleways are not deemed significant to walkers, cyclists and horse riders since there is little evidence they are currently used. Several other PRoWs in the Boreham area would be slightly impacted by construction activities, such as construction of drainage works or use as haul roads. Measures would be in place to ensure access for users of the PRoWs to be maintained and protected from construction activities. No significant impacts on routes used by walkers, cyclists and horse riders within Boreham village itself are anticipated. Overall, the significance of effect of construction activities on walkers, cyclists and horse riders in the Boreham area is assessed as **moderate adverse**. Refer to Table A.4 in Appendix 13.3 of the Environmental Statement [TR010060/APP/6.3] for further details.

Hatfield Peverel

13.10.27 Within Hatfield Peverel parish, the more notable impacts would be on Bury Lane and Station Road – each of which is anticipated to require closure for approximately six months to allow for the demolition and re-build of their respective bridges. Without mitigation, this would have a major magnitude of impact. At present, relatively few walkers and cyclists use Bury Lane but the numbers are increasing as housing development takes place on the former Arla Foods dairy site (Hatfield Grove) and Bury Farm. The Station Road Bridge is more significant in terms of effect since it is the route to Hatfield Peverel Station and there is already a sizeable housing estate where many people would need to use the bridge to access facilities within Hatfield Peverel south of the existing A12. Works to each bridge would be phased so that access could be maintained across the A12. Nevertheless, the proposed diversion route for residents, through the site of new housing development at Hatfield Grove and Bury Farm estates, could add considerable distance to a journey (it is approximately 1.3km via this route from the north of Station Road Bridge to south of Station Road Bridge), which would be particularly inconvenient for pedestrians and the magnitude of impact would remain as major, based on DMRB LA 112 (Highways England, 2020a) magnitude criteria. A temporary footbridge is proposed for the Station Road closure (see Section 13.9 of this chapter), which would limit the magnitude to moderate. However, residents at Bury Farm would need to take the diversion route. The use of a shuttle service would ensure continued connectivity for those with accessibility needs. Therefore, the magnitude of impact at Bury Lane is predicted to remain major, while a moderate magnitude of impact is expected at Station Road. There would also be a temporary closure of Wellington Road Bridge, which would also have a major magnitude impact by requiring walkers and cyclists to divert, this time making use of the proposed new walking and cycling route included in the proposed scheme.

13.10.28 The mitigation proposals for the Station Road and Bury Lane bridge closures would also have a local amenity impacts on residents which are assessed in Section 13.18 of this chapter.

13.10.29 Outside the main settlement of Hatfield Peverel (but within the parish), there would be moderate adverse impacts on the footways alongside the northbound and southbound sides of the A12 carriageway between Hatfield Peverel and Witham. This would be due to construction activities along the route causing ongoing disruption. Although access for walkers, cyclists and horse riders would be maintained, the sum of minor diversions and traffic management measures would cause inconvenience, and this would likely affect active travel commuters, some of whom may use the routes daily. In addition, the demolition of Woodend Bridge would prevent access to and from Witham from public footpath FP 90_29 (Hatfield Peverel), and the Latney's Boarding Kennels and Cattery, except via a lengthy diversion (approximately 2km) using new provision at the proposed new junction 21 arrangement which would be phased so that it is in place prior to demolition of Woodend Bridge. This large impact is likely to affect relatively few people who would use this route regularly.

13.10.30 Overall, the level of disruption to walkers and cyclists within the Hatfield Peverel parish during the construction phase is assessed to have a **very large adverse** significance of effect. Refer to Table A.8 in Appendix 13.3 of the Environmental Statement [TR010060/APP/6.3] for further details.

Witham and Rivenhall End

13.10.31 Approximately 370m of footway on the B1018 Maldon Road in Witham would require diversion while works to widen Olivers Bridge take place (over approximately seven months). The aspiration is that this bridge would be widened within the extents of the existing deck without widening the physical structure. However, for the purpose of this Environmental Statement a worst case of 4.5m widening either side has been assumed. Temporary lighting to the new route would be provided. This route is very well used and assessed as very high sensitivity, and so this moderate adverse magnitude of impact would be significant. A public footpath (FP 121_101 (Witham)) which connects Witham to Whetmead Nature Reserve would be closed on an intermittent basis during a period of up to approximately 12 months. The Blackwater Rail Trail would be closed while works to Benton Bridge take place requiring a diversion of approximately 720m via Maldon Road and Blue Mills Road. Construction activities associated with junction 22 would disrupt access along Little Braxted Lane, which would also impact on users of NCN Route 16. Walkers and cyclists would be diverted along the newly constructed section of shared use cycle track around the southern side of junction 22 and over a proposed new walking/cycling bridge which links back to Little Braxted Lane. This would be a more convoluted route for cyclists and pedestrians and may add up to 500m to some journeys. This would have a moderate adverse magnitude of impact, but due to the very high sensitivity of this route, the significance of effect on walkers and cyclists is large adverse. Proposed highway works to the B1389 and junction 22 would also disrupt access for walkers and cyclists seeking to access the east-west footway along the existing A12 to and from Colchester. Again, this is a very highly sensitive route and likely regularly used for active travel.

13.10.32 Within Rivenhall End, approximately 100m of the existing footway along Henry Dixon Road, and the road itself, immediately north of Fair-Rest caravan site would be closed to allow construction of the proposed new A12 alignment.

Walkers and cyclists would be diverted around the Braxted Road realignment. This could add 500m to the journey for Fair-Rest residents, but for most it would be a relatively minor inconvenience throughout the works period. In addition, there would be some footpath diversions, for example FP 105_45 (Rivenhall End) would be diverted around a proposed borrow pit. However, these impacts would affect relatively few people.

13.10.33 Overall, the level of disruption to walkers and cyclists within Witham and Rivenhall End during the construction phase is assessed to have a **large adverse** significance of effect mainly due to construction-related disruption to some very highly used active travel and cycle routes. Refer to Table A.12 in Appendix 13.3 of the Environmental Statement [TR010060/APP/6.3] for further details.

Kelvedon, Feering and Inworth

13.10.34 The most notable impact in these communities would be the proposed closure of a public footpath FP 78_18 (Feering), which would require closure for a period of approximately 39 months while the proposed demolition of Threshelford Bridge and construction of the replacement structure takes place. The footpath would then be diverted onto its new permanent alignment. There are limited alternative PRoWs which cross the A12 for residents from Feering, so alternative access to the PRoW network east of the A12 is likely to add over 1km to journeys, making this a major magnitude impact on the basis of DMRB LA 112 magnitude criteria. Another notable impact would be the closure of the footway on Highfields Bridge for six weeks while tie in works of the road are undertaken. Highfields Bridge is substantially well used by cyclists and walkers and so this would inconvenience many people seeking to use the wider lane and PRoW network. However, it is likely that recreational cyclists could find alternative routes through the lane network, while walkers could divert via Ewell Overbridge.

13.10.35 There are some other impacts of moderate magnitude such as the closure of public footpath FP 92_25 to allow for tie in with road after completion of new Ewell Overbridge replacement. The length of diversion required would translate as a moderate adverse magnitude of impact based on the DMRB LA 112, however, given this is likely a recreational route, it is not considered the additional length would be significant to most users of the route, compared to amenity of the route.

13.10.36 Overall, the level of disruption to walkers and cyclists within the parishes of Kelvedon, Feering and Inworth during the construction phase is assessed to have a **moderate adverse** significance of effect mainly due to construction-related disruption to PRoWs and recreational access. Refer to Table A.16 in Appendix 13.3 of the Environmental Statement [TR010060/APP/6.3] for further details.

Marks Tey, Copford and Easthorpe

13.10.37 Notable impacts on walking, cycling and horse-riding routes in these parishes include where public footpath FP 144_19 would be closed for a period of approximately 20 months and the northernmost 200m of FP 144_18 would be permanently stopped up to allow for the construction of the proposed new A12

alignment (whereby these PRoW would be connected to the proposed new cycleway). This would temporarily reduce access to outdoor recreation during the construction stage for residents in Marks Tey as alternative access to the PRoW network south of the A12 is limited or requires lengthy alternative routes via Copford Green. Disruption to the east-west route alongside the northbound carriageway of the A12 while the proposed Wishingwell Farm Roundabout, Easthorpe Road Roundabout and Feering East Roundabout are constructed could cause minor disruption to active travel commuters (most likely cyclists) with proposed temporary diversions in place around works.

13.10.38 Works to junction 25 would likely cause disruption to residents of Marks Tey for a period of at least two years. This would affect Old London Road, Station Road, North Lane, A120, B1408 and the footways around the Marks Tey roundabout. Given the duration and scale of disruption, although access would be maintained via diversions, the overall effect on Marks Tey is anticipated to be **moderate adverse**. Refer to Table A.20 in Appendix 13.3 of the Environmental Statement [TR010060/APP/6.3] for further details.

13.10.39 The identified construction effects on land use and accessibility assets are summarised in Table 13.9.

Table 13.9 Summary of construction land use and accessibility impacts

Aspect	Community	Significance of effect
Private property and housing	Boreham	Neutral
	Hatfield Peverel	Large adverse
	Witham and Rivenhall End	Moderate adverse
	Kelvedon, Feering and Inworth	Neutral
	Marks Tey, Copford and Easthorpe	Slight adverse
Community land and assets	Boreham	Neutral
	Hatfield Peverel	Large adverse
	Witham and Rivenhall End	Moderate adverse
	Kelvedon, Feering and Inworth	Slight adverse
	Marks Tey, Copford and Easthorpe	Moderate adverse
Development land and business	Boreham	Slight adverse
	Hatfield Peverel	Slight adverse
	Witham and Rivenhall End	Moderate adverse
	Kelvedon, Feering and Inworth	Moderate adverse
	Marks Tey, Copford and Easthorpe	Moderate adverse
Agricultural landholdings	N/A	Large adverse

Aspect	Community	Significance of effect
Walkers, cyclists and horse riders	Boreham	Moderate adverse
	Hatfield Peverel	Very large adverse
	Witham and Rivenhall End	Large adverse
	Kelvedon, Feering and Inworth	Moderate adverse
	Marks Tey, Copford and Easthorpe	Moderate adverse

Operation

Private property and housing

13.10.40 All land take impacts would occur at the construction phase for all communities. While thirteen properties would experience some permanent land take, this would not affect the residential function of the properties nor use of remaining garden area, and so is not considered significant.

13.10.41 In most cases, where housing is proposed to be permanently acquired, the houses would be returned to the housing market after construction and so the permanent scale of loss of residential resource would be limited to the two properties proposed for demolition (refer to Appendix 13.3 of the Environmental Statement [TR010060/APP/6.3] for relevant assessment tables). On this basis, for most communities the significance of effect on the private property and housing resource during operation is assessed as **neutral**, with the exception of Witham and Rivenhall End where the permanent loss of two properties to the housing stock is assessed as **slight adverse**.

Community land and assets

13.10.42 The main impacts on community land and assets would occur at the construction phase for all communities (refer to Appendix 13.3 of the Environmental Statement [TR010060/APP/6.3] for relevant assessment tables). There is potential for an easement associated with the gas main diversion to affect a golf course (see Table A.10 in Appendix 13.3). This would likely mean that on occasion, maintenance access may be required, resulting in some temporary disturbance of the existing community and recreational land uses of these assets. This is not expected to impact on the viability of the use of these assets over the long term and so is assessed to be of minor adverse magnitude and slight significance for the land use of these individual assets. Refer to Chapter 9: Biodiversity, of the Environmental Statement [TR010060/APP/6.1] for potential impacts on biodiversity function of the nature reserve. Overall, the operational effect of the proposed scheme on community land and assets is assessed to be **neutral** for all communities.

Development land and business

13.10.43 No direct operational effects have been identified that would have a significant ongoing impact on function of employment sites or proposals for development land (Tables A.3, A.7, A.11, A.15 and A.19 in Appendix 13.3 of the Environmental Statement [TR010060/APP/6.3]). It is uncertain whether the

introduction of traffic noise would have an impact on the function and viability of the recording studio at Wishingwell Farm. There is also the potential for impacts on businesses from lower footfall in the areas which would be bypassed by the proposed scheme, such as the garage and fast-food outlet at Rivenhall End. However, the greatly reduced through-traffic may also increase the amenity of the location, encouraging more use by pedestrians and local residents and there would be no change to the physical availability of business land use in these areas. Businesses throughout the study area should benefit from more reliable journey times along the A12 corridor once the proposed scheme is in operation.

13.10.44 While there may be significant adverse impacts to a small number of individual businesses, it is not considered significant in terms of the development land and business element as a whole, which is generally physically unaffected and benefiting from improved traffic conditions. On this basis, the operational impact on development land and business, in terms of land use, is **neutral**.

Agricultural landholdings

13.10.45 The significant effects on agricultural land use change would occur at the construction phase as it relates to loss of land. A proportion of this land would be restored to agricultural production after the construction phase. This would include approximately 109ha of arable land. However, 395ha of arable agricultural resource would be permanently lost to the proposed scheme. During operation, permanent land acquisition would reduce the size of the affected holdings, reducing overall agricultural productivity.

13.10.46 Two landholdings (agricultural landholdings 7 and 29) have been identified which would be severed by the proposed scheme, although alternative access arrangements would be in place. In the case of agricultural landholding 7, the closure of Woodend Bridge would mean an increase in distance from land south of the A12 to north of the A12 by approximately 811m, via the proposed junction 21. In the case of agricultural landholding 29, the proposed new A12 alignment would create new severance of land parcels, and access would be via the Prested Hall Overbridge to the west, or Easthorpe Road Overbridge to the east. This would mean longer journey times for farm vehicles to move between some fields.

13.10.47 Overall, taking account of the permanent loss of agricultural resource, this operational effect is assessed to be of **large adverse** significance.

Walkers, cyclists and horse riders

Boreham

13.10.48 Within the parish of Boreham, the most significant impacts on walkers, cyclists and horse riders would be in and around junction 19. In particular, the inclusion of controlled crossing facilities on Boreham Bridge, Generals Farm Roundabout and Generals Lane Roundabout would reduce the severance impact of fast moving, busy traffic conditions on walkers and cyclists, while the proposed Paynes Lane Bridge would restore bridleways north and south of the existing A12 (BR 213_23 and BR 213_45 (Boreham)) to a useable route for walkers, cyclists and horse riders. This would have the effect of increasing the value of

this route from 'low' in the baseline where the bridleways are currently not usable, to 'medium' with the proposed scheme in place, as a meaningful recreational route would be restored. The people who would benefit from improvements to junction 19 would include both active travel commuters and recreational users, including the future population of the Beaulieu Park development. In particular, many people may have been discouraged from using the routes across the junction 19 area in the baseline due to the absence of controlled crossings. In general terms, those most likely to be discouraged would be women, children, elderly people and those with disabilities. The inclusion of controlled crossings would therefore be of particular benefit to these people and would facilitate increased accessibility. No significant impact is predicted for walking, cycling and horse-riding assets in the settlement of Boreham itself. On the basis of the above, the overall significance of effect on walkers, cyclists and horse riders for Boreham parish (outside the main settlement) is assessed as **moderate beneficial**.

Hatfield Peverel

13.10.49 Within the settlement of Hatfield Peverel itself, during operation there would be beneficial impacts for pedestrians and cyclists due to the provision of higher standard shared-use routes on Bury Lane Bridge, Station Road Bridge and Wellington Road Bridge, which would be an improvement over the current provision. For the vast majority of walkers and cyclists within Hatfield Peverel, the proposals would be of a minor beneficial impact, with a moderate beneficial impact for commuters travelling east-west along the existing A12 corridor between Hatfield Peverel and Witham. However, access between Witham and public footpath FP 90_29 and the Latney's Boarding Kennels and Cattery (which are at the eastern edge of Hatfield Peverel parish) would be lengthened by some 2km due to the proposed demolition of Woodend Bridge and diversion via the proposed new junction 21. It is considered that this impact may discourage use of the public footpath. Nevertheless, it is expected that more people would benefit from the improvements in Hatfield Peverel parish than be disadvantaged by the additional journey distance for users of one footpath. Therefore, overall, the significance is assessed to be **slight beneficial**.

Witham and Rivenhall End

13.10.50 The greatest area of change for walkers and cyclists would be for routes around the area affected by the proposed new junction 22 (see Table A.12 in Appendix 13.3 of the Environmental Statement [TR010060/APP/6.3]). This would include NCN Route 16 where approximately 285m of the route would be stopped up (including where it currently uses Colemans Bridge, which is to be demolished) and an alternative alignment is proposed via a new shared walking/cycling bridge (Little Braxted Bridge) to maintain connectivity over the realigned and widened A12 corridor and onto Little Braxted Road south of the trunk road corridor. The potential need to negotiate a zig-zag ramp associated with the proposed new walking/cycling bridge would take longer for cyclists compared to the baseline route via Colemans Bridge. Commuting and road cyclists may find this frustrating and less convenient (therefore moderate adverse magnitude), whereas the new traffic-free connection may be preferable for less confident cyclists, and parents with children (therefore moderate beneficial magnitude).

13.10.51 A further area of notable change would be related to proposals where approximately 100m of the existing footway along Henry Dixon Road immediately north of Fair-Rest is to be stopped up to accommodate the proposed new A12 alignment. An alternative route is proposed along the realigned Henry Dixon Road to the proposed junction with the realigned Braxted Road, where it would tie into a shared use cycle track along Braxted Road and over Braxted Road Overbridge. This would add approximately 500m between Fair-Rest and the realigned Henry Dixon Road. However, it does provide an enhanced walking/cycling route, not previously available along Braxted Road. A controlled crossing location is proposed at the junction between Henry Dixon Road and Braxted Road, allowing for safe crossing. The magnitude of effect would be moderate adverse for pedestrians travelling to and from Fair-Rest but is assessed to be negligible adverse for the context of cycling and other pedestrian journeys.

13.10.52 The recreational value of three footpaths (FP 121_95 (Witham), FP 121_103 (Witham) and FP 105_36 (Rivenhall End)) would be restored as follows:

- For FP 121_95, by addressing past severance with the proposed new Gershwin Boulevard pedestrian bridge
- For FP 121_103, by providing a footpath diversion which would both address severance by linking to a proposed walking and cycling bridge, and create a circular recreational route
- For FP 105_36, by creating a circular recreational route where the current footpath is truncated by the existing A12.

13.10.53 Overall, improvements to provision are assessed to be of **slight beneficial** significance in operation, as improvements to accessibility and recreational value of some routes are countered by the creation of some more convoluted routes around junction 22, which may frustrate road cyclists who use NCN Route 16.

Kelvedon, Feering and Inworth

13.10.54 During operation there are several slight beneficial effects on routes due to minor improvements to accessibility (see Table A.16 in Appendix 13.3 of the Environmental Statement [TR010060/APP/6.3]). The proposed new shared use cycle track provision over the proposed Prested Hall Overbridge would replace access lost by the stopping up of part of FP 78_18 (Feering). The new route would be of a different character (metalled) and 200m longer. However, it would be able to accommodate cyclists, and this may also be beneficial for wheelchair access. It is therefore beneficial to some people but would be adverse in terms of recreational amenity for walkers seeking a more ‘rural’ experience.

13.10.55 The greatest area of impact for walkers and cyclists would be for routes meeting the existing A12 in the vicinity of the Essex County Fire and Rescue Service Headquarters. The provision of the proposed Sniveller’s Lane Bridge would address existing severance where currently people cannot cross north to south of the A12. This provision would also facilitate recreational access to the Blackwater Valley south of the A12 via FP 92_27, FP 92_32, FP 92_28 and FP 105_36, as well as the PRoW network north of the existing A12. East-west

connectivity would be served by an enhanced shared-use cycle track along the northbound side of the B1024, which would be an improvement over the current route alongside the existing A12 trunk road. Overall, the improved provision is likely to be of significance to east-west active travel commuters (although it is uncertain whether it would be sufficient to attract new users) and also facilitate more recreational use of the PRoW and lane network. Therefore, an overall **moderate beneficial** significance of effect is predicted for walkers and cyclists.

Marks Tey, Copford and Easthorpe

13.10.56 The proposed new footway on the north-east side of the realigned northern section of Easthorpe Road would connect to footpath 128_23 and also to the proposed Easthorpe Road Overbridge providing access across the proposed new A12 alignment and to an uncontrolled crossing on the existing A12 (London Road) route (to be de-trunked) (see Table A.20 in Appendix 13.3 of the Environmental Statement [TR010060/APP/6.3]). This would remove historical severance for walkers and cyclists north-south of the A12. It would provide connectivity from Easthorpe Road and the lane/PRoW network on the southern side of the A12 corridor for walkers and cyclists to Domsey Chase and the shared-use cycle tracks along the northbound side of the existing A12. The closure of the direct access onto the A12 for vehicular traffic on Easthorpe Road would also reduce traffic, making for safer use by walkers and cyclists. On the basis that these proposals would remove existing severance, this is assessed to be a major beneficial magnitude impact.

13.10.57 A new shared use cycle track route is proposed parallel along the south side of the proposed new A12 alignment between Wishingwell Farm and Marks Tey. Access across the proposed A12 would be provided via the Wishingwell Overbridge, which would link with Wishingwell Farm roundabout and an existing walking/cycling route along the existing A12 London Road (to be de-trunked). The route parallel to the A12 would link PRoW FP 128_88, FP 144_18, and FP 144_17 and would also link Hall Chase and the east side of the A12 at Marks Tey with Wishingwell Farm and the accommodation road down to Easthorpe Green Farm. It is expected that this route would help facilitate east-west active travel journeys between Kelvedon and Marks Tey (by linking with existing provision alongside the existing A12), as well as access to the PRoW network. It would therefore be expected to become a high value route. A number of minor beneficial impacts are also anticipated in Marks Tey such as where current controlled crossings would be replaced with toucan crossings to help cyclists as well as pedestrians.

13.10.58 Overall, the significance of effect in operation is assessed to be **moderate beneficial** mainly due to overall improved connectivity.

13.10.59 Table 13.10 sets out the summary of the operational effects identified through the assessment of land use and accessibility.

Table 13.10 Summary of land use and accessibility impacts during operation

Aspect	Community	Significance of effect
Private property and housing	Boreham	Neutral
	Hatfield Peverel	Neutral
	Witham and Rivenhall End	Slight adverse
	Kelvedon, Feering and Inworth	Neutral
	Marks Tey, Copford and Easthorpe	Neutral
Community land and assets	Boreham	Neutral
	Hatfield Peverel	Neutral
	Witham and Rivenhall End	Neutral
	Kelvedon, Feering and Inworth	Neutral
	Marks Tey, Copford and Easthorpe	Neutral
Development land and business	Boreham	Neutral
	Hatfield Peverel	Neutral
	Witham and Rivenhall End	Neutral
	Kelvedon, Feering and Inworth	Neutral
	Marks Tey, Copford and Easthorpe	Neutral
Agricultural landholdings	N/A	Large adverse
Walkers, cyclists and horse riders	Boreham	Moderate beneficial
	Hatfield Peverel	Slight beneficial
	Witham and Rivenhall End	Slight beneficial
	Kelvedon, Feering and Inworth	Moderate beneficial
	Marks Tey, Copford and Easthorpe	Moderate beneficial

13.11 Monitoring

13.11.1 No specific monitoring is proposed for land use and accessibility effects. Proposals for monitoring in relation to the wider determinant of health ‘employment, education and skills’ are set out in Section 13.19 of this chapter.

C. Human health

13.12 Human health assessment methodology

Definitions of health and mental health

13.12.1 The human health assessment adopts the World Health Organization (WHO) definition of health which is '*a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity*' (WHO, 1948).

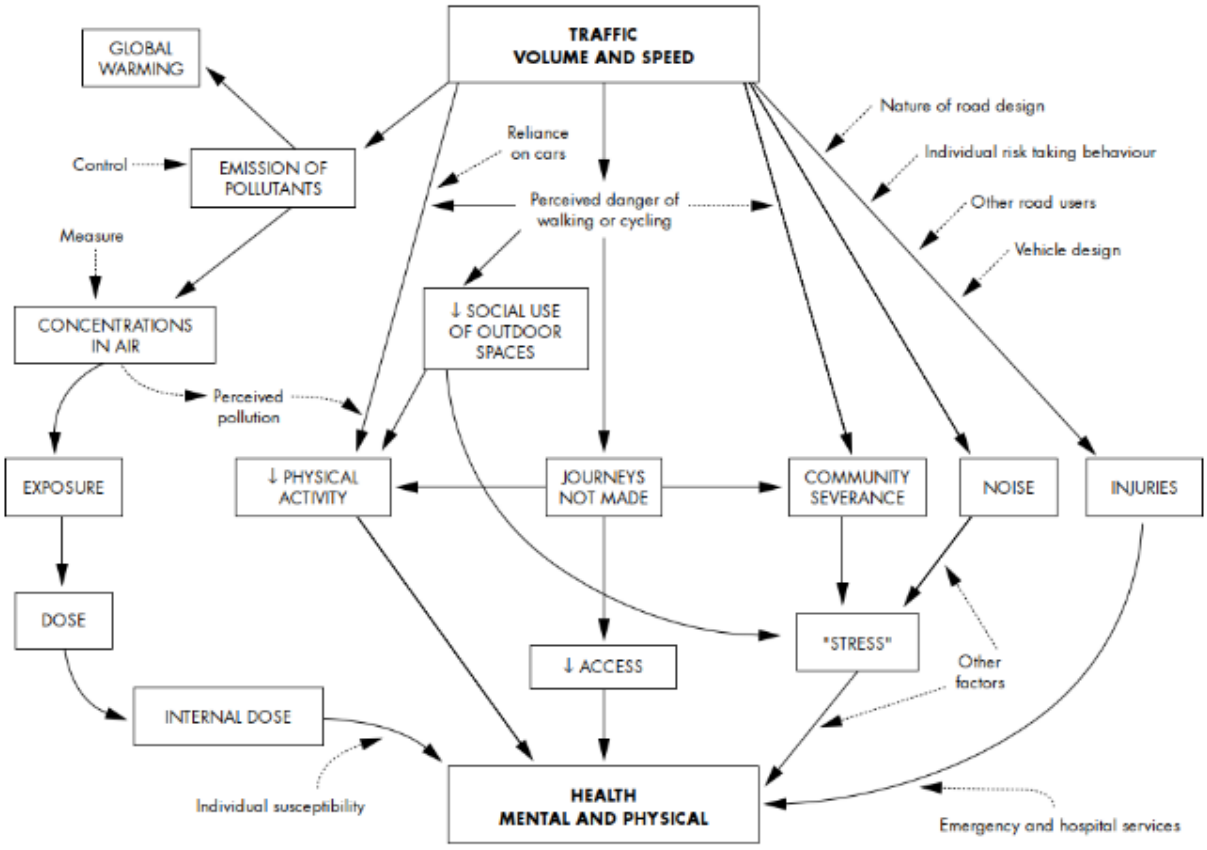
13.12.2 The WHO describes mental health as '*a state of wellbeing in which an individual realises his or her own abilities, can cope with the normal stresses of life, can work productively and is able to make a contribution to his or her community.*' (WHO, 2018).

13.12.3 This assessment applies that definition and uses the terms mental health and mental wellbeing interchangeably. Mental wellbeing is taken to include emotional, social and psychological wellbeing. Mental illness refers to clinically identifiable illness or conditions that affect cognitive functioning.

Pathways to health outcomes

13.12.4 Highway projects can affect human health in direct and indirect ways. Plate 13.1 provides an illustration of some of the pathways through which a completed highway scheme, with its associated traffic, can have unintended adverse impacts on physical and mental health. Well-designed highway projects can also have beneficial impacts on human health by providing opportunities for people to access a range of services, employment, education and leisure opportunities.

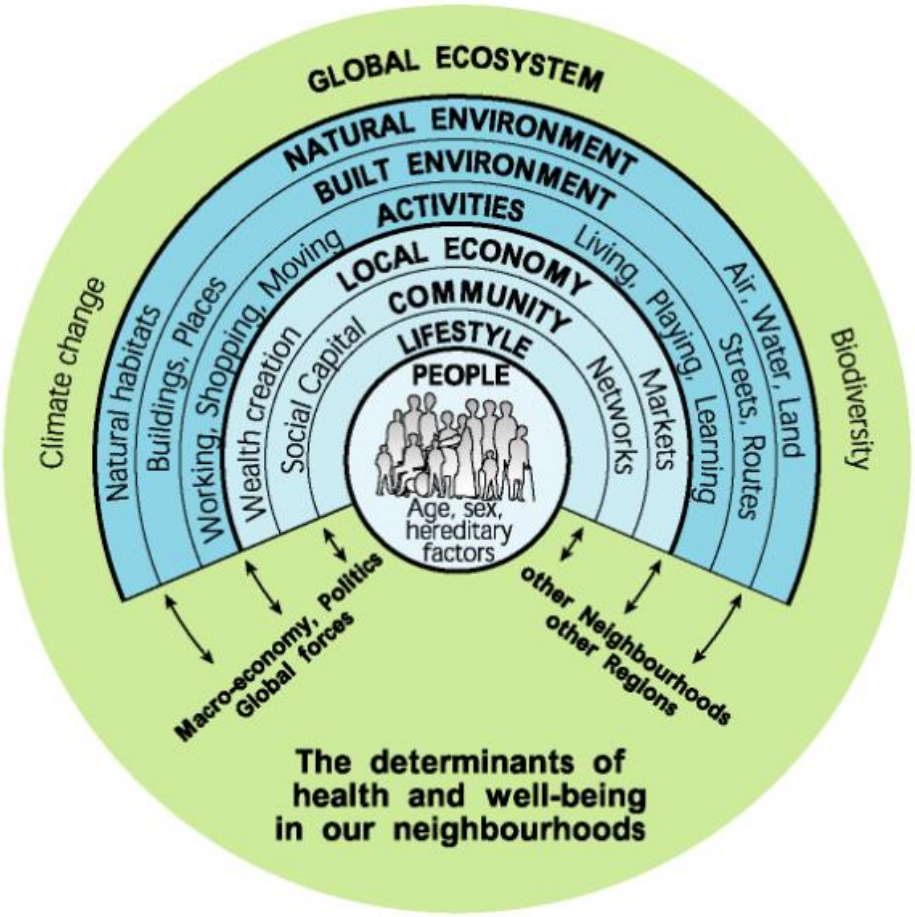
Plate 13.1 Pathways from transport policy to health outcomes (Source: Joffe and Mindell, 2002)



Wider determinants of health

13.12.5 Health is determined by a complex interaction between individual characteristics, lifestyle, and the physical, social and economic environment. These 'wider determinants of health' can have a greater influence than medical healthcare for ensuring a healthy population (WHO, 2022). Plate 13.2 provides a conceptual illustration of wider determinants of health.

Plate 13.2 Determinants of health and wellbeing in our neighbourhoods (Source: Barton and Grant, 2006)



Health inequalities

13.12.6 A related issue, of key importance to public health, is the issue of health inequalities. The Marmot Review 'Fair Society, Healthy Lives' (Marmot, 2010) highlighted how there is a social gradient of health, whereby inequalities in health outcomes are reflected in the social gradient on wider determinants such as educational attainment, employment, income, and quality of neighbourhood. Understanding the wider determinants of health is seen as an important means of tackling health inequalities and improving population health as a whole.

13.12.7 This assessment therefore considers how the proposed scheme is likely to have impacts on wider determinants of health and how those impacts are associated with effects on health outcomes. It does this by taking account of the findings from other aspects within this Environmental Statement, as well as considering impacts on determinants relating to access, traffic and transport, socio-economic conditions, and land use. The next subsection of this chapter provides further detail on the scope of matters covered within this assessment.

Scope of human health assessment

13.12.8 Table 13.11 sets out the scope of the assessment as identified in the Environmental Scoping Report (Highways England, 2020b) and subsequently expanded in response to scoping comments received from PHE to clarify the human health matters included within the health assessment scope.

Table 13.11 Scope of assessment for human health

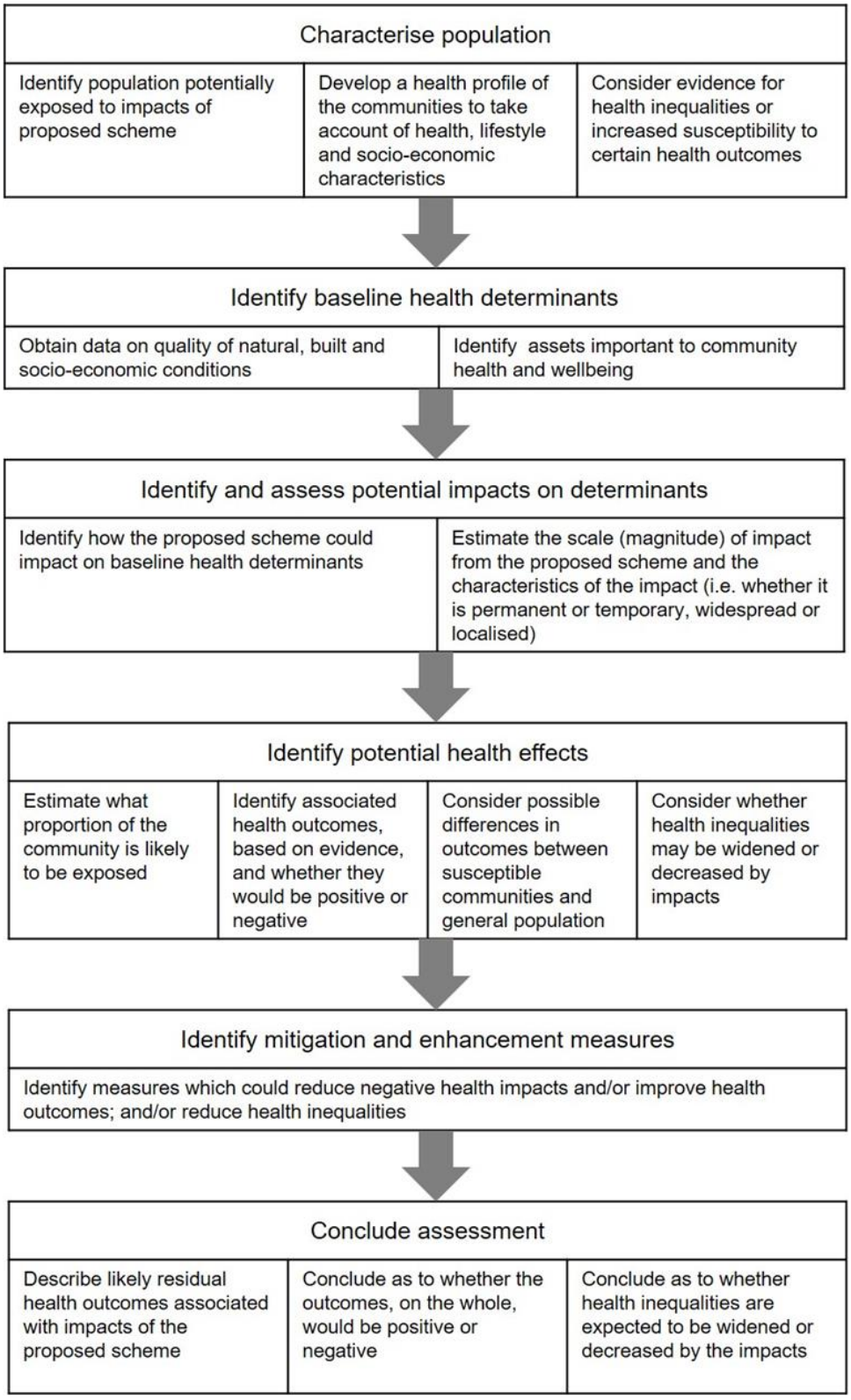
Matter	Scoped in - construction	Scoped in - operation
Noise, air quality and other environmental pollutants	✓	✓
Road traffic collisions	✓	✓
Active travel	✓	✓
Community severance and social networks	✓	✓
Access to services, facilities, employment, education and skills	✓	✓
Access to greenspace and outdoor recreation	✓	✓
Health inequalities	✓	✓
Protective factors for mental wellbeing	✓	✓
Notes: Health inequalities and protective factors for mental wellbeing are interrelated with the health determinants identified as assessment themes.		

13.12.9 The themes scoped into this assessment address the scope of health determinants identified in DMRB LA 112 (Highways England, 2020a) as well as 21 wider determinants of health identified by PHE as set out in its scoping response to the Planning Inspectorate (see Appendix 13.2 of the Environmental Statement [TR010060/APP/6.3] for information on how determinants of health identified by PHE have been scoped for this human health assessment).

General approach to human health assessment

13.12.10 The approach to the assessment on human health applies DMRB LA 112 and is supported by further guidance, including a primer by IEMA (Ben Cave Associated Ltd, 2017), HIA in Spatial Planning (PHE, 2020) and recent guidance by the International Association of Impact Assessment and European Public Health Association (2020). An overview of the general approach is set out in Plate 13.3.

Plate 13.3 Health assessment approach



13.12.11 The Mental Wellbeing Impact Assessment (MWIA) (Appendix 13.4 of the Environmental Statement [TR010060/APP/6.3]) takes on board guidance by the National MWIA Collaborative (2011) for opportunities to support mental wellbeing.

Characterising the population

13.12.12 The assessment relates to population health, which is concerned with the health outcomes of groups of people. The assessment has considered communities within the study area, as well as potential vulnerable groups.

Health profiles of communities

13.12.13 In accordance with DMRB LA 112, the health profiles of communities have been established through the inclusion of the following data which are available at ward level:

- Percentage of community with increased susceptibility to health issues (vulnerable members, e.g. ages below 16 and over 65)
- Percentage of community with pre-existing health issues (e.g. respiratory disease/chronic obstructive pulmonary disease (COPD))
- Deaths from respiratory diseases
- Percentage of community with long-term illness or disability
- Life expectancy
- Income deprivation

13.12.14 Data on cancer incidence and coronary heart diseases have also been obtained due to the associations between these outcomes and relevant risk factors linked to transport, for example physical activity levels (see Appendix 13.1 of the Environmental Statement [TR010060/APP/6.3]). These indicators are set out by district in Tables 13.16 to 13.21 in Section 13.15 of this chapter.

13.12.15 Data on mental health indicators have been obtained to help understand the general mental health condition of the communities (see Table 13.22). Mental health indicator datasets were only available at district and clinical commissioning group levels.

13.12.16 The health profile of communities has therefore been built up from a consideration of indicators of physical health, socio-economic status and mental health and wellbeing.

Identification of vulnerable groups

13.12.17 A list of potentially relevant vulnerable groups has been obtained from a guide by the Welsh Health Impact Assessment Support Unit (WHIASU), which was recommended for use by PHE in its scoping consultation response.

13.12.18 The potential presence of these groups has been identified through three principal approaches:

- The use of census data and other statistical data available through the Office for Health Improvement and Disparities (OHID) (2022)
- The results of spatial analysis undertaken to inform the land use and accessibility assessment (e.g. to identify community facilities such as schools and churches)
- A direct request for information on vulnerable groups made on 14 October 2021 to Essex County Council's Director of Public Health and department of Wellbeing and Public Health.

13.12.19 Table 13.12 sets out the list of vulnerable groups from the WHIASU guide, the scope of consideration in the assessment, and how they have been identified in the assessment.

Table 13.12 Vulnerable groups identification

Potentially vulnerable group[1]	Comment on relevance for assessment	Indicators
Age-related groups		
Children and young people	Children are more sensitive to air pollution. Differences in susceptibility to traffic collisions are also reported. Concern around speed and volume of traffic is a strong predictor of how much independent mobility children are granted, which is important for children's mental and social development. DMRB LA 112 requires data on this group to be collected.	Indicators from census data have been used to identify communities with a higher than average proportion of residents in this group. The proportion of ward populations aged 16 and under has been identified in accordance with DMRB LA 112. The presence of schools and playgrounds has been considered where relevant to indicate locations of clusters of individuals from these groups.
Older people	Older people are at greater risk of effects of air pollution than the general population. Participation in social networks is an important protective factor for mental wellbeing in later life, and therefore this group may be more susceptible to impacts of community severance. DMRB LA 112 requires data on this group to be collected.	Census data have been used to indicate communities with a higher than average proportion of residents in this group. The proportion of ward populations aged 65 and over has been identified in accordance with DMRB LA 112. The presence of care homes has been considered where relevant to indicate locations of clusters of individuals from this group.

[1] Based on indicative list from Wales Health Impact Assessment Support Unit (WHIASU, n.d.), as recommended by Public Health England

Potentially vulnerable group[1]	Comment on relevance for assessment	Indicators
Groups who suffer discrimination or other social disadvantage		
People with physical or learning disabilities or difficulties	People with physical or learning disabilities or difficulties are likely to be disproportionately affected by impacts on accessibility and access. Potentially more susceptible to impacts on mental wellbeing due to a greater likelihood of social exclusion, isolation, discrimination and past exposure to stressful events. These groups have therefore been identified using available information.	Census data were used to indicate communities with a higher than average proportion of residents who self-report long-term limiting illness or disability. Schools and facilities catering for disability and special educational needs have also been considered where relevant, to indicate locations of clusters of individuals from these groups.
Refugee groups	People from these groups are potentially more susceptible to impacts on mental wellbeing due to a greater likelihood of social exclusion, isolation, discrimination and past exposure to stressful events. They may also have language barriers which make them less able to understand and participate in consultation and engagement activities, or to understand the proposed scheme proposals. Information on the presence of these groups has therefore been sought.	Information on these groups locally was requested from Essex County Council's Director of Wellbeing and Public Health, dated 14 October 2021. The information request was forwarded to other departments within Essex County Council and a spatial planner provided a response dated 11 November 2021 with advice from the Essex County Council Resettlement Officer.
People seeking asylum		
Travellers	There are no formal traveller sites within the footprint of the proposed scheme, although seven sites and one proposed site have been identified within the human health study area. There are also informal sites within the study area. This includes a site used by show people at Fair Rest off Braxted Road, south of Rivenhall End. This site is within the land use and accessibility study area.	Information on these groups was requested via a request for local information from the Essex County Council's Director of Wellbeing and Public Health, dated 14 October 2021. The information request was forwarded to other departments within Essex County Council and a spatial planner provided a response dated 11 November 2021 with advice regarding traveller sites.

Potentially vulnerable group[1]	Comment on relevance for assessment	Indicators
Single parent families	While this group is potentially more susceptible to impacts on mental wellbeing due to a greater likelihood of social exclusion or isolation, any links between impacts of the proposed scheme and differential or disproportionate effects on health status of this community are likely to be tenuous and therefore these groups have not been specifically identified.	No specific indicators for this group have been used for the assessment.
Lesbian, gay and transgender people	While this group is potentially more susceptible to impacts on mental wellbeing due to a greater likelihood of discrimination, any links between impacts of the proposed scheme and differential or disproportionate effects on health status of this community are likely to be tenuous and therefore these groups have not been specifically identified.	No specific indicators for this group have been used for the assessment.
Ethnic minority groups	People from these groups are potentially more susceptible to impacts on mental wellbeing due to a greater likelihood of social exclusion, isolation and discrimination. There can also be geographical clustering of some ethnic groups due to historic, social and structural contexts, which has the potential to lead to disproportionate effects depending on the geographical location of proposed scheme impacts. Information on the presence of these groups has therefore been sought.	Indicators from census data have been used to identify communities with a higher than average proportion of residents in ethnic minority groups. This information is set out in Tables 13.19 to 13.21.
Religious groups	There is a potential impact on a place of worship which may affect the specific religious community and their ability to find a place to meet and worship.	Presence of existing places of worship that would potentially be impacted by the proposed scheme have been identified as part of the land use and accessibility assessment. They are included in the community assets assessment tables in Appendix 13.3 of the Environmental Statement [TR010060/APP/6.3].

Potentially vulnerable group[1]	Comment on relevance for assessment	Indicators
Income-related groups		
People on low income	Deprivation is linked to a greater burden of ill health and therefore communities with lower than average rates of income are scoped in as a vulnerable group.	Indices of Multiple Deprivation (IMD) data for the income deprivation domain can be used to indicate communities with a higher than average proportion of residents in this group. This information is set out in Tables 13.19 to 13.21.
Economically inactive	The Office for National Statistics (ONS) defines economically inactive persons as those '*not in employment who have not been seeking work within the last 4 weeks and/or are unable to start work within the next 2 weeks*.' Since the reasons for this are highly varied (including studying, retirement, long-term sickness) and may be through choice, it is not clear that this is necessarily a vulnerable group. Groups more associated with adverse health outcomes such as unemployed or suffering long-term sickness, have been identified though other indicators. This group has therefore not been specifically identified.	N/A (unemployment rates feed into income deprivation indicator).
Unemployed/workless	There is evidence to suggest that work is generally good for physical and mental health and wellbeing, depending on the nature and quality of work, and that unemployment is associated with poorer physical and mental health. There may be opportunities for work through the construction of the proposed scheme. Information on the presence of these groups has therefore been sought.	Indicators from census data have been used to identify communities with a higher than average proportion of residents in this group. This information is set out in Tables 13.19 to 13.21.

Potentially vulnerable group[1]	Comment on relevance for assessment	Indicators
People who are unable to work due to ill health	As with people who have physical or mental disabilities, people in this group may be disproportionately affected by impacts on accessibility and access. They are potentially more susceptible to impacts on mental wellbeing due to a greater likelihood of social exclusion and isolation. This group is therefore scoped in but considered in combination with people with physical and learning disabilities, for the context of the proposed scheme.	This vulnerable group could be specifically identified using a breakdown of economically inactive persons in Nomis labour market statistics. However, it is likely also to be reflected in the census data on '*percentage of people who reported having a limiting long-term illness or disability*' which is being used to identify proportions of disabled people in a community; and it is not possible to disaggregate limiting long-term illness or people unable to work, from that dataset. The information on those with long-term illness or disability is reported in Tables 13.16 to 13.18.
Geographical groups		
People living in areas known to exhibit poor economic and/or health indicators	Since many of the direct effects of the proposed scheme would have a geographic influence, locations with a higher than average proportion of the above scoped-in vulnerable groups have been a consideration in the assessment, along with areas with a high prevalence of existing underlying health conditions. Areas which exhibit poor economic and health indicators are set out in Section 13.15 of this chapter. These groups have therefore been identified.	Datasets have been mapped using geographic information system (GIS) mapping to identify areas with a higher than average prevalence of poor economic or health indicators. These geographic groups are described in the 'Value and sensitivity of receptors' part of Section 13.15 of this chapter.
People living in isolated/over-populated areas	Given the location of the proposed scheme within a predominantly urban and semi-urban environment, it is not considered that that these groups would be vulnerable to the impacts of the proposed scheme and therefore have not been identified.	N/A (scoped out)

Potentially vulnerable group[1]	Comment on relevance for assessment	Indicators
People unable to access services and facilities	The proposed scheme comprises predominantly online widening of an existing trunk road and it is considered that the main pathway to affecting this group would be through its impacts on determinants of health relating to access and accessibility. Groups likely to be disproportionately or differentially affected by the proposed scheme's likely impacts would be those already identified above, such as people with disabilities or income deprivation. This group has therefore not been specifically identified on the assumption that people unable to access services and facilities have already been included in the relevant groups described above.	N/A (scoped out)

Method of assessment for wider determinants of health

13.12.20 Matters considered within the assessment of effects on human health are set out in Table 13.13 together with an outline methodology as to how each wider determinant of health is assessed. The table shows how these matters relate to the various wider determinants of health as identified by Public Health England (since October 2021 this consultee is now known as UK Health Security Agency and OHID) in its response to the Environmental Scoping Report, which have been scoped into the assessment for the proposed scheme. In addition, the determinants of health identified in DMRB LA 112 for baseline collection are set out against the relevant matters to show how these have been addressed in the assessment.

13.12.21 As discussed in Chapter 5: Environmental assessment methodology, of the Environmental Statement [TR010060/APP6.1], population health can be impacted from multiple sources. The health assessment, by its very nature, takes a holistic approach, and therefore the consideration of these combined impacts (intra-project effects) is an integral part of the assessment. Impacts from other aspects, such as landscape and visual, noise and vibration, and air quality, have therefore been taken into account when determining the likely significant effects on population health. Cross-references to other aspect chapters are provided where relevant.

Table 13.13 Method of assessment for wider determinants of health

Matters assessed and outline methodology	PHE identified determinants	DMRB LA 112 identified determinants
Access to services, employment, education facilities and skills This section provides an indication of the potential opportunities for employment, skills and businesses during the construction phase of the proposed scheme. The section also addresses accessibility and potential impacts on local employment informed by the land use and accessibility assessment. Where relevant impacts on this health determinant have been identified, consideration has been given to the health profile and sensitivity of the communities affected (see Appendix 13.4 for establishing the health profile and sensitivity of communities within the Environmental Statement [TR010060/APP/6.3]). In the absence of adopted health assessment significance criteria in DMRB LA 112, a narrative approach to describing the effect and significance has been taken, using the approach set out in Section 13.12 of this chapter. **Active travel** The potential impacts on active travel have been assessed using the results of the walking, cycling and horse-riding assessment in the land use and accessibility assessment. The focus has been on whether impacts on active travel infrastructure and changes in traffic conditions would be likely to affect a step change in mode of transport that could contribute to increased health benefits associated with regular physical activity (drawing on evidence set out in Appendix 13.1 of the Environmental Statement [TR010060/APP/6.3]. The assessment is qualitative.	A1 Access to local public and key services and facilities T1 Accessibility T2 Access to/by public transport T3 Opportunities for access by cycling and walking T4 Links between communities T6 Connections to jobs T7 Connections to services, facilities and leisure opportunities S1 Employment opportunities, including training opportunities S2 Local business activity	The location and type of community, recreational and education facilities and severance/separation of communities from such facilities. The location of healthcare facilities and severance/separation of communities from such facilities. Outline spatial characteristics of the transport network and usage in the area, including the surrounding road network, Public Rights of Way (including bridleways), cycleways, non-designated public routes and public transport routes.

Matters assessed and outline methodology	PHE identified determinants	DMRB LA 112 identified determinants
Access to green space and outdoor recreation This assessment has been informed by the land use and accessibility assessment and the assessment of visual impacts reported in Chapter 8: Landscape and visual, of the Environmental Statement [TR010060/APP/6.1]. The assessment considers both physical access to green space and visual access to green space. The health profile of affected communities has been described, together with the identification of potentially vulnerable groups (see Section 13.15 of this chapter). A qualitative assessment has been made guided by the literature review in Appendix 13.1 of the Environmental Statement [TR010060/APP/6.3], and the assessment criteria set out in Section 13.12 of this chapter.	A4 Access to the natural environment A5 Access to the natural environment within the urban environment A6 Access to leisure, recreation and physical activities within the urban and natural environments T1 Accessibility T3 Opportunities for access by cycling and walking T7 Connections to services, facilities and leisure opportunities L1 Land use in urban and/or rural settings	The location of green/open space and severance/separation of communities from such facilities. Outline spatial characteristics of the transport network and usage in the area, including the surrounding road network, Public Rights of Way (including bridleways), cycleways, non-designated public routes and public transport routes. Landscape amenity.
Community severance and social networks This assessment has been informed by the land use and accessibility assessment. The assessment considers the potential for physical severance from facilities and social networks, as well as perceived severance, such as through increased traffic and changes to pedestrian amenity. The health profile of affected communities has been described, together with the identification of potentially vulnerable groups (see Section 13.15 of this chapter). A qualitative assessment has been made guided by the literature review in Appendix 13.1 of the Environmental Statement [TR010060/APP/6.3], and the assessment criteria set out in Section 13.12 of this chapter.	T5 Community severance S5 Community/social cohesions and access to social networks S6 Community engagement T1 Accessibility	The location and type of community, recreational and education facilities and severance/separation of communities from such facilities.

Matters assessed and outline methodology	PHE identified determinants	DMRB LA 112 identified determinants
Noise, air quality and other environmental pollutants This section of the health assessment is informed by Chapter 6: Air quality; Chapter 8: Landscape and visual; Chapter 9: Biodiversity; Chapter 10: Geology and soils; Chapter 12: Noise and vibration; and Chapter 14: Road drainage and the water environment, of the Environmental Statement [TR010060/APP/6.1]. A source-pathway-receptor approach has then been considered for each aspect of the biophysical environment predicted to be impacted by the proposed scheme to identify whether there is a likely significant link to human receptors (i.e. people who may live or work in the relevant study areas). Where a source-pathway-receptor relationship is identified, the health profile of affected communities has been described, together with the identification of potentially vulnerable groups (see below for information on how vulnerable groups have been identified). The assessment has been made guided by the literature review in Appendix 13.1 of the Environmental Statement [TR010060/APP/6.3], and the approach to assessment set out in Section 13.12 of this chapter. In addition, noise impacts have been monetised using the method described below.	L2 Quality of urban and natural environments	Air quality management areas and ambient air quality. Areas recognised as being sensitive to noise (e.g. noise important areas, noise management areas) and the ambient noise environment. Sources and pathways of potential pollution (e.g. land/water contamination). Landscape amenity. Safety information associated with the existing affected road network (e.g. numbers of killed and seriously injured).
Road traffic collisions This section uses data from the collision analysis and economic analysis to assess impact of the proposed scheme on risk of serious injury or fatalities. Economic analysis uses a 60-year time frame, which is beyond the 15-year time frame for health assessment required by the DMRB LA 112. This is a limitation in the data available to inform the assessment.	-	Safety information associated with the existing affected road network (e.g. numbers of killed and seriously injured)

Matters assessed and outline methodology	PHE identified determinants	DMRB LA 112 identified determinants
Health inequalities A theme of health inequalities has been included in the human health assessment in this chapter. The aim was to bring together any disproportionate or differential impacts on vulnerable groups identified through the human health assessment to make a qualitative judgement as to whether the proposed scheme has the potential to widen or reduce health inequalities. The assessment has also drawn on the Equality Impact Assessment [TR010060/APP/7.5].	-	-
Protective factors for mental wellbeing Data from community and stakeholder consultation has been used to inform the MWIA reported in Appendix 13.4 of the Environmental Statement [TR010060/APP/6.3]. The MWIA has supported the human health assessment whereby issues identified relevant to the above themes, have fed into those assessments.	S6 Community engagement	Where available, information collated from stakeholder consultation.

Mental wellbeing impact assessment (MWIA)

13.12.22 In its scoping consultation response, PHE recommended the use of a Mental Wellbeing Impact Assessment (MWIA) to help inform a systematic approach to the consideration of mental health.

13.12.23 An adapted form of a MWIA has been undertaken and is included in Appendix 13.4 of the Environmental Statement [TR010060/APP/6.3]. The methodology adopted for the MWIA is set out in that appendix. Key findings from the MWIA have been taken forward into the residual effects reported in this chapter.

Quantification of health impacts associated with noise

13.12.24 DMRB LA 112 (Highways England, 2020a) states that '*a qualitative assessment of human health shall be undertaken, with evidence provided to support conclusions*'.

13.12.25 The quantification of health outcomes related to noise was therefore not included in the proposed scope of assessment for population and human health, as set out in the Environmental Scoping Report (Highways England, 2020b).

13.12.26 In its scoping consultation response, PHE recommended the quantification of health outcomes related to noise using the methodology agreed by the Interdepartmental Group on Costs and Benefits - Noise subgroup [IGCB(N)] and more recent systematic reviews.

13.12.27 While quantification of health outcomes is not a requirement of DMRB LA 112, there is quantification (monetisation) of health outcomes made to inform the Business Case for the proposed scheme. This process follows the approach set out in Transport Analysis Guidance (TAG) Unit A3 (Department for Transport, 2022).

13.12.28 The approach set out in TAG Unit A3 is based on that developed by the IGCB(N). A TAG Noise Workbook is included which contains the dose-response functions for each impact pathway (e.g. road transport noise, railway noise or aviation noise). These functions describe, at different noise levels, the percentage of the population affected (for sleep disturbance and annoyance/amenity) or the increased risk of adverse health outcomes. The functions are based on a number of assumptions, for example, that an average household size is 2.3 persons.

13.12.29 The TAG Noise Workbook provides a monetised output for each health outcome considered. This is based on the number of Disability-Adjusted Life Years (DALYs) lost or gained under each impact pathway, and monetised at a value of £60,000 per DALY. The output is calculated for 15 years after the proposed scheme opening and includes some discounting factors in line with the Green Book discount rate set by HM Treasury.

13.12.30 The outputs of the TAG Noise Workbook have been drawn on to inform this chapter on the basis that this work was being undertaken as part of the wider project, and therefore provides consistency with the Business Case.

13.12.31 The TAG Noise Workbook provides outputs for several health outcomes, however, for the Environmental Statement, only the monetised effects for the following health outcomes are reported, on the basis that these are health outcomes for which the evidence base for associated effects is currently strongest:

- Amenity (this is equivalent to ‘annoyance’ as applied in the World Health Organization (WHO) (2018) Environmental Noise Guidelines)
- Sleep disturbance
- Acute myocardial infarction (AMI) – this is the clinical term for ‘heart attack’ and can be an outcome of ischaemic heart disease (IHD)

13.12.32 Recent systematic reviews supporting evidence of association between noise and annoyance, sleep disturbance and IHD are set out in Appendix 13.1 of the Environmental Statement [TR010060/APP/6.3].

13.12.33 A further request from PHE in its scoping consultation response was that noise results are also provided in the L_{den} metric. This has been included in Tables 5.1 and 5.2 in Appendix 12.6 of the Environmental Statement [TR010060/APP/6.3]. The tables have been prepared in the format of DMRB LA111 assessment tables, but with the data presented in L_{den} and L_{night} noise levels for dwellings and other sensitive receptors are provided. These are façade noise levels for L_{den} and free-field level for L_{night} and have been provided in L_{den} and L_{night}.

Making a judgement of significance

13.12.34 DMRB LA 112 (Highways England, 2020a) does not currently have significance criteria for health. Instead, it states that health outcomes should be reported in line with the criteria in Table 13.14.

Table 13.14 Health outcome categories

Health outcome category	Descriptors
Positive	A beneficial health impact is identified
Neutral	No discernible health impact is identified
Negative	An adverse health impact is identified
Uncertain	Where uncertainty exists as to the overall health impact

13.12.35 In its scoping consultation response, PHE recommended that significance should be judged in consideration of the following factors: sensitivity, magnitude, cumulative effects, importance, acceptability and opportunity for mitigation.

13.12.36 The assessment of residual effects on human health has been undertaken on the basis that essential mitigation has been included. Cumulative effects have been addressed in Chapter 16: Cumulative effects assessment, of the Environmental Statement [TR010060/APP/6.1].

13.12.37 In the absence of adopted significance criteria in DMRB LA 112, a judgement of significance has been made using a narrative approach. This has been done to help inform decision-making on which health effects are considered to be 'significant' or 'not significant' in terms of population health.

13.12.38 The reasoned judgement has taken account of the following guidance.

- International Association of Impact Assessment and European Public Health Association, 2020. Human health: Ensuring a high level of protection. A reference paper on addressing Human Health in Environmental Impact Assessment as per EU Directive 2011/92/EU amended by 2014/52/EU.
- Public Health England, October 2020. Health Impact Assessment in spatial planning guide for local authority public health and planning teams.
- Public Health England, November 2020. Scoping Consultation Response to A12 Chelmsford to A120 Widening Scheme. Annex A (within the Planning Inspectorate 2021 Scoping Opinion).

13.12.39 For each judgement of significance made, a narrative has been provided to explain which factors have been considered when making the judgement of significance. The following considerations have been made, where relevant, to inform the judgement of significance by the assessor:

- Whether there would be a high level of exposure or widespread impacts

- Whether the population exposed to an impact is particularly sensitive due to pre-existing vulnerabilities or inequalities
- The duration of effects and whether they would be reversible
- The level of acceptability, including whether statutory thresholds for pollutants would be exceeded and/or whether the issue is a public health priority
- The severity of the related health outcomes (i.e. whether it is related to a change in mortality or morbidity)
- The strength of evidence for an association between a change in a determinant and health outcomes (refer to Appendix 13.1 of the Environmental Statement [TR010060/APP/6.3] for evidence base)
- Whether a large proportion of the population would likely be affected
- Whether the impact is likely to increase or tackle health inequalities at a population level

Timescales

13.12.40 Human health effects are reported for construction and for up to 15 years of operation, unless otherwise indicated due to data limitations.

13.12.41 The following terms are used to describe the duration of impacts: transient impacts are those that would typically last up to two days, such as disruption caused in the case of a weekend road closure. Short-term impacts are those lasting up to six months. Medium-term effects are those lasting six months to five years. Long-term effects are those lasting more than five years.

13.12.42 Temporary impacts are those which would not be permanent, such as land take during the construction phase that would be returned to the landowner on completion of the works. It should be noted that in some cases impacts described as temporary could last for several months or even the duration of the construction phase.

13.13 Assessment assumptions and limitations

13.13.1 This assessment has been undertaken assuming a reasonable worst-case basis afforded by the proposed limits of deviation. While the lateral limits of deviation (as shown on the Works Plans [TR010060/APP/2.2]) may result in the proposed scheme being closer to some receptors or resources, it is not considered this would result in a greater level of significance than provided in this assessment.

13.13.2 The assessment considers health effects and data at a population level, rather than health data and effects relating to individuals. The aggregated data and statistics used to support the assessment cannot be used to make inferences about the health of individuals within the communities assessed.

13.13.3 Although the assessment refers to research that demonstrates evidence of association between changes in health determinants and effects on health, this should not be interpreted as causation. It is not possible to draw conclusions on cause-and-effect relationships for human health using aggregated population-level data.

13.13.4 There are difficulties in estimating the level of exposure of the population to impacts on certain health determinants. For example, it is difficult to ascertain what proportion of their lives each individual within a given population spends in a place that is exposed to the impact and also whether individuals have been exposed to other factors also associated with a given health outcome. It is also difficult to estimate exposure due to the nature of environmental assessment results yielded by the industry standard guidelines applied for various environmental aspects. For example, the landscape and visual assessment assesses visual impacts from specific viewpoints and therefore the scale and nature of impact on views of greenspace from individual households is uncertain. Any such uncertainty is set out in the assessment reported in Section 13.18.

13.13.5 The availability of health data in some cases is limited either due to the geographic scale, or the timescale that it covers. Where data are not available for the local geographical scale or do not reflect the 15-year timescale required by DMRB LA 112 (Highways England, 2020a), this is made clear in the part of the assessment where the data are used.

13.14 Study area

13.14.1 The study area for human health is shown on Figures 13.1 and 13.3 [TR010060/APP/6.2]. It has been developed through combining the following elements:

- The study area for operational effects on air quality, i.e. the affected road network (ARN) for air quality plus a buffer of 200m from the edge of the carriageway as set out in Chapter 6: Air quality, of the Environmental Statement [TR010060/APP/6.1].
- The study area for the operational effects on noise. This has been defined as the area within 600m of new road links or road links physically changed or bypassed by the proposed scheme as set out in Chapter 12: Noise and vibration, of the Environmental Statement [TR010060/APP/6.1].
- The study area for noise associated with the strategic diversion route which commences at junction 19 and follows the A130 and A131 to Braintree, followed by the A120 to junction 25. The strategic diversion route is set out in the Outline Construction Traffic Management Plan [TR010060/APP/7.7]. The noise study area of the diversion route includes 25m width from the kerb line of the diversion route (refer to Chapter 12: Noise and vibration, of the Environmental Statement [TR010060/APP/6.1]).
- The land within the Order Limits, together with a 500m buffer.

13.14.2 The human health study area described above is considered sufficient to capture the likely significant effects on human health associated with changes in air and noise pollution, temporary and permanent changes in land use and access, and also indirect effects associated with changes in traffic volumes, speed or composition which could indirectly affect active travel or recreational journeys undertaken by walkers, cyclists and horse riders. The wards which overlap this study area have been used to inform the baseline community health and socio-economic profile set out in Section 13.15 of this chapter for the human health baseline (see Figure 13.3 [TR010060/APP/6.2]).

13.15 Baseline conditions

Baseline sources

13.15.1 Key sources used to inform the understanding of baseline conditions are set out in Table 13.15. In addition, information from landowners' questionnaires has informed the agricultural baseline and assessment.

Table 13.15 Sources for the baseline conditions

Data source	Baseline information obtained
Essex Joint Health and Wellbeing Strategy 2018-2022 (Essex County Council, 2018)	Local health priorities
Essex Joint Strategic Needs Assessment and Area Profiles (Essex County Council, 2019)	Local health priorities
Ordnance Survey 1:25,000 mapping	Spatial data including regional trails
Ordnance Survey AddressBase Plus vector map data	Data on numbers of residential properties in the study area and other community facilities
Office for Health Improvement and Disparities England's public health profiles	Local health data for key indicators

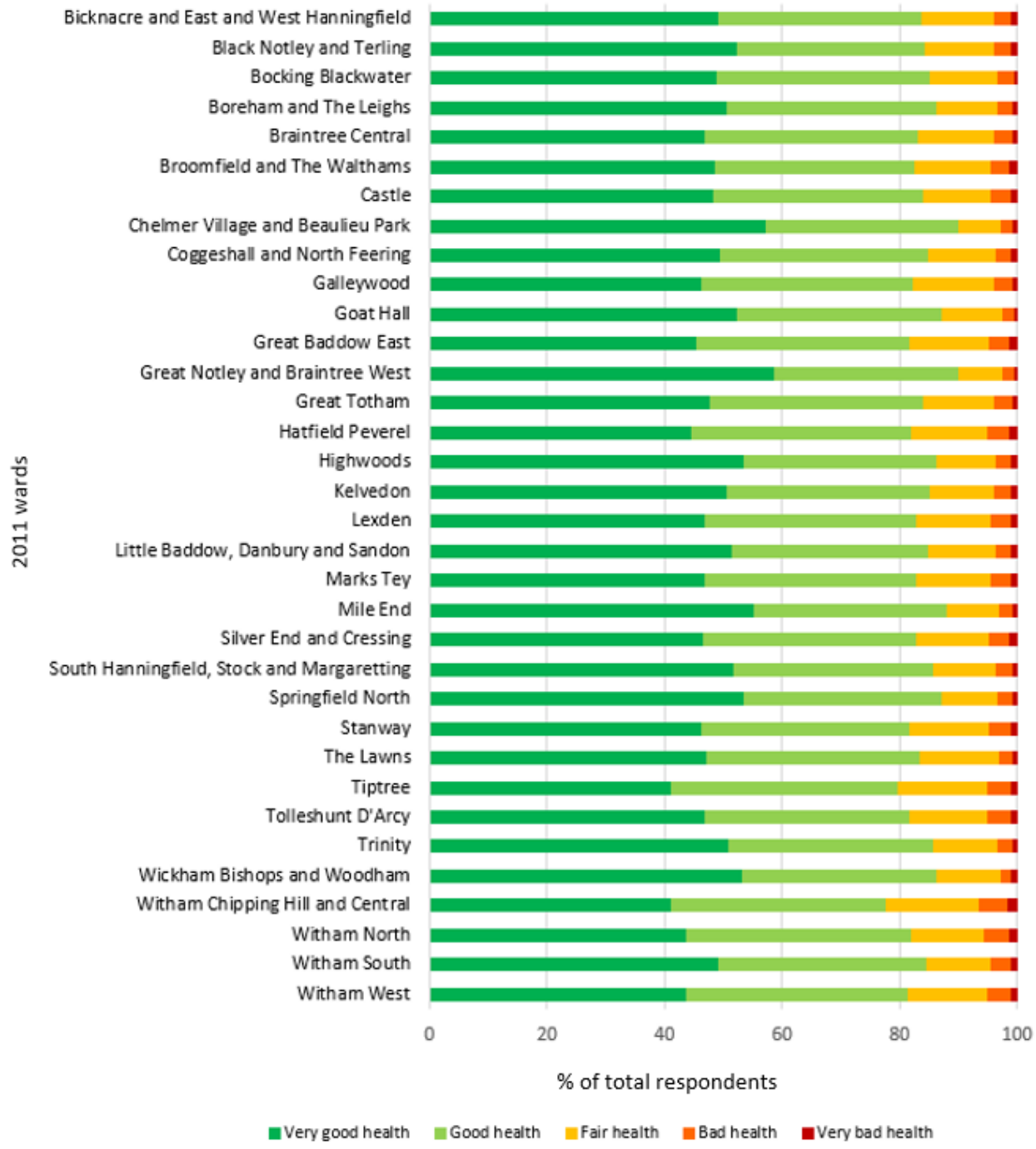
13.15.2 Health data have been obtained from OHID's Fingertips tool for the wards which coincide with the study area for human health, including those communities identified above, to provide an indication of local health issues. This is based on aggregated population-level data. The health of individuals within the study area will vary considerably and cannot be inferred from these data.

Baseline information

Baseline health profiles of communities in study area

13.15.3 Plate 13.4 shows the general health by wards which coincide with the human health study area. This is based on self-reported health by respondents in the wards, who indicate their general health on a five-point scale from 'very good health' through to 'very bad health'. The responses show that for the majority of wards, over 80% of respondents consider their health to be 'good' or 'very good'. There are some exceptions however, notably Witham Chipping Hill and Central ward and Tiptree ward, which have slightly lower reported levels of 'good' or 'very good' health.

Plate 13.4 General health by ward



13.15.4 Tables 13.16 to 13.18 set out data for various health indicators by ward within the human health study area, including those relevant to the matters and associated health outcomes described in the following paragraphs. Tables 13.19 to 13.21 provide data on socio-economic and population indicators.

13.15.5 Tables 13.16 to 13.18 are colour coded according to the data from OHID, which indicates which indicator health values are significantly worse than (coloured red), better than (coloured green), or similar to (coloured amber), the average for England[2]. As can be seen, some of the communities within Witham (Witham Central and Witham North wards) score significantly worse than the average for England, for indicators of chronic obstructive pulmonary disease (COPD) emergency admissions, limiting long-term illness and disability, and life expectancy. Communities within Witham North and Witham Central score worse than average across a number of the other health indicators as well, including premature deaths. This indicates that communities in Witham, particularly those in Witham Central ward, may be more sensitive to pollution and problems of traffic than the average for other communities. However, there will be sensitive individuals in all communities, regardless of each community's average level of health.

13.15.6 The population in Braintree Central and Beckers Green ward also scores significantly worse than average for England for life expectancy at birth among females, limiting long-term illness and disability, and income deprivation. Within Colchester, Stanway ward scores significantly worse than average for deaths from respiratory illnesses, while Castle ward scores significantly worse in terms of life expectancy at birth among males. These communities may also be more sensitive to potential pollution and problems of traffic. However, it should be noted that only a very small proportion of these ward's communities coincide with the human health study area since these wards coincide with that part of the study area which follows the strategic diversion route and affected road network (see Section 13.14 of this chapter) and are outside of the Order Limits.

[2] This is based on measures of statistical significance. Refer to PHE's technical guidance (PHE, 2017) for further information on how it determines whether indicator values are significantly different from average.

Table 13.16 Health profile indicators for Chelmsford wards in the study area

Table key:

Significantly better than average for England	Similar to average for England	Significantly worse than average for England

Health profile indicators	England average	Chelmsford Wards											
		South Hanningfield, Stock and Margaretting	Goat Hall	Bicknacre and East and West Hanningfield	Galleywood	Great Baddow East	Little Baddow, Danbury and Sandon	Chelmer Village and Beaulieu Park	The Lawns	Trinity	Springfield North	Boreham and The Leighs	Broomfield and The Walthams
Life expectancy at birth (male) (2015-2019) (years)	79.7	84.9	84.0	81.7	82.0	82.3	82.8	84.5	82.9	83.5	80.8	82.2	80.0
Life expectancy at birth (female) (2015-2019) (years)	83.1	87.0	87.7	85.3	84.7	84.6	84.3	85.1	87.4	83.8	83.2	84.4	83.7
Emergency hospital admissions for COPD (2015/16 – 2019/20) (Standardised Age Ratio (SAR))	100	41.1	43.9	48.3	73.1	52.5	53.3	37.6	51.7	79.4	54.0	92.0	64.2
Percentage of people who reported long-term illness or disability (2011) (%)	17.6	14.2	11.5	16.0	16.8	17.6	15.2	9.2	16.3	13.4	11.3	12.9	16.9

Health profile indicators	England average	Chelmsford Wards											
		South Hanningfield, Stock and Margaretting	Goat Hall	Bicknacre and East and West Hanningfield	Galleywood	Great Baddow East	Little Baddow, Danbury and Sandon	Chelmer Village and Beaulieu Park	The Lawns	Trinity	Springfield North	Boreham and The Leighs	Broomfield and The Walthams
Deaths from respiratory diseases, all ages, (2015-2019) (Standardised Mortality Ratio (SMR))	100	45.7	57.4	82.8	64.6	73.4	57.4	49.7	66.8	81.4	100.0	74.6	103.0
Deaths from coronary heart disease, all ages, (2015-2019) (SMR)	100	43.5	35.4	56.0	63.5	65.4	84.3	71.6	82.5	75.8	104.7	75.4	90.1
Incidence of all cancers (2014-2018) (Standardised Incidence Ratio (SIR))	100	100.3	97.6	96.7	104.6	89.1	87.7	97.7	89.9	91.6	86.6	93.8	92.0
Source of data: OHID. Local Health Profiles. 2021 https://fingertips.phe.org.uk © Crown copyright 2021													

Table 13.17 Health profile indicators for Braintree and Maldon wards in the study area

Table key:

Significantly better than average for England	Similar to average for England	Significantly worse than average for England

Health profile indicators	England Average	Braintree and Maldon Wards														
		Hatfield Peverel and Terling	Witham West	Witham South	Witham Central	Witham North	Wickham Bishops and Woodham	Great Totham	Silver End and Cressing	Kelvedon and Feering	Tolleshunt D'Arcy	Great Notley and Black Notley	Braintree West	Braintree South	Braintree Central and Beckers Green	Coggeshall	Bocking Blackwater
Life expectancy at birth (male) (2015-2019) (years)	79.7	81.2	82.9	82.5	75.2	77.2	83.2	81.9	82.2	79.8	77.4	81.9	83.7	79.0	79.2	81.5	79.0
Life expectancy at birth (female) (2015-2019) (years)	83.1	81.8	81.7	83.2	80.9	82.5	85.8	85.4	83.1	85.1	84.2	83.7	86.9	83.1	81.4	84.6	82.5
Emergency hospital admissions for COPD (2015/16 – 2019/20) (SAR)	100	101.8	103.0	57.4	113.6	169.3	20.4	35.5	110.6	63.2	39.3	23.3	54.7	46.8	122.6	63.2	63.4
Percentage of people who reported long-term illness or disability (2011) (%)	17.6	17.7	16.5	14.5	19.6	16.4	13.7	16.2	17.2	15.0	18.0	71.1	86.9	15.0	102.2	76.1	86.7

Health profile indicators	England Average	Braintree and Maldon Wards														
		Hatfield Peverel and Terling	Witham West	Witham South	Witham Central	Witham North	Wickham Bishops and Woodham	Great Totham	Silver End and Cressing	Kelvedon and Feering	Tolleshunt D'Arcy	Great Notley and Black Notley	Braintree West	Braintree South	Braintree Central and Beckers Green	Coggeshall	Bocking Blackwater
Deaths from respiratory diseases, all ages, (2015-2019) (SMR)	100	118.4	81.7	81.4	111.5	160.7	53.7	71.3	109.7	69.9	87.1	82.2	56.0	113.8	113.3	95.2	104.9
Deaths from coronary heart disease, all ages, (2015-2019) (SMR)	100	73.9	81.1	100.6	111.0	118.2	75.9	90.4	74.9	102.2	117.8	67.3	79.7	132.8	108.6	81.0	83.3
Incidence of all cancers (2014-2018) (SIR)	100	90.5	92.8	91.9	88.9	104.7	101.3	96.2	104.9	97.9	91.0	95.0	73.4	99.3	96.1	92.0	94.0

Source of data: OHID. Local Health Profiles. 2021 https://fingertips.phe.org.uk © Crown copyright 2021

Table 13.18 Health profile indicators for Colchester wards in the study area

Table key:

Significantly better than average for England	Similar to average for England	Significantly worse than average for England

Health profile indicators	England average	Colchester Wards							
		Marks Tey and Layer	Tiptree	Stanway	Lexden and Braiswick	Rural North	Castle	Mile End	Highwoods
Life expectancy at birth (male) (2015-2019) (years)	79.7	83.2	80.7	79.3	81.0	81.9	77.3	80.2	80.0
Life expectancy at birth (female) (2015-2019) (years)	83.1	84.2	84.3	81.9	85.9	83.9	82.2	82.7	83.8
Emergency hospital admissions for COPD (2015/16 – 2019/20) (SAR)	100	61.6	57.5	85.1	49.8	55.6	63.6	112.8	82.1
Percentage of people who reported long-term illness or disability (2011) (%)	17.6	15.9	17.7	18.2	17.0	15.5	14.7	12.2	11.8
Deaths from respiratory diseases, all ages, (2015-2019) (SMR) (100)	100	71.4	98.0	133.8	74.2	84.2	123.2	84.2	85.8

Health profile indicators	England average	Colchester Wards							
		Marks Tey and Layer	Tiptree	Stanway	Lexden and Braiswick	Rural North	Castle	Mile End	Highwoods
Deaths from coronary heart disease, all ages, (2015-2019) (SMR)	100	76.8	67.0	119.4	68.4	62.8	103.4	74.5	109.0
Incidence of all cancers (2014-2018) (SIR)	100	96.5	105.2	104.2	99.8	85.1	97.8	111.2	95.5
Source of data: OHID. Local Health Profiles. 2021 https://fingertips.phe.org.uk © Crown copyright 2021									

Table 13.19 Population and socio-economic indicators for Chelmsford wards in the study area

Table key:

Significantly better than average	Similar to average	Significantly worse than average
Lower	Similar	Higher
Highest quintile		Lowest quintile

Community profile indicators	England average	Chelmsford Wards											
		South Hanningfield, Stock and Margaretting	Goat Hall	Bicknacre and East and West Hanningfield	Galleywood	Great Baddow East	Little Baddow, Danbury and Sandon	Chelmer Village and Beaulieu Park	The Lawns	Trinity	Springfield North	Boreham and The Leighs	Broomfield and The Walthams
Percentage of total resident population aged 0-15 years (2019) (%)	19.1	17.7	18.8	15.6	19.2	16.8	18.3	21.1	18.6	19.3	20.6	21.4	21.4
Percentage of total resident population aged 65 and over (2019) (%)	18.0	23.7	21.2	24.4	24.4	25.1	26.7	11.0	24.3	14.4	15.1	18.0	20.3
Income deprivation (English Indices of Deprivation 2019) (%)	12.9	5.8	4.9	5.3	10.4	8.4	6.4	6.2	3.5	7.1	5.2	7.8	7.1

Community profile indicators	England average	Chelmsford Wards											
		South Hanningfield, Stock and Margaretting	Goat Hall	Bicknacre and East and West Hanningfield	Galleywood	Great Baddow East	Little Baddow, Danbury and Sandon	Chelmer Village and Beaulieu Park	The Lawns	Trinity	Springfield North	Boreham and The Leighs	Broomfield and The Walthams
Black and Minority Ethnic (BME) Population (2011) (%)	14.6	2.0	4.9	2.3	4.1	5.7	4.0	7.7	6.0	8.2	6.8	4.7	5.4
Percentage of people aged 65 and over who are living alone (2011)	31.5	25.8	24.9	24.0	27.0	31.1	19.9	35.9	25.6	33.7	30.8	25.1	24.5
Percentage of the working age population claiming out-of-work benefit) (2019/20)	2.8	0.9	1.0	0.9	2.3	2.1	1.0	1.3	1.2	1.9	1.3	1.2	1.4
Long-term unemployment rate per 1,000 working age population (2019/20)	3.2	0.9	0.0	1.9	5.0	4.4	1.6	1.3	2.8	2.4	2.0	2.1	2.3
Source of data: OHID. Local Health Profiles. 2021 https://fingertips.phe.org.uk © Crown copyright 2021													

Table 13.20 Population and socio-economic indicators for Braintree and Maldon wards in the study area

Table key:

Significantly better than average	Similar to average	Significantly worse than average
Lower	Similar	Higher
Highest quintile		Lowest quintile

Community profile indicators	England average	Braintree and Maldon Wards														
		Hatfield Peverel and Terling	Witham West	Witham South	Witham Central	Witham North	Wickham Bishops and Woodham	Great Totham	Silver End and Cressing	Kelvedon and Feering	Tolleshunt D'Arcy	Great Notley and Black Notley	Braintree West	Braintree South	Braintree Central and Beckers Green	Coggeshall	Bocking Blackwater
Percentage of total resident population aged 0-15 years (2019)	19.1	15.9	20.0	22.7	18.8	21.2	14.5	18.4	20.2	18.7	15.4	21.9	17.5	22.3	19.8	17.5	20.7
Percentage of total resident population aged 65 and over (2019)	18.0	27.1	18.7	14.3	20.5	15.6	30.7	26.3	19.8	21.9	26.9	15.8	23.2	14.9	14.5	25.7	17.1
Income deprivation (English Indices of Deprivation 2019) (%)	12.9	6.9	12.4	8.9	12.6	13.5	5.0	5.2	10.3	6.0	7.1	4.8	7.1	11.0	14.1	7.6	6.9

Community profile indicators	England average	Braintree and Maldon Wards														
		Hatfield Peverel and Terling	Witham West	Witham South	Witham Central	Witham North	Wickham Bishops and Woodham	Great Totham	Silver End and Cressing	Kelvedon and Feering	Tolleshunt D'Arcy	Great Notley and Black Notley	Braintree West	Braintree South	Braintree Central and Beckers Green	Coggeshall	Bocking Blackwater
Black and Minority Ethnic (BME) Population (2011) (%)	14.6	2.3	3.9	5.4	5.7	4.0	1.8	1.8	2.9	2.3	1.3	3.4	3.9	5.2	5.6	1.8	5.4
Percentage of people aged 65 and over who are living alone (2011)	31.5	24.9	33.0	37.2	39.0	33.2	19.5	20.9	28.1	30.2	24.9	22.3	25.5	27.8	45.1	33.5	24.5
Percentage of the working age population claiming out-of-work benefit) (2019/20)	2.8	1.3	2.9	2.2	2.8	3.0	1.1	0.8	2.2	1.5	1.0	0.9	2.2	2.9	3.0	1.1	1.5
Long-term unemployment rate, per 1,000 working age population (2019/20)	3.2	0.8	0.0	0.0	0.2	1.1	0.0	1.5	0.0	1.1	0.7	0.0	1.4	2.3	1.9	1.4	0.8
Source of data: OHID. Local Health Profiles. 2021 https://fingertips.phe.org.uk © Crown copyright 2021																	

Table 13.21 Population and socio-economic indicators for Colchester wards in the study area

Table key:

Significantly better than average	Similar to average	Significantly worse than average
Lower	Similar	Higher

Highest quintile				Lowest quintile

Community profile indicators	England average	Colchester Wards							
		Marks Tey and Layer	Tiptree	Stanway	Lexden and Braiswick	Rural North	Castle	Mile End	Highwoods
Percentage of total resident population aged 0-15 years (2019) (%)	19.1	19.9	16.3	18.5	17.9	17.2	17.5	23.2	23.0
Percentage of total resident population aged 65 and over (2019) (%)	18.0	20.8	26.4	22.3	23.6	23.8	15.5	8.9	10.4
Income deprivation (English Indices of Deprivation 2019) (%)	12.9	5.6	6.9	7.6	5.8	5.9	10.5	7.4	11.0
Black and Minority Ethnic (BME) Population (2011) (%)	14.6	2.1	1.4	4.9	4.9	2.7	13.2	13.0	10.9

Community profile indicators	England average	Colchester Wards							
		Marks Tey and Layer	Tiptree	Stanway	Lexden and Braiswick	Rural North	Castle	Mile End	Highwoods
Percentage of people aged 65 and over who are living alone (2011)	31.5	22.3	27.9	29.5	23.5	22.5	40.7	31.9	31.5
Percentage of the working age population claiming out-of-work benefit (2019/20)	2.8	1.2	1.3	1.4	1.2	0.8	2.7	1.6	1.9
Long-term unemployment rate, per 1,000 working age population (2019/20)	3.2	0.8	1.2	1.8	1.4	1.6	3.5	2.4	2.0
Source of data: OHID. Local Health Profiles. 2021 https://fingertips.phe.org.uk © Crown copyright 2021									

Mental health and wellbeing

13.15.7 Table 13.22 sets out indicators for mental health. These data are not available at ward level and the large area covered will mask some local variability. On the whole, the data show that the prevalence and incidence of mental health conditions within the districts and clinical commissioning groups (CCGs) that coincide with the human health study area are either lower or in line with the average for England and so no particular geographical areas of concern within the study area are identified for these indicators. The data show, however, that depression in people aged 18 years and over is a relatively common condition in England, with 12.3% of people affected. Depression can occur for a variety of reasons, but some cases can be triggered by stressful events. People who are more vulnerable to depression include those with long-term illness or disability, people who are isolated from family and friends, and those with a family history of depression (NHS, 2019).

13.15.8 The rates of suicide among men in Chelmsford, Braintree and Colchester are all above average for England, while the suicide rate for men in Maldon is 61% higher than the rate for England, and the highest rate among all districts in Essex (Essex County Council, 2019). Suicide rates for females in Braintree, Chelmsford and Colchester are lower than for men but slightly higher than the rates for both Essex and England (Essex County Council, 2019). Data on female suicide rates were not available for the Maldon district.

13.15.9 Maldon also has the highest age-standardised mortality rate from suicide and injury of undetermined intent among persons aged over 10 years (14.52 per 100,000), which is significantly higher than the rate for Essex as a whole (10.88) and England (9.57) (Essex County Council, 2019). The above data appear to indicate an inconsistency between diagnosed mental health disorders (as indicated by prevalence and incidence rates) and severe mental health outcomes indicated by suicide.

13.15.10 The MWIA which informs this chapter (Appendix 13.4 of the Environmental Statement [TR010060/APP/6.3]) includes further information on the community profile with regard to mental health and wellbeing. It also considers which groups may be more susceptible to poor mental health and wellbeing outcomes.

13.15.11 See below under ‘Value and sensitivity of receptors’ for summary information about vulnerable groups.

Table 13.22 Mental health baseline data

Table key

Significantly better than average for England	Similar to average for England	Significantly worse than average for England

Lowest quintile				Highest quintile

Indicator	District authority area				England
	Chelmsford	Braintree	Maldon	Colchester	
Estimated prevalence of common mental disorders: percentage of population aged 16 years and over (2017)[1]	13.1	14.7	14.0	15.1	16.9
Estimated prevalence of common mental disorders: percentage of population aged 65 years and over (2017)[1]	8.3	9.4	9.1	9.2	10.2
Depression: Recorded prevalence (aged 18+) (2020/21)	9.2	12.3	9.1	12.7	12.3
ESA claimants for mental and behavioural disorders: crude rate per 1,000 working age population (2018) [1]	19.2	18.3	17.5	24.7	27.3
Male suicide (rate per 100,000)[2]	18.0	17.6	23.6	19.6	14.7
Female suicide (rate per 100,000)[2]	5.72	5.86	NA	6.97	4.69
	NHS Mid Essex CCG			NHS North East Essex CCG	
Depression: QOF incidence (18+) – new diagnosis (2019/20) (crude rate %)[1]	1.2			1.7	1.5

Notes: ESA – Employment and Support Allowance (see Chapter 18: Glossary and acronyms [TR010060/APP/6.1]). QOF = Quality and Outcomes Framework (see Chapter 18: Glossary and acronyms). CCG = Clinical Commissioning Group. NA = [data] not available. Some data are only available at Clinical Commissioning Group geographical level. NHS Mid Essex CCG covers Chelmsford, Braintree and Maldon districts. NHS North East Essex covers Colchester and Tendring districts.

Sources of data:

[1]Public Health England. Public Health Profiles. 2021 https://fingertips.phe.org.uk © Crown copyright 2021

[2]Essex County Council. Joint Strategic Needs Assessment 2019. Local Authority Profiles for Chelmsford, Braintree, Maldon and Colchester. (Statistical data not available to note whether values are significantly higher or lower than average for England)

Noise, air quality and other environmental pollutants

Air pollution

13.15.12 Poor air quality is the largest environmental risk to public health in the UK (Public Health England, 2018) and the links between air pollution and health effects are well established. The key air pollutants of health concern related to traffic in the UK are particulate matter (PM) and nitrogen dioxide (NO_2), with PM being associated with the greater burden of disease between the two pollutants.

13.15.13 Appendix 13.1 of the Environmental Statement [TR010060/APP/6.3] presents the evidence for health effects associated with air pollution, but in summary, health outcomes associated with air pollution are as follows (WHO, 2021; Public Health England, 2018):

- Onset of asthma in children and exacerbation of asthma in children and adults
- Incidence of cardiovascular disease and risk of hospitalisation or death from heart failure
- Incidence of lung cancer, and mixed evidence for associations with other cancers including bladder cancer and breast cancer
- Adverse birth outcomes, including low birthweight, pre-term births and small for gestational age births
- Markers of reduced fertility in men and women
- Rates of all-cause mortality

13.15.14 PM is generally classified by aerodynamic size and referred to as follows:

- Coarse particles (PM_{10}; particles that are less than 10 microns (µm) in diameter)
- Fine particles ($PM_{2.5}$; particles that are less than 2.5µm in diameter)
- Ultrafine particles ($PM_{0.1}$; particles that are less than 0.1µm in diameter)

13.15.15 PM_{10} is the more routinely monitored fraction of PM, and therefore until relatively recently, the majority of health studies have this fraction as the exposure indicator. $PM_{2.5}$ is particularly hazardous to human health as it is small enough to bypass the body's defence system and penetrate deep into the respiratory and circulatory system. Often PM contains harmful substances such as heavy metals, sulphurs, carbon compounds and carcinogens, which can have adverse health effects on the heart, lungs and brain (WHO, 2021). There is no threshold below which no damage to health is observed for $PM_{2.5}$.

13.15.16 Groups most susceptible to health effects of air pollution are those with pre-existing respiratory or cardiovascular conditions, as well as elderly people and children (WHO, 2013).

13.15.17 Transport is responsible for around 14% of PM_{10} and 15% of $PM_{2.5}$ in the UK, whereas residential, commercial and public sector combustion sources make up 45.5%. Road transport is the greatest single contributor of NO_x in the UK (of which NO_2 is a component), accounting for around 51.5% (Defra, 2021).

13.15.18 As reported in Chapter 6: Air quality, of the Environmental Statement [TR010060/APP/6.1], modelling from Defra's mapped background concentrations of air pollutants indicates a downward trend in NO_2 background concentrations between 2019 and 2027, owing to improvements in vehicle emission standards, as well as expected reductions in emissions from other background sources. Concentrations of PM_{10} and $PM_{2.5}$ are expected to remain largely the same between 2019 and 2027.

13.15.19 Communities within 200m of the ARN (therefore within the human health study area), and so most at risk of exposure to any changes in air pollution linked to the proposed scheme, include parts of the following settlements:

- Chelmsford District: Chelmsford (Springfield and Chelmer Village), Boreham and Sandon
- Braintree District: Hatfield Peverel, Witham, Rivenhall End, Kelvedon, and Feering
- Maldon District: Great Totham
- Colchester District: Tiptree, Inworth, Heckfordbridge, Copford, Marks Tey, Colchester, and Horkesley Heath

13.15.20 One air quality management area (AQMA) is within 200m of the ARN: Lucy Lane North, Stanway, located on the western outskirts of Colchester. This AQMA was declared in 2012 and amended in 2013 in relation to exceedances for the NO_2 annual mean Air Quality Objective (AQO). NO_2 concentrations in 2019 were measured at 39.8µg/m^3 which is now in compliance with the annual mean AQO for NO_2 of 40µg/m^3.

13.15.21 The Stanway ward in Colchester (where the AQMA is located) has a significantly worse rate of deaths from respiratory diseases than is average for England (see Table 13.18). The data do not allow for the calculation of what proportion of deaths are attributable to outdoor air pollution (a proportion will be attributable to other risk factors such as those linked to lifestyle choices and housing quality). However, the data do indicate that this community could be more susceptible to changes in air quality than average across the study area.

13.15.22 Small parts of the Witham West and Witham North wards of Witham contain residential areas within 200m of the ARN. These both have significantly higher rates of hospital admissions for COPD than average for England, so again indicate a population which could be more susceptible to changes in air quality than average across the study area.

13.15.23 There will be sensitive individuals throughout the population within the study area and the air quality assessment presented in Chapter 6: Air quality, of the Environmental Statement [TR010060/APP/6.1], classes all sensitive receptors of equal value.

Noise

13.15.24 Transport is the main source of noise pollution in England and, except for people living in close proximity to railway lines or airports, road traffic is the major cause of human exposure to environmental noise. Noise from road traffic is considered the second greatest environmental risk to population health in Europe (WHO, 2011).

13.15.25 Traffic noise causes impaired communication (difficulty in making oneself heard), sleep disturbance and annoyance. Recent studies have resulted in a consistent body of evidence suggesting an association between long-term exposure to road traffic noise with increased incidence of cardiovascular outcomes such as ischaemic heart disease (see Appendix 13.1 of the Environmental Statement [TR010060/APP/6.3]). It is worth noting that the level of risk of developing more severe health outcomes such as cardiovascular events is relatively small for environmental noise compared to other risk factors (such as diet and lack of physical exercise). The most common associated health impacts are annoyance and sleep disturbance. Annoyance for the purposes of health effects associated with environmental noise relates to long-term noise annoyance but is considered by the WHO Environmental Noise Guidelines for the European Region as a less serious health effect than self-reported sleep disturbance, although it may be on the causal pathway to cardiovascular disease (WHO, 2018).

13.15.26 People most vulnerable to more severe health outcomes associated with road traffic noise would be those with long-term exposure to road noise (i.e. living in the same house for several years) and who live in older houses without triple glazing or who have bedrooms facing the street.

13.15.27 The noise environment in proximity to the proposed scheme is dominated by road noise, predominantly from the A12. There are 18 Noise Important Areas (NIA) within the A12 corridor between junction 19 and junction 25, and a further three NIAs located on the A130 and A120 close to where they join the A12, and on the A12 between junction 25 and junction 26. In total, there are 1,133 households within these NIAs, representing the households most at risk of adverse health outcomes associated with exposure to environmental noise within the study area. NIAs coincide with parts of some of the key communities in the study area, including Boreham, Hatfield Peverel, Rivenhall End, Witham and Marks Tey. The locations of NIAs are indicated on Figure 12.1 [TR010060/APP/6.2], which supports the noise assessment.

13.15.28 Further detail regarding the existing noise environment for the proposed scheme is provided in Chapter 12: Noise and vibration, of the Environmental Statement [TR010060/APP/6.1].

Community severance and social networks

13.15.29 Community severance refers to the situation when transport infrastructure or road traffic separates people from places in their communities, limiting mobility and opportunities for social interaction. An early yet influential piece of research in this area found that residents of a lightly trafficked street had three more friends and twice as many acquaintances as the people on a heavily trafficked (>16,000 vehicles per day) street (Appleyard and Lintell, 1972). Furthermore, as

traffic volume increased, the size of area people considered to be their neighbourhood reduced, which limited the area over which people socially interact.

13.15.30 Although there is concern about the effects of community severance on the wellbeing of local communities (Anciaes *et al*., 2016) this is an under-researched area of public health. There are limited studies that demonstrate measurable short or long-term health outcomes from reduced community severance, however, there is substantial evidence of the importance of social contacts to improved health outcomes (Mindell and Karlsen, 2012).

13.15.31 The current A12 trunk road passes through the communities of Hatfield Peverel, Rivenhall End, part of Witham (residents on Maldon Road), part of Marks Tey and part of Colchester. It forms a physical barrier, restricting where residents can cross north to south within their communities to a limited number of crossing points, for example Henry Dixon Road in Rivenhall End.

13.15.32 For the purposes of this chapter, traffic flows of over 16,000 vehicles per day (annual average daily traffic (AADT)) indicate very high levels of community severance, 8,000–16,000 AADT indicate high levels; 4,000–8,000 AADT indicate medium levels of community severance, while fewer than 4,000 AADT indicate low levels. This is only an approximate indicator as vulnerable groups such as the elderly, disabled people and children will more likely experience a barrier effect from traffic at lower volumes than a fit adult. Furthermore, peak hourly flows are also an important consideration, should they coincide with a sensitive time, for example when schoolchildren use a route to and from school.

13.15.33 Flows on the A12 are well in excess of 16,000 AADT, indicating severe severance wherever it passes through communities at grade, such as Rivenhall End. Flows along the A120 are also in excess of 16,000 AADT, which is likely to contribute to very high levels of existing severance for residents on the north side of the A120 in Marks Tey.

13.15.34 Based on traffic flows in the Do Minimum traffic model (which projects traffic growth without the proposed scheme to 2027), there is high community severance for the following communities:

- Either side of B1137 The Street in Hatfield Peverel
- The west side of Witham due to traffic flows on B1389 Hatfield Road
- Southern part of Witham due to traffic flows on B1018 Maldon Road
- Rivenhall End due to traffic flows on Oak Road and Henry Dixon Road
- Kelvedon due to the B1024
- Either side of B1023 Inworth Road and Kelvedon Road between Feering and Tiptree including the village of Inworth
- Marks Tey

Access to facilities, services and employment, education and skills

13.15.35 The 'Land use and accessibility' baseline in Section 13.7 of this chapter summarises some of the key community facilities and services within the study area such as places of employment and study, healthcare facilities, and the walking and cycling routes or public transport access points that are used to access these facilities or services. Figure 13.1 [TR010060/APP/6.2] indicates the presence of these facilities throughout the study area.

13.15.36 There are existing bus stops located on the A12 between junctions 22 and 23, and between junctions 24 and 25. However, due to safety concerns for both the operators and for users who have to cross the road at-grade at these locations, these bus stops are no longer serviced. This would limit access to services, employment and education for those without car access in these areas.

13.15.37 Access to good education, training and employment are extremely important wider determinants of health. The average time for an Essex resident to access eight key local services (including employment centres, education facilities, GP surgeries and hospitals) was 19.4 minutes by public transport or walking. This varies substantially across the county with averages in the more rural areas of Braintree being 23.7 minutes and Maldon 28.5 minutes (Department for Transport data reported by Essex County Council, 2019).

13.15.38 As indicated by Tables 13.19 to 13.21, levels of unemployment across the wards in the human health study area are generally below average for England. There are no wards where levels of unemployment are significantly worse than average for England. The highest rates of unemployment in the study area are for Witham North (3%), Witham West (2.9%) and Witham Central (2.8%). Although these are in line with average for England (2.8%), they are notably higher than the other wards in the study area and this issue is likely interrelated to the higher levels of income deprivation compared to average for Essex, found in these same wards.

13.15.39 Approximately 4.3% of Essex's 16- and 17-year-olds are not in education, employment or training (NEET) or unaccounted for in this regard, compared to 5.5% average for England as a whole (Department for Education, 2021). The proportion recorded as NEET or not known in this age group in Essex is greater for those with Special Education Needs and Disability (SEND) (8.4%), indicating a potential cause of health inequality.

13.15.40 While traffic and poor pedestrian and cycle infrastructure may inhibit physical access to employment, education and services, there is no clear evidence of physical severance between the existing residential areas caused by the existing A12 that may prevent access to education and employment facilities, although as noted in the 'Land use and accessibility' baseline above, there are areas where crossing points of the existing A12 are limited. It is likely that inequalities in access to employment, education and training in the study area reflect structural issues in society more than physical access.

Active travel

13.15.41 Increased physical activity levels are linked to a range of better health outcomes such as the following:

- Reduced risk of many types of cancer, as well as cancer mortality
- Reduced risk of cardiovascular disease and cardiovascular disease mortality (for moderate to high levels of physical activity)
- Reduced risk of poor mental wellbeing and mental ill-health
- Reduced risk of all-cause mortality

13.15.42 There is also more limited evidence for associations between higher levels of physical activity and better academic achievement, as well as reduced risk of dementia, diabetes and obesity (see Appendix 13.1 of the Environmental Statement [TR010060/APP/6.3]).

13.15.43 For many people, switching to active travel modes for regular journeys is an effective way of incorporating regular physical activity in daily life. The 'Land use and accessibility' baseline in Section 13.7 of this chapter identifies and describes facilities such as footways, cycleways and PRoWs within the study area which are likely to be used for active travel purposes. As noted in the above 'Land use and accessibility' baseline, the shared-use walking/cycling route alongside the existing A12 appears to be relatively well used but it is disrupted and narrow in places with limited segregation from the busy A12 carriageway. This may suppress the level of active travel which could be achieved with better conditions.

Access to greenspace and outdoor recreation

13.15.44 The presence, type and accessibility of local greenspace plays a role in good mental and physical health. There is emerging evidence for positive associations between exposure to greenspace and improved mental health or mental wellbeing in adolescents and children. A recent study has also shown that the amount of greenspace in the local area, and less reliably the frequency of visits to greenspace, are also positively associated with mental wellbeing in adults (see Appendix 13.1 of the Environmental Statement [TR010060/APP/6.3] for evidence).

13.15.45 There is relatively limited research into associations between greenspace and physical health, however, there is evidence for a negative association between exposure to greenspace and the following outcomes (see Appendix 13.1 of the Environmental Statement [TR010060/APP/6.3] for evidence):

- Incidence of cardiovascular disease and cardiovascular mortality
- Type 2 diabetes
- Adverse birth outcomes
- All-cause mortality

13.15.46 In addition, spending time in outdoor recreation also improves physical activity levels, which, if done regularly, may contribute to the positive health outcomes identified above under 'Active travel'.

13.15.47 The 'Land use and accessibility' baseline in Section 13.7 of this chapter identifies existing areas of greenspace located within the Order Limits and their use by people in surrounding communities, as well as describing routes within the study area which are predominantly used by walkers, cyclists and horse riders for recreational purposes.

Road traffic collisions

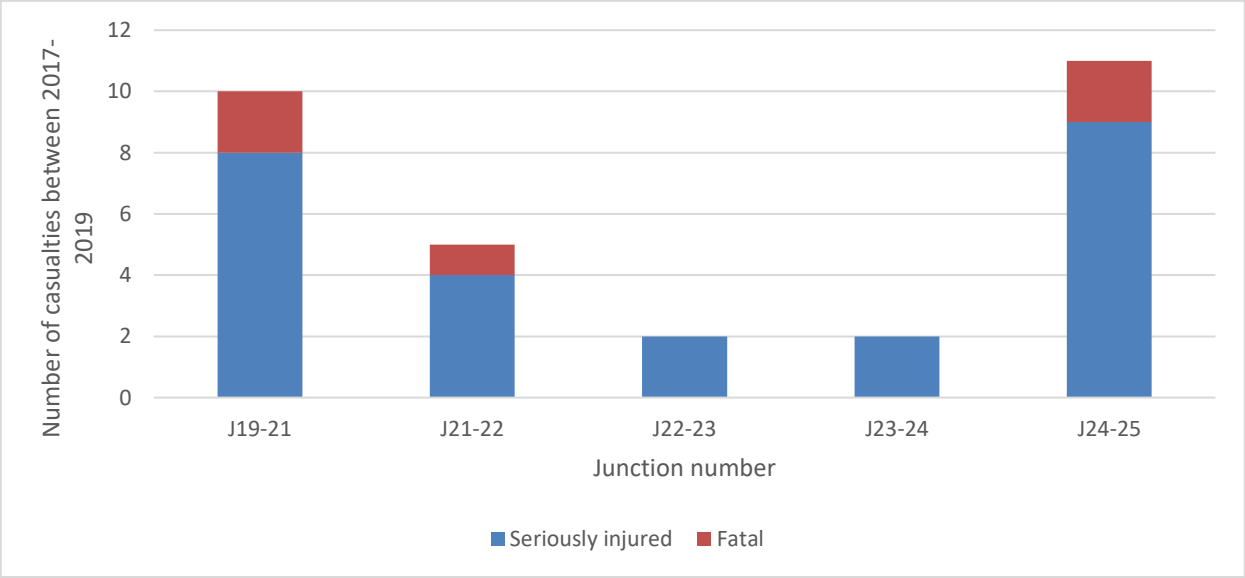
13.15.48 Rates of people killed and seriously injured (KSI) on roads in all four local authorities within which the proposed scheme is located, are worse than the average for England.

13.15.49 National Highways data on collisions have been used to provide an understanding of the numbers of people killed or seriously injured on the A12 trunk road and its junctions between, and including, junctions 19 and 25 (see Plate 13.5).

13.15.50 The data show that between 2017 and 2019, 28 people were KSI on the A12 between junctions 19 and 25. Of these, five were killed, nine were motorcyclists, three incidents involved pedestrians (at interchange locations, two were fatal), none involved cyclists and two vehicle collisions resulted in serious injury involving child passengers.

13.15.51 The interpretation of collision data and safety is a complex area in relation to population health. For example, low levels of pedestrian and cycle collisions could actually indicate highly unsafe road conditions as people are discouraged from walking and cycling due to fear of accidents. This in turn can lead to a burden of ill-health in the population associated with physical inactivity. Furthermore, police statistics and hospital data on road injuries are often different, indicating underreporting of collisions to the police.

Plate 13.5 Killed or seriously injured casualties on A12 between junctions 19 and 25 (2017-2019) (Collision data provided by National Highways)



13.15.52 In addition to deaths and physical injuries (with associated lifelong implications of disability), the wider effects on society are also an issue for road collisions. A study of 1,148 people aged 19 to 69 years who attended Accident and Emergency following a road accident identified that 32% suffered notable psychiatric outcomes (post-traumatic stress disorder, phobic travel anxiety, general anxiety or depression) at one year following the collision (Mayou, 2001).

13.15.53 Reducing the rates of KSI in Essex is a local public health priority, with the Joint Strategic Needs Assessment identifying it as a potential area of future focus for the Essex Health & Wellbeing Board (Essex County Council, 2019).

Health inequalities

13.15.54 The above analysis of baseline health and wider health determinant indicators has identified the following potential issues relating to health inequalities.

13.15.55 Witham North, Witham Central and Witham West have higher rates than average for Essex for the interrelated issues of income deprivation and unemployment. Witham North has a higher than average for England rates of hospital admissions for COPD and deaths for respiratory disease, while Witham Central has a higher than average proportion of its population reporting limiting long-term illness and disability. Both wards have lower than average life expectancy for males, while Witham Central also has lower than average life expectancy for females. This fits the pattern of health inequalities highlighted by Marmot (2010) that there is an association with low economic status and poor health.

13.15.56 16- and 17-year-olds with SEND are proportionately more likely to be NEET than average for their age group.

13.15.57 In terms of health impact, the COVID-19 pandemic is likely to have exacerbated many health issues and increased health inequalities through the following pathways:

- Loss of income from social-distancing measures and COVID-19 restrictions during 2020/2021, particularly affecting those in informal ‘gig economy’ employment who may not have access to sick pay or who are on zero hours contracts.
- Social isolation as a result of requirements to self-isolate or from general social-distancing measures. This may exacerbate levels of negative mental health outcomes and poor mental wellbeing.
- Disruption to healthcare and social support services, which will affect people with existing health problems and disabilities, as well as lead to later diagnoses of health conditions and lack of support for vulnerable people.
- Disruption to education, which may impact on socially disadvantaged children and young people more as they are less likely to have the support to catch up on lost education, or to support their mental wellbeing.

Future baseline

13.15.58 The future baseline will likely be characterised by continued population growth within and around the study area as more of the residential development allocations are completed. For example, a further 3,000 households are expected at North East Chelmsford, which is just outside the land use and access study area but may result in a larger population interacting with the land use and access study area.

13.15.59 The baseline air quality and noise are based on the Do Minimum traffic model, which is effectively a future baseline scenario setting out the projected traffic growth based on the planned growth in development for the districts.

13.15.60 Whilst future NO_2 emissions are projected to decline, and the majority of monitoring locations are at the roadside instead of locations of relevant human exposure, the baseline NO_2 monitoring data indicate that the annual mean AQO has the potential to be marginally exceeded at three modelled locations in the air quality study area (see chapter 6, Air Quality of the Environmental Statement [TR010060/APP/6.1]). On this basis, very few individuals within the population in the study area would be exposed to these concentrations.

13.15.61 PM_{10} concentrations (of which $PM_{2.5}$ will form a component) are not likely to change much but projected emissions of PM_{10} are expected to remain below the AQO of 40µg/m^3 by a considerable margin. These will be at levels where health outcomes are associated (WHO, 2021), but below levels considered significant to health in the UK regulatory context.

13.15.62 The COVID-19 pandemic that has affected the UK may influence future trends for land use and accessibility. For example, there may be a long-term increase in people working from home. Some people may switch from the use of public transport to walking, cycling or using their own cars due to concern about communicable diseases. There may be a further increase in cycling levels, which have been increasing in England since 1993 (Cycling UK, 2022). In addition, people may have an increased preference for outdoor recreation where social distancing is easier than in indoor leisure and recreation venues.

13.15.63 In terms of health, there are likely to be longer-term implications from the COVID-19 pandemic due to delayed access to healthcare and diagnoses for chronic conditions and exacerbated problems relating to mental health and wellbeing from reduced social support during 2020/2021, coupled with potential psychological stress from the pandemic (Douglas *et al*., 2020). This may affect the size of the population vulnerable or susceptible to adverse health outcomes associated with changes to the built environment.

13.15.64 The level of occurrence of these types of behaviour change will depend on the trajectory of the pandemic and individuals' responses to their experiences of it (e.g. heightened anxiety or concern), which are uncertain.

Value and sensitivity of receptors

13.15.65 The community health profiles established through Tables 13.16 to 13.18 and described above have informed the understanding of the sensitivity of communities in the study area. Communities which are assigned a low sensitivity are expected to be relatively resilient, on average, to many of the

adverse health outcomes associated with changes to determinants of health. Those which are assigned a high sensitivity may be more susceptible on average to changes in air pollution, on account of the indicators for respiratory issues, or less resilient to change on account of socio-economic indicators. The assignment of sensitivity is set out in Table 13.23. Locations of communities are indicated on Figure 13.3 [TR010060/APP/6.2].

Table 13.23 Community health sensitivity

Community	Ward	Sensitivity of community	Reason
Springfield	Springfield North	Low	Good general health. Above average or in line with average for England on health profile and socio-economic indicators.
Boreham	Boreham and the Leighs	Low	Good general health. Above average or in line with average for England on health profile and socio-economic indicators.
Great Leighs	Boreham and the Leighs	Low	Good general health. Above average or in line with average for England on health profile and socio-economic indicators.
Great Notley	Great Notley and Black Notley	Low	Good general health. Above average or in line with average for England on health profile and socio-economic indicators.
Braintree west and south	Braintree West Braintree South	Medium	Good general health. Braintree South is generally average in terms of health profile indicators, while Braintree West is generally better than average. Better than average for socio-economic indicators
Braintree east	Braintree Central and Beckers Green Bocking Blackwater	High	Braintree Central and Beckers Green ward scores significantly worse than average for England for some health profile indicators (life expectancy, self-reported long-term illness or disability, income deprivation and older people living alone), while Bocking Blackwater scores similar or better than average for most indicators. The population in Braintree Central and Beckers Green may be more sensitive to pollution and less resilient to change.
Bradwell and Coggeshall	Coggeshall	Medium	Generally average in terms of health profile indicators. Population older than average. Significantly better than average for socio-economic indicators.

Community	Ward	Sensitivity of community	Reason
Hatfield Peverel	Hatfield Peverel and Terling	Medium	Generally average in terms of health profile indicators. Population older than average. Significantly better than average for socio-economic indicators.
Witham	Witham South Witham Central Witham North Witham West	High	Witham Central and Witham North score worse than average for England for some health profile indicators (respiratory deaths and self-reported long-term illness or disability) and worse than Essex average for unemployment rates. Witham South and Witham Central have higher than average for England proportion of older people living alone. Potentially more sensitive to air pollution (Witham North) and less resilient to change.
Rivenhall End	Silver End and Cressing Ward	Medium	Generally average in terms of health profile indicators. Population older than average. Significantly better than average for socio-economic indicators.
Kelvedon and Feering	Kelvedon and Feering	Medium	Generally average in terms of health profile indicators. Population older than average. Significantly better than average for most socio-economic indicators.
Inworth	Marks Tey and Layer	Low	Good general health. Above average or in line with average for England on health profile and socio-economic indicators.
Marks Tey	Marks Tey and Layer	Low	
Copford	Marks Tey and Layer	Low	

13.15.66 There will be sensitive individuals within all of these communities. Furthermore, consultation feedback from the pre-application statutory consultation indicates significant levels of concern over issues such as noise and air pollution, with many people concerned for effects on their health as a consequence. This indicates a high sensitivity in relation to potential impacts on mental wellbeing due to changes to the environment. People within the study area who are most vulnerable to impacts on mental wellbeing will include those with pre-existing mental health conditions such as anxiety and depression, people who are lonely and isolated and potentially some with autism spectrum disorder.

13.16 Potential impacts

Construction

Noise, air quality and other environmental pollutants

13.16.1 Potential impacts of construction noise and dust may cause public concern and annoyance. There is also a risk of sleep disturbance due to construction noise, particularly where night-time working is required. The routeing of construction vehicles, use of temporary traffic diversions, and potential traffic congestion and emissions may also cause public concern, which could affect community wellbeing throughout the construction phase.

13.16.2 During certain construction activities (e.g. bridge demolition), it would be necessary to implement a closure of the A12. The planned diversion route for the entire proposed scheme would use the existing strategic diversion route for this part of the A12, starting at junction 19, the A130, A131 to Braintree and then the A120 to junction 25 where the noise assessment has identified 266 noise-sensitive receptors within 25m of this route that may experience temporary increase in road traffic noise during the period of any diversions (refer to Section 12.9 of Chapter 12: Noise and vibration, of the Environmental Statement [TR010060/APP/6.1]).

Community severance and social networks

13.16.3 Medium or long-term disruption to access, or permanent loss of access along existing routes connecting settlements bisected by the existing A12 such as Hatfield Peverel and Rivenhall End, could increase perceptions of community severance in these communities. Similar impacts would be felt by smaller communities located south of the existing A12 such as Inworth, Wickham Bishops, Nounsley, Messing and Easthorpe if access routes into Chelmsford, Witham, Kelvedon and Marks Tey or Colchester are disrupted in the medium to long term, or are permanently lost.

Access to facilities, services, employment, education and skills

13.16.4 Temporary or permanent land take from existing and proposed residential properties, commercial enterprises, agricultural landholdings or community assets, such as churches, where required to facilitate construction of new highway infrastructure, could compromise the ability of local planning authorities to meet predicted future housing needs, or reduce the availability of employment opportunities within certain sectors in the local area.

13.16.5 Impacts on public transport may also affect access to facilities, services and employment. For example, during construction there is a likelihood of disruption to bus services due to traffic management and construction activities.

13.16.6 The proposed replacement of the Bury Lane Bridge and the Station Road Bridge would potentially temporarily sever access to Hatfield Peverel railway station for residents in Hatfield Peverel south of the A12.

13.16.7 There is potential for social value initiatives, employment and skills training to be provided as part of the construction of the proposed scheme.

Active travel

13.16.8 Disruption in access along routes used by walkers and cyclists within and between settlements to access places of employment or study would reduce rates of active travel in affected communities. Those communities most likely to be affected would be as identified under 'Community severance and social networks' above.

Access to greenspace and outdoor recreation

13.16.9 Medium or long-term disruption to access along routes connecting settlements located along the existing A12 to areas of open space, PRoW networks and lanes used by walkers, cyclists and horse riders for recreational purposes would have a negative effect on access to greenspace and opportunities for outdoor recreation. Medium to long-term or permanent loss of areas of publicly accessible greenspace within settlements, and of garden space, trees and shrubs surrounding the existing highway infrastructure within these settlements, would also have a negative effect.

Road traffic collisions

13.16.10 Traffic management measures, diversions and the presence of construction vehicles on the highway may increase risk, or the perception of risk, of collisions for vehicle drivers, pedestrians and cyclists.

Health inequalities

13.16.11 Differential or disproportionate impacts on Witham North or Witham Central wards has the potential to exacerbate or reduce health inequalities, depending on the wider determinants affected. For example, improved employment opportunities during the construction phase could potentially reduce impacts on unemployment and income deprivation where these wards are currently worse than average for Essex as a whole.

Protective factors for mental wellbeing

13.16.12 Many of the potential impacts of the proposed scheme, such as impacts on private property and housing, community land, business and accessibility, have the potential to adversely affect the core protective factors for mental health, namely control, participation and inclusion. For example, the proposed scheme would blight some properties and alter the quality of the local environment, and affected residents would have limited control over the impacts. The MWIA in Appendix 13.4 of the Environmental Statement [TR010060/APP/6.3] provides an analysis of how the proposed scheme has the potential to affect mental wellbeing.

Operation

Noise, air quality and other environmental pollutants

13.16.13 The proposed new highway alignment and potentially redirected traffic flows may alter the exposure of people in local communities to traffic-related noise and air pollution. No change in exposure to other forms of pollutant are considered likely.

Community severance and social networks

13.16.14 The proposed scheme has the potential to reduce perceived community severance by drawing traffic away from settlements bisected by the existing A12 such as Rivenhall End, but also to increase community severance if traffic flows on residential roads within settlements rise as a result of changing alignments and junction arrangements in combination with induced demand.

Access to facilities, services, employment, education and skills

13.16.15 Changing traffic patterns may alter the accessibility of facilities and services including schools and areas of urban greenspace and could also affect the continued viability of hospitality and retail businesses located on the existing A12 that are dependent on high levels of passing trade, reducing local employment opportunities in certain sectors.

The proposed scheme would bring opportunities to improve public transport provision by improving the accessibility of bus stops on side roads at the various junctions of the proposed scheme and to railway stations located within Hatfield Peverel and Marks Tey. This could improve access for people who are dependent on public transport to access facilities, services and employment.

Active travel

13.16.16 Improvements in access to public transport and to walking and cycling provision would support increased rates of active travel within local communities. However, changing traffic patterns may also positively or negatively affect the amenity of active travel routes.

Access to greenspace and outdoor recreation

13.16.17 The reconnection of previously severed PRoWs would improve access to greenspace and outdoor recreation opportunities. However, changes in highway alignment and junction arrangements also could reduce visual access to greenspace from within settlements and from recreational routes used by walkers, cyclists and horse riders.

Road traffic collisions

13.16.18 Proposed improvements to walking, cycling and horse-riding infrastructure may encourage more active travel. There is concern that the promotion of active travel modes would lead to greater increases in casualties among pedestrians and cyclists. However, evidence suggests that there is ‘safety in numbers’ for walkers and cyclists. Motorists appear to adjust their behaviour in the presence of more people walking and cycling, which means the relationship between pedestrians’ and cyclists’ exposure and their casualties, is not linear (Jacobsen, 2003). The improved standard of highway infrastructure should also improve safety.

Health inequalities

13.16.19 Improvements to walking, cycling and horse-riding infrastructure, by improving accessibility standards, may help reduce inequity relating to access for people with disabilities, for example by removing obstacles such as steps or steep gradients.

Protective factors for mental wellbeing

13.16.20 During operation, the proposed scheme has the potential to affect some of the wider determinants that affect mental wellbeing. For example, potential impacts on the physical environment (access to greenspace, quality of built environment), economic security and transport options and access, may all impact on mental wellbeing. The MWIA in Appendix 13.4 of the Environmental Statement [TR010060/APP/6.3] provides an analysis of how the proposed scheme has the potential to affect mental wellbeing.

13.17 Design, mitigation and enhancement measures

13.17.1 Section 13.9 of this chapter sets out mitigation proposals for potential land use and accessibility impacts which are also of relevance to human health.

Embedded (design) mitigation

13.17.2 The environment team has worked in close collaboration with the infrastructure design team to avoid or reduce environmental impacts through the proposed scheme design. This is referred to as embedded (or design) mitigation. Chapter 3: Assessment of alternatives, of the Environmental Statement [TR010060/APP/6.1] details the design alternatives that have been considered, including the environmental factors which have influenced the decision making.

13.17.3 Chapter 8: Landscape and visual, of the Environmental Statement [TR010060/APP/6.1] sets out a series of embedded landscape design measures to reduce the visual impact of the proposed scheme and to help integrate the proposed scheme with the local landscape, and to support objectives for biodiversity. This would help protect the quality of green spaces, which is relevant for human health.

13.17.4 Sensitive lighting design such as the use of horizontally mounted flat glass lanterns, the use of modern dimmable light-emitting diodes (LEDs) with cut-off properties, together with dynamic systems of operation to provide the minimum amount of light required at different times, would help to reduce obtrusive light (light pollution) during the operational phase, which was a concern raised by some members of the public during the statutory consultation (see Appendix 13.2 of the Environmental Statement [TR010060/APP/6.3]).

Standard mitigation

13.17.5 Standard mitigation would occur as a matter of course due to legislative requirements or standard sector practices.

13.17.6 Standard mitigation is included in REAC, within the first iteration of the EMP [TR010060/APP/6.5] which forms part of the DCO submission (refer to Chapter 5: Environmental assessment methodology, of the Environmental Statement [TR010060/APP/6.1]). Relevant standard mitigation for this aspect is summarised below.

13.17.7 The issue of public concern and mental health can be partially mitigated through the adoption of good practice engagement and consultation through the pre-application and construction phases. The proposed scheme has undertaken two options consultations in 2017 and 2019, seeking early involvement with the

local community on the proposed design. Multiple channels were provided to engage in the statutory consultation, which ran between June and August 2021. This included six in-person events, as well as six webinars and a virtual exhibition available 24 hours a day during the consultation. Following further design work, and considering feedback received during the statutory consultation, a supplementary consultation was held between November and December 2021. Details of the consultation are set out in the Consultation Report [TR010060/APP/5.1].

13.17.8 A Community Liaison Manager would be appointed to address local concerns during the construction phase. This would help with protective factors for mental health such as giving communities enhanced control and facilitating participation.

13.17.9 Traffic management measures as documented in the Outline Construction Traffic Management Plan [TR010060/APP/7.7], would be implemented to ensure safe access along roads within the site where necessary. The construction works would be phased such that disruption to access is reduced, with full road closures restricted to nights and weekends wherever practicable and feasible.

13.17.10 As noted in Chapter 6: Air quality, of the Environmental Statement [TR010060/APP/6.1], the second iteration of the EMP would adopt best practice measures to control fugitive dust (and hence avoid or reduce potential impacts) in compliance with DMRB LA 105 (Highways England, 2019). This would reduce the likelihood of nuisance to people in the local communities due to construction dust.

13.17.11 Many of the standard mitigation measures identified in Chapter 8: Landscape and visual, of the Environmental Statement [TR010060/APP/6.1] would reduce the visual impact of the proposed scheme and also help retain and protect existing vegetation in accordance with the Retained and Removed Vegetation Plans [TR010060/APP/2.14], which would be important in terms of mental wellbeing, as well as the landscape and visual benefits.

13.17.12 A five-year aftercare period as outlined within the Landscape and Ecology Management Plan (LEMP), which is part of the first iteration EMP [TR010060/APP/6.5], would be established for all soft environmental features of the proposed scheme and would be included as part of the construction contract requirements. Thereafter, the soft estate would be maintained by National Highways through its managing agents. This would help with the establishment of proposed planting and other landscaping proposals, which relate to common concerns expressed by the public during statutory consultation (see Appendix 13.2 of the Environmental Statement [TR010060/APP/6.3).

13.17.13 To reduce lighting impacts during construction, temporary lighting would be avoided or directed away from heritage assets, residential and/or ecological receptors and provided to ensure safe working conditions and to maintain security within construction compounds and working areas.

13.17.14 Chapter 10: Geology and soils, of the Environmental Statement [TR010060/APP/6.1] sets out a series of standard mitigation measures to inform pollution prevention measures, to manage any potentially hazardous substances encountered during construction, and to inform any remedial treatment which may be required. These measures would effectively manage potential risks to human health relating to ground conditions.

13.17.15 Standard mitigation measures identified in Chapter 12: Noise and vibration, of the Environmental Statement [TR010060/APP/6.1] would include the relevant construction noise criteria and any monitoring proposals for the construction phase (to be set out in the second iteration of the EMP), and implementation of Best Practicable Means in accordance with British Standard 5228 1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Part 1: Noise (British Standards Institution, 2014).

Additional mitigation

13.17.16 Chapter 10: Geology and soils, of the Environmental Statement [TR010060/APP/6.1] sets out an additional mitigation measure for an exclusion zone around two sites where there is a suspected risk of asbestos present (refer to Chapter 10 Geology and soils for further details). The mitigation measure would avoid disturbance of the ground and so avoid the risk of human exposure.

13.17.17 Chapter 12: Noise and vibration, of the Environmental Statement [TR010060/APP/6.1] sets out additional mitigation in the form of noise bunds, noise barriers and surfacing with better noise-reducing properties than conventional low-noise surfacing.

13.17.18 Refer to Section 13.9 of this chapter for proposals to mitigate potential community severance and accessibility, notably in relation to the potential severance that would be caused by works to the bridges at Bury Lane and Station Road.

Other commitments

13.17.19 Any temporary and/or permanent job openings identified by the Principal Contractor working on the construction of the proposed scheme would be advertised in local job centres in settlements along the route of the proposed scheme, including Witham Job Centre. This would help ensure that local communities, including those in areas of higher than average rates of unemployment and income deprivation, have the chance to benefit from employment openings which may arise from the proposed scheme.

13.17.20 Targets would be set ahead of the construction phase of the proposed scheme and key stakeholders such as Essex County Council would be engaged as part of this target-setting process. Refer to Section 13.19 of this chapter for details on monitoring for employment and skills performance.

13.17.21 The Applicant and Principal Contractor will aim to use national and local partnerships to benefit the area and will set targets ahead of the construction phase for spend through local small and medium-sized enterprises. The Principal Contractor will be offering apprenticeships, work placements and Science, Technology, Engineering and Maths (STEM) ambassadors for the

area to work with local schools and colleges. It will also work with organisations such as Local Enterprise Partnerships, Prince's Trust and community organisations to support access into construction for diverse groups.

13.18 Assessment of likely significant effects

Construction

13.18.1 Figure 13.3 [TR010060/APP/6.2] provides an overview of health impacts identified for communities within the human health study area. A summary of health effects in the construction phase is provided in Table 13.26.

Noise, air and other environmental pollutants

Noise

13.18.2 Section 12.11 of Chapter 12: Noise and vibration, of the Environmental Statement [TR010060/APP/6.1] predicts construction activities where noise impacts of moderate or major magnitude are predicted and the duration of the activity may exceed the temporal thresholds given in DMRB LA 111 (Highways England, 2020d), as summarised in Table 13.24. Refer to Chapter 12 of the Environmental Statement for full details of predicted noise levels.

Table 13.24 Significant construction noise impacts

Significant construction noise impacts	Locations
Night-time noise impacts from structures demolition, sheet piling, and hydro-demolition.	Junction 19: Receptor 1 (Little Generals Main Road), which is representative of the Boreham Premier Inn and The Grange public house.
	Hatfield Peverel: Receptor 4 (Meadow Bank) which is representative of receptors in the vicinity of Bury Lane Bridge; and Receptor 6 (Crofton, Station Road), Receptor 9 (Lawrence Court) and Receptor 10 (The Vineyards) which are representative of receptors in the vicinity of Station Road Bridge and Wellington Road Bridge. At receptor 44 (Millfields), which is representative of those near the River Ter to the west of Hatfield Peverel.
	Witham bypass: Receptor 16 (Natgragle, Hodges Holt) which is representative of receptors closest to Olivers Bridge (Maldon Road underbridge), including Pantile Close, Hodges Holt and Benton Close; Receptor 17 (44 Market Street), which is representative of receptors along Market Lane facing the A12, and Receptor 19 (Burghey Brook Cottages).
	Marks Tey: Receptor 42 (121 London Road) which is also representative of receptors along London Road near the existing junction 25.

Significant construction noise impacts	Locations
Daytime noise impacts from demolition, piling and formwork reinforcement and concreting, earthworks, compound construction, borrow pit operation and material processing.	Hatfield Peverel: Receptor 4 (Meadow Bank) which is representative of receptors in the vicinity of Bury Lane Bridge; and Receptor 6 (Crofton, Station Road), Receptor 9 (Lawrence Court) which are representative of receptors in the vicinity of Station Road Bridge. At receptor 44 (Millfields), which is representative of those near the River Ter to the west of Hatfield Peverel. Receptor 10 (The Vineyards).
	Witham: Receptor 12 (Latney's Kennels)
	Rivenhall End: Receptor 20 Fair-Rest caravan site, which is also representative of The Cottage and Rose Cottage.
	Offline section between junction 24 and junction 25: Receptor 34 (Easthorpe Green) which is representative of 1 and 2 The Lodge. Receptor 36 (Wishingwell Farm) and 38 (Doggets).
Note: Receptor numbers relate to numbering applied in Chapter 12, (Noise and Vibration) of the Environmental Statement.	

13.18.3 Further significant noise impacts are predicted when the A12 would be closed to allow for certain construction activities such as bridge demolition to take place. An initial conservative estimate of the number of night closures, and hence use of the planned diversion route at night, indicates a requirement to use the diversion for 500 nights over the nearly four-year construction programme. This amount of closures would cause a significant adverse noise effect at 266 dwellings within 25m of the planned diversion route according to the standard set out in DMRB LA 111 (Highways England, 2020d). These dwellings are those within 25m of the strategic diversion route and are within or close to the communities of Springfield, Great Leighs, Great Notley, Bradwell and Marks Tey.

13.18.4 In terms of health effect, it is considered unlikely that exposure to construction noise from the proposed scheme would result in a notable increase of incidence of IHD, as this is associated with long-term exposure to noise. The most likely health effects would be temporary negative impacts on mental wellbeing and sleep disturbance. Impacts on mental wellbeing would most likely be reversible on completion of the construction activities and would not reflect the Environmental Noise Guidelines for Europe (WHO, 2018) definition of 'annoyance', which refers to long-term noise annoyance. Nevertheless, for the duration of construction activities anticipated to generate significant noise impacts, this has the potential to negatively affect the day-to-day wellbeing of individuals in the locations exposed and their ability to be productive, cope with normal stresses of life and enjoy social interaction.

13.18.5 Impacts on sleep disturbance would also likely be temporary but have the potential to negatively affect the wellbeing, productivity and social function of affected individuals for the duration of the night-time construction activities.

13.18.6 Some residents at risk of significant noise disturbance and other construction disruption would be temporarily or permanently re-housed, depending on the outcome of the compensation code. Furthermore, during the day many people would be out at work, school or elsewhere. Therefore, not all receptors identified through the noise assessment as being impacted by significant levels of construction noise would result in human exposure to those noise levels. There is also a commitment in the first iteration of the EMP [TR010060/APP/6.5] to reduce the number of required night-time closures, which would help to reduce the overall impact on sleep disturbance. However, at this time, it is assessed that the risk of sleep disturbance during the construction phase would be significant.

13.18.7 In addition, there would potentially be some localised disruption to residents in the neighbourhood close to the proposed temporary car park in Hatfield Peverel from people using the car park and travelling to and from the station (e.g. voices and car doors closing in an area which was previously quiet). This may cause transient annoyance and sleep interruption.

13.18.8 None of the neighbourhoods affected are in areas with populations identified as having high sensitivity for health (see Section 13.15 of this chapter). Groups most at risk of negative health outcomes related to construction noise would be homeworkers, shift workers, parents and young children, retired people, people with long-term illness or disability and their carers, all of whom are more likely to be at home and therefore exposed to the construction noise more of the time.

13.18.9 Overall, given the scale of potential exposure, particularly to increased night-time noise from the proposed strategic diversion route during A12 road closures, the temporary effect on wellbeing and sleep disturbance is assessed as **negative (significant)**.

Air pollution

13.18.10 The air quality assessment (Chapter 6 of the Environmental Statement [TR010060/APP/6.1]) does not predict that there would be any significant effects resulting from construction dust, nor from changes to NO_2 or PM_{10} concentrations resulting from changes to traffic during the peak construction year of 2025. On this basis, no likely significant population health outcomes are predicted, although it is possible that a small number of individuals may attribute health conditions they may have to dust or construction traffic. The effect on population health is assessed as **neutral**.

Other environmental pollutants

13.18.11 During construction there would be the use of construction lighting, including task lighting in low light or night-time conditions and security lighting at compounds and the proposed link between the temporary car park in Hatfield Peverel and Hatfield Peverel Train Station. Lighting would be installed to avoid glare or light spill onto neighbouring properties. It is therefore considered unlikely that it could disturb sleep. However, there is a possibility that lighting in previously unlit areas would be regarded as visually intrusive and cause some local concern. Given the temporary nature of the construction phase, this is not expected to result in any notable change to population health outcomes and so the effect is assessed as **neutral**.

13.18.12 Chapter 10: Geology and soils, of the Environmental Statement [TR010060/APP/6.1] sets out how risks of potential ground contamination are managed to avoid any significant risk of significant harm to human health. Health effects are therefore assessed as **neutral** due to the effectiveness of the essential mitigation.

Road traffic collisions

13.18.13 During construction, traffic management measures would be in place to ensure the safety of all road users (including walkers, cyclists and horse riders) as they approach, and travel through, sections of the existing A12, and other routes affected as a result of the proposed scheme. The Outline Construction Traffic Management Plan [TR010060/APP/7.7] provides details of the measures proposed for each section of the proposed scheme. Safety measures include weekend road closures for activities such as bridge demolition or resurfacing; use of speed restrictions and temporary barriers where narrow lane running is required; creation of safe access/egress points on the A12 for construction vehicles; supervised plant crossings; temporary traffic lights; incident management involving CCTV and vehicle recovery; safe systems of work; and the use of variable message signs to provide road users with live information on planned works, traffic conditions, and any incidents. The traffic management measures would limit the risk of injury or fatalities from road traffic collisions during the construction phase. On this basis the population health effect relating to road traffic collision risk is assessed as **neutral**.

Active travel

13.18.14 As noted in the assessment of effects on walkers, cyclists and horse riders in Section 13.10 of this chapter, there would be disruption of the shared-use walking and cycling route alongside the existing A12, notably at junction 19; between Hatfield Peverel and the B1389 at the west side of Witham; the east side of Witham and the B1024 at the west side of Kelvedon; and at locations where Feering East Roundabout, Easthorpe Road Roundabout and Wishingwell Farm Roundabout are proposed between Feering and Marks Tey. The east-west route along the existing A12 corridor is relatively well used and therefore disruption during construction would inconvenience many active travel commuters. It is likely that construction works would take place concurrently in a number of locations along the proposed scheme. Therefore, there is potential to disrupt a longer-distance cycle journey between Chelmsford and Colchester in a number of locations for one overall journey. This may discourage people from undertaking active travel commutes along this route.

13.18.15 It is possible that some people would divert and use the wider lane network as an alternative to avoid areas of disruption. However, this would not be feasible for all travellers, particularly pedestrians. Given that the construction phase would last for approximately four years, it is anticipated that some individuals would be discouraged from active travel for a prolonged period. This could contribute to weight gain and reduced mental wellbeing, which are the most likely health outcomes associated with this impact over this time period. On this basis, the impact is assessed to be **negative** for health. Given the level of public health concern over issues of sedentary lifestyles and obesity, this impact is judged to be significant.

Community severance and social networks

13.18.16 It is anticipated that construction traffic and vehicles carrying construction workers and materials to site from outside the local area would be routed via the following routes:

- From the north via the M11 and A120
- From the north-east (e.g. Felixstowe and Harwich ports) via the A14/A120 and A12
- From the south and west via the M25 and A12
- From Tilbury port via the A130

13.18.17 Within the local area, certain routes have been identified where construction traffic would be permitted, while other routes have been identified where construction traffic would be excluded. This is to help protect the amenity of communities surrounding the proposed scheme as far as practicable. There are also certain routes where construction traffic would be permitted, but this would be restricted to only specific activities where construction access would be required, for example bridge replacements. The construction traffic permitted, restricted and excluded routes are detailed in the Outline Construction Traffic Management Plan for details [TR010060/APP/7.7]).

13.18.18 The communities which would be most affected by construction traffic are as follows:

- Residents on Paynes Lane, Boreham
- Small number of residents on east side of B1137 The Street, Hatfield Peverel where construction vehicles would be permitted on the final 200m of road
- Small number of residents in Witham on Newland Street between junction with The Grove and where it becomes Colchester Street after the Blackwater Trail junction before entering the industrial estate
- Residents in Rivenhall End on the southern end of Oak Road and Henry Dixon Road where there are junctions with A12
- Residents on B1023 Inworth Road in Inworth and Feering and along B1024 London Road on the east side of Feering between junction with B1023 and junction 24 of existing A12
- Residents in Marks Tey on and around junction 25

13.18.19 The increase in heavy goods vehicle traffic in these communities could contribute to an increase in perceived community severance. Furthermore, noise and vibration from passing vehicles would adversely affect amenity of outdoor spaces and discourage social interaction, during the duration of the construction vehicle use in each area. This would negatively affect social networks but is unlikely to be significant as the impacts would be temporary for the construction phase, and generally limited to those few routes identified.

13.18.20 Potential impacts on community severance and social networks could also arise from physical construction activities which would require several temporary closures of roads and routes, as detailed in the Outline Construction Traffic Management Plan [TR010060/APP/7.7], to enable certain construction activities to safely be carried out. This includes night and weekend closures of the A12 itself, and closures of some side roads for bridge replacements and bridge widening activities. Temporary diversion routes would be in place, and diverted traffic may increase perceptions of severance in communities which would experience a temporary increase in traffic, although given that the A12 closures would be overnight or for the duration of some weekends, this is unlikely to be significant to population health.

13.18.21 The closure of Bury Lane and Station Road Bridge in Hatfield Peverel would each cause a degree of community severance over a period of approximately six months. One of the mitigation measures proposed is to install a temporary pedestrian bridge during the bridge replacement works to enable members of the community to move north and south of the existing A12 while Station Road is closed, however the additional distance (up to 400m) is likely to dissuade some people. There would be no temporary crossing provision for residents of Bury Farm estate. A shuttle bus service would be provided for those with mobility needs. This would run during the hours that the train station is operational but outside of those times use of the shuttle would be on a case-by-case basis via arrangement with the Community Liaison Manager (see Section 13.9 of this chapter). Those most vulnerable to community severance would be people with disabilities, the elderly and parents with very young children, who are less able to walk the additional distance in reasonable time.

13.18.22 Furthermore, the proposed temporary route through Bury Farm and Hatfield Grove estates would result in a temporary increase in traffic (albeit restricted to the vehicles set out in paragraph 13.9.22). The increase in traffic would be greater during the Station Road bridge closure due to the greater number of residents who would be affected. This may cause concern over safety, particularly among parents of young children who may restrict children's independent play and travel for the duration of the bridge closures (one year in total).

13.18.23 A degree of severance and reduction in social interaction is therefore likely during the construction phase, which may adversely affect the mental wellbeing of some individuals, but this would affect relatively few people and would be reversible on completion of the proposed scheme. On this basis, with mitigation in place, effects on community severance and social networks are assessed as **negative** (not significant) for health during construction.

Access to facilities, services, employment, education and skills

13.18.24 During construction there would be potential for some delay to journeys for all modes of travel – private car, bus passengers, and active travellers. Impacts on active travel are assessed above. The bus services identified as being potentially affected are set out in Table 13.25. The Principal Contractor would liaise with bus service providers about the proposals to enable decisions to be made regarding bus route alterations and journey times to be made.

13.18.25 Traffic management measures, as outlined in Chapter 2: The proposed scheme, of the Environmental Statement [TR010060/APP/6.1] and the Outline Construction Traffic Management Plan [TR010060/APP/7.7], would help to maintain traffic flows around the construction activities associated with the proposed scheme.

13.18.26 Physical access to services, facilities and places of employment would be maintained through the use of diversions and other traffic management measures.

13.18.27 There is a risk that changes in journey times due to diversions and traffic management may result in people being late for work or appointments, including healthcare appointments. However, plenty of advance notice and publicity regarding any road closures and required diversions would be given to local communities and road users to enable people to plan their journeys accordingly. Therefore, the risk of missing appointments due to journey delays during construction is relatively low.

13.18.28 The land use and accessibility assessment has not identified any significant impacts on access to existing community services (including healthcare and education) or employment. However, the assessment does identify that one business in Feering would be required to relocate. This has potential to affect employment for some staff in the event that they are unable to access the new business premises, which is likely to negatively affect the mental wellbeing of those individuals affected. The amenity of some business locations would also be negatively affected during construction, which may also negatively affect the wellbeing of affected staff.

Table 13.25 Bus services potentially affected by proposed scheme

Service and bus route	Service provider	Area of potential disruption
40 – Boreham – Channels	First	Potentially affected by works to J19, as the bus route uses the B1137, J19 and A130
70 Chelmsford – Colchester	First	Potential for service times to be affected due to increased traffic from the proposed A12 diversion route which would use A120 for heavy goods vehicles (Braintree to Marks Tey)
71, 71A, 71C Chelmsford – Colchester	First	Potential to be affected by construction throughout the proposed scheme as the bus route uses J19, the B1137, J20b, J21, J22, the A12 (between J22 and J23), J24, the A12 (between J24 and J25), J25 and the B1408
71D Chelmsford – Colchester	First	Potential to be affected by construction throughout the proposed scheme as the bus route uses J19, the B1137, J20b and J21
71X Chelmsford – Colchester	First	Potential to be affected by construction throughout the proposed scheme as the bus route uses J19, the B1137, J20b, J21, J22, the A12 (between J24 and J25), J25 and the B1408

Service and bus route	Service provider	Area of potential disruption
72 Chelmsford – Colchester	First	Potential to be affected by construction throughout the proposed scheme as the bus route uses J19, B1137, J20b, J21, the B1389, J22, the A12 (between J22 and J23), J24, the A12 (between J24 and J25), J25 and the B1408
73 Chelmsford – Maldon	First	Potential for bus route to be affected by J19 and Hatfield Peverel works
73A Heybridge – Oaklands Park	First	Potential for bus route to be affected by J19 and Hatfield Peverel works
99 and 99A Asheldham – Broomfield Hospital	Arrow Taxis	Potential for bus route to be affected by J19 and Hatfield Peverel works as the bus route uses J19, the B1137, J20a, and Station Road
525 Chelmsford – Colchester	First	Potential to be affected by construction throughout the proposed scheme as the bus route uses J19, the B1137, J20b, J21, the B1389, J22, the A12 (between J22 and J23), J24, the A12 (between J24 and J25), J25 and the B1408
673 Chelmsford – Wickham Bishops	Stephensons of Essex	Potential for bus route to be affected by J19 and Hatfield Peverel works as the bus route uses J19 and the B1137
594 South Woodham Ferrers – Witham	Stephensons of Essex	Potential for bus route to be affected by works between Chelmsford and Witham as the bus route uses J19, the B1137, J20b, and J21
90 Maldon – Witham	Stephensons of Essex	Potentially affected by works to Olivers Bridge as the bus route uses the B1018 Maldon Road
91 Tollesbury – Witham	Hedingham	Potential to be affected by works to J22, mainline A12 works between J22 and J23, and Park Bridge on Inworth Road
621 Chelmsford – Witham	Stephensons of Essex	Bus route may be affected by diversion at Hatfield Peverel affecting Terling Road
39 Witham Town Service	Stephensons of Essex	Bus route may be affected by diversion at Hatfield Peverel affecting Terling Road
345 Fuller Street – Braintree	Hedingham	Bus route may be affected by diversion at Hatfield Peverel affecting Terling Road
133 Colchester – Stansted Airport	Arriva	Potential to be affected by J25 works and also for service times to be affected by increased traffic from the proposed A12 diversion route which would use A120 for heavy goods vehicles (Braintree to Marks Tey)

Service and bus route	Service provider	Area of potential disruption
505 Colchester – Danbury	Stephensons of Essex	Potential to be affected by works to the A12 mainline between J22 and J25, works to J20b, J21, and J22.
506 Colchester – Heybridge	Stephensons of Essex	Potential to be affected by works to Park Bridge, Inworth Road, J24, mainline A12 between J24 and J25, and works to J25 itself
570 Colchester – Great Dunmow	First	Potential to be affected by works to J25 and the A120 (the main diversion route for when the A12 is closed due to works associated with the proposed scheme)
676 Colchester – Little Waltham	Stephensons of Essex	Potential to be affected by construction throughout the proposed scheme as the bus route uses J19, the B1137, and the A12 between J20b and J25
901 Mount Bures – Stanway School	Hedingham	Potential for bus route to be affected by J24 works, mainline works to the A12 between J24 and J25, and Easthorpe Road
903 Kelvedon – Stanway	Hedingham	Potential to be affected by Park Bridge works on Inworth Road
910 Honywood School – Marks Tey	Hedingham	Potential to be affected by works to J25
82 Colchester – Colne Engaine 82A Colne Engaine – Colchester	Hedingham	Potential to be affected by works to J25

13.18.29 The construction phase of the proposed scheme would bring potential employment opportunities for local communities. The A14 Cambridge to Huntingdon improvement scheme employed over 14,000 people during the life of the project. Assuming that £1.5bn project is a relevant model, the proposed A12 Chelmsford to A120 widening scheme would be expected to employ some 10,000 people. However, it should be noted that construction methods are also evolving with opportunities for offsite, low-carbon construction, and with ways of removing people from risk being progressed wherever possible.

13.18.30 It is estimated that approximately 60% of staff working on the proposed scheme would be site operative staff and 40% would be office-based staff (approximately 20% of whom would be likely to be working remotely from the proposed scheme).

13.18.31 The bulk of construction work would be delivered by supply chain partners. It is not possible to predict with accuracy at this early stage of the proposed scheme how many people would be employed, or jobs created, as construction plans continually evolve and so do market and employment conditions.

13.18.32 However, as noted in Section 13.17, the proposed scheme is committed to advertising permanent positions in local job centres, including Witham Job Centre, which is in an area where unemployment and income deprivation are higher than average for Essex.

13.18.33 There is also a commitment in Section 13.17 to set targets for spend through local small and medium-sized enterprises, to offer apprenticeships, work placements and STEM ambassadors to work with local schools and colleges. This would have a positive impact on the local economy, as well as access to training and education, although the level of benefit is currently uncertain.

13.18.34 On the basis of the above analysis, it is predicted that the proposed scheme would not generally prevent any access to services, facilities, employment, education and skills and that it would also bring a net increase in employment, training and education opportunities. It is therefore assessed as overall **positive** in terms of this wider determinant of health, but it is not considered significant in population health terms due to the uncertainty over the number of job opportunities that would be available and the level of economic and training benefit that would be achieved.

13.18.35 Potential cumulative effects of the construction workforce on local services are assessed in Chapter 16: Cumulative effects assessment, of the Environmental Statement [TR010060/APP/6.1].

Access to greenspace and outdoor recreation

13.18.36 The land use and accessibility assessments in Appendix 13.3 of the Environmental Statement [TR010060/APP/6.3] provide an assessment of effects on outdoor recreational assets (in Section 13.10 - Community land and assets) and PRoWs (in Section 13.10 - Walkers, cyclists and horse riders). These assessments are summarised by community in the relevant sections above and provide an indication of where impacts on access to greenspace and outdoor recreation are likely. Residents of Boreham and Hatfield Peverel are not likely to be greatly affected in terms of access to greenspace during construction (impacts relate more to active travel). The key communities and routes affected by changes in access are set out below.

- Residents in southern parts of Witham would have access to the countryside affected by the loss of access to public footpath FP 90_29 due to the demolition of Woodend Bridge and the closure of footpath 121_101 during construction which would prevent access to Whetmead Nature Reserve except via a long diversion (see Table A.12 in Appendix 13.3 of the Environmental Statement [TR010060/APP/6.3]). Other footpaths between Witham and the countryside south of the A12 are historically severed by the A12 (see baseline information in Table A.12 in Appendix 13.3 [TR010060/APP/6.3]). Proposals for borrow pit F, construction haul roads and the gas main diversion south and east of the A12 near Witham all have potential to adversely impact the visual amenity of greenspace and the PRoW network in this area.

- The construction activities affecting Ewell Hall Chase, Highfields Lane, Maldon Road, and Inworth Road (B1023) would disrupt countryside access and amenity for several PRoWs south of Kelvedon and Feering (see Table A.16 in Appendix 13.3 of the Environmental Statement [TR010060/APP/6.3]) while the closure of footpath FP 78_101 (Feering) for several months for works to the new Prested Hall Overbridge would reduce access for Feering residents to the countryside south-east of the A12.

- PRoW network south of Marks Tey and existing A12 London Road would be affected by the proposed new A12 alignment and associated landscaping proposals.

13.18.37 However, there are several PRoWs north of these settlements which would be unaffected and would allow continued access to greenspace.

13.18.38 There would also be short to medium-term loss of access to a small area of greenspace located off Olivers Drive, Witham. However, there is good availability of alternative facilities within close proximity to the affected site such as land north of Gershwin Boulevard, and north of Greenwell Road (see Table A.10 in Appendix 13.3 of the Environmental Statement [TR010060/APP/6.3]).

13.18.39 The landscape and visual assessment (Chapter 8 of the Environmental Statement [TR010060/APP/6.1]) identifies that the presence of construction elements such as construction compounds, temporary lighting, major earthworks for the construction of junctions, bypasses, overbridges and online widening, the movement of construction plant on haul roads, extensive extraction for borrow pits and attenuation ponds and removal of vegetation, would be dominant in open views within close proximity of the proposed scheme. This would therefore disrupt visual access to greenspace for local communities who overlook the proposed scheme or for people using the nearby PRoW networks. Construction activities would also reduce a sense of tranquillity, although it is noted that there are relatively few areas of tranquillity in the baseline due to existing highway and rail infrastructure and so this is not likely to be significant. The MWIA (see Appendix 13.4 of the Environmental Statement [TR010060/APP/6.3]) has identified that loss of trees and vegetation is a key concern for communities along the route. However, the impacts identified above are likely to be confined to the residents within approximately 1km of the proposed scheme. Beyond this distance the visual intrusion would be less, and people would have alternative PRoW networks to use away from the main construction footprint, particularly north of the affected settlements. Furthermore, on completion of construction, access would be restored (and in some cases improved – see operational impacts).

13.18.40 Temporary and permanent land take from the gardens of some residential properties in Hatfield Peverel, Witham and Rivenhall End would be required (see Tables A.5 and A.9 in Appendix 13.3 of the Environmental Statement [TR010060/APP/6.3]). Green areas within the curtilage of residential properties affected would be fully reinstated where temporary land take is proposed, although it would take time for planting to establish.

13.18.41 No specific vulnerable groups have been identified as present in areas more affected, however children and people who spend more time in their homes (e.g. older, retired residents, and those with limiting health conditions and disabilities) may be more vulnerable to any loss of greenspace close to homes. It is considered that this impact of the proposed scheme presents a moderate risk of short to medium-term adverse mental wellbeing outcomes such as psychosocial stress due to concerns over construction effects on trees, vegetation and greenspace.

13.18.42 Given the reversibility of the temporary effects, and limited number of properties experiencing a permanent reduction in garden size, it is not anticipated that changes in access in private greenspace would contribute to a measurable population-level impact on physical or mental health.

13.18.43 The most likely health outcomes associated with the above impacts would be adverse impacts on mental wellbeing (see Appendix 13.1 of the Environmental Statement [TR010060/APP/6.3] for evidence on health effects of access to greenspace). The impacts are therefore short to medium-term. On this basis the effect on likely health outcomes is assessed as **negative**, but not significant in terms of overall population health.

Health inequalities

13.18.44 Disruption during construction, including localised diversions to PRoWs or other pedestrian and cycle routes during construction, are likely to be disproportionately inconvenient to groups such as people with physical disabilities, those with mental health conditions (for example anxiety or autism spectrum disorders), parents with young children, and the elderly. Only one specific location has been identified where there is a greater likelihood of interaction between construction of the proposed scheme and people in these vulnerable groups. This is The Laurels specialist care home, Station Road in Marks Tey. It is understood this facility caters for up to 13 users. It is anticipated that works in this area can be appropriately managed by a Community Liaison Manager, to avoid significant impacts on the people who use this facility.

13.18.45 The commitment to advertise permanent job opportunities in local job centres in settlements along the route of the proposed scheme, including Witham Job Centre, may help to tackle health inequalities by providing opportunities to people in an area where employment is lower than average for Essex, and where income deprivation is higher than average. However, it is uncertain how many jobs would be available and so this is not considered significant.

13.18.46 The construction phase of the proposed scheme is not likely to address any of the structural issues that lead to health inequality. Overall, the impact is assessed to be **neutral**.

Protective factors for mental wellbeing

13.18.47 The MWIA (see Appendix 13.4 of the Environmental Statement [TR010060/APP/6.3]) identified the following impacts on wider determinants and protective factors of mental wellbeing which would be impacted during the construction phase:

- Physical environment (access to greenspace, countryside, outdoor recreation and quality of built environment)
- Impacts on economic security
- Access to quality housing (e.g. security, tenure, neighbourhood)

13.18.48 The findings of the MWIA in relation to physical environment and economic security are included in the assessment presented under 'Access to greenspace and outdoor recreation' and 'Access to facilities, services, employment, education and skills' reported above.

13.18.49 'Access to good quality affordable housing' as a wider determinant of health was scoped out of the human health assessment for the reasons set out in Appendix 13.2 of the Environmental Statement [TR010060/APP/6.3]. However, the MWIA has identified that during construction a small number of individual households would be impacted by temporary and permanent land take from gardens and drives, and in some cases, compulsory purchase of homes (see land use and accessibility assessment in Section 13.10 of this chapter). These impacts would affect small numbers of households within Hatfield Peverel and Terling, Witham South, Silver End and Cressing, and Marks Tey and Layer wards. The community profiling (see Section 13.15 of this chapter) shows that these are wards which have good levels of general health and socio-economic status, and so on average, would be expected to be relatively resilient. However, the personal health and wellbeing circumstances of the individuals within the homes affected by the proposals may vary considerably from the average community profile reported for the relevant wards and cannot be inferred from these data.

13.18.50 Moving house is widely acknowledged to be a stressful life event, and there is evidence to suggest that moves which are not made out of choice are linked to development of negative mental health outcomes in affected adults and a degree of stress and inconvenience is likely for all those affected by land acquisition, or whose properties may be blighted by the proposed scheme. The effect is assessed as **negative**, but not significant in terms of overall population health due to the relatively limited number of households affected. As noted in the land use and accessibility assessment (Section 13.10 of this chapter), the vast majority of residential land, hence householders, in the area would be unaffected by the proposed scheme.

13.18.51 In addition, the MWIA in Appendix 13.4 [TR010060/APP/6.3] provides an analysis of potential impacts on protective factors such as:

- impacts on people's control (opportunities to influence decisions and for expressing views and being heard)
- impacts on resilience and community assets (shared public places)

13.18.52 These issues relate largely to the pre-application consultation and any future engagement which would be held with communities. However, the issues are interrelated with likely mental wellbeing responses to construction impacts identified above. Refer to Appendix 13.4 of the Environmental Statement [TR010060/APP/6.3] for relevant issues raised.

Table 13.26 Summary of health effects in construction phase

Health determinants affected	Population health outcomes	Population health effect
Noise, air and other environmental pollutants	Air pollution – various health outcomes associated with exposure	Neutral
	Noise – temporary impacts on wellbeing and sleep disturbance	Negative (significant)
	Lighting – impacts on wellbeing	Neutral
	Ground contamination – various health outcomes associated with exposure	Neutral
Road traffic collisions	Risk of serious injuries and fatalities	Neutral
Active travel	Risk of weight gain and reduced mental wellbeing	Negative (significant)
Community severance and social networks	Reduction in social interaction and associated impacts on wellbeing (temporary)	Negative (not significant)
Access to facilities, services, employment, education and skills	Improved physical and mental health	Positive (not significant)
Access to greenspace and outdoor recreation	Improved physical and mental health	Negative (not significant)
Health inequalities	Inequalities in physical and mental health outcomes	Neutral
Protective factors for mental wellbeing – access to quality housing	Negative mental wellbeing from impacts on housing quality and security (requirements to move house)	Negative (not significant)

Operation

Noise, air and other environmental pollutants

Noise

13.18.53 In response to PHE's scoping response, quantified and monetised results of predicted noise impacts on the health outcomes of 'annoyance', 'sleep disturbance' and 'heart attack' have been obtained (refer to Section 13.12 of this chapter for information on the techniques used). The results (summarised in Tables 13.27 and 13.28) relate to the expected impact on these population health outcomes fifteen years after the proposed scheme commences operation. The results are also conservative in that they assume the noise reduction properties of conventional low-noise surfacing rather than the full 6.5dB reduction performance of the proposed surfacing with better noise-reducing properties that would be used for mitigation as part of the proposed scheme. This is because the results do not take account of the effect of surface maintenance on maintaining the noise reduction performance.

Table 13.27 Quantitative noise results

Quantitative results (year 15)	
Households experiencing increased daytime noise in forecast year	3,911
Households experiencing reduced daytime noise in forecast year	994
Households experiencing increased night-time noise in forecast year	3,664
Households experiencing reduced night-time noise in forecast year	952

13.18.54 The calculation of health impact takes account of the numbers of households to experience an increase and decrease of impact, the magnitude of increase and decrease of noise level, together with exposure-response function for each health outcome.

Table 13.28 Monetised health outcomes due to noise

Monetised health outcomes (year 15)		**Effect**
Net present value of impact on sleep disturbance (£)	-4,118,724	**Negative**
Net present value of amenity ('annoyance') (£)	-1,499,037	**Negative**
Net present value of impact on heart attacks (£)	254,897	**Positive**

13.18.55 The results show that negative effects are predicted on health outcomes of sleep disturbance and annoyance. The WHO (2018) identifies that sleep disturbance is a more serious outcome than annoyance.

13.18.56 In relation to the outcome of heart attacks, the results show a positive effect. This is because the proposed scheme would reduce the number of households exposed to higher volumes of noise.

13.18.57 Based on the above, it is judged that the impact on sleep disturbance is **negative** (significant) on account of the relatively high level of health impact and the nature of the condition. The impact on annoyance is **negative**, but not considered significant as it is a lower level of impact and a less serious health outcome. The impact on heart attacks is **positive**, but not considered significant due to the small magnitude of impact attributable to the proposed scheme.

Air pollution

13.18.58 The air quality assessment reported in Chapter 6 of the Environmental Statement [TR010060/APP/6.1] has assessed that there would be no significant effects relating to air quality as a result of the proposed scheme. Only three of the 260 modelled receptor locations are at risk of exceeding the threshold of the NO_2 AQO (40µg/m^3) with the proposed scheme in the opening year 2027. Of these, two would be at risk of exceeding the NO_2 AQO in the Do Minimum scenario as well, so the proposed scheme would not make a significant difference. One receptor would only exceed the threshold in the Do Something scenario and the magnitude of change recorded at the receptor (4.0µg/m^3) was deemed to be medium in accordance with DMRB LA 105 (Highways England, 2019). These values are below the guideline number of properties that would constitute a likely significant effect (see Section 6.5 of Chapter 6: Air quality, of the Environmental Statement [TR010060/APP/6.1]) according to the significance criteria in DMRB LA 105.

13.18.59 The air quality assessment has reported that there are no predicted exceedances of the AQO for PM_{10} or $PM_{2.5}$ in any of the modelled scenarios, therefore there would be no significant effects from the proposed scheme on health relating to particulate matter.

13.18.60 There is no ‘safe’ level of air pollution below which no health effects can be observed in a population. Therefore, to identify whether overall the proposed scheme would have a positive or negative effect on population (albeit not significant for the reasons described above) the full results of the modelled annual mean PM_{10} and NO_2 concentrations for modelled receptors in the ‘Do Something’ and ‘Do Minimum’ situation have been reviewed.

13.18.61 The results show that for NO_2 concentrations, 56 modelled receptor locations would experience a decrease in NO_2 concentrations with an average decrease of 3.15µg/m^3. 196 modelled receptor locations would experience an increase in NO_2 concentrations, with an average increase of 1.05µg/m^3. Nine modelled receptors would experience no change. The average change across all 260 modelled receptors would be an increase of 0.11µg/m^3 NO_2 concentration. It should also be noted that the 260 modelled receptors are those which would be most affected (either positively or negatively) and so whilst these are representative of the locations that would experience the greatest level of change, they are not representative of the change in exposure for the overall population in the air quality study area, where the vast majority of receptors would not experience any notable level of change. In this context, the average change across the most affected receptors of 0.11µg/m^3 is imperceptible, given the uncertainty involved in the level of exposure to human receptors. Therefore, the impact of NO_2 on population health outcomes is assessed as **neutral**.

13.18.62 There would be an increase in PM_{10} concentrations across 152 of the modelled receptors. The average increase would be 0.19µg/m^3. Of the modelled receptors, 58 would experience no change, while 51 would experience a decrease. The average decrease would be 0.56µg/m^3. Across all modelled receptors the average change would be 0.00µg/m^3 (i.e. no change). Therefore, the impact of particulate matter on population health outcomes is assessed as **neutral**.

Other environmental pollutants

13.18.63 The proposed scheme would introduce some new lighting at the proposed new junction arrangements. Lighting would be designed to avoid light spill or glare (see Chapter 8: Landscape and visual, of the Environmental Statement [TR010060/APP/6.1]) for a more comprehensive description of lighting mitigation. There would also be car headlights at night on new route alignments, which would introduce light to areas which are currently relatively unlit. The impact of light pollution has been highlighted as one of the community concerns (see Appendix 13.4 of the Environmental Statement [TR010060/APP/6.3]) which may impact on wellbeing.

13.18.64 It is not considered likely that many people would be affected by lighting, and so this is not considered to be significant. The impact is therefore assessed to be **negative** (not significant).

13.18.65 No other likely sources of environmental pollution where there is a credible pathway to population health outcomes, have been identified.

Road traffic collisions

13.18.66 The proposed scheme would apply a consistent standard of design along the A12 route with three-lane all-purpose trunk road throughout. Direct accesses onto the A12 would be removed, which would reduce risks to road users. Traffic modelling and appraisal for the proposed scheme has indicated that overall, there would be a net increase of 262 collisions over a 60-year appraisal period in the Do Something scenario compared to the Do Minimum scenario (refer to the Combined Modelling and Appraisal report [TR010060/APP/7.3]). However, there would be reductions in both serious (reduction of 200) and fatal (reduction of two) casualties over the 60-year appraisal period (the timeframe used in the appraisal guidance). The health impact of this is assessed as **positive**, owing to the reduction in serious and fatal collisions, but not significant, owing to the overall increase in slight casualties from collisions.

Active travel

13.18.67 The proposed scheme would provide several improvements over the baseline walking and cycling infrastructure, as assessed under ‘Walkers, cyclists and horse riders’ in Section 13.10 of this chapter. In summary, the main improvements would be as follows:

- Through junction 19 where controlled crossings would be introduced, for example on Boreham Bridge, to aid pedestrians and cyclists

- Between Hatfield Peverel and Witham, where wider continuous provision would be provided which would bypass the proposed junction 21 and provide greater segregation from the main dual carriageway, reducing exposure of active travellers to trunk road traffic conditions and emissions
- From the proposed junction 22 to the existing junction 23 west of Kelvedon where an improved active travel experience would be expected due to the proposed de-trunking of the existing A12 alignment (where a shared-use path currently runs alongside the northbound carriageway), and vastly decreased traffic flows
- Between Feering and Marks Tey where an improved active travel experience would be expected due to the proposed de-trunking of the existing A12 alignment (and vastly decreased traffic flows) coupled with a proposed new walking and cycling route south of the proposed new A12 alignment between Wishingwell Farm Roundabout and Marks Tey

13.18.68 It is likely that these improvements would be beneficial to the experience of existing active travellers who already use the east-west shared-use route in the baseline provision. It is also likely that the improved provision, which would be more segregated from the dual carriageway, would encourage some individuals to walk or cycle the routes more as they would feel less exposed to the trunk road traffic conditions. However, it is unlikely that these measures would be sufficient to cause a widespread modal shift and contribute to population health improvement. One of the main predictors of active travel is distance, and this would not be changed significantly by the proposed scheme.

13.18.69 There is also some uncertainty over the influence of the COVID-19 pandemic and increased levels of home working (hence fewer people may need to commute regularly). Also, improvements to highway capacity and journey reliability brought by the proposed scheme may actually encourage some individuals to switch to driving more as they would be at less risk of being held up in traffic queues. This could undermine potential health improvements by encouraging sedentary modes of travel. On the other hand, increasing fuel costs may encourage more people to use active travel and the proposed walking and cycling provision would help support that.

13.18.70 It is therefore assessed that, overall, the potential effect on population health outcomes relating to impacts on active travel would be **positive** (not significant).

Community severance and social networks

13.18.71 Refer to Appendix 13.1 of the Environmental Statement [TR010060/APP/6.3] for evidence on health effects of community severance and how severance is interpreted in this assessment.

Boreham

13.18.72 The provision of Paynes Lane walking, cycling and horse-riding bridge would address past severance for the bridleway. As noted in the land use and accessibility assessment (see Table A.4 in Appendix 13.3 of the Environmental Statement [TR010060/APP/6.3]), this route is likely to become more important over time as the Beaulieu Park development is built out. However, in terms of a

comparison with the baseline, the lack of bridleway access is more of an issue for recreational use than for social interaction within a community and is therefore considered neutral in terms of this health determinant.

13.18.73 The village of Boreham itself would not be particularly impacted by the physical footprint of the proposed scheme. However, traffic levels are predicted to increase slightly on Main Road which runs through Boreham, increasing from 4,000–8,000 vehicles per day in the Do Minimum scenario, to 8,000–16,000 vehicles per day in the Do Something scenario, which would increase severance to a moderate level. Speed restrictions are proposed on Main Road (B1137) where the current 50mph speed limit would be reduced to 40mph, and the current 40mph speed restriction through the village itself would be reduced to 30mph. The lower speed limits may help reduce perceived severance, however 30mph is a relatively standard speed in built-up areas and is not likely to greatly improve actual or perceived safety (compared with safety benefits brought by 20mph speed limits) particularly for vulnerable road users such as children, the elderly and people with disabilities. There is a controlled pedestrian crossing to enable crossing to the recreation ground and Boreham Village Hall (likely to be the main community hubs of social interaction) and so the physical ability to cross the road would not be greatly altered by changes in traffic flow. Overall, the impact of the proposed scheme on community severance in the Boreham village is assessed as **negative**, but not significant.

Hatfield Peverel

13.18.74 Traffic levels are predicted to reduce slightly on The Street which runs through Hatfield Peverel, decreasing from over 16,000 vehicles per day in the Do Minimum scenario, to 8,000–16,000 vehicles per day in the Do Something scenario which would slightly reduce severance in this village. Connectivity for the community north and south of the A12 corridor would be maintained through the replacement bridges at Bury Lane, Station Road and Wellington Road. The impact of the proposed scheme on community severance and social networks for Hatfield Peverel is assessed as **positive** but not significant.

Witham

13.18.75 No noticeable operational impacts are likely for Witham relating to community severance. Historic severance of a footpath would be addressed through the provision of the proposed Gershwin Boulevard Bridge. However, this would be of outdoor recreational benefit more than by linking communities. The impact of the proposed scheme on community severance and social networks for Witham would therefore be **neutral**.

Rivenhall End

13.18.76 The main community that would experience a physical impact from the proposed scheme would be Rivenhall End where the A12 currently cuts through the village at grade. Currently, the main route that residents must take to cross between the north and south of the village is via Henry Dixon Road as there is no at-grade crossing provision of the existing A12 where traffic levels are substantially over 16,000 vehicles per day (severe severance). The proposed realignment of the A12 trunk road approximately 180m south-east of its current alignment, coupled with de-trunking of the existing A12 through the village and

installation of toucan crossings, means there would potentially be a degree of relief from community severance, and traffic levels along the existing A12 alignment through the village are expected to reduce to 4,000–8,000 vehicles per day in the Do Something scenario (slight severance). However, most of the residential area of Rivenhall End is located on the north side of the A12 and it is mostly business use to the south, so it is unlikely that social interaction is significantly inhibited in the baseline situation. Furthermore, the proposed scheme would result in a less direct route for pedestrians between the Fair Rest community and Rivenhall End (see Table A.12 in Appendix 13.3 of the Environmental Statement [TR010060/APP/6.3]). It is therefore likely that any net health benefit associated with the relief of community severance for Rivenhall End would be relatively small. On this basis, the overall effect on population health outcomes related to community severance and social networks is assessed to be **positive** but is unlikely to be significant.

Kelvedon and Feering

13.18.77 Traffic flows on the B1024 London Road, on the west side of Kelvedon, are anticipated to reduce from 8,000–16,000 vehicles per day in the Do Minimum scenario, to 4,000–8,000 vehicles per day in the Do Something scenario. There would therefore be a slight reduction in severance in this part of the village. No other notable changes in traffic flows are anticipated for the communities of Kelvedon or Feering from the proposed scheme in operation and traffic levels through the central part of the community (where the majority of the population would interact) would remain similar. On this basis, the overall effect on population health outcomes related to community severance and social networks is assessed to be **neutral** for Kelvedon and Feering.

Inworth

13.18.78 One area of increase has been noted on the B1023 Inworth Road between Tiptree and Kelvedon where modelling indicates traffic flows would substantially increase. The baseline traffic flows on this route are already relatively high at around 10,000 AADT, and the predicted increase in the Do Something scenario would mean traffic would stay within the 8,000–16,000 vehicles per day band (moderate severance). The increase in flows could potentially increase severance (actual and perceived) within the village of Inworth, particularly at peak traffic times, which may reduce social interaction within the neighbourhood. The proposed scheme includes some localised widening and a lengthened pedestrian footway along Inworth Road. However, these measures would not mitigate the increase in traffic.

13.18.79 Evidence for health outcomes associated with community severance is currently relatively limited (see Appendix 13.1 of the Environmental Statement [TR010060/APP/6.3]). It seems likely that reduced social contacts as a result of increased traffic contributing to community severance would contribute to adverse health outcomes. However, there are very few good quality studies to support this. The population in the ward is relatively healthy and resilient based on health indicators reported in the baseline, and the population within Inworth is relatively small (approximately 100 residents). However, it does have a higher than average proportion of people aged over 65 years (more than 20% of the population in the ward). These people are more likely to be retired and spend

more of their day within the community and would therefore be more exposed to the change in traffic conditions. As a result, they may feel the impact more keenly. The most likely health outcome associated with perceived community severance for this village is anticipated to be adverse mental wellbeing. The MWIA has identified increased traffic volumes to be a key community concern (see Appendix 13.4 of the Environmental Statement [TR010060/APP/6.3]). Nevertheless, given that traffic volumes are already high through this village, it is uncertain whether the perception of severance would be particularly noticeable for most people.

13.18.80 On this basis, the impact of community severance at Inworth is assessed as **negative** but is not considered to be significant in population health terms, due to:

- the relatively small population affected
- uncertainty as to whether the traffic increases would be perceptible over the existing relatively high traffic flows
- limited good quality evidence of links to health outcomes
- the relatively healthy and resilient community exposed.

This does not mean that the impact would not be considered significant for some individuals.

Marks Tey

13.18.81 No impacts relating to community severance or social networks are expected on the communities of Marks Tey from the proposed scheme in operation. On this basis, the overall effect on population health outcomes related to community severance and social networks is assessed to be **neutral**.

Access to services, facilities, employment, education and skills

13.18.82 The proposed scheme has been designed to support economic growth, reduce current and forecast congestion, improve journey time reliability and improve accessibility for walkers, cyclists and public transport users. The walking, cycling and horse-riding assessment in Section 13.10 has assessed that the proposed scheme would have slight to moderate beneficial effects for walkers, cyclists and horse riders, depending on the community.

13.18.83 In relation to public transport, the proposed scheme would restore access and useability of bus stops in Rivenhall End and between Rivenhall End and Kelvedon (see Section 13.7 for baseline conditions). This would therefore be positive to residents by better linking these villages with other areas of employment. It would also provide access to the Essex County Fire and Rescue Service Headquarters near Kelvedon, which employs a large number of people in that area.

13.18.84 The proposed scheme would therefore be positive in terms of accessibility for pedestrians and cyclists, public transport users and also car users due to improved provision and journey time reliability.

13.18.85 The operational phase of the proposed scheme is not anticipated to compromise any existing or future planned residential properties or community assets.

13.18.86 There is a fuelling station accessed from the southbound carriageway at Rivenhall End, a service station, Travelodge and fast-food outlets accessed from the northbound carriageway east of Feering, and another service station accessed from the southbound carriageway west of Marks Tey. These businesses may suffer from a reduction in passing trade. However, with the de-trunking proposals, they may actually become more accessible for travellers both northbound and southbound.

13.18.87 Where adverse effects on existing or proposed businesses and employment land have been identified (see Tables A.3, A.7, A.11, A.15 and A.19 in Appendix 13.3 of the Environmental Statement [TR010060/APP/6.3]), the degree of impact is not anticipated to be sufficient to compromise the continued viability of the current land uses. There is potential, although considered unlikely, that the proposed scheme would affect the functioning of the individual small businesses which occupy these premises, leading to changes in employment on an individual level. However, given the very small number of commercial premises affected, the limited number of employment opportunities afforded by the occupying businesses, and the continued presence of similar alternative businesses within the local area, no noticeable change in the availability, nature or quality of employment opportunities across the study area is anticipated.

13.18.88 Overall, it is considered that the proposed scheme would provide a net improvement in physical accessibility to services, facilities, employment, education and skills through its improvements to highway capacity, access to bus stops and improvements to active travel infrastructure. However, it is unlikely to address wider structural barriers to services, employment and education, nor is it likely to significantly affect employment opportunities. On this basis, it is assessed as **positive**, but is not likely to be significant in terms of population health outcomes.

Access to greenspace and outdoor recreation

13.18.89 The proposed scheme would bring a number of beneficial impacts in terms of physical access to green space. It would remove existing severance between PRoW networks to the north and south of the de-trunked A12 at Boreham by re-connecting bridleways at Paynes Lane (BR 213_23 and BR 213_45 (Boreham)) and a footpath south of Witham (FP 121_95 (Witham)). This would improve countryside access. The proposed new alignment of NCN Route 16, which takes users via a dedicated bridge for pedestrians and cyclists (Little Braxted Bridge) instead of through the existing junction 23, would improve the attractiveness of this route for some recreational users. Proposals for PRoW realignment and landscaping near the Essex County Fire and Rescue Service Headquarters would provide a more diverse green space and circular recreational route, which would benefit workers from the headquarters as well as local residents. New walking, cycling and horse-riding bridges as part of the proposed scheme would meet requirements for disabled access, and so improve accessibility for more people.

13.18.90 However, the proposed scheme would also have some adverse impacts in relation to greenspace. Noise and visual intrusion associated with new highway infrastructure works for the proposed new junction arrangements and the offline highway sections would reduce tranquillity and amenity of greenspace associated with PRoWs. Given there are relatively few offline sections, and the trunk road is already present in the baseline, there is relatively little tranquillity and so this impact is not likely to be significant in the overall context of the study area.

13.18.91 The proposed scheme would affect visual access to greenspace, particularly from isolated residential dwellings and PRoWs located in close proximity to the new junction 21 between Hatfield Peverel and West Witham; south and south-east of the new junction 22 east of Witham; adjacent to the new Prested Hall Overbridge; the Blackwater River Valley between junction 22 and junction 23; south of the new A12 alignment between Feering and Marks Tey; and south and south-east of junction 25 at Marks Tey. Overall, the landscape and visual impact assessment assesses a moderate adverse effect on local landscape character and visual amenity (see Chapter 8: Landscape and visual, of the Environmental Statement [TR010060/APP/6.1]) which is indicative of the loss of greenspace in the local landscape and for representative viewpoints.

13.18.92 The landscaping proposals include replacement screening vegetation where feasible, and additional tree and hedgerow planting would also create new vegetated areas (see Figure 2.1: Environmental Masterplan [TR010060/APP/6.2]) which would help to offset some loss of vegetation in the longer term.

13.18.93 From the information available, it is difficult to ascertain whether more people would be positively or negatively affected by the impacts on access to greenspace. The enhanced physical access to outdoor recreation would likely be positive for some people, particularly cyclists and longer-distance walkers who can travel beyond the immediate influence of the proposed scheme, however, for those living close by and overlooking the proposed scheme, the impact would be negative.

13.18.94 Due to the combination of beneficial and adverse impacts described above and limitations in identifying the proportion of the population affected by each, the overall population health effect is **uncertain**. Given the degree of local concern over impacts on landscape (see the MWIA in Appendix 13.4 of the Environmental Statement [TR010060/APP/6.3]), this uncertainty is judged to be significant in terms of decision-making.

Health inequalities

13.18.95 Once operational, the proposed scheme would provide improved opportunity to access public transport (e.g. bus stops on the de-trunked London Road between Rivenhall End and Kelvedon). It would also provide an improved standard of accessibility and safety for all walking and cycling routes included in the proposed scheme. Therefore, while the proposed scheme is predominantly a trunk road improvement scheme, it would bring advantages for people who do not, or cannot use a car. It would therefore make some improvement in terms of reducing inequalities relating to accessibility. This is considered to be **positive,**

but not likely to be significant, given that health inequalities are caused by wider determinants such as housing and economic policy, which the proposed scheme would not significantly affect.

Protective factors for mental wellbeing

13.18.96 The MWIA (see Appendix 13.4 of the Environmental Statement [TR010060/APP/6.3]) identified the following impacts on wider determinants and protective factors of mental wellbeing which would be impacted during the operational phase:

- Physical environment (access to greenspace, countryside, outdoor recreation and quality of built environment)
- Impacts on economic security
- Transport access and options

13.18.97 The findings of the MWIA in relation to each of these factors are included in the assessment under 'Access to greenspace and outdoor recreation' and 'Access to facilities, services, employment, education and skills' reported above.

13.18.98 In addition, the MWIA in Appendix 13.4 provides an analysis of potential impacts on protective factors such as:

- Impacts on people's control (opportunities to influence decisions and opportunities for expressing views and being heard)
- Impacts on resilience and community assets (shared public places)

13.18.99 These issues relate largely to the pre-application consultation and any future engagement which would be held with communities. However, the issues are interrelated with likely mental wellbeing responses to operational impacts identified above. Refer to Appendix 13.4 of the Environmental Statement [TR010060/APP/6.3] for relevant issues raised.

13.18.100 A summary of health effects in the operational phase is provided in Table 13.29.

Table 13.29 Summary of health effects in operational phase

Health determinants affected	Population health outcomes	Population health effects
Noise, air and other environmental pollutants	Noise – sleep disturbance	Negative (significant)
	Noise – long-term noise annoyance	Negative (not significant)
	Noise – heart attacks associated with long-term exposure to high levels of environmental noise	Positive (not significant)
	Air pollution – health outcomes associated with NO_2 and particulate matter	Neutral

Health determinants affected	Population health outcomes	Population health effects
	Lighting – impacts on wellbeing	Negative (not significant)
Road traffic collisions	Risk of serious injuries and fatalities	Positive (not significant)
Active travel	Improved physical and mental health (various health outcomes associated with regular exercise)	Positive (not significant)
Community severance and social networks	Social interaction and associated impacts on wellbeing in Boreham	Negative (not significant)
	Social interaction and associated impacts on wellbeing in Hatfield Peverel	Positive (not significant)
	Social interaction and associated impacts on wellbeing in Witham	Neutral
	Social interaction and associated impacts on wellbeing in Rivenhall End	Positive (not significant)
	Social interaction and associated impacts on wellbeing in Kelvedon and Feering	Neutral
	Social interaction and associated impacts on wellbeing in Inworth	Negative (not significant)
	Social interaction and associated impacts on wellbeing in Marks Tey	Neutral
Access to facilities, services, employment, education and skills	Improved physical and mental health	Positive (not significant)
Access to greenspace and outdoor recreation	Improved physical and mental health	Uncertain (significant)
Health inequalities	Reduced differences in health outcomes associated with accessibility (various physical and mental health outcomes)	Positive (not significant)

13.19 Monitoring

13.19.1 A significant uncertainty is the level of benefit likely to be provided in terms of employment opportunities, skills and training from the proposed scheme and therefore monitoring is proposed. The Principal Contractor would set targets for its employment and skills strategy ahead of the construction phase. Stakeholders such as Essex County Council would be engaged to support the target-setting process.

13.19.2 The performance of the Principal Contactor's employment and skills strategy would be monitored through the quantification of the following employment and skills outputs (Table 13.30). Further targets would be agreed as part of the target-setting process. For example, this would likely include the number and proportion of new starts who would be employed from the local area, along with the number who were previously unemployed.

Table 13.30 Monitoring criteria

Employment or skill criterion	Definition
Apprenticeship start	A new employee of the Principal Contractor or its suppliers as an apprentice into the workforce and enrolled on an approved Apprenticeship Standard relevant to the delivery of the works.
Job start	A new job start for an individual recruited as a result of the contract. This could include a graduate job start (non-workless).
Placement position	A position intended to enable an individual to learn, develop or enhance their knowledge and skills in an industry or role by providing a short work experience placement.
Professional status attainment	Number of individuals supported to attain professional registration and status in agreed critical skills shortage disciplines at no cost to the individuals supported. This includes registration at technician, incorporated and chartered levels.
Sector skills qualifications attainment	Number of individuals supported to attain technical or occupational skills relevant to the delivery of the proposed scheme construction at no cost to the individuals supported. This includes NVQs, health and safety qualifications, and leadership qualifications.

D. Overall conclusion

13.20 Summary of significant land use and accessibility effects

13.20.1 Table 13.31 sets out the land use and accessibility effects which have been assessed as significant.

13.20.2 The proposed scheme complies with the NNNPS insofar as it delivers improvements that reduce community severance and improves accessibility.

Table 13.31 Summary of significant land use and accessibility effects

Description of effect	Mitigation measures	Mitigation mechanism	Significance of effect
Construction			
Private property and housing in Hatfield Peverel – Permanent acquisition of five residential properties, temporary acquisition of one property, and temporary land take on a further four, to accommodate Bury Lane Bridge and Station Road Bridge replacement proposals. Disruption and inconvenience of access to over 400 properties during the proposed Station Road Bridge replacement.	(i) The principles of the compensation code will apply (ii) Support would be provided for occupiers who may need to find alternative accommodation (iii) Phased demolition and bridge replacement to ensure north-south access is maintained for Hatfield Peverel residents (iv) Maintain access for residents living within and around works associated with the proposed scheme where practicable (v) Reinstate land temporarily acquired to its former use unless otherwise agreed with landowners	(i) DCO (procedures under Powers of Acquisition and Possession of Land) (ii), (iv) and (v) REAC, within the first iteration of the EMP [TR010060/APP/6.5] (iii) and (iv) Outline Construction Traffic Management Plan [TR010060/APP/7.7]	Large adverse (significant)

Description of effect	Mitigation measures	Mitigation mechanism	Significance of effect
Private property and housing in Witham and Rivenhall End – Demolition of two houses, direct land take from a further ten properties, including permanent land take from eight properties resulting in partial loss of garden areas.	(i) The principles of the compensation code will apply (ii) Support would be provided for occupiers who may need to find alternative accommodation (iii) Maintain access for residents living within and around works associated with the proposed scheme where practicable (iv) Reinstate land temporarily acquired to its former use unless otherwise agreed with landowners	(i) DCO (procedures under Powers of Acquisition and Possession of Land) (ii), (iii) and (iv) REAC, within the first iteration of the EMP [TR010060/APP/6.5]	Moderate adverse (significant)
Community land and assets in Hatfield Peverel – minor magnitude indirect impacts on a variety of community assets and a moderate magnitude impact on Hatfield Peverel railway station, due to impacts on access north-south of the A12 in Hatfield Peverel associated with the Station Road Bridge and Bury Lane Bridge demolition and replacement proposals.	Phased demolition and bridge replacement to ensure north-south access is maintained for Hatfield Peverel residents, together with the following mitigation measures: • Provision of a temporary car park to allow temporary and alternative access and provide a parking area for the railway station users during the Station Road Bridge replacement • Provision of a shuttle service with stops at the temporary car park, Hatfield Peverel railway station, Station Road and central Hatfield Peverel. Vehicles would be suitable to support persons with accessibility needs • Temporary pedestrian/cycle bridge over the A12 to provide access during the Station Road Bridge replacement	REAC, within the first iteration of the EMP [TR010060/APP/6.5] Outline Construction Traffic Management Plan [TR010060/APP/7.7]	Large adverse (significant)

Description of effect	Mitigation measures	Mitigation mechanism	Significance of effect
Community land and assets in Witham and Rivenhall End – Temporary loss of car park for the Church of Latter-day Saints and loss of access to Whetmead Nature Reserve as well as potential disturbance due to the gas main diversion proposals. Several impacts on access and minor encroachment on an area of informal green space and a golf course.	(i) Maintain access for users of community assets within and around works associated with the proposed scheme where physical land take of asset is not required (ii) Reinstate land temporarily acquired to its former use unless otherwise agreed with landowners (iii) Replace lost open space with equivalent or better quality	(i), (ii) and (iii) REAC, within the first iteration of the EMP [TR010060/APP/6.5] (ii) and (iii) DCO (procedures under Powers of Acquisition and Possession of Land)	Moderate adverse (significant)
Community land and assets in Marks Tey – General disruption and inconvenience of access to community facilities including Marks Tey railway station, Marks Tey recreation ground and Marks Tey Parish Hall due to proposed works associated with the new arrangement for junction 25 improvements. The level of inconvenience may be sufficient to deter some use of facilities.	Maintain access for users of community assets within and around works associated with the proposed scheme	REAC, within the first iteration of the EMP [TR010060/APP/6.5]	Moderate adverse (significant)
Development land and business in Witham, Rivenhall End, Kelvedon, Feering, Inworth and Marks Tey – General disruption and inconvenience of access for businesses in these settlements due to traffic management and construction activities in the construction phase (short to medium term).	(i) Maintain access for users of business assets within and around works associated with the proposed scheme where physical land take of asset is not required (ii) Reinstate land temporarily acquired to its former use unless otherwise agreed with landowners (iii) Appoint Community Liaison Manager to address business concerns	REAC, within the first iteration of the EMP [TR010060/APP/6.5]	Moderate adverse (significant)

Description of effect	Mitigation measures	Mitigation mechanism	Significance of effect
Agricultural landholdings – moderate or major impacts on agricultural land affecting 17 farm businesses.	(i) Appoint an Agricultural Liaison Officer for ongoing engagement with landholders, tenants and their agents (ii) Undertake record condition of farm assets at pre-construction against which to measure quality of reinstatement of temporarily acquired land (iii) Require Principal Contractor to protect biosecurity, water supplies, soils, and other farm assets	REAC, within the first iteration of the EMP [TR010060/APP/6.5]	Large adverse (significant)
Walkers, cyclists and horse riders in Boreham (outside of main settlement) – Major disruption to walkers and cyclists who use routes across Boreham Bridge and Generals Lane Roundabout, including users of Chelmsford to Boreham cycle route. Impacts on several PRoWs due to haul roads and drainage works.	(i) Plan to limit requirements for PRoW, footway and cycleway closures or diversions during the construction phase (ii) Temporary diversion routes, provided and appropriately signed (iii) Where closure of a PRoW is required during construction and no local diversion can be provided, appropriate signage would be supplied at each end of the closed PRoW	(i), (ii) and (iii) Outline Construction Traffic Management Plan [TR010060/APP/7.7] (i), (ii) and (iii) REAC, within the first iteration of the EMP [TR010060/APP/6.5] (ii) and (iii) DCO (procedures under Powers of Acquisition and Possession of Land)	Moderate adverse (significant)

Description of effect	Mitigation measures	Mitigation mechanism	Significance of effect
Walkers, cyclists and horse riders in Hatfield Peverel – considerable diversions for walkers and cyclists required over several months due to proposals for demolition and replacements of Bury Lane Bridge, Station Road Bridge and Wellington Road Bridge in Hatfield Peverel. Prevention of access to/from public footpath FP 90_29 (Hatfield Peverel), and the Latney's Boarding Kennels and Cattery, except via a lengthy diversion (approximately 2km) due to the demolition of Woodend Bridge mainly affecting recreational users. Moderate adverse magnitude impacts on the footways alongside the northbound and southbound sides of the A12 carriageway between Hatfield Peverel and Witham, mainly affecting active travellers.	(i) Plan to limit requirements for PRoW, footway and cycleway closures or diversions during the construction phase (ii) Temporary diversion routes, provided and appropriately signed (iii) Where closure of a PRoW is required during construction and no local diversion can be provided, appropriate signage would be supplied at each end of the closed PRoW (iv) Phased demolition and bridge replacement to ensure north-south access is maintained for Hatfield Peverel residents together with the following measures: • Temporary access through two new housing estates, Hatfield Grove and Bury Farm • Provision of a shuttle service with stops at the temporary car park, Hatfield Peverel railway station, Station Road and central Hatfield Peverel. Vehicles would be suitable to support persons with accessibility needs • Temporary pedestrian bridge over the A12 to provide access during the Station Road bridge replacement	(i), (ii), (iii) and (iv) Outline Construction Traffic Management Plan [TR010060/APP/7.7] (i), (ii), (iii) and (iv) REAC, within the first iteration of the EMP [TR010060/APP/6.5] (ii) and (iii) DCO (procedures under Powers of Acquisition and Possession of Land)	Very large adverse (significant)

Description of effect	Mitigation measures	Mitigation mechanism	Significance of effect
Walkers, cyclists and horse riders in Witham and Rivenhall End – considerable diversions for walkers and cyclists required over several months due to proposals for Olivers Bridge widening, and activities associated with junction 22, which would impact on users of NCN Route 16. Proposed highway works to B1389 and junction 22 would also disrupt access for walkers and cyclists seeking to access the east-west footway along the existing A12 to/from Colchester. These are both very well-used routes so there is potential to affect large numbers of walkers, cyclists and horse riders. Closure of public footpath (FP 121_101 (Witham)) for approximately 17 months, preventing access to Whetmead Nature Reserve except via a large diversion.	(i) Plan to limit requirements for PRoW, footway and cycleway closures or diversions during the construction phase (ii) Temporary diversion routes provided and appropriately signed (iii) Where closure of a PRoW is required during construction and no local diversion can be provided, appropriate signage would be supplied at each end of the closed PRoW	(i), (ii) and (iii) Outline Construction Traffic Management Plan [TR010060/APP/7.7] (i), (ii) and (iii) REAC, within the first iteration of the EMP [TR010060/APP/6.5] (ii) and (iii) DCO (procedures under Powers of Acquisition and Possession of Land)	Large adverse (significant)
Walkers, cyclists and horse riders in Kelvedon, Feering and Inworth – Closure of public footpath FP 78_18 (Feering) for approximately 39 months during the proposed demolition of Threshelford Bridge and construction of the replacement structure. This would limit access to the PRoW network for residents of Feering except via major magnitude diversions. Various other impacts on PRoWs involving moderate magnitude diversions.	(i) Plan to limit requirements for PRoW, footway and cycleway closures or diversions during the construction phase (ii) Temporary diversion routes provided and appropriately signed (iii) Where closure of a PRoW is required during construction and no local diversion can be provided, appropriate signage would be supplied at each end of the closed PRoW	(i), (ii) and (iii) Outline Construction Traffic Management Plan [TR010060/APP/7.7] (i), (ii) and (iii) REAC, within the first iteration of the EMP [TR010060/APP/6.5] (ii) and (iii) DCO (procedures under Powers of Acquisition and Possession of Land)	Moderate adverse (significant)

Description of effect	Mitigation measures	Mitigation mechanism	Significance of effect
Walkers, cyclists and horse riders in Marks Tey, Copford and Easthorpe – Closure of footpath FP 144_19 for approximately 20 months and stopping up of northernmost 200m of FP 144_18, during construction reducing recreational access for Marks Tey residents except via major magnitude diversions. Disruption to the east-west route alongside the northbound carriageway of the A12 while the proposed Wishingwell Farm Roundabout, Easthorpe Road Roundabout and Feering East Roundabout are constructed, would affect active travel commuters. Works to junction 25 would likely cause disruption to walkers and cyclists in Marks Tey for a period of at least two years.	(i) Plan to limit requirements for PRoW, footway and cycleway closures or diversions during the construction phase (ii) Temporary diversion routes provided and appropriately signed (iii) Where closure of a PRoW is required during construction and no local diversion can be provided, appropriate signage would be supplied at each end of the closed PRoW	(i), (ii) and (iii) Outline Construction Traffic Management Plan [TR010060/APP/7.7] (i), (ii) and (iii) REAC, within the first iteration of the EMP [TR010060/APP/6.5] (ii) and (iii) DCO (procedures under Powers of Acquisition and Possession of Land)	Moderate adverse (significant)
Operation			
Agricultural landholdings – permanent loss of approx. 395ha arable agricultural resource.	(i) Appoint an Agricultural Liaison Officer for ongoing engagement with landholders, tenants and their agents (ii) Undertake record condition of farm assets at pre-construction against which to measure quality of reinstatement of temporarily acquired land (iii) Require Principal Contractor to protect biosecurity, water supplies, soils, and other farm assets	REAC, within the first iteration of the EMP [TR010060/APP/6.5]	Large adverse (significant)

Description of effect	Mitigation measures	Mitigation mechanism	Significance of effect
Walkers, cyclists and horse riders in Boreham – Improvements to pedestrian and cycling infrastructure on and around junction 19 and removal of past severance of BR 213_23 and BR 213_45 (Boreham) with proposed Paynes Lane Bridge.	None required (overall beneficial provision)	N/A	Moderate beneficial (significant)
Walkers and cyclists in Kelvedon, Feering and Inworth – Removal of severance through provision of Sniveller's Lane Bridge, enhanced shared-use cycle track along B1024 providing east-west connectivity with greater amenity than current provision along existing A12, several other minor improvements to PRoWs, improving overall access.	None required (overall beneficial provision)	N/A	Moderate beneficial (significant)
Walkers and cyclists in Marks Tey, Copford and Easthorpe – removal of existing severance through provision of proposed Easthorpe Road Overbridge and improvements in connectivity by linking proposed new shared-use cycle tracks to existing PRoW network, for example near Wishingwell Overbridge. A number of minor improvements to existing pedestrian crossings in Marks Tey to accommodate cyclists.	None required (overall beneficial provision)	N/A	Moderate beneficial (significant)

13.21 Summary of significant human health effects

13.21.1 Table 13.32 sets out the human health effects which have been assessed as significant.

Table 13.32 Summary of significant human health effects

Description of effect	Mitigation measures	Mitigation mechanism	Significance of effect
Construction			
Noise – significant night-time and daytime noise affecting some residents in Hatfield Peverel, near Witham bypass, Rivenhall End, Easthorpe, Marks Tey and the 266 receptors associated with the planned A12 diversion route. Associated health outcomes: • Reduced mental wellbeing • Sleep disturbance	(i) Consideration of further measures to reduce the noise from construction activities (ii) Development of a Noise and Vibration Management Plan	REAC, within the first iteration of the EMP [TR010060/APP/6.5]	Negative (significant)
Active travel – disruption of east-west shared-use cycle track during construction with the potential risk of discouraging existing commuters from undertaking active travel journeys during the construction phase. Associated health outcomes: • Weight gain • Reduced mental wellbeing	Provide efficient, well-signed diversion routes around areas of construction to limit delay for active travel commuters	Outline Construction Traffic Management Plan [TR010060/APP/7.7] REAC, within the first iteration of the EMP [TR010060/APP/6.5]	Negative (significant)
Operation			
Traffic noise – impacts on sleep disturbance	Low-noise surfacing, barriers and bunds, as described in Section 12.10 of Chapter 12: Noise and vibration [TR010060/APP/6.1]	REAC, within the first iteration of the EMP [TR010060/APP/6.5] Environmental Masterplan [TR010060/APP/6.2]	Negative (significant)

Description of effect	Mitigation measures	Mitigation mechanism	Significance of effect
Access to greenspace (physical and visual) – combination of loss of vegetation, visual intrusion and effects on landscape character and tranquillity as well as improvements to physical access to the countryside and outdoor recreation from the proposed scheme. Associated health outcomes: • Effects on mental wellbeing	Tree, shrub and woodland planting proposals as set out in Section 8.10 of Chapter 8: Landscape and visual [TR010060/APP/6.1]	Environmental Masterplan [TR010060/APP/6.2] REAC and LEMP, within the first iteration of the EMP [TR010060/APP/6.5]	Uncertain (significant) – it is uncertain whether mental wellbeing benefits associated with improved access to outdoor recreation would outweigh reduced mental wellbeing from landscape and visual impacts on local residents

13.21.2 The assessment has identified and set out likely significant adverse health impacts, including effects on mental wellbeing, and identified measures to avoid, reduce or compensate for adverse health impacts as appropriate.

13.21.3 There has been substantial pre-application consultation, and feedback has been carefully considered, with improvements made to the proposed scheme where feasible. This has allowed members of the community to have some say in the final proposals submitted for the DCO application.

13.21.4 Nevertheless, there would be some individuals adversely affected by the proposed scheme, with impacts on their housing or businesses. There is also considerable community concern regarding impacts on trees and greenspace, other environmental impacts (air pollution, noise and light pollution), as well as traffic increases in some locations. Many of these individuals may feel that their views have not been taken into account, or feel that they have had no control over the outcomes.

13.21.5 Such impacts are typical of any major development proposal where it is unlikely that a solution that would benefit everyone can be found.

13.21.6 The proposed scheme has been designed to limit impacts on communities as far as practicable, but as recognised by paragraph 5.83 of the NNNPS (Department for Transport, 2014), '*for nationally significant infrastructure projects of the type covered by this NPS* [National Policy Statement]*, some impact on amenity for local communities is likely to be unavoidable.*'

13.21.7 No research was identified through the literature review that assessed any level of association between major infrastructure construction projects of the nature of the proposed scheme, and mental health outcomes. In the absence of scientific evidence, it is judged probable that, despite proposed mitigation, there is a moderate to high risk of adverse mental wellbeing outcomes, such as psychosocial stress, among individuals most adversely affected by the

proposals. This is indicated by the concern expressed through the community consultation, and having to move house, or impacts on financial security for business owners, which are known risk factors for adverse mental health outcomes. However, while some individuals may be at risk of adverse mental wellbeing outcomes, there is little evidence to support a judgement that this may lead to a change in mental health status at a population level or in the longer term.

13.21.8 It is not considered that the proposed scheme is likely to be substantially different from similar scale projects in this regard.

13.22 References

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