13.0 Transport and Access

Introduction

13.1 This chapter of the ES assesses the likely significant effects of the Development on the environment in respect of transport and access.

13.2 This chapter has been prepared by Fore Consulting Limited (see Appendix 1.2 Statement of Expertise). This chapter should be read in conjunction with the following appendices and figures, which have been used to inform the assessment:

- Appendix 13.1 Land South of Dearne Valley Parkway, Goldthorpe: Transport Assessment;
- Figure 13.1 Study Area Highway Links;
- Figure 13.2 2km Walking Catchment;
- Figure 13.3 8km Cycling Catchment and Routes; and
- Figure 13.4 Public Transport Network.

Policy Context

National Planning Policy Framework (NPPF)[i]

13.3 The NPPF sets out that transport issues should be considered from the earliest stages of development proposals and that the potential impacts of development on transport networks can be addressed and mitigated to an acceptable degree, where required.

13.4 The NPPF encourages the promotion of sustainable modes of travel including walking, cycling and public transport.

Planning Practice Guidance (PPG)[ii]

13.5 PPG provides planning guidance in line with the overarching NPPF. PPG provides guidance on when Transport Statements/Assessments and Travel Plans are required and what these documents should contain.

Local Planning Policy

Barnsley Metropolitan Borough Council (BMBC) Local Plan[iii]

13.6 The following policies of the BMBC Local Plan are relevant to the Development from a transport perspective. Further details of these policies are provided in the Transport Assessment (TA) which has been submitted with the planning application and is provided at Appendix 13.1.

- Policy GD1: General Development;
- Policy T3: New Development and Sustainable Travel; and
- Policy T4: New Development and Transport Safety.

13.7 The majority of the Site falls within the ES10 employment allocation ‘Land South of Dearne Valley Parkway’ of the BMBC Local Plan, however a portion of the western part of the Site falls within Green Belt (no built development is proposed within this Green Belt area). The majority of the Site is allocated for employment development under reference ‘ES10 – Land South of Dearne Valley Parkway’ of the BMBC Local Plan.

13.8 In relation to transport, the policy relating to Site ES10 sets out that the Development will be subject to the production of a phased Masterplan Framework and will be expected to:

> *'Improve the highway network to mitigate the impact of additional traffic generated by the development on surrounding roads and in particular effects on the A635 and other strategic road links to the A1/M and M1 motorways" .*
>
> *"Provide appropriate access to housing site reference HS51 from Billingley View through the south east corner of the site" .*
>
> *"Provide an air quality assessment to assess the impacts of traffic emissions within air quality management areas along the A635 and other strategic road links to the A1/M and M1. Any adverse impacts on air quality should be mitigated in accordance with policy AQ1.'*

13.9 The Goldthorpe Masterplan Framework was adopted by BMBC in September 2021[iv].

Assessment Methodology

Consultation

13.10 The EIA Scoping exercise undertaken is summarised in Chapter 2 EIA Methodology of the ES. This chapter has been prepared based on the EIA Scoping Opinion received from BMBC (refer to Appendix 2.2), in accordance with the requirements of the Town and Country Planning (Environmental Impact Assessment) Regulations 2017 (as amended) (the 'EIA Regulations')[v].

13.11 In relation to Transport and Access, the EIA Scoping Opinion set out that the TA to be prepared and submitted as part of the planning application will form the basis of network assessment from a highways perspective.

13.12 In preparing the TA, a Scoping Note was submitted to highways officers at BMBC as the Local Planning and Highway Authority and given the anticipated potential impacts on the wider local and strategic transport networks, this was also submitted to City of Doncaster Council (CDC) and National Highways (NH). The Scoping Note set out the assessment scenarios and input parameters for the assessment. Subsequent discussions regarding the input parameters have been held between Fore and highways officers at BMBC and DC.

13.13 The EIA Scoping Opinion also set out that a Framework Travel Plan (FTP) should be submitted with the application and implemented at the Development, with the overall aim of reducing single-occupancy car trips made to/from the Development. This document has been submitted with the planning application and includes principles that will inform future occupier-led Travel Plans that will be submitted as part of future reserved matters applications.

Scope of Assessment

13.14 The methodology used in this chapter accords with that set out in the guidance produced by the Institute of Environmental Management and Assessment (IEMA), the Environmental Assessment of Traffic and Movement[vi], which is hereafter referred to in this chapter as the 'IEMA guidelines'.

13.15 A TA and a FTP have been prepared and submitted with the planning application. These documents have informed the assessment undertaken within this chapter.

13.16 The IEMA guidelines identify a number of environmental effects that may arise from changes in vehicular travel demand. This chapter considers the likely effects that the traffic generated by the Development would have on severance, driver delay, pedestrian delay, non-motorised user amenity, road safety, and fear and intimidation. The environmental effects listed will be considered in relation to anticipated changes in traffic volume and composition.

13.17 The environmental effects cover potential effects on the users of the roads within the study area, as well as adjacent land uses and communities.

13.18 The assessment of hazardous loads has been excluded from the scope of this assessment given that hazardous loads are not expected during the construction or operation of the Development.

Study Area

13.19 The study area for this chapter incorporates highway links where significant effects may potentially occur as a result of the Development and reflects that considered in the TA. The highway links comprising the study area are illustrated on Figure 13.1 and shown in Table 13.1.

Table 13.1: Study Area Highway Links

Highway Link ID	Road	Section
1	Proposed Site Access	South of the A635 (Proposed Access Road)
2	A635	West of Proposed Site Access
3	A635	East of Proposed Site Access
4	Billingley Green Lane	North of the A635
5	A635	West of Billingley Green Lane
6	A635	East of Cathill Roundabout
7	A6195	North of Cathill Roundabout
8	A635	West of Cathill Roundabout
9	A6195	South of Cathill Roundabout
10	A6195	Northeast of Broomhill Roundabout
11	A633 Manvers Way	Southeast of Broomhill Roundabout
12	A6195	Between Broomhill Roundabout and Wath Road Roundabout
13	A633 Wath Road	Northwest of Wath Road Roundabout
14	A6195	Between Wath Road Roundabout and Cortonwood Roundabout
15	A6195	West of Cortonwood Roundabout
16	Dudley Drive	Entire Road
17	Commercial Road	Entire Road
18	Highgate Lane	South of Junction with Commercial Road
19	Barnsley Road	East of Hollygrove Roundabout
20	A635	East of Hollygrove Roundabout
21	A635	West of Fields End Roundabout
22	Barrowfield Road	North of Fields End Roundabout
23	B6098	South of Fields End Roundabout
24	A635	East of Fields End Roundabout
25	A635	West of Red Hill Lane/Hickleton Road Junction
26	Red Hill Lane	North of the A635
27	A635	East of Red Hill Lane/Hickleton Road Junction
28	A635	West of Blacksmiths Lane Junction
29	A635	East of Blacksmiths Lane Junction
30	A635	West of Church Lane Junction
31	A635	East of Church Lane Junction
32	A635	West of A1(M) Junction 37
33	A1(M) Junction 37	Northbound On Slip
34	A1(M) Junction 37	Southbound Off Slip
35	A635	East of A1(M) Junction 37

Highway Link ID	Road	Section
36	A1(M) Junction 37	Southbound On Slip
37	A1(M) Junction 37	Northbound Off Slip

13.20 The following rules, taken from the IEMA guidelines, have been considered in determining the significance of the effects occurring as a result of the Development:

> *Rule 1 – Include highway links where traffic flows will increase by more than 30% (or the number of heavy goods vehicles will increase by more than 30%).*
>
> *Rule 2 – Include highway links of high sensitivity where traffic flows have increased by 10% or more.*

13.21 The IEMA guidelines state that projected changes in traffic flow of less than 10% should be assumed to create no discernible environmental impact given that the day-to-day variation of traffic flow is frequently at least + or -10%.

Determining Baseline Conditions

13.22 Baseline conditions on the study area have been determined as follows:

- The 2022 Base Year traffic flows have been derived from junction turning count surveys which were undertaken by an independent traffic survey company at key junctions across the study network on Tuesday 21 June 2022 between 07:00-09:00 and 15:00-18:00. Queue length surveys were undertaken at each of the junctions. The traffic flows have been factored to 18-hour (06:00-24:00) average annual weekday traffic (AAWT) flows and 24-hour average annual daily traffic (AADT) flows using factors identified from automatic traffic count (ATC) data on the A635 in Marr, as received from DC. The ATC data was available for March 2022;

- Local highway network descriptions have been informed by visits to the Site and detailed desktop study, including reviews of Google Maps/Street View data;

- The pedestrian network has been analysed through a detailed desktop study, including reviews of Google Maps/Street View data and Public Right of Way (PRoW) information published online by BMBC[vii];

- The cycling network has been analysed through a detailed desktop study, including reviews of Google Maps/Street View data and information published online by BMBC, and Sustrans; and

- Personal injury collision data has been obtained from BMBC and CDC for the period covering 2015-2022. The years 2020 and 2021 have been excluded from the assessment given collision records on the network may have been affected by changes in traffic flows as a result of Covid pandemic restrictions.

Assessment Scenarios

13.23 To assess the likely significant effects of the Development, the following assessment scenarios have been considered within this chapter. These scenarios reflect those considered within the TA.

13.24 **2022 Base Year:** This scenario represents the existing conditions on the local highway network.

13.25 **2028 Do Minimum:** The 2028 Do Minimum scenario represents a future year situation on the highway network without the Development in place. This scenario includes 2022 base year traffic, relevant background traffic growth and cumulative development traffic. This is set out in further detail in the 'Future Baseline' section of this chapter.

13.26 **2028 With Development:** The 2028 With Development scenario represents a future year situation on the highway network with the Development in place. The traffic flows have been derived by adding the

Development traffic flows (which reflect the predicted trip generation for the completed Development) to the 2028 Do Minimum traffic flows.

13.27 The trip generation associated with the Development has been estimated based on comparable survey sites within the Trip Rate Information Computer System (TRICS) database. The trip rates derived from TRICS are provided in the TA at Appendix 13.1.

13.28 The distribution of the car/light vehicle trips generated by the Development has been predicted based on the 2011 Census dataset 'WU03EW - Location of usual residence and place of work by method of travel to work (MSOA level)' and routing derived from Google Maps Journey Planner. A population-based gravity model has been produced to derive the HGV trip distribution.

13.29 The likely significant effects of the Development have been determined by comparing the predicted traffic flows and local junction operation in the 2028 Do Minimum and the 2028 With Development assessment scenarios.

13.30 As well as the assessments described above (which reflect the operational effects associated with the Development), an assessment of the likely environmental effects during the construction phase will be undertaken.

Determining Effect Significance

13.31 The significance of an effect is derived from a measurement of the magnitude of impact and the sensitivity of the receptors affected. Categories of sensitivity and magnitude are defined and assessed to determine the significance of the effect.

13.32 The magnitude of impact and the sensitivity of the affected receptors are assessed on a scale of high, moderate, low and negligible.

13.33 The significance of the likely effects of the Development has been determined using the criteria set out in the IEMA guidelines and professional judgement.

13.34 The IEMA guidelines identify a number of environmental effects that may arise from changes in vehicular travel demand and set out the broad principles of how to assess the magnitude of impact for each category. This is summarised below:

- **Severance:** This is the perceived division that can occur within a community when it becomes separated by major transport infrastructure. Such division may result from the crossing of a heavily trafficked road or a physical barrier created by infrastructure. The measurement and prediction of severance is difficult, but relevant factors include road width, traffic flow and composition, vehicle speed, the availability of crossing facilities and the number of pedestrian movements across the affected route. The IEMA guidelines set out that changes in traffic flow of 30%, 60% and 90% are regarded to produce 'slight', 'moderate' and 'substantial' changes in severance, respectively. It is advised that these broad indicators should be used with care and regard paid to specific local conditions such as sensitivity of adjacent land uses, prevalence of vulnerable people, whether or not crossing facilities are provided and traffic signal settings.

- **Driver Delay:** The IEMA guidelines note that driver delay can occur at several points on the network, although the effects are only likely to be significant when the traffic on the highway network is predicted to already be at, or close to, the capacity of the system. For the purposes of this assessment, reference is made to junction capacity assessments undertaken in the TA.

- **Pedestrian Delay:** The IEMA guidelines note that changes in the volume, composition or speed of traffic may affect the ability of a person to cross a road. In general, increases in the traffic levels are likely to lead to increased pedestrian delay. The guidelines do not set definitive thresholds for assessing pedestrian delay, recommending instead that assessors use their judgement to determine the significance of the effect. The assessment of pedestrian delay serves as a proxy for delay that other modes of non-motorised users may experience when crossing roads.

- **Non-Motorised User Amenity:** This is broadly defined as the relative pleasantness of a journey. It is affected by traffic flow, traffic composition, footway width and separation from traffic. The IEMA guidelines suggest a tentative threshold for judging the significance of a change in non-motorised user amenity where the traffic flow (or the heavy good vehicles (HGV) component) is halved or doubled.

- **Fear and Intimidation:** The IEMA guidelines note that a further environmental impact that traffic may have on people is fear and intimidation created by all moving objects. The impact of fear and intimidation is dependent upon the volume of traffic, the HGV composition, the proximity of traffic to people and the lack of protection caused by factors such as narrow footway width. The IEMA guidelines state that there are no commonly agreed thresholds for estimating fear and intimidation from known traffic and physical conditions. Some traffic flow thresholds are however identified in the IEMA guidelines. These are shown in Table 13.2.

Table 13.2: Fear and Intimidation Thresholds

Level of Fear and Intimidation	Average Hourly Traffic Flows over 18-Hour Day	Total 18-Hour HGV Flow
Extreme	>1,800	>3,000
Great	1,200-1,800	2,000-3,000
Moderate	600-1,200	1,000-2,000
Negligible	<600	<1,000

- **Road Safety:** The IEMA guidelines refer to the identification of any collision clusters on the local highway network including any patterns or factors that could be exacerbated by traffic or movement generation. For the purposes of this assessment, reference is made to the assessment of road traffic collision data as undertaken in the accompanying TA.

Magnitude of Impact

13.35 The magnitude of impact will be assessed based upon the criteria shown in Table 13.3.

Table 13.3: Criteria for Assessing Magnitude of Impact

Magnitude of Impact	Criteria for Assessing Impact
High	Total loss or major/substantial alteration to key elements/features of the baseline (pre-Development) conditions such that the post Development character/composition/attributes will be fundamentally changed.
Moderate	Loss or alteration to one or more key elements/features of the baseline conditions such that post Development character/composition/attributes of the baseline will be materially changed.
Minor	A minor shift away from baseline conditions. Change arising from the loss/alteration will be discernible/detectable but not material. The underlying character/composition/attributes of the baseline condition will be similar to the pre-Development circumstances/situation.
Negligible	Very little change from baseline conditions. Change barely distinguishable, approximating to a 'no change' situation.

Receptors and Receptor Sensitivity

13.36 The IEMA guidelines identify groups, locations and areas which may be sensitive to changes in traffic conditions and which should be considered for assessment. These are set out below:

- People at home;

- People at work;
- Sensitive and/or vulnerable groups (including young age older age, income, health status, social disadvantage, and access and geographic factors);
- Locations with concentrations of vulnerable users, e.g. hospitals, places of worship, schools;
- Retail areas;
- Recreational areas;
- Tourist attractions;
- Collision clusters and routes with road safety concerns;
- Junctions and highway link at (or over) capacity.

13.37 Categories of receptor sensitivity have been defined as follows:

- The need to identify particular groups or locations which may be sensitive to changes in traffic conditions.
- The list of affected groups and special interests set out in the IEMA guidelines.
- The identification of links or locations where it is felt that specific environmental problems may occur. Such locations could include collision black spots, conservation areas, hospitals, links with high pedestrian flows etc.

13.38 These categories have been used to outline, in broad terms, the sensitivity of receptors to traffic for the types of effect assessed in this chapter, although each receptor assessed will have a different sensitivity to each specific effect.

13.39 Table 13.4 provides a summary of the sensitivity of receptors, categorised either as high, moderate or low.

Table 13.4: Sensitivity of Receptors

Category	Receptor Sensitivity	Receptor Type
High	The receptor has little ability to absorb change without fundamentally altering its present character or is of international or national importance.	Schools, colleges, playgrounds, collision black spots, retirement homes, roads used by pedestrians with no footways.
Moderate	The receptor has moderate capacity to absorb change without significantly altering its present character or is of high importance.	Congested junctions, surgeries and clinics, hospitals, shopping areas with roadside frontage, roads used by pedestrians with narrow footways, parks and recreational areas.
Low	The receptor is tolerant of change without detriment to its character or is of low or local importance.	Places of worship, public open space, tourist/visitor attractions and residential and employment areas with adequate footway provision.

Determining Effect Significance

13.40 The significance of the effect is judged on the relationship of the magnitude of impact and the sensitivity of the receptor. A matrix that has been used to determine the significance of the effects is set out in Table 13.5. Effects can be adverse, beneficial or negligible.

Table 13.5: Criteria for Assessing Effect Significance

Sensitivity of Receptor	Magnitude of Impact			
	High	**Moderate**	**Minor**	**Negligible**
High	Major	Major	Moderate	Negligible
Moderate	Major	Moderate	Minor	Negligible
Low	Moderate	Minor	Negligible	Negligible

13.41 The following terms have been used to define the significance of the effects identified:

- Major effect – where the Development could be expected to have a very significant effect (either beneficial or adverse) on the existing environment.
- Moderate effect – where the Development could be expected to have a noticeable effect (either beneficial or adverse) on the existing environment.
- Minor effect – where the Development could be expected to result in a small, barely noticeable effect (either beneficial or adverse) on the existing environment.
- Negligible effect – where no discernible effect is expected as a result of the Development on the existing environment.

13.42 Moderate and major effects are considered to be 'significant' for the purposes of this assessment. Mitigation measures should be identified (where appropriate) to avoid, reduce or offset any significant adverse effects. Mitigation measures will not be identified for non-significant effects (e.g. minor adverse or negligible effects).

13.43 The temporal scope of impacts can be described as short, medium, long-term, or permanent as shown below:

- Short term – less than 12 months;
- Medium term – between 1 to 5 years;
- Long term – more than 5 years;
- Permanent – impacts that are considered to be 'irreversible' or extremely long lasting.

Limitations and Assumptions

13.44 The assessment undertaken within this chapter is based on surveyed traffic flow data, which is subject to variation and change in the future. The assessment is also based on estimations of trip generation and distribution which, although based on surveys of comparable developments and appropriate Census data, are similarly subject to variation in future. Further, the anticipated average daily construction traffic flows are subject to daily variation.

13.45 Whilst all traffic flows are therefore forecast, this is an accepted method of assessment.

13.46 The years 2020 and 2021 have been excluded from the personal injury collision assessment given collision records on the network may have been affected by changes in traffic flows as a result of Covid pandemic restrictions.

Baseline Conditions

Local Highway Network

13.47 The local highway network is summarised below.

A635

13.48 The A635 runs east-west along the northern boundary of the Site. The Development will take access onto the A635 via a new three-arm roundabout. Planning consent for the roundabout was granted by BMBC on 16 February 2022 (application reference 2021/1511) and at the time of writing the circulatory carriageway has been constructed.

13.49 The A635 is a key route within the area and provides a connection to the strategic road network to the east via A1(M) Junction 37. The road connects between Barnsley and Doncaster.

13.50 In the immediate vicinity of the Site, the A635 is a single carriageway with one lane in each direction. The road connects to Cathill Roundabout and the A6195 to the west and Hollygrove Roundabout to the east. Beyond Hollygrove Roundabout, the road passes through Fields End Roundabout and the villages of Hickleton and Marr before reaching A1(M) Junction 37.

13.51 The road is subject to the national speed limit (60mph) with 30mph and 40mph speed limits in operation through the villages of Hickleton and Marr, respectively. Average speed checks are in operation through both villages.

A6195

13.52 The A6195 runs north-south approximately 750m to the west of the Site boundary. The A6195 is a key route within the area and connects between the A628 at Shafton and M1 Junction 36.

13.53 The A6195 connects to the A635 at Cathill Roundabout and the A633 at Broomhill Roundabout. Between Cathill Roundabout, Broomhill Roundabout and Wath Road Roundabout, the A6195 is a single carriageway with one lane in each direction. Between Wath Road roundabout and M1 Junction 36, the road is dual carriageway, with two lanes in each direction.

13.54 The road is subject to the national speed limit.

Traffic Flow Data

13.55 The baseline 24-hour Average Annual Daily Traffic (AADT) and 18-hour Average Annual Weekday Traffic (AAWT) flows for all links within the study area (see Table 13.1 and Figure 13.1) are set out in Table 13.6.

Table 13.6 Base 2022 AADT 24-Hour and AAWT 18-Hour Traffic Flow Data

Highway Link ID	Average Annual Daily Traffic (AADT) 24-Hour Data (00:00-24:00)		Average Annual Daily Traffic (AAWT) 18-Hour Data (06:00-24:00)	
	All Vehicles	HGV	All Vehicles	HGV
1	0	0	0	0
2	22,607	2,306	23,108	2,496
3	22,607	2,306	23,108	2,496
4	835	36	850	39
5	21,874	2,301	22,363	2,490
6	21,893	2,260	22,380	2,445
7	18,090	1,402	18,461	1,517
8	14,226	1,027	14,513	1,111

Highway Link ID	Average Annual Daily Traffic (AADT) 24-Hour Data (00:00-24:00)		Average Annual Daily Traffic (AAWT) 18-Hour Data (06:00-24:00)	
	All Vehicles	HGV	All Vehicles	HGV
9	25,334	1,977	25,855	2,140
10	25,412	1,958	25,933	2,119
11	22,462	1,583	22,913	1,713
12	24,709	1,613	25,196	1,746
13	13,453	696	13,706	753
14	26,350	1,747	26,871	1,891
15	22,616	1,799	23,083	1,947
16	4,181	852	4,302	922
17	2,850	145	2,904	157
18	10,030	356	10,208	385
19	6,923	378	7,055	409
20	15,031	2,328	15,417	2,519
21	14,922	2,281	15,303	2,469
22	5,120	498	5,232	539
23	4,120	257	4,201	279
24	14,665	2,424	15,052	2,623
25	19,772	2,720	20,257	2,943
26	3,177	197	3,239	213
27	16,425	2,577	16,849	2,789
28	16,541	2,624	16,970	2,839
29	20,298	2,816	20,798	3,047
30	20,322	2,783	20,819	3,011
31	19,826	2,769	20,315	2,996
32	19,870	2,777	20,361	3,005
33	3,466	553	3,556	599
34	4,135	567	4,236	614
35	14,098	967	14,379	1,046
36	6,575	855	6,733	925
37	7,135	1,063	7,316	1,150

Junction Capacity Assessments – 2022 Base Year

13.56 The 2022 Base Year Weekday AM and PM peak hour operation of junctions in the study area has been considered in detail as part of the TA. To provide a robust assessment within the TA, the Weekday AM and PM peak hours identified for each junction have been considered.

13.57 The junctions have been modelled using Junction10 software which, amongst other performance indicators and statistics, calculates the Ratio of Flow to Capacity (RFC) of each arm. The RFC is a key indicator of the likely performance of a turning movement at a junction under a given set of traffic flows. An RFC of 0.85 is widely accepted as being at the level at which a junction's practical capacity is reached and an RFC of 1.00 the level at which a junction's theoretical absolute capacity is reached. However, RFC values in excess of these thresholds do not indicate a situation that is inherently unacceptable; it indicates that further consideration of operating conditions (including impacts on queues) is appropriate.

13.58 The junction models have been validated based on comparisons with queue length surveys. As such, the junction models are considered to reflect the existing operation of the junctions. Further detail of the model validation is provided in the TA. The modelling for each junction is summarised below:

- **Hollygrove Roundabout:** The modelling undertaken indicates that in the 2022 Base Year, all arms of the junction operate with RFC values of less than 0.85. The maximum RFC of 0.74 occurs during the Weekday PM peak hour on the A635 (east) arm of the junction.

- **Highgate Lane/Commercial Road three-arm priority junction:** The modelling undertaken indicates that in the 2022 Base Year, all arms of the junction operate with RFC values of less than 0.85. The maximum RFC of 0.40 occurs during the Weekday PM peak hour on the Commercial Road arm of the junction.

- **Fields End Roundabout:** The modelling undertaken indicates that in the 2022 Base Year, all arms of the junction operate with RFC values of less than 0.85. The maximum RFC of 0.61 occurs during the Weekday AM peak hour on the A635 (west) arm of the junction.

- **A635/Red Hill Lane/Hickleton Road crossroads:** The modelling undertaken indicates that in the 2022 Base Year, all arms operate with RFC values of less than 0.85, with the exception of the Red Hill Lane arm which operates with an RFC of 0.91 during the Weekday AM peak hour.

- **A635/Blacksmiths Lane three-arm priority junction:** The modelling undertaken indicates that in the 2022 Base Year, all arms of the junction operate with RFC values of less than 0.85. The maximum RFC of 0.82 occurs during the Weekday AM peak hour on the Blacksmiths Lane arm of the junction.

- **A635/Church Lane three-arm priority junction:** The modelling undertaken indicates that in the 2022 Base Year, all arms of the junction operate with RFC values of less than 0.85. The maximum RFC of 0.64 occurs during the Weekday AM peak hour on the Church Lane (right-turn) arm of the junction.

- **Cathill Roundabout:** The modelling undertaken indicates that in the 2022 Base Year, all arms of the junction operate with RFC values of less than 0.85. The maximum RFC of 0.57 occurs during the Weekday AM peak hour on the A635 (west) arm of the junction.

- **Broomhill Roundabout:** The modelling undertaken indicates that in the 2022 Base Year, all arms of the junction operate with RFC values of less than 0.85. The maximum RFC of 0.68 occurs during the Weekday PM peak hour on the A633 Manvers Way arm of the junction.

- **Wath Road Roundabout:** The modelling undertaken indicates that in the 2022 Base Year, all arms of the junction operate with RFC values of less than 0.85. The maximum RFC of 0.63 occurs during the Weekday PM peak hour on the A6195 (west) arm of the junction.

- **Cortonwood Roundabout:** The modelling undertaken indicates that in the 2022 Base Year, all arms of the junction operate with RFC values of less than 0.85. The maximum RFC of 0.73 occurs during the Weekday PM peak hour on the A6195 (north) arm of the junction.

Road Safety

13.59 Collisions recorded at key junctions within the study area for the period covering 2015-2022 (excluding 2020 and 2021 given collision records may have been affected by changes in traffic flows as a result of Covid pandemic restrictions) are summarised in Table 13.7. Further detail of the collisions is provided at in the TA at Appendix 13.1.

Table 13.7: Personal Injury Collision Summary

Junction	Accident Severity			Total
	Slight	Serious	Fatal	
A635 / Billingley Green Lane	2	0	0	2
Hollygrove Roundabout	1	0	0	1
Highgate Lane / Commercial Road	1	1	0	2
Fields End Roundabout	1	0	0	1
A635 / Red Hill Lane / Hickleton Road	9	3	1	13
A635 / Blacksmiths Lane	4	0	0	4
A635 / Church Lane	5	1	0	6
A1(M) Junction 37 (Marr Roundabout)	12	1	0	13
Cathill Roundabout	13	2	0	15
Broomhill Roundabout	3	0	0	3
Wath Road Roundabout	8	2	0	10
Cortonwood Roundabout	3	3	0	6

13.60 A total of 76 collisions have been recorded at the junctions within the study area during the period covering 2015-2022 (excluding 2020 and 2021). Of the 76 collisions, 62 were classified as being of 'slight' severity, 13 as 'serious' and one resulted in fatalities. Given the daily traffic flows, the number of collisions occurring at the junctions is considered to be relatively low.

13.61 In addition to the above, a fatal collision involving a HGV and a pedestrian occurred on the A635 in Hickleton in August 2023. At the time of writing, the collision is subject to a police investigation. As such, causation factors for the collision are not available.

13.62 Table 13.8 provides a summary of the recorded causation factors of the collisions. It is apparent that the vast majority of collisions occurred for reasons indicative of driver error. The causation factors do not suggest a specific road safety issue on the network that would need to be addressed.

Table 13.8: Recorded Causation Factors

Recorded Causation Factor	Occurrence
Failed to Look Properly	23
Failed to Judge Other Persons Path or Speed	23
Careless/Reckless/In a Hurry	17
Poor Turn or Manoeuvre	8
Weather Related	6
Loss of Control	3
Learner or Inexperienced Driver/Rider	4
Sudden Braking	4
Following too Close	4
Slippery Road Surface	4
Disobeyed Double White Lines, Give Way or Stop Sign	3
Speeding	3
Swerved	2
Distraction	2

Recorded Causation Factor	Occurrence
Deposit on the Road (e.g. Oil, Mud, Chippings)	2
Driver Error by Junction Overshoot	2
Aggressive Driving	2
Vision Affected by Road Layout	1
Impaired by Alcohol	1
Junction Restart	1
Road Layout e.g. Bend, Hill etc.	1
Vehicle in course of crime	1

Pedestrian Network

13.63 Residential areas in west Goldthorpe, west Bolton-upon-Dearne and Billingley village are located within 2km walking distance of the Site (the Chartered Institution of Highways and Transportation (CIHT)[viii] suggests 2km as the preferred maximum walking distance for commuting). The 2km walking catchment is illustrated on Figure 13.2.

13.64 A footway is provided on the northern side of the section of the A635 to the immediate north of the Site between Hollygrove Roundabout and Cathill Roundabout.

13.65 At Hollygrove Roundabout, dropped kerbs and pedestrian refuge islands are provided on the Barnsley Road, Dudley Drive and A635 (West) arms. This allows for pedestrian access between Goldthorpe and the Site via Barnsley Road or Dudley Drive/Commercial Road, where footways are provided. Street lighting is provided along the routes between the Site and Goldthorpe.

13.66 PRoW Footpath Number 15 (FP15) runs through the Site between the A635 and Carr Field Lane. FP15 runs along the western perimeter of the adjacent Aldi Goldthorpe Regional Distribution Centre. A footway is provided on the southern side of Carr Field Lane and on both sides of Billingley View. Street lighting is provided at Carr Field Lane/Billingley View.

13.67 Towns and villages such as Bolton upon Dearne, Goldthorpe, Thurnscoe, Mexborough, Wath upon Dearne and Wombwell are located within 8km cycling distance of the Site (8km is typically considered to be acceptable for a range of journey purposes, including commuting[ix]). The 8km cycling catchment is illustrated on Figure 13.3.

13.68 The BMBC cycling network map[x] shows a number of local cycling routes in the vicinity of the Site. This includes a route that connects between Highgate Lane, Carr Field Lane and National Cycle Route 62 via a disused railway line.

13.69 The Sustrans Cycle Map[xi] shows National Cycle Routes (NCR) 62 and 67 are located within the 8km cycling distance catchment. The NCRs are outlined below:

- NCR 62 provides a connection between northern areas of Doncaster to the east and Wombwell, and Worsbrough to the west. This section of NCR 62 is predominantly traffic-free. The route is accessible from the B6098 Mexborough Road approximately 3.6km cycling distance to the south east of the Site, and the B6273 Pontefract Road approximately 3.8km cycling distance to the south west of the Site. NCR 62 connects to NCR 67 at Wombwell; and

- NCR 67 provides a connection between Barnsley and Sheffield. NCR 67 is predominantly traffic-free towards Barnsley and a combination of on-road/traffic-free towards Sheffield. The route is accessible from NCR 62, approximately 6.4km cycling distance to the south west of the Site.

13.70 The key local routes are illustrated on Figure 13.3.

Public Transport Network

13.71 The public network within the vicinity of the Site has been analysed through a detailed desktop study, including reviews of Google Maps/Street View data and information published online by bus and rail operators.

13.72 The nearest bus stops to the Site are located on the A635 to the west, Barnsley Road to the east, and Carr Field Lane to the south east. The bus stop locations are illustrated on Figure 13.4.

13.73 The A635 stop provides access to the 203, 208, 218, 218a, 219e, and X19 services. The Barnsley Road stops provide access to the 208, 218, 218a, 219, 226, and X19 services. The Carr Field Lane and Carr Head Lane stops provide access to the 218 and 218a services. The services are operated by Stagecoach. The bus services at the stops outlined above are summarised in Table 13.9.

Table 13.9: Bus Service Summary

Service	Route	Approximate Daytime Frequency (In Each Direction)		
		Monday-Friday	Saturday	Sunday
203	Wombwell – Doncaster	3 services per day	3 services per day	No service
208	Rotherham Interchange – Grimethorpe	3 services per day	3 services per day	3 services per day
218	Barnsley Interchange – Rotherham Interchange	Hourly	Hourly	No service
218A		Hourly	Hourly	No service
219E	Doncaster Interchange – Barnsley Interchange	5 per evening	5 per evening	3 per evening
226	Barnsley Interchange – Thurnscoe	30 Minutes	30 Minutes	Hourly
X19	Barnsley Interchange – Doncaster Interchange	Hourly	Hourly	Hourly

13.74 Goldthorpe and Bolton-upon-Dearne are the nearest rail stations to the Site and are located approximately 1.5km and 1.7km (straight line measurement) from the Site. The stations are located on the Wakefield Line and are operated by Northern who run an hourly service Monday to Sunday, southbound to Sheffield and Rotherham and northbound to Leeds and Wakefield Westgate.

Future Baseline

13.75 The future baseline considers the conditions on the local highway network if the Development was not to come forward (the 2028 Do Minimum assessment scenario).

13.76 This assessment scenario includes local background traffic growth from 2022 to 2028 as taken from TEMPro, as well as cumulative development traffic.

13.77 Cumulative development traffic has been obtained from a combination of committed developments and potential sites associated with Local Plan allocations, as requested by BMBC in relation to the TA to be submitted as part of the planning application. The sites considered are set out in Table 13.10.

Table 13.10: Cumulative Development Site List

Local Plan Ref.	Planning Application Ref.	Description
ES8	2020/1032	B2 and B8 development at Park Spring Road, Grimethorpe
ES11	2021/0012	7,400 sqm extension to existing warehouse at Fields End Business Park, Portwest, Colliery Lane, Thurnscoe
ES12	N/A	Thurnscoe Business Park – 6ha (1.5ha left to develop)
ES20	2018/1353	B1, B2 and B8 development at Land at Everill Gate, Wombwell
ES23	2021/1282	19,147 sqm employment development (Class E, B2 and B8) at Land at Houghton Main, Park Spring Road, Little Houghton
HS42	N/A	Land South of Lowfield Road, Bolton upon Dearne – 86 residential dwellings (indicative)
HS43	2017/1051	479 residential dwellings at Land off Willow Road, Thurnscoe
HS44	N/A	Bolton House Farm – 194 residential dwellings (indicative)
HS45	2020/1439	68 residential dwellings at Land off Barnburgh Lane, Goldthorpe
HS46	2021/1171	137 residential dwellings at Lockwood Road, Goldthorpe
HS47	2022/0420	109 residential dwellings at Land off Goldthorpe Road, Goldthorpe
HS48	N/A	Land North of Barnburgh Lane, Goldthorpe – 109 residential dwellings (indicative)
HS49	2019/1274	116 residential dwellings at Land at Kingsmark Way, Goldthorpe
HS50	N/A	Site at Brunswick Street – 45 residential dwellings (indicative)
HS51	N/A	Site to the west of Broadwater Estate - 279 residential dwellings (indicative)
HS52	N/A	Land west of Thurnscoe Bridge Lane and south of Derry Grove, Thurnscoe – 308 residential dwellings (indicative)
HS53	N/A	Site south of King Street, Thurnscoe – 25 residential dwellings (indicative)
HS54	N/A	Land off Gooseacre Avenue, Thurnscoe - 80 residential dwellings (indicative)
HS55	N/A	Former Highgate Social Centre - 29 residential dwellings (indicative)
HS92	N/A	Everill Gate Farm - 26 residential dwellings (indicative)
MU6	2019/0089	235 residential dwellings at Lundhill Road, Wombwell
N/A	2015/1198	61 residential dwellings at Land off Barnburgh Lane, Goldthorpe (Phase 2)
N/A	2017/1001	150 residential dwellings at Land east of Lundhill Road, Wombwell
N/A	2020/1246	43 residential dwellings at Land off Barnsley Road, Goldthorpe
N/A	2022/0056	1,979 sqm retail unit at Former Goldthorpe Primary School, High Street, Goldthorpe

13.78 Traffic flow information for the above cumulative development sites has been included based on information submitted with their respective planning applications, where applicable. Where there are no planning applications (e.g. allocated sites), a trip generation/distribution exercise has been undertaken.

13.79 This sub-section sets out the future year (2028 Do Minimum assessment scenario) traffic flows and the operation of key junctions as a result of background traffic growth and the addition of cumulative development traffic. For the purpose of this assessment, it is assumed that all other baseline conditions as set out in the 'Baseline Conditions' sub-section of this chapter are to remain the same.

13.80 The 2028 Do Minimum traffic flows on all highway links in the study area are shown in Table 13.11.

Table 13.11: 2028 Do Minimum AADT 24-Hour and AAWT 18-Hour Traffic Flow Data

Highway Link ID	Average Annual Daily Traffic (AADT) 24-Hour Data (00:00-24:00)		Average Annual Daily Traffic (AAWT) 18-Hour Data (06:00-24:00)	
	All Vehicles	HGV	All Vehicles	HGV
1	0	0	0	0
2	25,795	2,366	26,531	2,560
3	25,795	2,366	26,531	2,560
4	910	37	931	40
5	24,996	2,360	25,714	2,554
6	24,998	2,318	25,712	2,508
7	20,273	1,438	20,734	1,557
8	15,578	1,054	15,944	1,140
9	28,264	2,028	28,979	2,195
10	28,344	2,009	29,058	2,174
11	24,528	1,624	25,124	1,757
12	26,765	1,655	27,371	1,791
13	14,804	714	15,142	772
14	28,231	1,792	28,859	1,940
15	24,373	1,846	24,943	1,997
16	5,029	874	5,229	946
17	3,158	149	3,237	161
18	11,437	365	11,727	395
19	8,715	388	9,003	420
20	16,234	2,388	16,680	2,584
21	16,121	2,340	16,563	2,533
22	5,750	511	5,891	553
23	4,785	264	4,917	286
24	15,887	2,486	16,354	2,691
25	21,829	2,790	22,464	3,019
26	3,378	202	3,452	219
27	18,275	2,644	18,837	2,861
28	18,367	2,692	18,931	2,913
29	22,221	2,888	22,857	3,125
30	22,245	2,854	22,880	3,089
31	21,737	2,840	22,362	3,074
32	21,782	2,849	22,409	3,083
33	3,648	568	3,748	614
34	4,334	582	4,445	629
35	14,868	992	15,194	1,073
36	7,151	877	7,349	949
37	7,721	1,090	7,941	1,180

13.81 The Weekday AM and PM peak hour operation of key junctions on the study network has been considered for the 2028 Do Minimum assessment scenario in detail as part of the modelling undertaken for the TA.

13.82 The modelling for each junction is summarised below:

- **Hollygrove Roundabout:** The modelling undertaken indicates that in the 2028 Do Minimum assessment scenario, all arms of the junction are predicted to continue to operate with RFC values of less than 0.85, except for the A635 (east) arm during the Weekday PM peak hour which is predicted to operate with an RFC of 0.85.

- **Highgate Lane/Commercial Road three-arm priority junction:** The modelling undertaken indicates that in the 2028 Do Minimum assessment scenario, all arms of the junction are predicted to continue to operate with RFC values of less than 0.85. The maximum RFC of 0.48 occurs during the Weekday PM peak hour on the Commercial Road arm of the junction.

- **Fields End Roundabout:** The modelling undertaken indicates that in the 2028 Do Minimum assessment scenario, all arms of the junction are predicted to continue to operate with RFC values of less than 0.85. The maximum RFC of 0.67 occurs during the Weekday AM peak hour on the A635 (west) arm of the junction.

- **A635/Red Hill Lane/Hickleton Road crossroads:** The modelling undertaken indicates that in the 2028 Do Minimum assessment scenario, the Red Hill Lane arm of the junction is predicted to operate with RFC values in excess of 1.00 during both the Weekday AM and PM peak hours. The maximum RFC of 1.37 occurs during the Weekday AM peak hour.

- **A635/Blacksmiths Lane three-arm priority junction:** The modelling undertaken indicates that in the 2028 Do Minimum assessment scenario, the Blacksmiths Lane arm of the junction is predicted to operate with RFC values in excess of 1.00 during both the Weekday AM and PM peak hours. The maximum RFC of 1.07 occurs during the Weekday PM peak hour.

- **A635/Church Lane three-arm priority junction:** The modelling undertaken indicates that in the 2028 Do Minimum assessment scenario, the Church Lane arm of the junction is predicted to operate with RFC values in excess of 1.00 the Weekday AM peak hour. The maximum RFC of 1.36 occurs during the Weekday AM peak hour on the Church Lane (left-turn) arm of the junction.

- **Cathill Roundabout:** The modelling undertaken indicates that in the 2028 Do Minimum assessment scenario, all arms of the junction are predicted to continue to operate with RFC values of less than 0.85. The maximum RFC of 0.66 occurs during the Weekday AM peak hour on the A635 (west) arm of the junction.

- **Broomhill Roundabout:** The modelling undertaken indicates that in the 2028 Do Minimum assessment scenario, all arms of the junction are predicted to continue to operate with RFC values of less than 0.85. The maximum RFC of 0.78 occurs during the Weekday PM peak hour on the A633 Manvers Way arm of the junction.

- **Wath Road Roundabout:** The modelling undertaken indicates that in the 2028 Do Minimum assessment scenario, all arms of the junction are predicted to continue to operate with RFC values of less than 0.85. The maximum RFC of 0.69 occurs during the Weekday PM peak hour on the A6195 (west) arm of the junction.

- **Cortonwood Roundabout:** The modelling undertaken indicates that in the 2028 Do Minimum assessment scenario, all arms of the junction are predicted to continue to operate with RFC values of less than 0.85. The maximum RFC of 0.79 occurs during the Weekday PM peak hour on the A6195 (north) arm of the junction.

Likely Significant Effects

Construction Phase

13.83 Vehicle movements generated during the construction phase will be associated with the delivery of plant and construction materials, as well as construction staff travelling to and from the Site.

13.84 The predicted trip generation during the construction phase is significantly lower than that during the operational phase. As such, an assessment of the likely significant effects with regards to severance, driver delay, pedestrian delay, pedestrian amenity, fear and intimidation, and road safety has been

undertaken for the operational phase only, as the operational phase effects will represent the 'worst-case'. Further, any significant effects associated with the construction phase will be temporary (construction is expected to take place between summer 2024 and summer 2026, subject to gaining planning permission) whereas those associated with the operational phase will likely be permanent.

13.85 It is concluded later in this chapter that measures are not required to mitigate the Development's impact on severance, driver delay, pedestrian delay, pedestrian amenity, fear and intimidation or road safety during the operational phase. As the operational phase effects represent the 'worst-case', it is concluded that measures are also not required to mitigate the Development's impact on severance, driver delay, pedestrian delay, non-motorised user amenity, fear and intimidation or road safety during the construction phase. As such, the impact of the construction phase on these environmental effects is considered to be negligible.

13.86 Notwithstanding, a Construction Environmental Management Plan Framework (CEMPF) has been submitted as part of the application that will inform future plot-specific Construction Environmental Management Plan (CEMPs). The CEMPF contains a Construction Traffic Management Plan (CTMP) with compliance secured by a suitably-worded planning condition. The CEMPF and subsequent CEMPs considered at the Reserved Matters application stage will manage the environmental effects resulting from the construction works.

13.87 Further detail of the CEMPF and CTMP is provided in Chapter 5 of this ES.

Operational Phase

Severance

13.88 The IEMA guidelines set out that changes in traffic flow of 30%, 60% and 90% are regarded to produce 'slight', 'moderate' and 'substantial' changes in severance, respectively. It is advised that these broad indicators should be used with care and with regard paid to specific local conditions such as sensitivity of adjacent land uses, prevalence of vulnerable people, whether or not crossing facilities are provided and traffic signal settings.

13.89 The 2028 Do Minimum and 2028 With Development 24-Hour AADT flows on all highway links in the study area are shown in Table 13.12. The % change is also shown for each of the highway links.

Table 13.12: With and Without Proposed Development AADT 24-Hour

Highway Link ID	2028 Do Minimum		2028 With Development		% Change	
	All Vehicles (AADT)	HGV (AADT)	All Vehicles (AADT)	HGV (AADT)	All Vehicles (AADT)	HGV (AADT)
1	0	0	6,657	2,556	N/A	N/A
2	25,795	2,366	29,613	4,068	14.8%	72.0%
3	25,795	2,366	28,633	3,220	11.0%	36.1%
4	910	37	1,005	37	10.5%	0.0%
5	24,996	2,360	28,719	4,062	14.9%	72.1%
6	24,998	2,318	28,721	4,020	14.9%	73.4%
7	20,273	1,438	20,899	1,685	3.1%	17.2%
8	15,578	1,054	16,452	1,397	5.6%	32.6%
9	28,264	2,028	30,488	3,140	7.9%	54.8%
10	28,344	2,009	30,567	3,120	7.8%	55.3%
11	24,528	1,624	25,214	1,742	2.8%	7.3%
12	26,765	1,655	28,303	2,648	5.7%	60.0%
13	14,804	714	15,048	842	1.6%	18.0%
14	28,231	1,792	29,525	2,658	4.6%	48.3%

Highway Link ID	2028 Do Minimum		2028 With Development		% Change	
	All Vehicles (AADT)	HGV (AADT)	All Vehicles (AADT)	HGV (AADT)	All Vehicles (AADT)	HGV (AADT)
15	24,373	1,846	25,668	2,711	5.3%	46.9%
16	5,029	874	5,907	874	17.5%	0.0%
17	3,158	149	4,036	149	27.8%	0.0%
18	11,437	365	12,315	365	7.7%	0.0%
19	8,715	388	9,031	388	3.6%	0.0%
20	16,234	2,388	17,878	3,242	10.1%	35.8%
21	16,121	2,340	17,765	3,194	10.2%	36.5%
22	5,750	511	5,941	511	3.3%	0.0%
23	4,785	264	4,910	264	2.6%	0.0%
24	15,887	2,486	17,215	3,341	8.4%	34.3%
25	21,829	2,790	23,157	3,644	6.1%	30.6%
26	3,378	202	3,411	202	1.0%	0.0%
27	18,275	2,644	19,570	3,498	7.1%	32.3%
28	18,367	2,692	19,662	3,546	7.0%	31.7%
29	22,221	2,888	23,516	3,742	5.8%	29.6%
30	22,245	2,854	23,540	3,709	5.8%	29.9%
31	21,737	2,840	23,031	3,695	6.0%	30.1%
32	21,782	2,849	23,077	3,703	5.9%	30.0%
33	3,648	568	3,798	697	4.1%	22.8%
34	4,334	582	4,496	722	3.7%	24.2%
35	14,868	992	15,127	1,149	1.7%	15.9%
36	7,151	877	7,499	1,081	4.9%	23.3%
37	7,721	1,090	8,096	1,312	4.9%	20.4%

13.90 In relation to the total vehicle 24-Hour AADT flows presented in the table above, it can be seen that no highway links in the study area are predicted to exceed a % change in traffic flows above the thresholds suggested by the IEMA guidelines.

13.91 Regard should also be given to the composition of traffic, and it can be seen that the HGV component is predicted to increase to a level that could be considered to be significant in terms of severance (i.e., a % change in traffic flows above the thresholds suggested by the IEMA guidelines). The highway links where this is predicted to occur are set out in Table 13.13.

Table 13.13: AADT 24-Hour HGV Flows - % Change above IEMA Thresholds

Highway Link ID	Road	Section	% Change (HGV – AADT)	Likely Change in Severance (in accordance with IEMA Guidelines)
2	A635	West of Proposed Site Access	72.0%	Moderate
3	A635	East of Proposed Site Access	46.1%	Slight
5	A635	West of Billingley Green Lane	72.1%	Moderate
6	A635	East of Cathill Roundabout	63.4%	Moderate
8	A635	West of Cathill Roundabout	32.6%	Slight
9	A6195	South of Cathill Roundabout	54.8%	Slight
10	A6195	Northeast of Broomhill Roundabout	55.3%	Slight

Highway Link ID	Road	Section	% Change (HGV – AADT)	Likely Change in Severance (in accordance with IEMA Guidelines)
12	A6195	Between Broomhill Roundabout and Wath Road Roundabout	60.0%	Moderate
14	A6195	Between Wath Road Roundabout and Cortonwood Roundabout	48.3%	Slight
15	A6195	West of Cortonwood Roundabout	46.9%	Slight
20	A635	East of Hollygrove Roundabout	45.8%	Slight
21	A635	West of Fields End Roundabout	36.5%	Slight
24	A635	East of Fields End Roundabout	34.3%	Slight
25	A635	West of Red Hill Lane/Hickleton Road Junction	30.6%	Slight
27	A635	East of Red Hill Lane/Hickleton Road Junction	32.3%	Slight
28	A635	West of Blacksmiths Lane Junction	31.7%	Slight
31	A635	East of Church Lane Junction	30.1%	Slight
32	A635	West of A1(M) Junction 37	30.0%	Slight

13.92 Whilst the predicted HGV component increase could be considered to be significant in terms of severance i.e. resulting in either slight or moderate changes to severance (in accordance with the IEMA guidelines), it is considered that the links highlighted above (the A635 and the A6195) are of low sensitivity with regards to severance. This is due to the primary nature of the routes and the absence of built-up areas along both sides of the routes. Pedestrian flows across these roads are likely to be low.

13.93 Where there are built up areas on both sides of the road e.g. along the A1695 around Brampton, crossing facilities are provided on the Wath Road and Broomhill Roundabouts in the form of dropped kerbs with tactile paving. Pedestrian refuge is provided on the roundabout splitter islands.

13.94 A crossing facility is provided within Hickleton, where a slight change in severance is predicted (highway link 25), in the form of dropped kerbs. A pedestrian refuge island with barriers is also provided. Notwithstanding this, it is not likely that pedestrian flows across the A635 in this location will be significant.

13.95 Further, the majority of increases to the HGV component are likely to result in slight changes to severance, with the moderate changes predicted in the immediate vicinity of the proposed site access (highway links 2, 5 and 6) only. The exception to this is the section of the A6195 between Broomhill and Wath Road roundabouts (highway link 12), which is predicted to result in a 60.0% increase to the HGV component (i.e. on the threshold of slight/moderate). As discussed previously, crossing facilities are provided on the Wath Road roundabout, with dropped kerbs, tactile paving and pedestrian refuge on splitter islands.

13.96 Given the above, the likely effect of the Development in terms of severance is considered to be of **minor adverse** significance. The likely significant effect will be permanent.

13.97 In accordance with the methodology set out within this chapter (that mitigation measures will not be identified for non-significant effects (e.g. minor adverse or negligible effects)), measures are not required to mitigate the Development's impact on severance.

Driver Delay

13.98 The IEMA guidelines note that driver delay can occur at several points on the network, although the effects are only likely to be significant when the traffic on the highway network is predicted to already be at, or close to, the capacity of the system. As such, the analysis presented below considers the impact on driver delay for the junctions predicted to operate with an RFC value in excess of 0.85.

- **Hollygrove Roundabout:** The modelling undertaken indicates that in the 2028 With Development assessment scenario, all arms of the junction are predicted to continue to operate with RFC values of less than 0.85, except for the A635 (west) and A635 (east) arms during the Weekday PM peak hour which are predicted to operate with RFC values of 0.86 and 0.92, respectively. The increase in queuing on these arms is not considered to be significant when compared with the 2028 Do Minimum assessment scenario and the Development is not predicted to have a significant impact on the future operation of the junction. As such, the impact on driver delay is likely to be negligible.

- **A635/Red Hill Lane/Hickleton Road crossroads:** The modelling undertaken indicates that in the 2028 With Development assessment scenario, the Red Hill Lane arm of the junction is predicted to operate with RFC values in excess of 1.00 during both the Weekday AM and PM peak hours. The increase in queuing on these arms is not considered to be significant when compared with the 2028 Do Minimum assessment scenario. Further, an additional assessment, to isolate the impact of the Development, has been undertaken without traffic associated with NTM/TEMPro growth and committed developments. The Development, in isolation, is not predicted to have a significant impact on the future operation of the junction. As such, the impact on driver delay is likely to be negligible.

- **A635/Blacksmiths Lane three-arm priority junction:** The modelling undertaken indicates that in the 2028 With Development assessment scenario, the Blacksmiths Lane arm of the junction is predicted to operate with RFC values in excess of 1.00 during both the Weekday AM and PM peak hours. The increase in queuing on these arms is not considered to be significant when compared with the 2028 Do Minimum assessment scenario. Further, an additional assessment, to isolate the impact of the Development, has been undertaken without traffic associated with NTM/TEMPro growth and committed developments. The Development, in isolation, is not predicted to have a significant impact on the future operation of the junction. As such, the impact on driver delay is likely to be negligible.

- **A635/Church Lane three-arm priority junction:** The modelling undertaken indicates that in the 2028 With Development assessment scenario, the Church Lane arm of the junction is predicted to operate with RFC values in excess of 1.00 in the Weekday AM and PM peak hours. The increase in queuing on these arms is not considered to be significant when compared with the 2028 Do Minimum assessment scenario. Further, an additional assessment, to isolate the impact of the Development, has been undertaken without traffic associated with NTM/TEMPro growth and committed developments. The Development, in isolation, is not predicted to have a significant impact on the future operation of the junction. As such, the impact on driver delay is likely to be negligible.

13.99 Given the above, and that the majority of approaches on all junctions assessed are predicted to operate within capacity (i.e. with RFC values of less than 0.85), the likely effect of the Development in terms of driver delay, network-wide, is considered to be of **negligible** significance.

Pedestrian Delay

13.100 The IEMA guidelines note that a change in the volume, composition or speed of traffic may affect the ability of a person to cross a road. In general, increases in the traffic levels are likely to lead to increased pedestrian delay. The guidelines do not set definitive thresholds for assessing pedestrian delay, recommending instead that assessors use their judgement to determine the significance of the effect. The assessment of pedestrian delay serves as a proxy for delay that other modes of non-motorised users may experience when crossing roads.

13.101 The IEMA Guidelines state that projected changes in traffic flow of less than 10% should be assumed to create no discernible environmental impact given that day-to-day variation of traffic flow is frequently at least + or -10%. It is therefore considered that links exceeding a change in traffic flows above 10% have the potential to have an adverse effect on pedestrian delay.

13.102 It is shown in Table 13.12 that in 2028, the Development is predicted to result in an increase in total traffic flows (24-Hour AADT) by more than 10% on 9 highway links in the study area. These links and the predicted percentage increases are shown in Table 13.14.

Table 13.14: AADT 24-Hour Total Vehicle Flows - % Change Exceeding 10%

Highway Link ID	Road	Section	% Change (Total Vehicles – AADT)
2	A635	West of Proposed Site Access	14.8%
3	A635	East of Proposed Site Access	11.0%
4	Billingley Green Lane	North of the A635	10.5%
5	A635	West of Billingley Green Lane	14.9%
6	A635	East of Cathill Roundabout	14.9%
16	Dudley Drive	Entire Road	17.5%
17	Commercial Road	Entire Road	27.8%
20	A635	East of Hollygrove Roundabout	10.1%
21	A635	West of Fields End Roundabout	10.2%

13.103 It can be seen in the table above that the majority of highway links exceeding a change in total vehicle 24-Hour AADT flows above 10% are on the A635 which is a primary route. Pedestrian movements across the A635 in these locations are likely to be low. Pedestrian movements across Billingley Green Lane, Dudley Drive and Commercial Road are also likely to be low. The sensitivity of these links with regard to pedestrian delay is therefore considered to be low.

13.104 In terms of the composition of traffic, HGV trips to/from the Development have been distributed across primary routes, primarily the A635 and the A6195. As set out previously, pedestrian movements across these routes are likely to be low.

13.105 Given the above, the likely effect of the Development in terms of pedestrian delay is considered to be of **minor adverse** significance. The likely significant effect will be permanent.

13.106 In accordance with the methodology set out within this chapter, measures are not required to mitigate the Development's impact on pedestrian delay.

Non-Motorised User Amenity

13.107 The IEMA guidelines suggest a tentative threshold for judging the significance of a change in non-motorised user amenity where the traffic flow (or the HGV component) is halved or doubled.

13.108 It can be seen in Table 13.12 that neither the traffic flow or HGV component is predicted to double on any of the highway links in the study area as a result of the Development.

13.109 Given the above, the likely effect of the Development in terms of non-motorised user amenity is considered to be of **negligible** significance.

13.110 In accordance with the methodology set out within this chapter, measures are not required to mitigate the Development's impact on non-motorised user amenity.

Fear and Intimidation

13.111 The IEMA guidelines state that there are no commonly agreed thresholds for estimating fear and intimidation from known traffic and physical conditions. Some traffic flow thresholds are however identified in the IEMA guidelines. These are shown in Table 13.15.

Table 13.15: Fear and Intimidation Thresholds

Degree of Hazard	Average Hourly Traffic Flows over 18-Hour Day	Total 18-Hour HGV Flow
Extreme	>1,800	>3,000
Great	1,200-1,800	2,000-3,000
Moderate	600-1,200	1,000-2,000
Negligible	<600	<1,000

13.112 Table 13.16 shows the average hourly total vehicle traffic flows over an 18-hour period (06:00-24:00) and the total HGV flows over the 18-hour period.

Table 13.16: With and Without Proposed Development AAWT 18-Hour

Highway Link ID	Average Hourly Traffic Flows over 18-Hour Day (AAWT)		Total 18-Hour HGV Flow (AAWT)	
	2028 Do Minimum	2028 With Development	2028 Do Minimum	2028 With Development
1	-	319	-	1,983
2	1,474	1,655	2,560	3,880
3	1,474	1,612	2,560	3,222
4	52	57	40	40
5	1,429	1,605	2,554	3,874
6	1,428	1,605	2,508	3,828
7	1,152	1,182	1,557	1,748
8	886	928	1,140	1,407
9	1,610	1,715	2,195	3,057
10	1,614	1,719	2,174	3,036
11	1,396	1,430	1,757	1,849
12	1,521	1,591	1,791	2,561
13	841	853	772	872
14	1,603	1,662	1,940	2,611
15	1,386	1,445	1,997	2,668
16	291	335	946	946
17	180	225	161	161
18	651	696	395	395
19	500	516	420	420
20	927	1,004	2,584	3,247
21	920	997	2,533	3,195
22	327	337	553	553
23	273	280	286	286
24	909	970	2,691	3,353
25	1,248	1,309	3,019	3,681
26	192	193	219	219
27	1,046	1,106	2,861	3,523
28	1,052	1,111	2,913	3,575
29	1,270	1,329	3,125	3,788
30	1,271	1,330	3,089	3,751

Highway Link ID	Average Hourly Traffic Flows over 18-Hour Day (AAWT)		Total 18-Hour HGV Flow (AAWT)	
	2028 Do Minimum	2028 With Development	2028 Do Minimum	2028 With Development
31	1,242	1,302	3,074	3,736
32	1,245	1,304	3,083	3,745
33	208	215	614	714
34	247	254	629	739
35	844	856	1,073	1,195
36	408	425	949	1,107
37	441	458	1,180	1,352

13.113 It can be seen in Table 13.16 that, with regard to the average hourly total vehicle traffic flows, the Development does not result in a change to the degree of hazard, as per the thresholds set out in Table 13.15. That is, the degree of hazard, with regard to fear and intimidation is the same in both the 2028 Do Minimum and the 2028 With Development Assessment Scenarios.

13.114 With regard to the total 18-hour AAWT HGV flows, the Development is predicted to result in a change to the degree of hazard on the links set out in Table 13.17.

Table 13.17: Degree of Hazard Assessment (Total 18-Hour HGV Flow (AAWT))

Highway Link ID	Total 18-Hour HGV Flow (AAWT)		Degree of Hazard	
	2028 Do Minimum	2028 With Development	2028 Do Minimum	2028 With Development
2	2,560	3,880	Great	Extreme
3	2,560	3,222	Great	Extreme
5	2,554	3,874	Great	Extreme
6	2,508	3,828	Great	Extreme
9	2,195	3,057	Great	Extreme
10	2,174	3,036	Great	Extreme
12	1,791	2,561	Moderate	Great
14	1,940	2,611	Moderate	Great
15	1,997	2,668	Moderate	Great
20	2,584	3,247	Great	Extreme
21	2,533	3,195	Great	Extreme
24	2,691	3,353	Great	Extreme
27	2,861	3,523	Great	Extreme
28	2,913	3,575	Great	Extreme
36	949	1,107	Negligible	Moderate

13.115 The links where the degree of hazard is predicted to change as a result of additional HGV traffic associated with the Development are all primary routes (the A635, the A6195 and the A1(M) Junction 37 southbound on-slip). As set out previously, pedestrian movements across these primary routes are likely to be low/nil. The sensitivity of these links with regard to fear and intimidation is therefore considered to be low.

13.116 Given the above, the likely effect of the Development in terms of fear and intimidation is considered to be of **minor adverse** significance. The likely significant effect will be permanent.

13.117 In accordance with the methodology set out within this chapter, measures are not required to mitigate the Development's impact on fear and intimidation.

Road Safety

13.118 The IEMA guidelines refer to the identification of any collision clusters on the local highway network including any patterns or factors that could be exacerbated by traffic or movement generation.

13.119 An assessment of five-year personal injury collision data at key junctions within the study area has therefore been undertaken.

13.120 As previously highlighted, the IEMA guidelines state that projected changes in traffic flow of less than 10% should be assumed to create no discernible environmental impact given that day-to-day variation of traffic flow is frequently at least + or -10%.

13.121 It has previously been identified that in 2028, the Development is predicted to result in an increase of traffic flows by more than 10% on 9 highway links in the study area. These links and the predicted percentage increases are reproduced in Table 13.18.

Table 13.18: AADT 24-Hour Total Vehicle Flows - % Change Exceeding 10%

Highway Link ID	Road	Section	% Change (Total Vehicles – AADT)
2	**A635**	**West of Proposed Site Access**	**14.8%**
3	A635	East of Proposed Site Access	11.0%
4	Billingley Green Lane	North of the A635	10.5%
5	A635	West of Billingley Green Lane	14.9%
6	A635	East of Cathill Roundabout	14.9%
16	Dudley Drive	Entire Road	17.5%
17	Commercial Road	Entire Road	27.8%
20	A635	East of Hollygrove Roundabout	10.1%
21	A635	West of Fields End Roundabout	10.2%

13.122 It has previously been set out that, given the daily traffic flows, the number of collisions occurring at the junctions is considered to be relatively low.

13.123 Further, it is apparent that the vast majority of collisions occurred for reasons indicative of driver error. The causation factors do not suggest a specific road safety issue on the network that would need to be addressed.

13.124 The highway links presented above are therefore considered to be of low sensitivity in terms of road safety. Whilst it is acknowledged that, naturally, increases in traffic flows have the potential to have an adverse effect on road safety, the Development is unlikely to have a detrimental impact on the collision rate of the network, given the network's low sensitivity.

13.125 It is acknowledged that a fatal collision involving a HGV and a pedestrian occurred on the A635 in Hickleton in August 2023. At the time of writing, the collision is subject to a police investigation. As such, causation factors for the collision are not available.

13.126 Notwithstanding the above, the likely effect of the Development in terms of road safety, network-wide, is considered to be of **negligible** significance.

13.127 In accordance with the methodology set out within this chapter, measures are not required to mitigate the Development's impact on road safety. Notwithstanding this, mitigation has been identified to accommodate Development-related traffic as well as existing traffic plus traffic associated with planned and committed development.

Mitigation Measures

13.128 This section identifies any additional measures that are required to mitigate the effects of the Development.

Construction Phase

13.129 In accordance with the methodology set out within this chapter (that mitigation measures will not be identified for non-significant effects (e.g. minor adverse or negligible effects)), measures are not required to mitigate the Development's impact during the construction phase other than those that feature in the CEMPF and the subsequent CEMPs to be agreed at the Reversed Matters application stage.

Operational Phase

13.130 The likely effects of the Development in terms of severance, pedestrian delay and fear and intimidation are considered to be of **minor adverse** significance.

13.131 The likely effects of the Development in terms of driver delay, non-motorised user amenity and road safety are considered to be **negligible**.

13.132 In accordance with the methodology set out within this chapter, measures are not required to mitigate the Development's impact during the operational phase.

13.133 Notwithstanding the above, on 4 October 2023, the UK Government announced a vision for transport in the North of England[xii], which as part of a wide package of measures, identified funding to ensure delivery of road schemes in the North of England, including a 'A1-A19 Hickleton bypass'. As well as a bypass of the village of Hickleton, it is understood that this route would provide an upgraded connection from the A19 in the Doncaster district to the Dearne Valley via the A1. The precise scheme and delivery arrangements are not confirmed at this stage and will be subject to securing funding and planning permission; however, such a scheme would provide effective relief from through traffic for Hickleton, with benefits to the operation of the highway network and existing junctions, and environmental conditions in Hickleton.

13.134 Though the changes in traffic flows related to the Development in isolation are not considered to represent a significant impact on the operation of the A635 / Red Hill Lane / Hickleton Road junction, given the status of a potential A1-A19 Hickleton bypass, and taking into account the capacity assessments undertaken, proposed changes to the junction have been discussed with both BMBC and CDC to accommodate Development-related traffic as well as existing traffic plus traffic associated with planned and committed development. A preliminary junction layout has been prepared and discussed with BMBC (as the Local Planning Authority that will determine the planning application for the Development) and the CDC (as the Local Highway Authority for the location of the identified works).

13.135 Briefly, the proposed changes to the junction include the realignment of Red Hill Lane to form a staggered arrangement (compared to the existing crossroads layout), and the provision of ghost-island right-turn facilities on the A635.

13.136 Modelling of the proposed junction has demonstrated that the scheme represents an overall improvement to the operation of the junction, as well as an improvement with regard to road safety. Currently, no provision for right-turning vehicles exists at the junction, and therefore any vehicles turning right are required to do so from the A635 carriageway. The proposed changes provide a specific facility for right-turning vehicles, and in doing so improve road safety, through better facilitating conflicts between turning movements at the junction.

13.137 Overall, though the changes in traffic flows related to the Development in isolation are not considered to represent a significant impact on the operation of the junction, changes to the junction layout have been identified in consultation with BMBC and CDC to safely and efficiently accommodate traffic associated with the Development as well as relevant planned and committed development. Discussions with BMBC and CDC to define and agree the necessary works and mechanism for delivery are currently ongoing; however, it is proposed that the applicant will make a financial contribution commensurate with the

impact of the Development at the junction. The intention is that such a contribution will be used to facilitate either delivery of the identified scheme layout by CDC, or support CDC in delivering a bypass for Hickleton as part of the wider A19-A1 Hickleton bypass scheme identified by the 'Network North' vision.

Residual Effects

Construction Phase

13.138 In accordance with the methodology set out within this chapter, with regard to the construction phase, measures are not required to mitigate the Development's impact.

13.139 The residual effects therefore remain as identified.

Operational Phase

13.140 In accordance with the methodology set out within this chapter, with regard to the operational phase, measures are not required to mitigate the Development's impact.

13.141 The residual effects therefore remain as identified.

Cumulative Effects

13.142 As outlined in this chapter, both the 2028 Do Minimum and the 2028 With Development assessment scenarios include traffic associated with cumulative development sites.

13.143 The inclusion of these sites has been requested by BMBC. They are a combination of committed development sites and potential sites associated with Local Plan allocations. They are listed in Table 13.10.

13.144 As such, a cumulative assessment has inherently been included in this chapter.

13.145 The likely cumulative effects during both the construction and operational phases therefore remain the same as those identified within the main assessment. No mitigation measures are required as a result of the likely cumulative effects.

Summary

13.146 This chapter of the ES has been prepared by Fore Consulting Limited and has assessed the likely significant effects of the Development on the environment in respect of transport and access.

13.147 The methodology used in this chapter accords with that set out in the IEMA guidelines. The IEMA guidelines identify a number of environmental effects that may arise from changes in vehicular travel demand. This chapter has considered the likely effects that the traffic generated by the Development would have on severance, driver delay, pedestrian delay, non-motorised user amenity, road safety, and fear and intimidation.

13.148 The significance of an effect is derived from a measurement of the magnitude of impact and the sensitivity of the receptors affected. Categories of sensitivity and magnitude are defined and assessed to determine the significance of the effect.

13.149 Baseline traffic data on the study network has been obtained from junction turning count surveys undertaken by an independent traffic survey company and automatic traffic count data obtained from DC. Descriptions of the local highway network, and pedestrian and cycling networks have been obtained from site visits, desktop study and information published online by BMBC and Sustrans. Personal injury collision data has been obtained from both BMBC and DC.

13.150 During the operational phase, the likely effects of the Development in terms of severance, pedestrian delay and fear and intimidation are considered to be of minor adverse significance. The likely effects of

the Development in terms of driver delay, non-motorised user amenity and road safety are considered to be negligible.

13.151 During the construction phase, vehicle movements will be associated with the delivery of plant and construction materials, as well as construction staff travelling to and from the Site. The predicted trip generation during the construction phase is significantly lower than that during the operational phase. As such, an assessment of the likely significant effects has been undertaken for the operational phase only, as the operational phase effects will represent the 'worst-case'. Further, any significant effects associated with the construction phase will be temporary.

13.152 In accordance with the methodology set out within this chapter (that mitigation measures will not be identified for non-significant effects (e.g. minor adverse or negligible effects)), measures are not required to mitigate the Development's impact during either the construction or operational phases.

13.153 As no mitigation measures are required, the residual effects remain as identified.

13.154 Notwithstanding this, a CEMPF has been submitted as part of the application that will inform future plot-specific CEMPs. The CEMPF contains a CTMP with compliance secured by a suitably-worded planning condition. The CEMPF and subsequent CEMPs considered at the Reserved Matters application stage will manage the environmental effects resulting from the construction works.

13.155 Further, though the changes in traffic flows related to the Development in isolation are not considered to represent a significant impact on the operation of the junction, given the status of a potential A1-A19 Hickleton bypass, and taking into account the capacity assessments undertaken, proposed changes to the junction have been discussed with both BMBC and CDC to accommodate Development-related traffic as well as existing traffic plus traffic associated with planned and committed development.

13.156 Modelling of the proposed junction has demonstrated that the scheme represents an overall improvement to the operation of the junction, as well as an improvement with regard to road safety. Discussions with BMBC and CDC to define and agree the necessary works and mechanism for delivery are currently ongoing; however, it is proposed that the applicant will make a financial contribution commensurate with the impact of the Development at the junction. The intention is that such a contribution will be used to facilitate either delivery of the identified scheme layout by CDC, or support CDC in delivering a bypass for Hickleton as part of the wider A19-A1 Hickleton bypass scheme identified by the 'Network North' vision.

13.157 Table 13.19 contains a summary of the likely significant effects of the Development.

Table 13.19: Table of Significance – Transport and Access

Potential Effect	Nature of Effect (Permanent/ Temporary)	Significance (Major/Moderate/Minor) (Beneficial/Adverse/Negligible)	Mitigation / Enhancement Measures	Geographical Importance*							Residual Effects (Major/Moderate/Minor) (Beneficial/Adverse/Negligible)
				I	UK	E	R	C	B	L	
Construction											
Severance	Temporary	Negligible	Whilst mitigation measures are not required in accordance with the methodology set out in this chapter, to manage any environmental effects resulting from construction, a CEMPF has been submitted as part of the application to inform future plot-specific CEMPs. The CEMPF contains a CTMP. Further detail is provided at chapter 5.							X	Negligible
Driver Delay	Temporary	Negligible								X	Negligible
Pedestrian Delay	Temporary	Negligible								X	Negligible
Non-Motorised User Amenity	Temporary	Negligible								X	Negligible
Fear and Intimidation	Temporary	Negligible								X	Negligible
Operational											
Severance	Permanent	Minor Adverse	Whilst mitigation measures are not required in accordance with the methodology set out in this chapter, the proposed scheme at the A635/Red Hill Lane/ Hickleton Road junction is predicted to result in an improvement to the							X	Minor Adverse
Driver Delay	Permanent	Negligible								X	Negligible
Pedestrian Delay	Permanent	Minor Adverse								X	Minor Adverse
Non-Motorised User Amenity	Permanent	Negligible								X	Negligible
Fear and Intimidation	Permanent	Minor Adverse								X	Minor Adverse

Road Safety	Permanent	Negligible	overall operation of the junction and with regard to road safety. It is proposed that the applicant will make a financial contribution commensurate with the impact of the Development at the junction. The intention is that such a contribution will be used to facilitate either delivery of the identified scheme layout by CDC, or support CDC in delivering a bypass for Hickleton as part of the wider A19-A1 Hickleton bypass scheme identified by the 'Network North' vision.							X	Negligible
Cumulative Effects											
Construction											
N/A – A cumulative assessment has inherently been included in this chapter.											
Completed Development											
N/A – A cumulative assessment has inherently been included in this chapter.											

* Geographical Level of Importance

I = International; UK = United Kingdom; E = England; R = Regional; C = County; B = Borough; L = Local

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[i] Department for Levelling Up, Housing & Communities (2023), National Planning Policy Framework.

[ii] Department for Levelling Up, Housing and Communities and Ministry of Housing, Communities & Local Government (2014), Travel Plans, Transport Assessments and Statements.

[iii] Barnsley Metropolitan Borough Council (2019), Barnsley Local Plan.

[iv] Barnsley Metropolitan Borough Council (2021), Goldthorpe Masterplan Framework, version 2.0.

[v] Town and Country Planning (Environmental Impact Assessment) Regulations 2017 SI 2017/571, as amended by SI 2018/695

[vi] Institute of Environmental Management and Assessment (2023), Environmental Assessment of Traffic and Movement.

[viii] Institution of Highways and Transportation (2000), Guidelines for Providing for Journeys on Foot.

[ix] Cycling England (2009), Integrating Cycling into Development Proposals.

[x] Barnsley Metropolitan Borough Council (2022), National Cycle Network Map **https://www.barnsley.gov.uk/services/sport-and-leisure/cycling/cycle-lanes-and-routes/**

[xi] Sustrans (2022), National Cycle Network Map **https://www.sustrans.org.uk/national-cycle-network**

[xii] Department for Transport (2023), Network North: Transforming British Transport.