

Network Rail

**170248 Headbolt Lane New
Station GRIP 4**

**Environmental Statement Volume I:
Main Report**

170248-ARU-REP-EEN-000015

Final | August 2021

This report takes into account the particular instructions and requirements of our client.

It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

Job number 276736

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Contents

Chapter 1: Introduction

Chapter 2: Scheme Description

Chapter 3: EIA Assessment Methodology

Chapter 4: Traffic and Transport

Chapter 5: Air Quality and GHG Emissions

Chapter 6: Noise and Vibration

Chapter 7: Ecology

Chapter 8: Landscape and Visual

Chapter 9: Flood Risk

Chapter 10: Ground Conditions

Chapter 11: Cumulative Impact Assessment

Chapter 12: Summary of Significant Effects and Mitigation

Contents

	Page
1 Introduction	2
1.1 Introduction	2
1.2 The Site	2
1.3 The Proposed Scheme	2
1.4 The Requirement for EIA	3
1.5 Structure of this Environmental Statement	3
1.6 EIA Experience and Competent Expert	4
1.7 Availability of the Environmental Statement	6

1 Introduction

1.1 Introduction

The findings of the Environmental Impact Assessment (EIA) are presented within this Environmental Statement (ES). The EIA assesses the proposed project (hereafter referred to as ‘the proposed Scheme’) as described in this ES.

The ES is designed to inform readers of the likely significant environmental effects associated with the proposed Scheme and the measures (mitigation) which have been included as part of its design or is to be provided to protect or minimise those effects on the environment.

This ES has been prepared on behalf of Network Rail (‘the Applicant’) to support a detailed planning application for the development of Headbolt Lane station, car park and associated railway line works submitted under the Town and Country Planning Act (TCPA).

This chapter is supported by the following figures (Volume II: Figures) and appendices (Volume III: Technical Appendices):

- Figure 1.1: Proposed Scheme Location;
- Appendix 1A: Screening and Scoping Report; and
- Appendix 1B: Knowsley Metropolitan Borough Council’s Scoping Opinion.

1.2 The Site

The extent of the proposed Scheme site is approximately 10 hectares (ha) and is shown in Figure 1.1. For the purposes of this ES, the site is divided into the two following areas:

- the station and car park (an area of 5.9 ha); and
- the railway corridor (an area of 4.1 ha).

A detailed description of the proposed Scheme site is contained in Chapter 2: Scheme Description.

1.3 The Proposed Scheme

The proposed station and car park comprises the following elements:

- a new station located on land at Headbolt Lane;
- a new 300 space car park and associated structures (signage, waiting shelters and car park lighting) and to service the new station;
- bulk supply point and substation to accommodate electrification of rail corridor upgrades and for the new station;

- new vehicular and pedestrian access including two footbridges over Kirkby Brook and a road bridge to access each section of the car park; and
- associated landscaping.

Works to the railway corridor comprises the following:

- railway line upgrade to a twin track and associated infrastructure to extend the Merseyrail electrification to the proposed station (including the extension of the existing third line electrification network and a new substation); and
- decommissioning works to the existing Kirkby Station.

Construction of the proposed Scheme is due to commence immediately following grant of planning permission and the proposed Scheme is anticipated to be fully operational in Q1 2023.

A detailed description of the proposed Scheme is contained in Chapter 2: Scheme Description.

1.4 The Requirement for EIA

This ES has been prepared in accordance with the Town and Country Planning (EIA) Regulations 2017 (referred to in this ES as the ‘EIA Regulations’).

An EIA Screening and Scoping Opinion Request for the proposed Scheme was submitted to Knowsley Metropolitan Borough Council (KMBC) in February 2021. Merseyside Environmental Advisory Service (MEAS), on behalf of KMBC, confirmed that the development should be considered to be EIA development and as such an ES is required.

Scoping has been undertaken with KMBC to agree the assessment methodology and topics to be included in the EIA. The Screening and Scoping Report is contained in Appendix 1A and KMBC’s Scoping Opinion in Appendix 1B. Further information on the scoping process is provided in Chapter 3: EIA Assessment Method.

The proposed Scheme is considered to fall within Schedule 2 Part 10(b): Urban development projects, including the construction of shopping centres and car parks, sports stadiums, leisure centres and multiplex cinemas.

1.5 Structure of this Environmental Statement

This ES is divided into four separate volumes as follows:

- Volume I: Main Report (this document). This comprises the main text including a description of the proposed Scheme and the site, the baseline conditions, an assessment of the likely significant environmental effects resulting from the proposed Scheme, and proposed measures to mitigate those effects;
- Volume II: Figures. This comprises supporting figures, plans and other illustrations or visualisations which are cross referenced throughout Volume I;

- Volume III: Technical Appendices. This comprises the supporting technical information such as baseline surveys which are cross referenced throughout Volume I; and
- Volume IV: Non-Technical Summary (NTS). This is intended to be readily accessible to the general public. It is concise and written in non-technical language providing a description of the proposed Scheme, a summary of the significant environmental effects and proposed mitigation measures.

The requirements for information to be included in an ES are set out in Schedule 4 of the EIA Regulations and are further detailed in Chapter 3: EIA Assessment Methods.

Volume I of the ES is structured as follows:

- Chapter 1 – Introduction;
- Chapter 2 – Scheme Description;
- Chapter 3 – EIA Assessment Method;
- Chapter 4 to 10 – comprise the technical environmental assessments;
- Chapter 11 – Cumulative Impact Assessment; and
- Chapter 12 – Summary of Significant Effects, Mitigation and Monitoring.

1.6 EIA Experience and Competent Expert

1.6.1 EIA Quality Mark

Arup has established an extensive track record of undertaking all aspects of EIA. This has been recognised through the award of the EIA Quality Mark from the Institute of Environmental Management and Assessment (IEMA). The EIA Quality Mark is a voluntary scheme for organisations that operate in accordance with IEMA's commitments, including EIA Management, EIA Team Capabilities, EIA Regulatory Compliance, EIA Context & Influence, EIA Content, EIA Presentation, and Improving EIA Practice.

1.6.2 Competent Experts

The ES has been undertaken by specialists and project managers who are experienced in their field, qualified to at least degree level and, where applicable, chartered with a relevant professional body. Table 1.1 presents the list of experts who prepared the ES for the proposed Scheme, along with their relevant expertise and experience. Names and CVs are available to the local planning authority (LPA) on request.

Table 1.1: Qualifications and experience of ES authors

Role	Qualification and experience of Lead Author
EIA Project Director	Academic qualifications: BSc (Hons) Aquatic Bioscience; MSc Aquatic Resource Management.

Role	Qualification and experience of Lead Author
	Professional qualifications: Full member of the Institute of Environmental Management and Assessment (MIEMA); Chartered Environmentalist (CEnv SocEnv). Experience: 14 years' experience of EIA
EIA Project Manager	Academic qualifications: BSc (Hons) Environmental Geography; MSc Environmental Consultancy and Project Management Professional qualifications: Chartered Environmentalist (CEnv); Member IEMA (MIEMA) Experience: 9 years' experience of EIA
Traffic and Transport Lead	Academic qualifications: BA (Hons) Geography; MSc Transport Engineering and Planning Professional qualifications: Transport Planning Professional (TPP) Experience: 14 years experience in transport planning
Air Quality Lead	Academic qualifications: BSc Geography; MSc Environmental Technology Professional qualifications: Chartered Environmentalist (CEnv); Chartered Scientist (CSci); Member of Institute of Air Quality Management (MIAQM); Member Institute of Environmental Sciences (MIES); IEMA Practitioner Member (PIEMA) Experience: 10 years experience of air quality impact assessment
Townscape and Visual Impact Lead	Academic qualifications: BSc Geology; MSc Landscape Design Professional qualifications: Fellow of the Landscape Institute; Landscape Institute's LVIA Technical Panel Experience: Over 25 years of experience of townscape and visual impact assessment
Noise & Vibration Lead	Academic qualifications: BEng. Mechanical Engineering; Professional qualifications: Professional Engineer - Association of Professional Engineers and Geoscientists of British Columbia (P.Eng.); Member, Institute of Acoustics (MIOA); Experience: 15 years in environmental noise impact assessments for roads and railways.
Ecology Lead	Academic qualifications: MSc. Landscape Ecology, Design and Management; B.Sc. (Hon) RRD: Wildlife and Landscape Conservation; NDip in Botany (1992). Professional qualifications: CBIOL Chartered Biologist (RSB), CEnv; MRSB Royal Society of Biology (RSB), CIEEM Chartered Institute of Ecology and Environmental Management (IEEM). Experience: Over 20 years' experience in ecology and biodiversity.
Flood Risk Lead	Academic qualifications: BSc (Hons) Geography; MSc Catchment Dynamics and Management Professional qualifications: Chartered Environmentalist (CEnv); Chartered Scientist (CSci); Chartered Water and Environmental Manager (C.WEM.MCIWEM); Practitioner Member of Institute of Environmental Management and Assessment (PIEMA); PRINCE 2 Practitioner Experience: Over 10 years' experience in flood risk and water management.
Ground Conditions Lead	Academic qualifications: BSc (Hons) Geography; MSc Environmental Science.

Role	Qualification and experience of Lead Author
	Professional qualifications: Chartered Water and Environmental Manager; Chartered Scientist; Member CIWEM (MCIWEM). Experience: Over 20 years' experience addressing the challenges of complex brownfield site, providing advice on ground conditions and contamination for the discharge of planning conditions, EIA and compliance with environmental legislation.

1.7 Availability of the Environmental Statement

CD copies will be available from Arup at a cost of £10.00 per copy + VAT. Electronic copies of the ES can also be downloaded from the KMBC planning website.

Contents

	Page
2 Scheme Description	2
2.1 Introduction	2
2.2 The Site	3
2.3 The Proposed Scheme	6
2.4 Construction	12
2.5 Operation	14
2.6 Alternatives	15

2 Scheme Description

2.1 Introduction

This chapter of the ES describes the site and the proposed Scheme that forms the basis of the assessment of impacts undertaken in the technical assessments reported in technical chapters 4 – 10 of this ES.

This chapter is supported by the following figures (see Volume II: Figures) and technical appendices (see Volume III: Technical Appendices):

- Figure 2.1: Proposed Scheme Boundary;
- Figure 2.2: Existing Land Uses;
- Figure 2.3: Environmental Constraints Plan;
- Figure 2.4a and 2.4b: Kirkby Station Modifications;
- Figure 2.5a – 2.5d: Railway Corridor GA Drawings;
- Figure 2.6a and 2.6b: Underbridge 55 GA Drawings;
- Figure 2.7a and 2.7b: Underbridge 56 GA Drawings;
- Figure 2.8: Station Car Park and Access Layout;
- Figure 2.9: Substation General Arrangement;
- Figure 2.10: Platform General Arrangement;
- Figure 2.11a and 2.11b: Proposed Station External General Arrangement;
- Figure 2.12: Proposed Station Internal General Arrangement;
- Figure 2.13: Station and Car Park Drainage;
- Figure 2.14: Track Drainage;
- Figure 2.15: Landscape Plan;
- Figure 2.16: Car Park Cross Section;
- Figure 2.17a – 2.17c: Tannoy and Telecom General Arrangement;
- Figure 2.18: Temporary Laydown Areas and Construction Compounds; and
- Appendix 2A: Outline Construction Environmental Management Plan (CEMP).

2.2 The Site

2.2.1 Site Location

Station and Car Park

The proposed station and car park is situated on an area of green space off Headbolt Lane (Grid Ref: SJ 41308 99815). The proposed station and car park is bound to the north and east by Headbolt Lane, to the south by the railway line and to the west by the A506. The proposed station and car park lies approximately 900 m north-east of the centre of Kirkby (shown in Figure 2.1). The area of the proposed station and car park is approximately 5.9 ha.

Rail Corridor

The proposed railway corridor upgrade element of the proposed Scheme is on the existing Liverpool-Wigan rail corridor extending from 200 m to the west of the existing Kirkby station to 120 m to the east of the proposed station and car park site. The alignment of the rail corridor is roughly south-west to north-east. For the majority of its length the existing rail corridor is bounded by residential properties to the north and south (shown in Figure 2.1). The railway corridor is approximately 1.9 km in length and approximately 4.1 ha in area.

2.2.2 Site History

The existing railway line is shown in its present-day alignment on the earliest mapping reviewed which dates from 1850. The line was initially constructed as a two-track railway as part of the Liverpool to Bury line which opened in 1848.

Historical mapping indicates the line reduced from a two to a one track railway between 1962 and 1972. Overbridge 57 (Glovers Brow / B55192 road bridge), Underbridge 56 (over Simonswood Brook) and the existing western span of Underbridge 55 (over County Road and the A506) were constructed when the original railway line was established. Record drawings indicate that the western span of Underbridge 55 (over County Road), was constructed in 1847. The original superstructure was replaced with the existing deck in 1930. In 1970 the remaining two spans of Underbridge 55 (over A506), intermediate pier and eastern abutment were built as part of works associated with the construction of the present day A506.

Significant strengthening works were undertaken on the intermediate pier in 1990 due to deterioration, thought to be the result of Alkali-Silica Reaction (ASR).

The earliest mapping reviewed, dating from 1850, shows the proposed station and car park site to be occupied by agricultural land with a sandstone quarry identified as Mercer's Delf located within the centre of the site, to the north of Kirkby Brook which is shown flowing through the centre of the site from east to west. A small building identified as Tanpit House is shown to be located in the centre north of the site off Headbolt Lane. Mapping dating from 1902 shows the quarry to be no longer present and further development of buildings on the northern boundary of

the site adjacent to Headbolt Lane. As the quarry is no longer evident it is assumed to have been infilled.

Mapping from 1972 shows the western portion of Kirkby Brook to have been realigned to its present-day alignment; presumably as part of works for construction of the A506, and Headbolt Lane which bounds the site in its present-day alignment. The footpath which currently crosses the site from east to west is also shown. Mapping dating from 1990 no longer shows Tanpit House to be present. The crest of the hill on the northern boundary with Headbolt Lane appears to have moved southwards, suggesting a change of ground levels.

2.2.3 Existing Uses

The boundary for the proposed Scheme is shown in Figure 2.1 and 2.2.

Station and Car Park

The proposed station and car park is located in an area of undulating, amenity grassland and is also an area of Urban Greenspace/ Education Land, called Mercers Dell, as allocated by Knowsley Council's Local Plan. A Public Right of Way (PRoW) is located within the north-eastern corner of the area running southwards from Headbolt Lane, via a non-designated footpath, before heading south-east along the banks of Kirby Brook. The non-designated footpath bisects Mercers Dell connecting Headbolt Lane in the north east to the A506 County Road in the south-west. A series of existing bridges along the non-designated footpath provide crossings over Kirkby Brook. The amenity grassland is frequently used by dog walkers.

The proposed station and car park is on an area of undulating grassland bounded to the south by the Liverpool-Wigan railway line, to the north and east by Headbolt Lane, and to the west by the A506, Back Lane. The ground levels within the proposed car park area gently slope from the north and south forming a shallow valley centred on Kirkby Brook.

Kirkby Brook bisects the proposed car park area, entering the east of the site from the south via a culvert beneath the railway. The brook flows north-west to the centre of the site before diverting to the south-west exiting the site to the west beneath the A506.

Rail Corridor

The railway corridor comprises the existing Liverpool-Wigan railway line. On the approach to Kirkby Station the existing rail alignment is situated in cutting, transitioning to embankment to the east of Kirkby Station. The rail alignment remains on embankment for the majority of the proposed Scheme length. Within the vicinity of the proposed station the rail alignment transitions briefly to at-grade, before entering a section of low-height embankment and cutting to the east.

2.2.4 Existing Access

Headbolt Lane runs adjacent to the north of the proposed station and car park. There is currently no vehicular access onto the proposed station and car park site. Users of the amenity space access the land on foot. Headbolt Lane connects to the A506, Bank Lane to the west, with the A506 connecting to the M58 at Junction 1 at its northern extent and continues south through Kirkby Centre connecting to the M57 at Junction 6.

Vehicular access at the existing Kirkby Station is via the B5192, Whitefield Drive, through a one-way system through the station car park, and exiting back onto the B5192 Whitefield Drive and B5192 Glovers Brow junction. There are three existing pedestrian accesses to the existing Kirkby Station; two at the vehicular entrance and exit points and a further one from the B5192 Glovers Brow via existing footbridge 57A.

2.2.5 Sensitive Receptors

Key environmental constraints and receptors are shown on Figure 2.3.

Notable receptors in the area include residential properties. There are large housing estates to the north of Headbolt Lane, adjacent to the proposed station and car park site and to the south, adjacent to the existing railway line. There are also residential properties located directly adjacent to the existing Kirkby Station and to the south and north of the railway line between the existing Kirkby Station and the proposed station at Headbolt Lane.

There are 18 designated heritage assets within 1 km of the proposed Scheme boundary, the closest of which are:

- six Listed Buildings associated with St Chad's Church and grounds and St Chads Park, notably Church of St Chad (Grade II* Listed Building) located approximately 750 m to the south-west of the proposed station and car park site; and
- Carter Arms Public House Waverley House (Kirkby Conservative Club) and 1 and 3 Mill Lane (Grade II Listed Buildings) are located adjacent to the existing Kirkby railway station.

Kirkby Brook/Mill Brook Local Wildlife Site (LWS) is a non-statutory ecological designated site which is located adjacent to Simonswood Brook situated below the existing elevated railway line and runs through the proposed station and car park site. One further non-statutory ecological designated site is located within a 2km of the proposed scheme is Northwood Forest Hills LWS which is located approximately 640 m to the east.

The habitats recorded on site are relatively common and widespread and support commonly occurring botanical species comprising semi-improved neutral grassland, tall ruderal, scrub, amenity grassland, bare ground and running water.

Kirkby Brook runs through the proposed station and car park site and is designated by the Environment Agency as a main river. Kirkby Brook feeds

directly into Simonswood Brook which is located approximately 300 m to the west of the proposed station and car park.

Simonswood Brook is a designated Water Framework Directive (WFD) waterbody (GB112069060630), has a classification of Moderate (Ecological score of Moderate and Chemical score of Fail) and flows under the existing railway bridge (Underbridge 56).

There are areas of Flood Risk Zones 2 (between a 1 in 100 and 1 in 1,000 annual probability of river flooding) and 3 (1 in 100 or greater annual probability of river flooding) on the land immediately adjacent to Kirkby Brook within the proposed station and car park site. The rail corridor is situated entirely within Flood Zone 1 (land assessed as having a less than 1 in 1,000 annual probability of river flooding).

There are two historic landfills within 1 km of the proposed Scheme boundary; Bank Lane site, located adjacent to the A506 (Bank Lane) approximately 600 m to the north of the proposed railway corridor works and Stopgate Lane located at Simonswood Industrial Estate approximately 980 m to the east of the proposed station and car park site.

The Environment Agency classifies the land beneath the entire proposed Scheme as a Principal Bedrock Aquifer, an aquifer which can provide a high level of water storage and may provide water supply and/or base river flow on a strategic scale. The entire proposed Scheme is located within a groundwater Source Protection Zone (SPZ) 3, with several abstractions located to the north and south. The nearest groundwater abstractions are located approximately 2 km to the north of the rail corridor.

2.3 The Proposed Scheme

2.3.1 Overview of the Proposed Scheme

The proposed station and car park comprises the following elements:

- a new station located on land at Headbolt Lane;
- a new 300 space car park and associated structures (signage, waiting shelters and car park lighting) and to service the new station;
- supply bulk point and substation to accommodate electrification of rail corridor upgrades and for the new station;
- new vehicular and pedestrian access including two footbridges over Kirkby Brook and a road bridge to access each section of the car park; and
- associated landscaping.

Works to the railway corridor comprises the following:

- railway line upgrade to a twin track and associated infrastructure to extend the Merseyrail electrification to the proposed station (including the extension of the existing third line electrification network and a new substation); and

- decommissioning works to the existing Kirkby Station.

Further scheme details are provided below.

2.3.2 Existing Kirkby Station works

The existing Northern Rail platform at Kirkby will be decommissioned, made safe from public access and will be partially removed. The removed section of the platform will be between Over Bridge 57 (Glovers Brow / B5192 road bridge) and the end of the back of platform retaining wall. The walkway that currently connects the Northern Rail platform will be removed with reconstruction of a maintenance walkway taking its place. This new maintenance walkway will include surfacing, channel drain, handrails, fencing, gated access and steps to track level (Figures 2.4a and 2.4b).

The eastern end of the Merseyrail platform will be fenced off to stop public accessing the operational railway. The remainder of the existing Kirkby Station will remain fully operational (Figures 2.4a and 2.4b).

An extension to the Merseyrail third rail network is proposed through the Kirkby Station continuing through to Headbolt Lane. To meet the third rail safety case a segregated access walkway will be provided through Over Bridge 57 and the redundant Northern Rail platform.

2.3.3 Rail Corridor Works

The existing rail corridor comprises a single line. The Merseyrail network will be extended east from the existing terminating station at Kirkby by removing the existing buffer stops and connecting these with new trackwork. A new railway switch will split the tracks from a single alignment into a new twin-track arrangement (Figures 2.5a – 2.5f).

As part of these works the existing embankment will be widened and strengthened to accommodate the twin track arrangement. The embankment will be widened by 3.4 m to the north of the track and 2.6 m to the south of the track within the extent of the rail corridor and within the Network Rail owned land boundary. This widening will also allow for the introduction of safe walkways beside the tracks and to accommodate Low Voltage (LV) and High Voltage (HV) cables.

To facilitate the new twin-track arrangement, vegetation removal will be required along the existing railway corridor.

As part of the rail corridor works, work is needed to be carried out on Underbridge 55 (crossing the A506 and County Road) and Underbridge 56 (crossing Simonswood Brook and a public footpath).

Underbridge 55 currently spans over both the A506 (Span 1 and 2) and County Road (Span 3). The proposed modifications to Underbridge 55 are to remove the existing bridge pier and foundations between County Road and the A506 and replace with a portal frame pier which falls under LPA / local highways land. Span 1 and 2 over the A506 will be replaced by a new single span which will be a twin Network Rail painted steel U-type deck extending the new single span over

A506 to 18 m and 5.3 m in height which will be done within both the Network Rail and local highway boundary (Figures 2.6a and 2.6b).

Underbridge 56 (crossing Simonswood Brook and a public footpath) is a two-span natural stone masonry arch bridge. Spans are 4.6 m long. The bridge deck is approximately 9.3 m wide. Span 1 crosses a public footpath, and span 2 crosses Simonswood Brook. In order to accommodate the twin track configuration and to provide additional safety features it is proposed that a concrete trough will be placed on the existing bridge to house the new track alignment and to strength the bridge. As a result, Underbridge 56 will extend by 1 m on either side due to this concrete trough and the addition of steel walkways for safety and maintenance with all works being undertaken within both the Network Rail and local highway boundary (Figures 2.7a and 2.7b).

The existing Merseyrail third rail network will be extended to the proposed station. The existing Northern Rail network will be shortened as a result of it stopping up at the proposed Station rather than its current stopping up point at the Kirkby Station. To facilitate this third rail extension, a new substation is required that will be located in the vicinity of the proposed station and car park site (see Figure 2.8).

The entire length of the rail corridor will be bound by fencing which will be 1.8 m high. This fencing will be a mixture of existing fencing which already meets the height requirements and new fencing to ensure safety along the whole route of the major rail corridor.

The total distance of the major rail corridor works (including the third rail extension works) will be approximately 1.9 km.

2.3.4 Substation

To facilitate the third rail extension and the proposed Station, a new sub-station is proposed. The new substation will occupy an area of land to the west of the proposed Station and will amount to a total footprint of 0.09 ha (see Figure 2.9).

The substation will consist of all the components needed for the rail corridor works with most of the assets being housed in the substation building which is up to 3.04 m in height, 6.3 m in length and 2.3 m in width. Outdoor transformers, not able to be stored in the substation building will be located adjacent to the building and will be up to 2.4 m in height and 3.1 m in width.

2.3.5 Proposed Station

The proposed station will comprise three platforms, with two platform faces (Platform 1 and 2) serving Merseyrail located on the northern side of the rail corridor and a single platform face (Platform 3) serving Northern Rail on the south side of the rail corridor. Buffer stops will be provided to Merseyrail and Northern Rail to indicate the two Train Operating Companies. The platforms will be connected by a cross station access platform (which will be the same height as platforms 1 – 3), replicating the operational interchange functionality at the existing Kirkby station (Figure 2.10). This cross-station access platform will run

adjacent to an obscuration screen, which will be installed between the buffer stops of each railway line so that oncoming trains are not affected by lighting produced by oncoming trains in the opposite direction. This obscuration screen will be approximately 2.9 m in height and 20 m in length.

A single station building will be provided, with mess facilities for station staff and train crew. The station building will be staffed and will have facilities for customers to purchase tickets. Ticket vending machines will be available on the platform for customers who approach the station on foot from south of the railway line. The proposed station building will have a height of 8 m (Figures 2.11a and 2.11b) and total footprint of approximately 190 m² (see Figure 2.12) and will be finished in brickwork and white render with extensive glazing.

2.3.6 Proposed Car Park

The approximate area for the station and car park is 5.9 ha (see Figure 2.8) and comprises approximately 300 spaces. The proposed car park will be split into two; the main car park consisting of 270 spaces located north of Kirkby Brook, and an accessible car park consisting of 30 spaces (15 accessible bays and 15 enlarged bays) located south of Kirkby Brook adjacent to the proposed station building.

Three staff spaces and two Network Rail maintenance bays are to be provided, along with a parking area for five motorcycles. Provision of electric charging points will be in-line with Knowsley Council policy. A short stay pick-up / drop-off area is also proposed outside the station building, with space for four vehicles. Covered parking facilities for 100 cycles will be provided.

2.3.7 Vehicular Access

A new signalised junction is proposed on Headbolt Lane providing access to the proposed station and car park site. The junction will be positioned at the existing junction between Fallowfields and Headbolt Lane, creating a ‘four-armed’ junction. Controlled pedestrian crossings are to be provided on each ‘arm’ of the junction.

Headbolt Lane and Fallowfields are public highways maintained by KMBC. Junction works will therefore be subject to technical approval by KMBC.

A proposed internal road links the junction with Headbolt Lane to the proposed station forecourt, which includes two bus stops and a drop-off area for four private vehicles. Bus stops have been sized for 12 m long buses based on Merseytravel requirements. The layout of the internal road is shown in Figure 2.8.

A new road bridge is required to span the access road over Kirkby Brook, which will be 4 m above existing ground level at its highest point and will have an under bridge clearance of 1.4 m and can be seen in Figure 2.8.

2.3.8 Pedestrian / Cycle Access

The main access road mentioned in Section 2.3.7 above includes 2 m footways on each side and a bi-directional 3 m cycleway on the east side of the access road.

The cycle route is diverted around the accessible parking area to provide a more direct route to cycle storage areas at the proposed station and avoid conflicts with pedestrian movements. Where pedestrian routes intersect access roads, zebra crossings are provided to promote pedestrian priority through the site.

The existing footpath, referenced in detail in Section 2.2.3 above, which crosses the site from east to west will be diverted and incorporated into the site access proposals. The existing western footbridge over Kirkby Brook shall be removed and the eastern footbridge retained. An additional footbridge is proposed over Kirkby Brook to the east of the station building. The eastern bridge provides a link to the eastern section of Headbolt Lane and allows pedestrians arriving from this area to easily cross Kirkby in order to reach the station building (see Figure 2.8).

2.3.9 Drainage

The proposed station and car park surface water drainage has been divided into two networks, north and south of Kirkby Brook. The northern catchment consists of the main car park and northern portion of the access road up to the road bridge. This area will be drained to an attenuation tank beneath the car park, discharging into Kirkby Brook via a flow control device and petrol interceptor with a maximum discharge rate of 5 l/s (Figure 2.13).

The southern catchment consists of the proposed station forecourt, accessible parking area, station building and platforms. This catchment will also be drained to an attenuation tank beneath the car park, discharging into Kirkby Brook via a flow control device and petrol interceptor (Figure 2.13).

Track drainage is also proposed as part of the proposed station, drainage catch pits 1.1 m x 0.6 m will be used along the track section at the proposed station (see Figure 2.14).

2.3.10 Landscaping

Landscaping will form an important part of the proposed Scheme and will consist of a combination of hard landscaping, soft landscaping and street furniture (Figure 2.15).

Soft landscaping dominates the landscaping plan for the proposed Scheme and consists of the following features;

- improved habitat area (consisting of methods such as shrub planting) which is focussed around the proposed car park and the pick up drop off areas of the proposed station;
- native planting which is found directly adjacent to Kirkby Brook and will focus on the existing landscaping found within the 8 m working buffer from the watercourse as per the Environment Agency's policy;
- ornamental shrubs and grasses which are proposed to be utilised between the platforms of the proposed Station and in between staff parking bays and the pick up drop off system; and

- wildflower meadows which are proposed in the land west of the proposed car park and in land between the proposed station building and the proposed substation.

Landscaping and planting will also be used along Headbolt Lane to screen the proposed Scheme from nearby receptors and will be used trackside, especially on the widened embankment, to also help screen the rail corridor works from nearby receptors. In addition to screening, the landscaping will contribute to the enhancement of biodiversity.

2.3.11 Lighting, Security and Information

Lighting for the proposed station and car park will typically take the form of post-mounted low powered LED lighting on columns up to a height of 5 m above ground level and finished in a light grey colour. The lighting will utilise warmer colour temperate light as this has much less blue light component - proven to be less disturbing to sleep patterns for humans (and many mammals).

All lights will be designed to have sensors and dimming to reduce light levels during low occupancy off-peak times. Lighting columns will also be designed to be minimised in height, reducing the visibility of the light sources from beyond the proposed station and car park.

Footbridge lighting will not use lighting columns, instead handrail level lighting will be used. This focuses light onto the deck which reduces light spill over the water.

The proposed car park will include a 1.5 m roll top mesh perimeter fence to provide a clear boundary to the site while maintaining an open and attractive layout. Low profile fencing (e.g. knee rail) shall be provided at the extents of the accessible car park and access routes to discourage pedestrian access to other areas. However, due to the open aspect of the site and multiple entry points, it is not proposed to provide a secure boundary fence between station access routes and the adjacent areas of grassland. Where steep slopes or vertical drops are present (e.g. at bridges and abutments) parapets will be provided to prevent falls from height (Figure 2.16).

The existing boundary fence along the length of the rail corridor works will be replaced with a 1.8 m high fence designed to Network Rail standards.

The video surveillance system to be provided as part of the proposed Scheme will consist of Dome, Box and Pan and Tilt and Zoom cameras. There will be a total of 58 cameras installed within the proposed station and car park site.

There will also be Long Line Public Address System installed as part of the Proposed Scheme, allowing automatic train departure announcements to be made to the Merseyrail and Northern Rail platforms and inside the proposed station building.

57 loudspeakers will be arranged in the following zones to provide coverage at the proposed station (see Figures 2.17a – 2.17c):

- Platform 1 – 17 Loudspeakers to be configured into Day/Night zones;

- Platform 2 – 19 Loudspeakers to be configured into Day/Night zones;
- Platform 3 – 19 Loudspeakers to be configured into Day/Night zones; and
- Ticket Office – two Loudspeakers configured on a single zone.

The loudspeakers will either be mounted within passenger waiting shelters or mounted onto lighting columns on the platforms with a minimum height of 2.5 m.

Customer Information System (CIS) displays shall be installed at the Proposed Station and will provide passengers with train running information, the Displays shall incorporate white Light Emitting Diodes (LEDs).

2.4 Construction

2.4.1 Construction Programme and Hours

Construction of the proposed Scheme is due to commence immediately following grant of planning permission and the proposed Scheme is anticipated to be fully operational in Q1 2023. The construction phase is anticipated to take 18 months.

Construction activities would include the following phases:

- preliminary works and site establishment;
- earthworks;
- civil engineering work;
- rail systems works within the railway corridor; and
- buildings and substation construction.

Construction will generally operate Monday-Friday between 08:00-18:00 and Saturday 08:00-13:00, with no working on Sundays or bank holidays, however, during rail blockades, which are required to facilitate construction of certain aspects of the proposed Scheme, there will be some night -time working and instances where construction working hours will operate on a 24 hours a day, for seven days basis.

Should construction works, other than those undertaken during blockades, need to be conducted outside these normal construction working hours they would be agreed in advance with Knowsley Council and would comply with any restrictions imposed by the planning consent, and in particular regarding control of noise and traffic.

2.4.2 Preliminary Works

Preliminary works may include surveys, site clearance, decontamination measures, erection of signage and temporary fencing and the preparation of the construction laydown areas and temporary facilities.

2.4.3 Laydown Areas

There are three construction laydown areas / compounds proposed for the construction phase of the proposed Scheme, consisting of one main compound and two temporary construction compounds and welfare areas.

The main compound will be located within the proposed station and car park site and will be located in land to the western extent of where the proposed car park and sub station are to be located (Figure 2.18). This main compound will consist of;

- temporary mastic asphalt car park for 100 vehicles;
- one way system for all vehicles;
- temporary welfare set up for enabling works;
- single storey welfare consisting of office, canteen, drying rooms, changing rooms, meeting and briefing rooms;
- separate access/egress for construction and staff vehicles;
- manned security 24/7;
- occupied entrance gates during site operating hours;
- site hoarding erected to full perimeter of footprint;
- wheel wash at construction access/egress point;
- mains water/electricity supply for welfare;
- smoking/vaping shelters;
- vehicular off load area;
- re-fuelling area; and
- CCTV.

The two satellite welfare areas are all expected to contain one or more towable 25-man welfare units to be used by construction staff. The locations of the welfare areas are as follows;

- Welfare 1 Millennium Park – located west of Underbridge 56 and Simonswood Brook; and
- Welfare 2 Kirkby Station – located on the car park of the existing Kirkby Station.

2.4.4 Construction Methods and Equipment

Due to underground rock being shallow at the site it is not anticipated that piling will be required for any proposed structures.

The following vehicles and plant are expected to be used throughout the construction period:

- HGV for transportation of construction material and plant to site;

- HGV for removal of construction material off site;
- Heavy plant machinery:
 - 25 T, 14 T and 5 T excavators;
 - 9 T and 5 T dump trucks;
 - Tractors;
 - Cranes; and
 - Concrete pumps.
- Rail plant (for works within railway corridor).

Storage areas for hazardous substances will be located in a separate locked fenced off area. Material data sheets will be available for all these materials and the Control of Substances Hazardous to Health (COSHH) assessments kept within the relevant Risk Assessment for the task being undertaken.

2.4.5 Construction Traffic and Access

Construction traffic will be advised to follow the M6, leaving at Junction 26 towards Liverpool on the M58. Construction traffic will then leave the M58 at Junction 1 onto Maghull Lane and travel south along the A506 until reaching Headbolt Lane. This route can also be used by construction traffic travelling easterly from Liverpool along the M58.

The intent for construction traffic using these routes is to minimise transport travelling through Kirkby town centre and Westvale to avoid disruption.

These access details will be consulted upon with the Knowsley Council's highways department and other highways consultees to ensure that the design accords with Knowsley Council's design guide and the impact of additional vehicular traffic can be mitigated effectively.

2.4.6 Construction Lighting

Construction temporary site lighting is proposed to enable safe working on the construction site in hours of darkness. Construction temporary lighting will be arranged so that glare is minimised outside the construction site.

2.5 Operation

2.5.1 Operational Train Movements

Once operational, the proposed station will act as the new interchange between Merseyrail and Northern services, replacing the interchange capabilities once provided by Kirkby Station. Train movements at the proposed station are expected to be four Merseyrail train services per hour and one Northern train services per hour.

The Merseyrail trains will primarily be Class 777 trains which are either a four or eight car configuration. The four car configuration has a seated capacity of 184 passengers and standing capacity of 291 passengers whereas the eight car configuration has a seated capacity of 368 passengers and a standing capacity of 582 passengers.

The Northern trains will primarily be Class 195 trains which are either a three or six car configuration. The three car configuration has a seated capacity of 204 passengers and a standing capacity of 142 passengers whereas the six car configuration has a seated capacity of 408 passengers and a standing capacity of 284 passengers.

2.5.2 Operational Staff

Once operational, the proposed station will be staffed from the first to the last train each day. Staff numbers will fluctuate naturally based on cleaning and maintenance operations. The minimum number of staff at the proposed station on duty at any one time will be two, one staff member manning each of the two ticket offices.

2.5.3 Maintenance

Maintenance of assets and operations at the proposed station will primarily lie with Merseyrail. This includes maintenance of;

- video surveillance;
- public address systems;
- passenger help points;
- customer information systems; and
- ticket vending machines.

Merseytravel will also be responsible for the delivery of landscape plan and for the ongoing maintenance.

2.6 Alternatives

This section sets out the alternatives considered for the proposed Scheme, in relation to alternatives that have been considered for the station and car park design. It also includes an explanation of where changes have been made to the design through the process of evaluation and environmental assessment.

Schedule 4 of the EIA Regulations requires that the Environmental Statement (ES) includes “*A description of the reasonable alternatives studied by the applicant which are relevant to the proposed project and its specific characteristics and an indication of the main reasons for selecting the chosen option, including a comparison of the environmental effects*”.

The EIA Regulations do not impose a specific requirement to consider and assess alternatives, however, the consideration of alternatives to a range of aspects of the

location and design is best practice in design development and carrying out EIA. An outline of the main alternatives considered and the rationale for choosing the preferred option is set out in this section.

2.6.1 The ‘Do Nothing’ alternative

Best practice guidance in EIA suggests that the assessment should consider the evolution of the Site in the absence of the proposed Scheme *i.e.* the ‘do-nothing’ or no development alternative.

The ‘do nothing’ alternative would result in the site remaining in its current state and the capacity of the Merseyrail services remaining the same.

2.6.2 Alternative sites considered

The purpose of the proposed Scheme is to increase the capacity of the Merseyrail service and provide a new station and car park facilities.

Given the need for the proposed station and car park to be located along the existing rail corridor, and the limited availability of land adjacent to the railway corridor that can accommodate the scale of the station and car park proposed, no other sites have been considered as alternatives.

2.6.3 Alternative station and car park designs considered

Four design options were considered for the proposed Scheme, as described below:

- Option 1 – surface car park with access for general traffic and buses to the north.
- Option 2 – a main vehicular access to the west of Fallowfields. Buses entering the station utilise the same vehicular access. All parking is consolidated to the east of the access requiring culverting of Kirkby Brook;
- Option 3 – split level car park located to the south of Kirkby Brook. Access into the proposed station and car park gained via two new accesses to the east on Headbolt Lane; and
- Option 4 – multi-storey car park located to the south of Kirkby Brook with all vehicular access from the north of the proposed Station adjacent to Fallowfields;

Option Appraisal

During the initial options meeting, attended by Arup, Seed Architects, BGCL, Network Rail, Merseytravel/ Liverpool City Region Combined Authority and Merseyrail, it was agreed to discount the following options:

- Option 2 – discounted due to the amount of culverting of Kirkby Brook required to deliver the car park. It was agreed that this would have a

significant impact on Kirby Brook and posed a risk to the consenting process, making the scheme unviable; and

- Option 4 – discounted due to concerns regarding user safety and crime associated with a multi-storey car park in this area. Also it was considered that this option would have significant visual impact.

Subsequent consultations, with the same attendees mentioned above, considered the remaining options and a preference for Option 1 emerged, which was felt to offer the best value solution for the site, minimising the impact on Kirkby Brook. Concerns regarding the increased culverting of Kirkby Brook and the location and form of the access junctions within Option 3 were raised by Knowsley Council.

The proposed Scheme is considered to provide the following benefits over the other options considered:

- environment – the design minimised the number of crossings over Kirkby Brook, thus reducing the impact. Visually, the surface level car park was considered to have less of an impact than the multi-storey options;
- simplicity – the layout offers the quickest and simplest design option to construct, achievable within the desired project programme;
- junction / highway layout – a single junction into the site reduces potential for vehicle conflicts on Headbolt Lane. Internally, private vehicles are segregated from buses / drop-off helping to improve the legibility and safety of both facilities;
- security – the large open plan layout provides a high level of passive surveillance for those using the station car parks. This will reduce the potential for crime, a major concern for any split level or multi storey car park design. Walking routes are also well overlooked throughout the site; and
- environment – the design minimised the number of crossings over Kirkby Brook, thus reducing the impact. Visually, the surface level car park was considered to have less of an impact than the multi-storey options.

Contents

	Page
3 EIA Assessment Methods	2
3.1 Introduction	2
3.2 The Requirement for EIA	2
3.3 Information for Inclusion in the Environmental Statement	2
3.4 Approach to Scoping	5
3.5 Assessment Method	9
3.6 Cumulative and In-Combination Effects	13
3.7 Assumptions and Limitations	13
3.8 Preparation of the Environmental Statement and Non-Technical Summary	14

3 EIA Assessment Methods

3.1 Introduction

This chapter of the ES sets out the overall approach and methodology for undertaking the EIA associated with the proposed Scheme, described in Chapter 2: Scheme Description.

3.2 The Requirement for EIA

As discussed in Chapter 1: Introduction, this ES has been prepared in accordance with the Town and Country Planning (Environmental Impact Assessment) Regulations 2017 ('the EIA Regulations').

Under the EIA Regulations, the proposed Scheme falls within Schedule 2 Part 10(b): Urban development projects, including the construction of shopping centres and car parks, sports stadiums, leisure centres and multiplex cinemas.

For Schedule 2, Part 10(b) development, EIA is more likely to be required where:

- '(i) the development includes more than 1 ha of urban development which is not dwellinghouse development, or*
- (iii) the overall area of the development exceeds 5 ha'*

The proposed Scheme is over the threshold for both overall area (approximately 10ha) and for urban development projects (approximately 5.9 ha for the station and car park).

3.3 Information for Inclusion in the Environmental Statement

The requirements with regard to the content of an ES are outlined in Schedule 4 of the EIA Regulations. The ES must provide all information included as is reasonably required to assess the environmental effects of the proposed Scheme. Table 3.1 sets out where the relevant information required under Schedule 4 is located within the ES.

Table 3.1 Requirements of Schedule 4 of the EIA Regulations

Summary of requirements of Schedule 4, Part 1, by paragraphs	Location of information in this ES
Description of the proposed Scheme.	Chapter 2: Scheme Description contains a detailed description the proposed Scheme.
A description of the reasonable alternatives studied by the developer, which are relevant to the proposed project and its specific characteristics, and an indication of the main reasons for selecting the chosen option,	Chapter 2: Scheme Description contains a summary of the alternatives considered during the design development process, the reasons for the choice made and a summary of

Summary of requirements of Schedule 4, Part 1, by paragraphs	Location of information in this ES
including a comparison of the environmental effects.	how the environmental effects have been taken into account in the decision-making process.
A description of the relevant aspects of the current state of the environment and an outline of the likely evolution thereof without implementation of the development as far as natural changes from the baseline scenario can be assessed with reasonable effort on the basis of the availability of environmental information and scientific knowledge.	Contained within the technical assessments in Chapters 4 – 10 of this ES. Within each technical chapter, Section 4 contains the description of the existing baseline environmental conditions.
A description of the factors specified in regulation 4(2) likely to be significantly affected by the development: population, human health, biodiversity, land, soil, water, air, climate, material assets, cultural heritage and landscape.	Contained within the technical assessments in Chapters 4 - 10 of this ES. Within each technical chapter, Section 6 contains an assessment of likely significant effects on the receiving environment.
A description of the likely significant effects of the development on the environment resulting from, inter alia: (a) the construction and existence of the development, including, where relevant, demolition works; (b) the use of natural resources, in particular land, soil, water and biodiversity, considering as far as possible the sustainable availability of the (c) the emission of pollutants, noise, vibration, light, heat and radiation, the creation of nuisances, and the disposal and recovery of waste; (d) the risks to human health, cultural heritage or the environment (for example due to accidents or disasters); (e) the cumulation of effects with other existing and/or approved projects, taking into account any existing environmental problems relating to areas of particular environmental importance likely to be affected or the use of natural resources; (f) the impact of the project on climate (for example the nature and magnitude of greenhouse gas emissions) and the vulnerability of the project to climate change; (g) the technologies and the substances used.	Contained within the technical assessments in Chapters 4 – 10 of this ES: (a) Within each technical chapter, Section 6 assesses effects during construction and operation; (b) use of natural resources is considered in Chapter 7: Ecology and Chapter 10: Ground Conditions (c) considered in Chapter 5: Air Quality, Chapter 6: Noise and Vibration and Chapter 10: Ground Conditions (d) considered in Chapter 5: Air Quality, Chapter 6: Noise and Vibration and Chapter 10: Ground Conditions considered in Chapter 4: Traffic and Transport and Chapter 9: Flood Risk (e) considered in Chapter 11: Cumulative Impact Assessment; (f) considered in Chapter 4: Traffic & Transport, Chapter 5: Air Quality and Chapter 9: Flood Risk (g) considered where applicable in technical chapters 4 - 10.
The description of the likely significant effects on the factors specified in regulation	Chapter 11 details the likely significant effects resulting from

Summary of requirements of Schedule 4, Part 1, by paragraphs	Location of information in this ES
4(2) should cover the direct effects and any indirect, secondary, cumulative, transboundary, short-term, medium-term and long-term, permanent and temporary, positive and negative effects of the development.	cumulative impacts. Chapter 12: Summary of Significant Effects, Mitigation and Monitoring of this ES contains information of any significant effects caused by the proposed Scheme.
A description of the forecasting methods or evidence, used to identify and assess the significant effects on the environment, including details of difficulties encountered compiling the required information and the main uncertainties involved.	Contained within the technical assessments in Chapters 4 - 10 of this ES. Within each technical chapter, Section 8 contains information regarding assumptions and limitations for each assessment.
A description of the measures envisaged to avoid, prevent, reduce or, if possible, offset any identified significant adverse effects on the environment and, where appropriate, of any proposed monitoring arrangements. That description should explain the extent, to which significant adverse effects on the environment are avoided, prevented, reduced or offset, and should cover both the construction and operational phases.	Contained within the technical assessments in Chapters 4 - 10 of this ES. Within each technical chapter, Section 5 describes any design features that avoid or reduce any impact, and any standard (tertiary) mitigation that is assumed to be applied within the assessment. Section 7 contains information on any further mitigation or enhancement methods proposed. Chapter 12: Summary of Significant Effects, Mitigation and Monitoring, also contains a summary of mitigation required and any monitoring arrangements. Chapter 2: Scheme Description of this ES also contains information on the proposed Scheme, including measures which have been designed-in, to prevent significant effects.
A description of the expected significant adverse effects of the development on the environment deriving from the vulnerability of the development to risks of major accidents and/or disasters which are relevant to the project concerned.	Vulnerability of the scheme to risks of major accidents and/or disasters has been scoped out of the EIA (Appendix 1A).
A non-technical summary	Volume IV of the ES is the Non-Technical Summary.
A reference list detailing the sources used for the descriptions and assessments included in the ES.	References are included as footnotes through technical chapters 4-11 and a reference list included at the end of ES Vol I Main Report.

3.4 Approach to Scoping

Under Regulation 15 of the EIA Regulations “a person who is minded to make an EIA application may ask the relevant planning authority to state in writing their opinion as to the information to be provided in the environmental statement (a “scoping opinion”)”. The purpose of the scoping stage is to engage with the local planning authority and other statutory and non- statutory consultees in seeking agreement on the scope of the EIA, and the approach to be adopted for the technical topics which have been scoped into the EIA. It also helps to ensure that the scope of the assessment is proportional.

3.4.1 Process for Determining the Scope

An EIA Screening and Scoping Report was submitted to KMBC on the 17th February 2021. In response, KMBC’s Scoping Opinion was received 30th March. A copy of the Screening and Scoping Report and KMBC’s Scoping Opinion are included in Appendix 1A and 1B respectively (Volume III: Technical Appendices of this ES).

The information and comments provided in the Scoping Opinion were used to refine the scope of the EIA. The following topics were identified as requiring detailed assessment, which are addressed in technical chapters 4-10.

- Chapter 4: Traffic & Transport;
- Chapter 5: Air Quality & Greenhouse Gas Emissions;
- Chapter 6: Noise & Vibration;
- Chapter 7: Ecology;
- Chapter 8: Landscape and Visual Impact Assessment (LVIA);
- Chapter 9: Flood Risk; and
- Chapter 10: Ground Conditions.

KMBC agreed through the scoping process that the following chapters could be scoped out of the EIA:

- Cultural Heritage;
- Water Resources (excluding Flood Risk);
- Population and Human Health;
- Waste and Resources;
- Major Accidents and Disasters; and
- Climate Change.

Consultation is a core component in the development of a scope of assessment that is comprehensive, proportionate and balanced. The considerations of interested parties provide insight on site specific issues, which assists in focusing environmental studies on those issues most relevant to the proposed Scheme and is also important in shaping the design. The ES includes consideration of topics/issues raised by statutory consultees in the Scoping Opinion (Appendix

1B), and they are summarised in Table 3.3 below. Subsequent consultation with statutory consultees is summarised in the relevant technical chapters (chapters 4 - 10).

3.4.2 Consultation

Provide details of any consultation to agree the scope of the assessment. If no consultation has taken place, state. This should also include a summary of key relevant aspects of the scoping opinion.

Table 3.2: Consultation Summary

Consultee and date	Issue Raised	Summary of Response
Knowsley Metropolitan Borough Council (30/03/2021)	Section 8.6 (Major Accidents and Disasters) of the Scoping Report states that a Flood Risk Assessment will consider the potential of increased flooding on or off site, however Water Resources and Flood Risk and Climate Change are proposed to be scoped out of the ES. As the site falls within a Flood Risk Zone 3 it is recommended that an EIA chapter is required to assess the flood risk potential of the proposed Scheme and therefore KMBC, the Environment Agency and the Lead Local Flood Authority disagree that flood risk should be scoped out of the EIA.	A Flood Risk has been scoped back into the ES and will be included as a Chapter 9.
Knowsley Metropolitan Borough Council (30/03/2021)	As Climate Change has been proposed to be scoped out of the EIA it is recommended and hoped that the Air Quality chapter will consider the impact of climate change and greenhouse gases.	Chapter 5: Air Quality includes an assessment of greenhouse gas emissions associated with vehicles during the proposed Schemes operation.
Knowsley Metropolitan Borough Council (30/03/2021)	There is a concern that there is limited information on how intra-project impacts are to be assessed. The importance of an integrated approach taken to the EIA methodology to ensure consideration of interactions and in-combination effects was stressed.	All intra project interactions, cumulative and in-combination effects will be addressed within Chapter 11: Cumulative Impact Assessment. Cumulative developments assessed in the cumulative impact assessment has been agreed with KMBC.
Knowsley Metropolitan Borough Council (30/03/2021)	The following additional potential impacts highlighted	The following surveys have been undertaken and reports

Consultee and date	Issue Raised	Summary of Response
	in the pre application advice have not been considered: • Potential for bat roosting within the railway bridges that will be impacted by the construction works; • Potential presence of great crested newts in the pond to the south of the site; • Potential impacts on water voles as a result of construction works in close proximity to the brook; and • Potential operational impacts associated with new external lighting.	will be submitted as part of the planning application documents.: - updated Preliminary Ecological Appraisal (Appendix 7A); - Riparian mammal report (Appendix 7B); - Great Crested Newt survey (Appendix 7C); and - Bat Report (Appendix 7D).
Knowsley Metropolitan Borough Council (30/03/2021)	It was advised that the following should also form part of the ES: • The ES should provide information on a CEMP to be produced for the site in order to manage potential pollution risks (specifically in relation to watercourses and retained habitats), invasive species issues and protected species impacts. • Ecological issues should be considered both in isolation, and in combination with other nearby developments. • Mitigation measures should adopt the mitigation hierarchy (avoidance-mitigate-compensate). • A landscape strategy showing retained habitats and proposed habitat creation and planting would be required with any future EIA application. This would provide certainty of habitat loss and facilitate assessment of impacts. The landscape strategy should include the creation of new Priority Habitat	An outline CEMP (Appendix 2A) is submitted with the planning application which includes all the mitigation relied on in the ecology chapter. A Landscape and Ecology Management Plan is submitted as part of the planning application (Document ref no.: 170248-ARU-REP-EEN-000024) and provides a strategy for the ecological and landscaping mitigation and management.

Consultee and date	Issue Raised	Summary of Response
	grassland to replace that being lost and replacement tree planting along the section of the railway to be widened. • A habitat management plan is required and will provide a mechanism to secure necessary ecological compensation, mitigation and enhancements. • Biodiversity enhancements should be incorporated into the scheme design in line with NPPF and local plan policy CS8, and also in anticipation of mandatory net gain due for inclusion as part of the pending Environment Bill. The Defra Biodiversity metric should be used to assess net gain. This should form part of the ES.	
Knowsley Metropolitan Borough Council (30/03/2021)	The scoping opinion stated that “the archaeological potential in the area is predicted to be low” is incorrect and there are sites within the area of the proposed Scheme that have been flagged on the Merseyside Historic Environmental Record. It is noted however that although this statement is incorrect any issues associated with the proposed Scheme and archaeological features are not likely to be significant.	Although it has been agreed that Cultural Heritage can be scoped out of the EIA, a standalone Historic Environment Desk Based Assessment (DBA) will be submitted with the planning application (Document ref no.: 170248-ARU-REP-EEN-000021)
Knowsley Metropolitan Borough Council (30/03/2021)	No appendices regarding the Ground Investigation Reports were submitted as part of the Scoping Report, as such KMBC can not fully review the statements and findings of these documents. It is therefore proposed that Ground Conditions be copied back into the EIA.	Chapter 10: Ground Conditions has been scoped into the ES and the Ground Investigation Report (Appendix 10C) is submitted as part of the planning application.

Consultee and date	Issue Raised	Summary of Response
Knowsley Metropolitan Borough Council (30/03/2021)	A Light assessment and subsequent scheme will be required with the planning application to ensure any external lighting used in the development will not have a negative impact on the nearby residents.	A lighting assessment will be undertaken and submitted as part of the planning application (Document ref no.: 170248-ARU-REP-EEN-00002).

3.5 Assessment Method

3.5.1 Baseline Data Gathering

A wide range of baseline data on the local environmental conditions has been used for the purposes of the assessment. Data has been gathered from a combination of sources, including:

- published documentary information from a variety of sources including historical and contemporary records;
- field survey information including ecological features and landscape character; and
- other survey information including topographic surveys, aerial photography, and geotechnical data.

More detailed information is included in each of the topic sections, as required to describe the aspects of the environment that have the potential to be significantly affected by the proposed Scheme. The technical chapters of this ES (Chapters 4 - 10) describe their spatial scope, which includes the rationale for determining the specific area within which the assessment is focused. The study areas take into account the nature of the potential impacts, and the locations of potentially affected environmental resources and receptors.

3.5.2 Temporal Scope: Baseline and Assessment Years

The EIA assesses the environmental impacts of the proposed Scheme at key stages of both the construction and operation phases. Where appropriate, these are then compared to the pre-construction (i.e. the current baseline), and if relevant, to the situation prevailing in the future in absence of the proposed Scheme (i.e. the projected future baseline).

The ‘current baseline year’ is taken as 2021, as this is the period of time where the majority of data collection in support of the EIA occurred. Assessment years that are considered vary between topics (the reasons for this are set out in each technical chapter), but generally include:

- Current baseline (2021) – the baseline describes the existing conditions on site without the proposed Scheme;

- Future baseline in the absence of development (2036);
- Construction phase(s) – 18 month construction programme Q4 2021 to Q1 2023; and
- Operational phase (2023) – the proposed Scheme is anticipated to be operational in 2023.

The proposed Scheme does not have an expected end of life and it is not anticipated that the proposed Scheme would be demolished at any point in the foreseeable future. If demolition did occur of any part of the proposed Scheme, effects would be expected to be similar to those arising during construction, with appropriate controls in place. If necessary, depending on changes to the baseline or surrounding receptors, the environmental effects of demolition would be considered as part of the relevant regulator processes surrounding any future demolition. As such, the EIA does not consider a decommissioning of the proposed Scheme.

3.5.3 Design Development and Impact Avoidance

Each technical chapter sets out specific measures that have been incorporated into the design of the proposed Scheme to avoid or minimise impacts, this includes any industry standard impact avoidance measures or best practice guidance to be implemented during construction or operation.

3.5.4 Impact Assessment Method and Significance Criteria

This ES contains a comprehensive assessment of the likely significant effects on the environment arising from the proposed Scheme.

In accordance with the EIA Regulations each assessment describes “*the direct effects and any indirect, secondary, cumulative, transboundary, short-term, medium-term and long-term, permanent and temporary, positive and negative effects of the development*”.

Where it has not been possible to quantify effects, qualitative assessments have been carried out, based on available knowledge and professional judgment. Where uncertainty exists, this has been noted in the relevant technical chapter.

Where appropriate, the individual topic assessments consider and describe each of the above effects during the construction and operation phases of the proposed Scheme as set out previously. The methodologies used for individual technical assessments within the EIA vary from topic to topic, in accordance with topic specific guidance. An assessment of significance is made by each technical assessment having regard to aspects such as the scale, duration and permanence of the impact and sensitivity of the receptors. The methodologies used for individual technical assessments are set out in detail in the topic sections (Chapters 4-10 of this ES).

To enable comparison between technical topics and aid understanding of the EIA findings, however, the following standard terms are used wherever possible to describe the relative significance of effects throughout the ES:

- negligible, minor, moderate and major; and
- adverse or beneficial.

Moderate and major effects are generally considered to be ‘significant’ for the purposes of the EIA Regulations, in accordance with standard EIA practice.

Table 3.3 shows how the interaction of magnitude and sensitivity can be combined to determine the significance of an effect. Where there are deviations away from this matrix (due to the technical guidance or approach of a specific discipline), this is highlighted within the relevant technical chapter and the reason for the variation explained. The definition of what constitutes a significant effect is provided within the method section of each technical chapter of the ES.

Table 3.3: Matrix defining the relative significance of effects

Magnitude of Impact	Sensitivity/Importance of Receptor			
	High	Medium	Low	Very Low
High	Major	Major	Moderate	Minor
Medium	Major	Moderate	Minor	Negligible
Low	Moderate	Minor	Negligible	Negligible
Very Low	Minor	Negligible	Negligible	Negligible

3.5.5 Identification of Effects

Construction phase effects

Construction effects are defined in this ES as those temporary effects that arise during construction aspects including:

- site clearance;
- earthworks;
- construction; and
- landscaping.

The effects generally cease after the completion of the construction and are generally considered to be short-term. Examples include construction noise, vibration and dust effects arising from construction traffic and earthworks.

Operational phase effects

The operational assessment identifies effects arising from both the existence and operation of the proposed Scheme:

- long-term existence effects arise from the physical presence of the scheme and are generally unchanging over time *e.g.* effects from land take for the scheme such as loss of ecological resources and/or change in the visual landscape; and
- effects from operational activities on the Site may vary from hour to hour, day to day and year to year, *e.g.* operational traffic. However, for the purpose of the EIA, the worst-case effect is reported i.e. for traffic the effect during the peak hour of traffic flow is reported.

3.5.6 Mitigation

Schedule 4 of the 2017 EIA Regulations requires an ES to include “*A description of the measures envisaged to prevent, reduce and where possible offset any significant adverse effects on the environment and, where appropriate, of any proposed monitoring arrangements*”.

These measures are generally referred to as mitigation measures (although it is noted that offset measures are more akin to compensation measures where mitigation of the effect is not possible).

For the purposes of this ES, mitigation measures have been broadly defined to incorporate the following:

- measures to prevent or avoid significant adverse effects on the environment;
- measures to reduce significant adverse effects on the environment; and
- measures to remedy significant adverse effects on the environment through enhancement.

In general, a ‘hierarchy’ of mitigation has been adopted during this EIA, such that potentially significant adverse environmental effects have been firstly prevented or avoided through the iterative design process. Where it has not been possible to design-out environmental effects, they have been reduced or ameliorated as far as practicable through mitigation. All types of mitigation measures, including those which are recommended through best practice, are described within the individual topic sections. A summary of the significant effects and mitigation is provided in Chapter 12: Summary of Significant Effects and Mitigation.

3.5.7 Residual Effects

The effects of a development which remain following the implementation of mitigation measures are known as ‘residual effects’. This ES assesses the significance of the identified effects, following the implementation of the proposed mitigation measures, and considers if the proposed Scheme is likely to cause significant residual effects.

To ensure consistency, each potential effect is identified as:

- short-term (St) – effects occurring only over a short period of time, which can include a period of several years but is a period that is not expected to last beyond the construction phase, or one that lasts for only part of the operational phase;

- medium-term (Mt) – effects occurring for only part of the scheme’s operation, for example, air quality may be impacted at opening year but there is an overall trend of air quality improving so air quality impacts are not anticipated for the full duration of the scheme’s operation; or
- long-term (Lt) – effects occurring for the duration of the scheme’s operation;
- temporary (T) – effects that are not permanent because the effect would no longer occur if the impact was removed within the relevant timescale (for example the visual amenity impact of construction structures would be described as St, T as the impact goes when the structures are removed); or
- permanent (P) – effects that are permanent and cannot be readily reversed; and
- direct (D) – effects that result from a direct impact, for example, the loss of ecological habitat; or
- indirect (In) – also known as secondary effects, are effects that result indirectly, for example, increased traffic could indirectly impact on air quality or creation of construction jobs can indirectly impact upon the local area through increased use of services/ goods.

3.6 Cumulative and In-Combination Effects

As required by Schedule 4 of the EIA Regulations, the ES also considers the potential for cumulative effects with other developments. In consultation with the KMBC, a number of committed developments (i.e. those that have planning permission but not yet constructed, or are formally within the planning process, therefore reasonably foreseeable within timescales of relevance to the proposed Scheme) have been identified with potential for cumulative effects with the proposed Scheme. These are considered in Chapter 11: Cumulative Impact Assessment.

In addition, the various technical chapters also consider the inter-relationships of effects, also referred to as in-combination effects. In-combination effects are those which could be caused by various impacts of the proposed Scheme in combination, such as noise and dust impacts acting together at a receptor. A matrix of in-combination effects is included in Chapter 11: Cumulative Impact Assessment.

3.7 Assumptions and Limitations

A number of assumptions have been made during preparation of the ES, and the assessments have been subject to certain limitations. The key assumptions that apply across the ES are summarised as follows (assumptions relevant to specific disciplines are discussed in the relevant technical chapters of this ES):

- that the principal land uses adjacent to the site remain as they are at the time of the ES submission (the cumulative impact assessment considers reasonably foreseeable changes, as do the future baseline conditions as defined within each technical chapter, to ensure the assessment is robust); and

- that information provided by third parties, including publicly available information and databases is correct at the time of ES publication.

The EIA has been subject to the following limitations:

- baseline conditions have been assumed to be accurate at the time of the physical surveys but, due to the dynamic and changing nature of the environment, conditions may change during the site preparation, construction and operational phases (this does not affect the robustness of the assessment reported within this ES, however there will be a requirement to review and confirm baseline conditions that are subject to change at future stages e.g. pre-construction ecology surveys);
- due to the impacts of COVID-19 it has been identified that traffic around the site will be reduced in relation to ordinary circumstances, therefore traffic surveys were not carried out on site and historic AADT and AAWT traffic data was used; and
- the assessment of cumulative effects has been reliant on the availability of information on the committed developments identified and agreed with the KMBC. Assumptions have been made regarding those developments where information is not available, to ensure the assessment is as robust as possible.

3.8 Preparation of the Environmental Statement and Non-Technical Summary

The results of the EIA process are reported in this ES, which has been prepared in accordance with the requirements of Schedule 4 of the EIA Regulations. In line with these requirements, a non-technical summary (NTS) document has also been prepared which forms part of this ES and is bound separately as Volume IV: Non-Technical Summary.

Contents

	Page
4 Traffic and Transport	2
4.1 Introduction	2
4.2 Planning Policy Context	2
4.3 Assessment Method	4
4.4 Baseline Conditions	11
4.5 Design Development and Impact Avoidance	15
4.6 Environmental Impacts and Significance of Effects	15
4.7 Mitigation	27
4.8 Residual Effects	27

4 Traffic and Transport

4.1 Introduction

This chapter presents an assessment of potential impacts on traffic and transport associated with the proposed Headbolt Lane station scheme, described in Chapter 2: Scheme Description.

This chapter is supported by the following figures (see Volume II: Figures) and technical appendices (see Volume III: Technical Appendices):

- Figure 4.1: Local Key Routes;
- Figure 4.2: Key Sensitive Receptors;
- Figure 4.3: Construction HGV Routing Plan;
- Appendix 4A: Headbolt Lane Station Transport Assessment; and
- Appendix 4B: Headbolt Lane Framework Travel Plan.

4.2 Planning Policy Context

This section outlines the relevant national and local transport policy and planning guidance documents which form the context for the proposed Scheme.

4.2.1 National Planning Policy

The National Planning Policy Framework (NPPF) sets out the Government's planning policies for England and how these are to be applied.

Chapter 9 of NPPF discusses how development should promote sustainable transport. Paragraph 109 states that *'development should only be prevented or refused on highways grounds if there would be an unacceptable impact on highway safety, or the residual cumulative impacts on the road network would be severe'*. In addition, Paragraph 111 states that *'all developments that will generate significant amounts of movements should be required to provide a travel plan, and the application should be supported by a transport statement or transport assessment so that the likely impacts of the proposal can be assessed'*.

The National Planning Practice Guidance (NPPG) was last updated in October 2019 and contains guidance on Travel Plans and Transport Assessments, setting out that they are required for all developments which generate significant amounts of movements.

A Transport Assessment (TA) (Appendix 4A) and Framework Travel Plan (FTP) (Appendix 4B) have been produced for the proposed Scheme in line with the above guidance to appropriately assess the potential transport impacts of the proposals and promote a sustainable development.

4.2.2 Local Planning Policy

The Liverpool City Region Combined Authority (LCRCA) Transport Plan (2019) sets out a strategic framework and delivery plan for transport in the LCR. The strategic objectives of the plan include:

- supporting inclusive economic growth by developing a transport network that connects people, businesses and visitors;
- creating a new mobility culture with modern, safe, clean and inclusive transport, where public transport is the mode of choice, which in turn will help to enhance health and wellbeing;
- developing a liveable and reliant city region that addresses poor air quality and supports a zero carbon LCR by 2040; and
- providing a safe, well maintained and resilient transport network.

The Merseyside Third Local Transport Plan (LTP3) outlines a number of goals to support the Liverpool City Region (LCR) to achieve its transport vision. The goals include:

- providing a clean, resilient and low emissions transport system;
- ensuring equality of travel opportunities than enable access to employment, education, healthcare and leisure for all;
- delivering a transport system that promotes improved health and wellbeing and road safety; and
- delivering a network that supports the economic success of the LCR through efficient movement of people and goods.

Strategic Objective 6 of the Knowsley Local Plan Core Strategy (2016) relates to sustainable transport. It states that new development should seek to prioritise sustainable transport to help improve accessibility between housing and employment areas, as well as shopping leisure, healthcare, education and other services.

The local policies summarised above all emphasise the need for sustainable development in accessible locations. The proposed Scheme itself would provide a sustainable travel option for local residents and increased accessibility for all its users.

Similarly, a key theme across all policy documents is ensuring development supports inclusive and sustainable access. The aim of the proposed Scheme is to minimise long vehicle trips and encourage multi-modal trips by more sustainable modes, which fully supports these key policies. Access to the site by all modes has been considered and designed for. The provision of cycle infrastructure, cycle parking, and electric vehicle charging further enhances the sustainability of the development.

4.2.3 Other Relevant Legislation, Standards and Guidance

The scope of the assessment has been informed by the guidance issued by the following organisations:

- The Institution of Highways and Transportation (IHT)¹, now the Chartered Institution of Highways and Transportation (CIHT); and
- The Institute of Environmental Assessment (IEA)², now the Institute of Environmental Management and Assessment (IEMA).

The IHT Guidelines recommend that the traffic and transportation effects of proposed developments should be assessed in accordance with the IEA Guidelines.

The IEA Guidelines identify the basis through which to assess the significance of changes to levels of vehicular traffic and pedestrian and cycle movements on the operation of existing transport networks.

Taking into account this guidance, the focus of this chapter is on the following:

- impacts of the construction and operational phases of the proposed Scheme;
- the transport specific environmental topics as identified in the IEMA guidance, namely: severance, driver and pedestrian delay, pedestrian and cycle amenity, fear and intimidation, accidents and safety and hazardous loads; and
- identifying and incorporating measures during evolution of the design of the proposed Scheme to avoid, reduce or remedy potential adverse effects in relation to transport.

Within the context of access and transportation, there are a range of best practice techniques which are frequently used to mitigate the likely effects of a proposed Scheme upon the operation of the surrounding transport networks. These often include a Construction Traffic Management Plan (CTMP). This document is generally used as a means of identifying potential management techniques to help mitigate the temporary effects associated with construction traffic. A CTMP will be prepared by the contractor for approval by KMBC before commencement of the construction process.

4.3 Assessment Method

4.3.1 Consultation

Discussion and email correspondence with KMBC Highways Officer was conducted to agree the assessment scope of the Transport Assessment.

¹ Institute of Highways and Transportation (1994); Guidelines for Traffic Impact Assessment.

² Institute of Environmental Assessment (1993); Guidelines on the Environmental Assessment of Road Traffic (Guidance Note 1).

Table 4.1: Consultation summary

Consultee and date	Issue Raised	Summary of Response
KMBC Highways Officer 5 February 2021	Scope of Transport Assessment	Transport Assessment and Travel Plan required to support planning application.

4.3.2 Sources of Information and Data

Desk-Based Study

Due to the ongoing impacts of Covid-19 on travel behaviour, it is not considered that traffic surveys undertaken at this time will be representative of typical traffic levels. Alternative sources of data have therefore been agreed with KMBC to inform the baseline traffic flows. These are detailed in Table 4.2.

Table 4.2: Summary of baseline traffic data

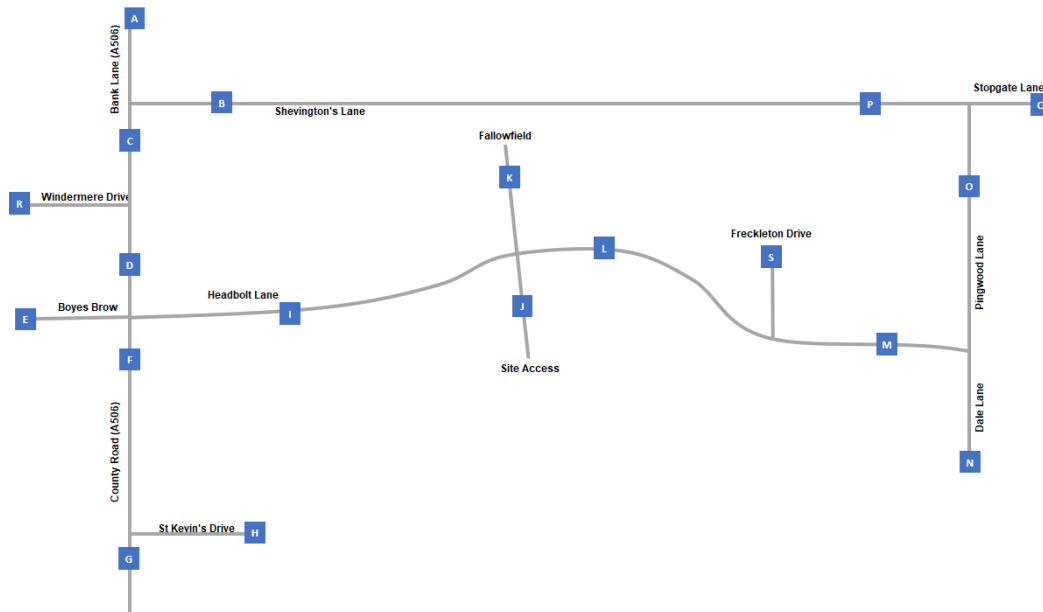
Survey location	Date surveys undertaken
Headbolt Lane / Fallowfield	January 2014
Stopgate Lane / Pingwood Lane / Shevington's Lane	
Pingwood Lane / Dale Lane / Headbolt Lane	
A506 Bank Lane / Headbolt Lane / A506 County Road / Boyes Brow	January 2019
A506 Bank Lane / Shevington's Lane	
A506 County Road / St Kevin's Drive	

4.3.3 Study Area

The extent of the study area has been defined using a combination of the IEA guidelines and the extent of the network being considered as part of the TA, in order to maintain consistency between the two assessment processes.

The study area with link references is shown in Image 4.1.

Image 4.1: Link reference diagram



4.3.4 Impact Assessment and Significance Criteria

The baseline conditions which the proposed Scheme has been assessed against consists of a range of different receptors. These include pedestrians, cyclists, public transport users and drivers of private and commercial motorised vehicles.

The methodology used for this assessment is based upon a comparison of baseline and predicted traffic flows along affected roads using the IEA Guidelines for the Environmental Assessment of Road Traffic. This assessment is structured around a series of potential environmental effects relating to traffic and transport, namely:

- severance;
- driver delay;
- pedestrian delay;
- pedestrian and cycle amenity;
- fear and intimidation;
- hazardous loads; and
- accidents and safety.

When assessing the likely environmental effects, it is important to determine the magnitude and significance of any individual effects or the combined effect of the proposed Scheme on a range of receptors. In accordance with EIA Regulations, the likely environmental effects of the proposed Scheme have been identified and their significance determined. Evaluation of their significance has been based upon specific criteria for each type of receptor and impact. This process has considered the following:

- impact likelihood, extent and magnitude;

- impact nature (whether beneficial or adverse, direct or indirect, primary or secondary, permanent, temporary and/or reversible);
- importance and sensitivity of the environmental receptor;
- the number of receptors that are impacted;
- impact duration (whether short, medium or long term); and
- whether it is a stand-alone impact or is cumulative.

The following terms have been used to assess the significance of effects, and are based on Design Manual for Roads and Bridges (DMRB) definitions:

- major beneficial or adverse: where the proposed Scheme is likely to cause a significant improvement or deterioration to the existing environment;
- moderate beneficial or adverse: where the proposed Scheme is likely to cause a noticeable improvement or deterioration to the existing environment;
- minor beneficial or adverse: where the proposed Scheme is likely to cause a barely perceptible improvement or deterioration to the existing environment
- negligible: no discernible improvement or deterioration to the existing environment.

4.3.5 Sensitivity of Receptors

The significance of an effect on a receptor is defined in accordance with the sensitivity of the receptor and the magnitude of the impact. A set of criteria has been defined and used as a means of determining the sensitivity of receptors which are likely to be affected by any changes in the composition of traffic, in particular, the volume and movement patterns of HGVs.

The criteria that have been used to make judgements on the value / sensitivity of receptor(s) within the context of the development proposals are summarised in Table 4.3.

Table 4.3: Sensitivity of receptors

Sensitivity	Description of receptor group
High	The receptor/resource has little ability to absorb change without fundamentally altering its present character, or is of international or national importance. Examples of receptors of greatest sensitivity to traffic flow: schools, colleges, playgrounds, accident black spots, retirement homes, urban/residential roads without footways that are used by pedestrians. (Paragraph 2.5, IEA Guidelines, 1993).
Medium	The receptor/resource has moderate capacity to absorb change without significantly altering its present character, or is of high importance. Examples of traffic-flow sensitive receptors include congested junctions, doctors' surgeries, hospitals, shopping areas with roadside frontage, roads with narrow footways, un-segregated cycleways, community centres, parks and recreation facilities.

Sensitivity	Description of receptor group
Low	The receptor/resource is tolerant of change without detriment to its character, or is of low or local importance.
Very Low	Receptors with some sensitivity to traffic flow: places of worship, public open spaces, nature conservation areas, listed buildings, tourist attractions and residential areas with adequate footway provision.

4.3.6 Magnitude of Impact

In accordance with Section 3.1 of the IEA guidelines, the impact of traffic is dependent upon a wide range of factors, including:

- the volume of traffic;
- traffic speeds and operational characteristics; and
- traffic composition (e.g. the percentage of HGVs).

In determining the impact of, and crucially, the significance of the above factors, the IEA guidelines suggest that two basic rules are used to define the extent of the assessment. These rules are defined as follows:

- **Rule 1:** Highway links where traffic flows will increase by more than 30% (or the number of HGVs will increase by more than 30%); and
- **Rule 2:** Any specifically sensitive areas where the traffic flows have increased by 10% or more.

A summary of the impact thresholds, which are referred to in Section 4.3.4, is provided in Table 4.4. As noted, there are no definitive set of criteria for assessing or quantifying the impact of traffic flow increases / decreases on all impact types (i.e. levels of severance, fear and intimidation, etc.). However, for the purposes of this assessment, it is still necessary to be able to identify the magnitude of all impact types and be able to justify the criteria used.

In the absence of a set of consistent impact magnitude criteria for traffic, it is considered that the magnitude thresholds should be based on paragraph 4.31 of the IEA guidelines, which notes the following:

“Changes in traffic flows of 30%, 60% and 90% are regarded as producing ‘slight’, ‘moderate’ and ‘substantial’ changes in severance, respectively.”

While the IEA guidelines suggest that these percentages should be applied within the context of assessing levels of severance, it is considered that they are also suitable as a basis of developing an appropriate set of quantifiable thresholds which can be used as a means of measuring the magnitude of other effects, particularly as levels of severance and other elements such as traffic delay or accident rates often increase as traffic flows increase.

On this basis, Table 4.4 sets out the specific magnitude criteria for assessing the impacts of traffic.

Table 4.4: Magnitude of impact – transport criteria

Impacts	Magnitude of Impact			
	Very Low	Low	Medium	High
Severance – results from the creation of new barriers such as roads combined with increased traffic flow along existing routes.	Little or no hindrance to pedestrian movement. Change in total traffic flows of <30%.	All people wishing to make pedestrian movements will be able to do so, but there will probably be some hindrance to movement. Change in total traffic flows of 30-60%.	Some people, particularly elderly people and children may be dissuaded from making a journey on foot. For others, pedestrian journey will be longer or less attractive. Change in total traffic flows of 60-90%.	People are likely to be deterred from making pedestrian journeys to an extent sufficient to induce a reorganisation of their activities. Those who do make the journey on foot will experience considerable hindrance. Change in total traffic flows of >90%.
Driver Delay – often caused by the impact of the works on the local road network, along with increases in overall traffic flow along existing routes.	Little or no change in delays to drivers. Change in total traffic flows of <30%.	A measurable and perceptible change in driver delay. Unlikely to affect overall journey times. Change in total traffic flows of 30-60%.	Delay may have a noticeable effect on journey times but is unlikely to cause drivers to choose alternative route or time for their journey. Change in total traffic flows of 60-90%.	Delay may have a major effect on journey times. The magnitude of delay is such that drivers may choose alternative route or time for their journey, or may decide not to make journey at all. Change in total traffic flows of >90%.
Pedestrian Delay – results from increases in traffic flow, speed or composition along existing routes.	Little or no change in delays to pedestrians. Change in total traffic flows of <30%.	A measurable and perceptible change in pedestrian delay. Change in total traffic flows of 30-60%.	Delay may have a noticeable effect on journey times but is unlikely to cause pedestrians to choose alternative route or time for their journey. Change in total traffic flows of 60-90%.	Delay may have a major effect on journey times. The magnitude of delay is such that pedestrians may choose alternative route or time for their journey, or may decide not to make journey at all. Change in total traffic flows of >90%.

Impacts	Magnitude of Impact			
	Very Low	Low	Medium	High
Pedestrian and Cyclist Amenity – relates to the relative pleasantness of a journey and can be affected by increases in traffic.	Little or no change in the pleasantness of journeys made by foot or cycle. Change in total traffic flows of <30%.	A measurable and perceptible change in the pleasantness of journeys made by foot or cycle. Change in total traffic flows of 30-60%.	Change in the pleasantness of journeys made by foot or cycle may have a noticeable effect but is unlikely to cause pedestrians or cyclists to choose alternative route for their journey. Change in total traffic flows of 60-90%.	The magnitude of change in the pleasantness of journeys made by foot or cycle is such that pedestrians and cyclists may choose alternative route or may decide not to make journey at all. Change in total traffic flows of >90%.
Fear and Intimidation – a pedestrian's level of fear and intimidation is linked to the volume of traffic on the local road network.	Little or no change in the level of intimidation experienced by pedestrians due to road traffic, particularly HGVs. Change in total traffic flows of <30%.	A measurable and perceptible change in level of intimidation experienced by pedestrians due to road traffic, particularly HGVs. Change in total traffic flows of 30-60%.	Change in the level of intimidation experienced by pedestrians due to road traffic, particularly HGVs may have a noticeable effect but is unlikely to cause pedestrians to choose alternative route for their journey. Change in total traffic flows of 60-90%.	Change in the level of intimidation experienced by pedestrians due to road traffic, particularly HGVs may be such that pedestrians choose alternative route or may decide not to make journey at all. Change in total traffic flows of >90%.
Accident and Safety – the impact of the development through and increase in vehicles could have an effect on the accidents and safety of the surrounding road network.	Change in total traffic flows of <30%.	Change in total traffic flows of 30-60%.	Change in total traffic flows of 60-90%.	Change in total traffic flows of >90%.
	A qualitative assessment based on historical accident trends over the last five years.			

4.3.7 Significance

As a guide to inform the assessment, but not as a substitute for professional judgement, criteria for determining the significance of traffic related effects are summarised in Table 4.5. This is based on a combination of the sensitivity of the receptor, described in Table 4.3, and the magnitude of the impact, described in Table 4.4. It should be noted that effects could be either adverse or beneficial.

Table 4.5: Effect significance matrix

Sensitivity of Receptor	Magnitude of Impact			
	High	Medium	Low	Very Low
High	Major	Major	Moderate	Minor
Medium	Major	Moderate	Minor	Negligible
Low	Moderate	Minor	Negligible	Negligible
Very Low	Minor	Negligible	Negligible	Negligible

Effects are considered as having a ‘major’, ‘moderate’, ‘minor’ or ‘negligible’ significance. ‘Major’ and ‘moderate’ significance represents effects which are considered to be significant in an EIA context.

Effects judged to be of ‘minor’ or ‘negligible’ significance are not considered to be significant (in an EIA context) and therefore do not form any further part of the assessment process.

It is suggested that any increase in traffic flow below 10% is generally considered to be insignificant given that daily variations in background traffic flows on any given road link can fluctuate by the same amount. Changes in traffic flow levels below this level have therefore been assumed to result in no discernible environmental impact.

4.4 Baseline Conditions

4.4.1 Overview of Existing Conditions

The local highway network surrounding the proposed station and car park site comprises a mixture of A-classified and unclassified roads. The key routes in the vicinity of the proposed station and car park site are described below (shown on Figure 4.1).

Headbolt Lane forms a priority controlled T-junction with Pingwood Lane and Dale Lane to the east, and a signalised crossroads with Bank Lane (A506) and Boyes Brow to the west. The road runs adjacent to the north of the proposed station and car park site. Headbolt Lane is a relatively wide single carriageway with intermittent footways and few formal pedestrian crossing points.

Bank Lane (A506) provides a direct connection to the Strategic Road Network at its northern end via the M58 Junction 1. In the vicinity of the proposed station and car park site, the road comprises a two-way single carriageway and has a 30mph speed limit. Footways are in place on both sides of the carriageway and are separated from the road by grass verges and guard railings. A shared footway / cycleway is in place on the north side of the Boyes Brow / Bank Lane (A506) / Headbolt Lane junction.

Pingwood Lane / Dale Lane are located at the eastern end of Headbolt Lane. Pingwood Lane is a single carriageway subject to a 30mph speed limit and forms a priority-controlled T-junction with Shevington’s Lane and Stopgate Lane to the

north. Dale Lane is also a single carriageway and is subject to a 50mph speed limit. It becomes North Perimeter Road to the south, which provides access to Knowsley Industrial Park. In the vicinity of Headbolt Lane, footways are provided on the western side of Pingwood Lane and Dale Lane. There is no footway provision on the eastern side of the carriageway.

4.4.2 Road Safety and Accidents

Personal injury accident data for May 2016 to December 2020, has been provided by KMBC. The study area comprises the local highway network in the vicinity of Headbolt Lane.

A total of 26 collisions were recorded within the study period. A breakdown of collisions by location and severity is shown in Table 4.6.

Table 4.6: Recorded collisions by severity

Location	No. of recorded collisions	Severity		
		Slight	Serious	Fatal
A506 / St Kevin's Drive	4	3	0	1
A506 / Headbolt Lane	2	2	0	0
Shevington's Lane / Pingwood Drive / Stopgate Lane	4	4	0	0
A506 / Shevington's Lane	1	1	0	0
Headbolt Lane / Stopgate Lane / Dale Lane	1	1	0	0
A506 County Road	1	1	0	0
Headbolt Lane	1	1	0	0
A506 Bank Lane	5	5	0	0
Shevington's Lane	3	2	1	0
Domingo Drive	1	0	1	0
Chamberlain Drive	1	0	1	0
Pingwood Lane	2	0	1	1
Total	26	20	4	2

A full analysis of the accident data is set out within the TA in Appendix 4A. In summary, the analysis reveals that there are no underlying trends in contributory factors which indicate any fault within the layout of the surrounding highway network, and no existing highway safety issues which would be likely to be exacerbated by an increase in traffic due to the proposed Scheme.

4.4.3 Traffic Flow Data

As noted in Section 4.3.2, baseline traffic data has been derived from traffic count surveys undertaken in January 2014 and January 2019, which has been supplied by KMBC. No baseline traffic data is available for Freckleton Drive. This is addressed in Sections 4.6.1 and 4.6.2.

The traffic data is described in further detail within the TA (see Appendix 4A). Using the traffic survey data, the future 2023 and 2028 baseline traffic estimates have been forecast using traffic growth factors derived from TEMPRO. A mixture of 24-hour Automatic Traffic Count (ATC) data and existing junction turning count data has been used to calculate Annual Average Daily Traffic (AADT) flows.

The results of the analysis are presented in Table 4.7.

Table 4.7: Baseline traffic data

Link ID	Link	2023 Baseline		2028 Baseline	
		24hr AADT	% HGVs	24hr AADT	% HGVs
A	Bank Lane (north of Shevington's Lane)	14556	5%	15124	5%
B	Shevington's Lane (west)	12214	2%	12691	2%
C	Bank Lane (south of Shevington's Lane)	15875	4%	16495	4%
D	Bank Lane (north of Headbolt Lane)	15305	4%	15903	4%
E	Boyes Brow	6430	1%	6681	1%
F	A506 County Road (north)	15224	5%	15818	5%
G	A506 County Road (south)	15099	5%	15689	5%
H	St Kevin's Drive	2106	1%	2189	1%
I	Headbolt Lane (west of site access)	5969	3%	6202	3%
J	Site access				
K	Fallowfield	352	1%	366	1%
L	Headbolt Lane (east of site access)	6551	3%	6806	3%
M	Headbolt Lane (east)	3659	3%	3802	3%
N	Dale Lane	5310	6%	5517	6%
O	Pingwood Lane	6958	6%	7230	6%
P	Shevington's Lane (east)	6054	2%	6290	2%
Q	Stopgate Lane	1864	6%	1936	6%
R	Windermere Drive	570	1%	592	1%
S	Freckleton Drive				

Network Peak

As per the TA, the following peak periods for vehicle movements across the study network have been identified:

- AM Peak – 07:45-08:45
- PM Peak – 16:15-17:15

4.4.4 Sensitive Receptors

The sensitivity of each highway link within the study area has been categorised based on the criteria outlined in Table 4.3. The findings are shown in Table 4.8.

Table 4.8: Sensitivity of links

Link ID	Link	Sensitivity
A	Bank Lane (north of Shevington's Lane)	Medium
B	Shevington's Lane (west)	High
C	Bank Lane (south of Shevington's Lane)	Very Low
D	Bank Lane (north of Headbolt Lane)	Medium
E	Boyes Brow	High
F	A506 County Road (north)	Very Low
G	A506 County Road (south)	High
H	St Kevin's Drive	Very Low
I	Headbolt Lane (west of site access)	Low
J	Site access	N/A
K	Fallowfield	Very Low
L	Headbolt Lane (east of site access)	High
M	Headbolt Lane (east)	Medium
N	Dale Lane	Medium
O	Pingwood Lane	Medium
P	Shevington's Lane (east)	High
Q	Stopgate Lane	Very Low
R	Windermere Drive	Very Low
S	Freckleton Drive	Very Low

From the receptors identified within the study area, the following are considered to be the most sensitive to potential impacts as a result of the proposed Scheme:

- The Star Early Years Centre, Shevington's Lane;
- Mill Farm Playground, Boyes Brow;
- All Saints Catholic High School, A506 County Road; and
- Eastcroft Park Primary School, Hollinghurst Road.

The locations of the above receptors are shown in Figure 4.2.

Existing network users, such as pedestrians and cyclists are also considered to be amongst the most sensitive to potential impacts.

4.5 Design Development and Impact Avoidance

The following considerations are particularly relevant to the assessment of the likely effects resulting from the construction and operational phases of the proposed Scheme on the surrounding transport networks.

Construction:

A Construction Traffic Management Plan (CTMP) will be produced addressing the following:

- the anticipated volume, type and frequency of construction vehicles;
- construction times and hours of operation with respect to construction vehicle movements to minimise travel during the AM and PM peak periods; and
- an agreement on suitable construction vehicle routes.

Operation:

- signalised pedestrian crossings on all arms of the new site access junction, providing a new crossing point on Headbolt Lane;
- a new uncontrolled crossing with dropped kerbs and tactile paving to the east of the site to provide a connection across Headbolt Lane and to the residential area to the east;
- pedestrian footways and multiple zebra crossings throughout the site to maximise pedestrian connectivity;
- the existing footway that traverses the site, connecting Headbolt Lane with Bank Lane (A506), is to be partially retained to maintain an east-west connection across the site, with diversions made to tie this footway into the wider site layout; and
- an at-grade crossing within the station will provide a connection across the rail line, linking the residential areas to the north and south.

4.6 Environmental Impacts and Significance of Effects

4.6.1 Construction

This section provides an assessment of the significance of likely effects of construction, prior to the incorporation of any mitigation measures. In accordance with IEMA guidance, determination of the significance of effect has been undertaken in consideration of the anticipated highest level of construction traffic impact that might reasonably be expected. Where multiple receptors are affected by any one potential effect, then the receptor with the highest level of importance has been used in the calculation of the significance of effect. As stated in Section 4.3.5, the significance of the environmental effects is determined by sensitivity of the receptor and the magnitude of the impact.

The indicative construction programme is expected to start in Q4 2021, with the proposed Scheme planned for completion in Q1 2023. All estimates of volumes and types and of vehicles required have been supplied by BGCL and are considered to represent a realistic worst-case scenario.

The main construction compound will be located within the proposed station and car park site, to the south of Headbolt Lane. The vast majority of construction traffic will be travelling to / from the main compound.

Two satellite compounds are to be located near Millennium Green and the existing Kirkby station. The construction traffic volumes associated with the satellite compounds are expected to be very low (i.e. maximum 10 two-way car trips and 4 two-way HGV trips per day). The satellite compounds will be used on a short-term basis. Given the low traffic volumes, the traffic impact associated with the satellite compounds is not considered to be significant. This assessment will therefore focus on the main construction compound within the proposed station and car park site at Headbolt Lane.

Construction will generally operate Monday-Friday between 08:00-18:00 and Saturday 08:00-13:00, with no working on Sundays or bank holidays, however, during rail blockades, which are required to facilitate construction of certain aspects of the proposed Scheme, there will be some night -time working and instances where construction working hours will operate on a 24 hours a day, for seven days basis. HGV movements to/from the site will not be permitted during highway network peak periods to reduce any adverse impact on the operation of the local road network.

All construction vehicles will arrive at and depart the Site via the proposed access on Headbolt Lane.

Forecast HGV Movements

A period of 76 weeks (approximately 18 months) has been outlined for the programme. It is estimated that during this time, the construction works will generate a total of 6,323 HGVs (12,646 two-way HGV movements). This equates to an average of 83 HGVs (166 two-way HGV movements) per week across the whole programme.

Based on the forecast provided by BCGL, the number of HGV movements is anticipated to peak for a one-week period, during which 165 weekly HGVs (330 two-way HGV movements) are expected. In addition, 10 wide-load deliveries are expected during this same week period, increasing the total to 175 weekly HGVs (350 two-way HGV movements). Arrival and departure of all wide-load deliveries will be appropriately scheduled and managed in order to minimise any adverse impact on the local highway network.

Based on a six-day working week, an average of 29 HGVs per day (58 two-way movements) will be generated by the construction works during the busiest week. This includes, on average, two wide-load deliveries per day.

A routing plan for HGVs accessing the Site has been provided by BGCL, as shown in Figure 4.3.

Forecast Construction Staff Movements

As stated previously, proposed construction working hours are Monday-Friday between 08:00-18:00 and Saturday 08:00-13:00, with no working on Sundays or bank holidays. Staff are expected to arrive within a one-hour period before each shift starts and depart the site within 30 minutes of the shift end. The assumed staff arrival and departure periods will therefore largely fall outside of the network peak periods identified in Section 4.4.3.

It is anticipated that the majority of construction staff will drive, but use of public transport, walking, cycling and car sharing will be encouraged. To ensure a robust assessment, it has been assumed that 100% of staff will drive to / from the Site. Staff parking will be accommodated within the Site, and all staff vehicles will therefore arrive at and depart the Site via the proposed access on Headbolt Lane.

The number of construction workers on site has been built up from information provided by BCGL. The number of workers on site is forecast to range between 10-150 staff per day.

It is estimated that the construction works will generate a total of 33,180 staff vehicles (66,360 two-way vehicle movements). This equates to an average of 437 staff vehicles (874 two-way vehicle movements) per week across the whole programme.

Based on the forecast provided by BCGL, the number of staff vehicle movements is anticipated to peak for a four-week period, which coincides with the expected HGV peak identified in the previous section. During this four-week period, 900 weekly staff trips (1,800 two-way vehicle movements) are expected on site. Based on a six-day working week, this equates to an average of 150 staff trips per day (300 two-way movements).

It is assumed that all construction staff will travel to the site from outside the immediate study area. In the absence of any construction staff postcode data, the staff vehicle distribution has been derived from existing turning proportions.

Net Change in Vehicles During Construction

Given that the majority of the construction works will take place in 2022, and will subsequently generate the highest number of annual staff and HGV movements, this will form the assessment year.

The 24-hour traffic impacts during the construction phase of the proposed Scheme are presented in Table 4.9. Note that no committed development has been included in the 'Do Minimum' scenario for the assessment of construction traffic, making the assessment of construction traffic impacts more robust.

Table 4.9: AADT two-way construction traffic increase (2022 Construction Year)

Link		24hr AADT (Veh)			24hr AADT (HGVs)		
		DM	DS	Change	DM	DS	Change
A	Bank Lane (north of Shevington's Lane)	14415	14465	0%	785	803	2%

Link		24hr AADT (Veh)			24hr AADT (HGVs)		
		DM	DS	Change	DM	DS	Change
B	Shevington's Lane (west)	12096	12096	0%	211	211	0%
C	Bank Lane (south of Shevington's Lane)	15721	15771	0%	688	707	3%
D	Bank Lane (north of Headbolt Lane)	15157	15207	0%	669	688	3%
E	Boyes Brow	6367	6393	0%	71	71	0%
F	A506 County Road (north)	15076	15108	0%	706	706	0%
G	A506 County Road (south)	14953	14984	0%	710	710	0%
H	St Kevin's Drive	2086	2086	0%	11	11	0%
I	Headbolt Lane (west of site access)	5911	6019	2%	158	177	12%
J	Site access	0	165	100%	0	19	100%
K	Fallowfield	348	348	0%	2	2	0%
L	Headbolt Lane (east of site access)	6487	6544	1%	175	175	0%
M	Headbolt Lane (east)	3624	3681	2%	98	98	0%
N	Dale Lane	5310	5317	0%	313	313	0%
O	Pingwood Lane	6958	7009	1%	411	411	0%
P	Shevington's Lane (east)	6054	6054	0%	128	128	0%
Q	Stopgate Lane	1864	1915	3%	110	110	0%
R	Windermere Drive	570	570	0%	3	3	0%
S	Freckleton Drive		0	0%		0	0%

No baseline traffic data is available for Freckleton Drive, however, no construction traffic is anticipated to route via this link, so no further assessment of construction traffic impacts on Freckleton Drive is required.

In addition, the site access link (J) lies within the site boundary and will not form part of the future adopted highway under the proposed Scheme. No further assessment of this link is therefore required.

Assessment of Construction Effects

The results of the assessment indicate that all links show forecast increase of less than 10% in overall traffic volumes during the construction phase. Based on Table 4.4, the magnitude of impact arising from the increase in total traffic is considered to be 'very low'. Where there are receptors classified as 'high' sensitivity, this will result in a 'minor' effect with regards to 'severance', 'driver delay', 'pedestrian delay', 'pedestrian and cycle amenity', 'fear and intimidation' and 'accidents and safety'.

The majority of links within the study network will not see any change in HGV volumes during the construction phase. HGV volumes are predicted to increase by 2-3% on the Bank Lane links (A, C and D). Where there are receptors classified as 'high' sensitivity, this will result in a 'minor' adverse effect for all assessed effects, which is not considered to be significant.

At the Headbolt Lane (West of site access) link, the forecast increase in HGVs is approximately 12%. Based on Table 4.4, the magnitude of impact arising from the increase in total traffic is considered to be 'low'. Receptors along this link are classified as 'low' sensitivity. The overall significance of the effects on this link would therefore be 'negligible'.

The construction phase will not require the movement of any hazardous loads to / from the Site. The magnitude of effect is therefore considered to be 'negligible'.

A summary of the likely effects of construction is presented in Table 4.10. Where the significance varies between links, the worst case has been presented.

Table 4.10: Assessment of effects of construction traffic

Effect	Description of Effect	Magnitude	Sensitivity	Significance
Severance	Increase in construction vehicle movements discouraging pedestrians from crossing Headbolt Lane.	Very Low	High	Minor
Driver Delay	Increase in construction vehicles may cause delay for drivers and public transport (bus) users travelling on Bank Lane and Headbolt Lane.	Very Low	High	Minor
Pedestrian Delay	Increase in construction vehicle movements discouraging pedestrians from crossing Headbolt Lane, creating delay along pedestrian desire lines.	Very Low	High	Minor
Pedestrian and Cycle Amenity	Increase in construction vehicle movements impacting on the 'pleasantness' of pedestrian / cycle journeys.	Very Low	High	Minor
Fear and Intimidation	An increase in the level of fear and intimidation perceived by pedestrian and cyclists as a result of increased levels of HGV	Very Low	High	Minor

Effect	Description of Effect	Magnitude	Sensitivity	Significance
	movements on the local road network.			
Hazardous Loads	No hazardous loads expected.	N/A		Negligible
Accidents and Safety	Increased likelihood of road accidents occurring during the construction period.	Very Low	High	Minor

4.6.2 Operation

This section provides an assessment of the predicted environmental effects resulting from the operation of the proposed Scheme. It outlines the likely volume of traffic to be generated by the proposed Scheme once operational, and should be read in conjunction with the trip generation set out in the TA (see Appendix 4A).

As agreed with KMBC, the following scenarios have been considered as part of this operational assessment:

- Weekday AM / PM 2023 ‘Opening Year’ Base (‘Do Minimum’);
- Weekday AM / PM 2023 ‘Opening Year’ Base + Proposed Development (‘Do Something’);
- Weekday AM / PM 2028 ‘Opening Year’ Base (‘Do Minimum’); and
- Weekday AM / PM 2028 ‘Future Year’ Base + Proposed Development (‘Do Something’).

The ‘Do Something’ scenarios include traffic associated with the following committed developments, as agreed with KMBC:

- Land east of Maghull (Planning Ref. DC/2020/01778);
- Kirkby town centre redevelopment (Planning Ref. 17/00559/FUL);
- Bank Lane residential development (Planning Ref. 13/00393/OUT and 14/00874/REM);
- Tower Hill residential development (Planning Ref. 15/00570/HYB);
- St Kevin’s Drive residential development (Planning Ref. 17/00201/FUL);
- Academy Business Park (Planning Ref. 19/00337/OUT); and
- PLP Knowsley (Planning Ref. 20/00124/FUL).

In accordance with the agreed scope, a trip generation exercise was undertaken as part of the TA to quantify the forecast trip generation of the proposed Scheme. This is summarised in Table 4.11.

Table 4.11: Vehicle trip generation

Direction	Weekday AM Peak (08:00-09:00)	Weekday PM Peak (17:00-18:00)	Daily Trips
Arrivals	93	60	610

Direction	Weekday AM Peak (08:00-09:00)	Weekday PM Peak (017:00-18:00)	Daily Trips
Departures	39	111	587
Total	132	171	1,197

The proposed Scheme is anticipated to generate 132 two-way vehicle movements in the weekday morning peak and 171 two-way movements in the weekday evening peak. A total of 1,197 daily trips are forecast.

It should be noted that a proportion of these trips that are likely not 'new' trips, but existing trips on the network currently utilise Kirkby station and will divert to the proposed station at Headbolt Lane upon its opening. However, no discount has been made to account for this, resulting in a robust assessment.

The distribution of the proposed Scheme trips arriving and departing is based on the methodology used as part of the TA.

The 24-hour traffic impacts for vehicles during the operational phase of the proposed Scheme are presented in Table 4.12. There are no forecast HGV trips associated with the operational phase of the proposed Scheme.

Table 4.12: AADT two-way operational traffic increase (vehicles)

Link		2023 Opening Year			2028 Future Year		
		DM	DS	Change	DM	DS	Change
A	Bank Lane (north of Shevington's Lane)	20545	20597	0%	21113	21166	0%
B	Shevington's Lane (west)	12214	12436	2%	12691	12913	2%
C	Bank Lane (south of Shevington's Lane)	21864	22138	1%	22484	22757	1%
D	Bank Lane (north of Headbolt Lane)	21294	21664	2%	21891	22261	2%
E	Boyes Brow	6430	6438	0%	6681	6689	0%
F	A506 County Road (north)	21213	21790	3%	21807	22385	3%
G	A506 County Road (south)	21363	21940	3%	21952	22530	3%
H	St Kevin's Drive	3374	3374	0%	3456	3456	0%
I	Headbolt Lane (west of site access)	5969	6925	16%	6202	7158	15%
J	Site access	0	1196	100%	0	1196	100%
K	Fallowfield	352	352	0%	366	366	0%
L	Headbolt Lane (east of site access)	6551	6791	4%	6806	7047	4%

Link		2023 Opening Year			2028 Future Year		
		DM	DS	Change	DM	DS	Change
M	Headbolt Lane (east)	3659	3814	4%	3802	3956	4%
N	Dale Lane	5310	5354	1%	5517	5562	1%
O	Pingwood Lane	6958	7068	2%	7230	7340	2%
P	Shevington's Lane (east)	6054	6162	2%	6290	6398	2%
Q	Stopgate Lane	1864	1866	0%	1936	1939	0%
R	Windermere Drive	570	666	17%	592	688	16%
S	Freckleton Drive		86			86	

As previously noted, no baseline traffic data is available for Freckleton Drive. However, a daily traffic increase of 86 two-way trips is forecast on this link, which equates to an average of 3-4 two-way trips per hour. This is not considered to be significant, and so no further assessment of operational traffic impacts on Freckleton Drive is required.

The results of the assessment indicate that all count locations, excluding the Site Access, show a predicted increase in AADT of less than 30%. There are no forecast increases in HGVs in any location. Based on the criteria set out in Table 4.4, the magnitude of impact in all count locations during the operational phase, excluding the Site Access, are considered to be 'very low'.

The only count location that experiences an increase in AADT over 30% is the Site access. Due to this being a new link, an AADT increase of 100% will occur in both the opening and future years.

It should be noted that the TA includes a more detailed assessment of the effects of the forecast increases in traffic, in particular on congestion and delay on the surrounding highway network.

Geographical Extent of Assessment

As noted in Section 4.3.6, IEA guidelines suggest that the following rules should be used to define the extent of assessment:

- **Rule 1:** Highway links where traffic flows will increase by more than 30% (or the number of Heavy Goods Vehicles (HGVs) will increase by more than 30%); and
- **Rule 2:** Any specifically sensitive areas where the traffic flows have increased by 10% or more.

On the basis of the above rules, all links within the study network could be omitted from this assessment. However, it is considered prudent to include Headbolt Lane within the assessment for the following reasons:

- a 17% increase in traffic is anticipated on Headbolt Lane as a result of the proposed Scheme;
- a 'high' sensitivity receptor is present on Headbolt Lane (ie. Eastcroft Park Primary School); and
- a new signalised crossroad junction is proposed on Headbolt Lane to provide access to the site.

The following sections address the potential impacts of the proposed Scheme on Headbolt Lane, in relation to each of the transport-specific environmental topics identified in the IEMA guidance.

Severance

The proposed Scheme will result in an increase in the number of pedestrians crossing Headbolt Lane to access the new station.

The main potential severance effects relate to the severance caused by increases in traffic due to the development on Headbolt Lane, which separates the proposed Scheme from the residential areas to the north, respectively. However, as set out in the previous section of this report, it is considered that the increase in traffic on Headbolt Lane due to the development is 'very low' in the context of the existing and future traffic flows using the road.

At present, Headbolt Lane mainly provides an east-west through link, as well as access to a number of residential neighbourhoods. Eastcroft Park Primary School, which has been identified as a sensitive receptor, is located adjacent to Headbolt Lane and accessed via Hollinghurst Road.

As outlined in Section 4.5, a number of design features are proposed as part of the new station, which will reduce severance for station users and local residents. These improvements are particularly focused on Headbolt Lane, and will therefore help mitigate any adverse severance impacts associated with increased traffic volumes resulting from the proposed Scheme.

Combining the 'high' sensitivity of Headbolt Lane (as per Table 4.8), along with the 'very low' adverse impact (as per Table 4.4 and Table 4.12), it is considered that severance effects of the traffic impacts associated with the operational phase on Headbolt Lane will be 'minor'.

Driver Delay

The proposed Scheme could increase driver delay due to increased volumes of traffic routing via Headbolt Lane to access the station car park. This could also result in delays to existing bus services operating on this route.

As previously noted, it is considered that the relative increase in traffic on Headbolt Lane due to the development is ‘very low’ in the context of the existing and future traffic flows using the road.

The TA includes a detailed assessment of the predicted impact of the forecast increases in traffic at the following junctions on Headbolt Lane:

1. A506 Bank Lane / Headbolt Lane / County Road / Boyes Brow signalised junction; and
2. Pingwood Lane / Dale Lane / Headbolt Lane priority junction; and

The modelling assessments conclude that the traffic associated with the proposed Scheme can be accommodated at both junctions without significant impact on the future baseline situation.

The TA also includes a modelling assessment of the proposed site access junction on Headbolt Lane and concludes that the proposed junction design provides sufficient capacity to accommodate the forecast traffic demand. The provision of a junction in this location will, however, introduce a degree of delay for drivers and buses that did not previously exist.

Overall, adverse impacts on driver delay on Headbolt Lane are therefore considered to be ‘very low’ adverse. Combining this with the ‘high’ sensitivity of Headbolt Lane, it is considered that the effects on driver delay and bus users associated with the operational phase will be ‘minor’ adverse.

Pedestrian Delay

The proposed Scheme will result in an increase in the number of pedestrians crossing Headbolt Lane to access the new station.

The degree to which the proposed Scheme could be considered to increase pedestrian delay would be due to increased levels of traffic accessing the site via Headbolt Lane. As previously stated, it is considered that the increase in traffic on Headbolt Lane due to the development is ‘very low’ in the context of the existing and future traffic flows using the road.

The existing pedestrian crossings at the A506 Bank Lane / Headbolt Lane / County Road / Boyes Brow junction would be unaffected, as these are signalised and their operation in terms of crossing time for pedestrians is therefore not impacted by increased traffic volumes.

Pedestrians utilising uncontrolled crossing points on Headbolt Lane may experience a slight increase in delay due to increased traffic flows, however, as previously noted, the increase in traffic resulting from the proposed development is not considered to be significant.

As noted under ‘Severance’, a number of improvements to the pedestrian network are proposed on Headbolt Lane and within the site as part of the new station, which cumulatively will reduce pedestrian delay. It is considered that the proposed Scheme will have a ‘low’ beneficial impact on pedestrian delay on Headbolt Lane. When combined with the ‘high sensitivity’ of this link, the

proposed Scheme is considered to have a ‘moderate’ beneficial effect on pedestrian delay.

Pedestrian and Cycling Amenity

The proposed Scheme will result in an increase in the number of pedestrians and cyclists using Headbolt Lane to access the new station.

Increased volumes of traffic accessing the site via Headbolt Lane could negatively impact pedestrian and cycling amenity, however, as previously stated, it is considered that the increase in traffic on Headbolt Lane due to the proposed Scheme is not significant.

As noted under ‘Severance’, a number of enhancements to the pedestrian network are proposed on Headbolt Lane and within the site, which will improve pedestrian amenity.

In addition, a 3 m wide bi-directional cycleway is proposed alongside the site access road, and will provide a continuous off-road cycle route between Headbolt Lane and the station cycle parking. Parking facilities for 100 cycles will be provided adjacent to the station building, with passive provision for a further 200 spaces.

Furthermore, it is understood that KMBC plans to deliver a new cycleway on the southern side of Headbolt Lane. The proposed station access junction design has been developed to enable the future cycleway to tie into the junction. Overall, these proposals will improve cycling amenity on Headbolt Lane.

It is therefore considered that the proposed Scheme will have a ‘very low’ beneficial impact on pedestrian and cycling amenity on Headbolt Lane. When combined with the ‘high sensitivity’ of this link, the proposed Scheme is considered to have a ‘minor’ beneficial effect on pedestrian and cycling amenity.

Fear and Intimidation

The increase in the volume of traffic, and particularly buses, travelling on Headbolt Lane as a result of the proposed Scheme could potentially increase fear and intimidation for pedestrians and cyclists.

However, the proposed signalised crossing provision on all arms of the site access junction, along with the proposed uncontrolled crossing to the east of the site, will help to reduce the existing level of fear and intimidation on Headbolt Lane by providing safer and more frequent crossing points for pedestrians.

The inclusion of advanced stop lines at the site access junction, and passive provision to tie into KMBC’s future plans to deliver a new cycleway on Headbolt Lane, will also reduce fear and intimidation for cyclists.

It is therefore considered that the proposed Scheme will have a ‘very low’ adverse impact on fear and intimidation on Headbolt Lane. When combined with the ‘high sensitivity’ of this link, the proposed development is considered to have a ‘minor’ adverse effect in terms of fear and intimidation.

Hazardous Loads

The operational phase will not require the movement of any hazardous loads to / from the proposed Scheme. This means that there will be no additional vehicle movements associated with the transportation of hazardous loads directly attributable with the site's normal daily operations. The magnitude of effect is therefore considered to be 'negligible'.

Accidents and Safety

The increase in the volume of traffic, and particularly buses, travelling on Headbolt Lane as a result of the proposed Scheme could potentially impact on accidents and safety, particularly for pedestrians and cyclists.

However, the proposed signalised crossing provision on all arms of the site access junction, along with the proposed uncontrolled crossing to the east of the site, will aid pedestrians on Headbolt Lane by providing safer and more frequent crossing points.

The inclusion of advanced stop lines at the site access junction, and passive provision to tie into KMBC's future plans to deliver a new cycleway on Headbolt Lane, will also improve safety for cyclists.

Furthermore, no clusters of collisions have been identified on Headbolt Lane. Analysis of the collision data shows that there are no underlying trends in contributory factors which indicate any fault within the layout of the surrounding highway network, and no existing highway safety issues which would be likely to be exacerbated by an increase in traffic due to the proposed Scheme.

It is therefore considered that the proposed Scheme will have a 'very low' adverse impact on accidents and safety on Headbolt Lane. When combined with the 'high sensitivity' of this link, the proposed Scheme is considered to have a 'minor' adverse effect in terms of accidents and safety.

Summary

A summary of the likely effects of operational traffic is presented in Table 4.13.

Table 4.13: Summary of operational effects on Headbolt Lane

Assessment Effect	Impact Magnitude	Receptor Sensitivity	Effect Significance
Severance	Very Low	High	Minor adverse
Driver Delay	Very Low	High	Minor adverse
Pedestrian Delay	Low	High	Moderate beneficial
Pedestrian and Cycle Amenity	Very Low	High	Minor adverse
Fear and Intimidation	Very Low	High	Minor adverse
Hazardous Loads	N/A		Negligible
Accidents and Safety	Very Low	High	Minor adverse

The operational phase of the proposed Scheme is anticipated to have a ‘moderate’ beneficial effect on pedestrian delay, which is considered to be significant. The remaining effects of the operational phase have been found to be ‘minor’ or ‘negligible’ adverse effects, which are not considered to be significant.

4.7 Mitigation

4.7.1 Mitigation of construction effects

No construction impacts with a ‘moderate’ or ‘major’ significance have been identified, therefore no additional mitigation measures are proposed beyond those identified in Section 4.5.

4.7.2 Mitigation of operational effects

No operational impacts with a ‘moderate’ or ‘major’ adverse significance have been identified, therefore no additional mitigation measures are proposed.

Notwithstanding, a range of mitigation embedded in the design of the proposed Scheme, as identified in Section 4.6.2. A Framework Travel Plan has also been prepared to encourage sustainable travel to/from the site and minimise the number of single occupancy vehicle trips associated with the proposed Scheme.

4.8 Residual Effects

The environmental effects have been assessed for the both the construction and operational phases of the proposed Scheme. A summary of residual effects is provided in Table 4.14.

The assessments conclude that the level of traffic generated by the proposals would not have any significant effects in terms of the criteria assessed.

Table 4.14: Summary of Effects

Potential impact	Impact avoidance measures / embedded mitigation	Environmental effect without additional mitigation	Additional mitigation	Environmental effect after additional mitigation (residual effect)	Nature of effect
<i>Severance</i> - increase in construction vehicle movements on Headbolt Lane.	CTMP	Minor adverse	No additional mitigation proposed	Minor adverse	St, T, D
<i>Driver delay</i> – increase in construction vehicles may cause delay for drivers and bus users on Bank Lane and Headbolt Lane.	CTMP	Minor adverse	No additional mitigation proposed	Minor adverse	St, T, D
<i>Pedestrian delay</i> – increase in construction vehicle movements on Headbolt Lane creating delay along pedestrian desire lines.	CTMP	Minor adverse	No additional mitigation proposed	Minor adverse	St, T, D
<i>Pedestrian and cycle amenity</i> – increase in construction vehicle movements impacting on the ‘pleasantness’ of pedestrian / cycle journeys.	CTMP	Minor adverse	No additional mitigation proposed	Minor adverse	St, T, D
<i>Fear and intimidation</i> – increase in HGVs on local road network increasing perceived fear and intimidation for pedestrians and cyclists.	CTMP	Minor adverse	No additional mitigation proposed	Minor adverse	St, T, D

Potential impact	Impact avoidance measures / embedded mitigation	Environmental effect without additional mitigation	Additional mitigation	Environmental effect after additional mitigation (residual effect)	Nature of effect
<i>Accidents and safety</i> - increased likelihood of road accidents occurring during the construction period due to increase in general traffic and HGV movements	CTMP	Minor adverse	No additional mitigation proposed	Minor adverse	St, T, D
<i>Severance</i> – increase in operational vehicle movements and increase in number of pedestrians crossing on Headbolt Lane.	Provision of pedestrian crossing facilities on Headbolt Lane. Integration of zebra crossings and footways into site layout. Framework Travel Plan.	Minor adverse	No additional mitigation proposed	Minor adverse	Lt, P, D
<i>Driver delay</i> – increase in operational traffic on local highway network	Framework Travel Plan	Minor adverse	No additional mitigation proposed	Minor adverse	Lt, P, D
<i>Pedestrian delay</i> – increase in operational vehicle movements and increase in number of pedestrians crossing on Headbolt Lane.	Improvement to local pedestrian network and crossing facilities, which will cumulatively reduce pedestrian delay. Framework Travel Plan	Moderate beneficial	N/A	Moderate beneficial	Lt, P, D
<i>Pedestrian and cycle amenity</i> – increase in operational vehicle movements impacting on the ‘pleasantness’ of pedestrian / cycle journeys.	Improvements to local pedestrian network and crossing facilities. Framework Travel Plan	Minor adverse	No additional mitigation proposed	Minor adverse	Lt, P, D

Potential impact	Impact avoidance measures / embedded mitigation	Environmental effect without additional mitigation	Additional mitigation	Environmental effect after additional mitigation (residual effect)	Nature of effect
<i>Fear and intimidation</i> – increase in operational traffic on local road network increasing perceived fear and intimidation for pedestrians and cyclists.	Improvements to local pedestrian network and crossing facilities. Integration of dedicated cycleway into site layout. Passive provision in station access junction design to accommodate integration of future KMBC cycleway proposals on Headbolt Lane. Framework Travel Plan	Minor adverse	No additional mitigation proposed	Minor adverse	Lt, P, D
<i>Accidents and safety</i> - increased likelihood of road accidents occurring due to increase in vehicle movements on local highway network.	Improvements to local pedestrian network and crossing facilities. Integration of dedicated cycleway into site layout. Passive provision in station access junction design to accommodate integration of future KMBC cycleway proposals on Headbolt Lane. Framework Travel Plan	Minor adverse	No additional mitigation proposed	Minor adverse	Lt, P, D

Contents

	Page
5 Air Quality and GHG Emissions	2
5.1 Introduction	2
5.2 Planning Policy Context	2
5.3 Assessment Method	6
5.4 Baseline Conditions	18
5.5 Design Development and Impact Avoidance	20
5.6 Environmental Impacts and Significance of Effects	24
5.7 Mitigation	30
5.8 Residual Effects	30

5 Air Quality and GHG Emissions

5.1 Introduction

This chapter presents an assessment of potential impacts on air quality and the contribution to greenhouse gas (GHG) emissions associated with the proposed Scheme, described in Chapter 2: Scheme Description.

Air quality studies are concerned with the presence of airborne pollutants in the atmosphere. This report outlines the relevant air quality policy and legislative context and presents the methodology used in the assessment. It assesses the existing air quality conditions at the vicinity of the site and outlines the likely air quality impacts from the construction and operation of the proposed Scheme. The effects have been assessed in the context of relevant national, regional and local air quality policies and guidance. Mitigation measures are proposed which would be implemented to reduce the effect of the proposed Scheme on air quality as far as practicable.

This chapter is supported by the following figures (see Volume II: Figures) and appendices (see Volume III: Technical Appendices):

- Figure 5.1: Modelled road network;
- Figure 5.2: Location of sensitive receptors;
- Figure 5.3: Local monitoring locations;
- Figure 5.4: Construction dust; and
- Appendix 5A: Construction dust assessment.

5.2 Planning Policy Context

5.2.1 Air quality standards and legislation

Environment Act 1995

Part IV of the Environment Act 1995¹ places a duty on the Secretary of State for the Environment to develop, implement and maintain an Air Quality Strategy with the aim of reducing atmospheric emissions and improving air quality. The Air Quality Strategy for England, Scotland, Wales and Northern Ireland² provides the framework for ensuring compliance with the air quality limit values based on a combination of international, national and local measures to reduce emissions and improve air quality. This includes the statutory duty, also under Part IV of the Environment Act 1995, for local authorities to undergo a process of local air

¹ Environment Act 1995, Chapter 25, Part IV Air Quality

² Department for Environment, Food and Rural Affairs in partnership with the Scottish Executive, Welsh Assembly Government and Department of the Environment Northern Ireland (2007) The Air Quality Strategy for England, Scotland, Wales and Northern Ireland, Volume 1

quality management and declare Air Quality Management Areas (AQMA) where necessary.

Air Quality Standards

Some pollutants have standards expressed as annual average concentrations due to the chronic way in which they affect health or the natural environment (i.e. effects occur after a prolonged period of exposure to elevated concentrations) and others have standards expressed as 24-hour, 1-hour or 15-minute average concentrations due to the acute way in which they affect health or the natural environment (i.e. after a relatively short period of exposure). Some pollutants have standards expressed in terms of both long-term and short-term concentrations.

In this assessment, the term ‘air quality standard’ has been used to refer to both the UK objectives and European limit values.

Table 5.1 sets out the air quality standards for the pollutants relevant to this study. Other pollutants have been screened out of this air quality assessment since they are not likely to cause exceedances of their respective standards.

Table 5.1: Air quality standards

Pollutant	Averaging period	Air quality standard
Human health		
Nitrogen dioxide (NO ₂)	Annual mean	40µg/m ³
	1-hour mean	200µg/m ³ [1]
Particulate matter (PM ₁₀)	Annual mean	40µg/m ³
	24-hour mean	50µg/m ³ [2]
Fine particulate matter (PM _{2.5})	Annual mean	25µg/m ³
[1] not to be exceeded more than 18 times a year (99.8th percentile)		
[2] not to be exceeded more than 35 times a year (90.4th percentile)		

Dust Nuisance

Dust is the generic term used to describe particulate matter in the size range 1-75µm in diameter (British Standard document BS 6069 Part Two)³. Dust nuisance is the result of the perception of the soiling of surfaces by excessive rates of dust deposition. Under provisions in the Environmental Protection Act 1990⁴, dust nuisance is defined as a statutory nuisance.

There are currently no standards or guidelines for dust nuisance in the UK, nor are formal dust deposition standards specified. This reflects the uncertainties in dust monitoring technology and the highly subjective relationship between deposition events, surface soiling and the perception of such events as a nuisance. In law, complaints about excessive dust deposition would have to be investigated by the local authority and any complaint upheld for a statutory nuisance to occur.

³ BS 6069-2:1994, ISO 4225:1994 Characterization of air quality

⁴ Environmental Protection Act 1990, Chapter 43, Part III Statutory Nuisances and Clean Air

However, dust deposition is generally managed by suitable on-site practices and mitigation rather than by the determination of statutory nuisance and/or prosecution or enforcement notice(s).

5.2.2 National Planning Policy

National Planning Policy Framework

The National Planning Policy Framework (NPPF)⁵ was updated in February 2019 with the purpose of planning to achieve sustainable development. Paragraph 181 of the NPPF on air quality states that:

“Planning policies and decisions should sustain and contribute towards compliance with relevant limit values or national objectives for pollutants, taking into account the presence of Air Quality Management Areas and Clean Air Zones, and the cumulative impacts from individual sites in local areas. Opportunities to improve air quality or mitigate impacts should be identified, such as through traffic and travel management, and green infrastructure provision and enhancement. So far as possible these opportunities should be considered at the plan-making stage, to ensure a strategic approach and limit the need for issues to be reconsidered when determining individual applications. Planning decisions should ensure that any new development in Air Quality Management Areas and Clean Air Zones is consistent with the local air quality action plan.”

In addition, paragraph 103 states that:

“The planning system should actively manage patterns of growth in support of these objectives. Significant development should be focused on locations which are or can be made sustainable, through limiting the need to travel and offering a genuine choice of transport modes. This can help to reduce congestion and emissions and improve air quality and public health. However, opportunities to maximise sustainable transport solutions will vary between urban and rural areas, and this should be taken into account in both plan-making and decision-making.”

Paragraph 170 discusses how planning policies and decisions should contribute to and enhance the natural and local environment. In relation to air quality, NPPF notes that this can be achieved by:

“e) preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans.”

⁵ Ministry of Housing, Communities and Local Government (2019) *National Planning Policy Framework*. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/779764/NPPF_Feb_2019_web.pdf

Planning Practice Guidance

Planning Practice Guidance (PPG) on air quality to supplement the latest NPPF was updated in November 2019⁶. The guidance refers to the significance of air quality assessments to determine the impacts of proposed developments in the area and describes the role of local and neighbourhood plans with regard to air quality. It also provides a flowchart method to assist local authorities to determine how considerations of air quality fit into the development management process.

Local Air Quality Management Policy

The 2016 policy guidance note from Defra, LAQM.PG(16)⁷, provides additional guidance on the links between transport and air quality and guidance on the links between air quality and the land-use planning system. It summarises the main ways in which the land-use planning system can help deliver compliance with the air quality objectives. This guidance is relevant to any external organisations who may wish to engage with the local authority to assist in the delivery of their statutory duties on managing air quality.

5.2.3 Local Planning Policy

Knowsley Local Plan (2016)

Knowsley Council adopted their local plan in 2016 and it contains policy relevant to air quality.

“Policy CS2, Development principles

New development in Knowsley and the preparation of subsequent stages of the Local Plan will be expected to support the following development principles:

Principle 4: Recognise environmental limits, protect and enhance environmental assets, enhance local character and promote quality of place by:

Mitigating potential negative impacts of traffic growth and road traffic on highway safety, air quality, noise and health”

“Policy CS7, Transport networks

Location, design and management of new development

Inclusive of measures that will mitigate carbon emissions and improve air quality where appropriate”

⁶ Ministry of Housing, Communities and Local Government, *Air Quality*. Available at: <https://www.gov.uk/guidance/air-quality--3>

⁷ Defra (2016) *Local Air Quality Management Policy Guidance PG(16)*

5.2.4 Other Relevant Legislation, Standards and Guidance

Local Air Quality Management Technical Guidance

The LAQM Technical Guidance, TG(16)⁸ is designed to support local authorities in carrying out their duties to review and assess air quality in their area. LAQM TG(16) is published at the UK level and is relevant to England, Scotland, Wales and Northern Ireland with the exception of London. It provides detailed guidance on how to assess the impact of measures using existing air quality tools. Where relevant, this guidance has been taken into account in this assessment.

Guidance on the Assessment of Dust from Demolition and Construction

The Assessment of Dust from Demolition and Construction guidance⁹ produced by the Institute of Air Quality Management (IAQM) provides guidance to development consultants and environmental health officers on how to assess air quality impacts from construction. The IAQM guidance provides a method for classifying the significance of effects from construction activities based on the 'dust magnitude' (high, medium or low) and proximity of the proposed development to the closest receptors. The guidance recommends that once the significance of effect from construction is identified, the appropriate mitigation measures are implemented. Experience has shown that once the appropriate mitigation measures are applied, in most cases the resulting dust impacts can be reduced to negligible levels.

Guidance on Land-Use Planning & Development Control

The 2017 Land-Use Planning & Development Control guidance document¹⁰ produced by Environmental Protection UK (EPUK) and the IAQM provides a framework for professionals operating in the planning system to provide a means of reaching sound decisions, with regard to the air quality implications of development proposals.

The document provides guidance on when air quality assessments are required by providing screening criteria regarding the size of a development, changes to traffic flows/composition energy facilities or combustion processes used.

5.3 Assessment Method

The overall approach to the air quality assessment comprises:

- a review of the existing air quality conditions at, and in the vicinity of, the proposed Scheme;

⁸ Defra (2016) *Local Air Quality Management Technical Guidance TG(16)*

⁹ IAQM (2016) *Guidance on the Assessment of Dust from Demolition and Construction (v1.1)*

¹⁰ Moorcroft and Barrowcliffe. et al. (2017) *Land-use Planning & Development Control: Planning for Air Quality. (v1.2)*. Institute of Air Quality Management, London. Available at: <http://www.iaqm.co.uk/text/guidance/air-quality-planning-guidance.pdf>.

- a desktop review of receptors in the vicinity of the proposed Scheme;
- an assessment of the potential changes in air quality arising from the construction and operation of the proposed Scheme; and
- formulation of mitigation measures, where appropriate, to ensure any adverse effects on air quality are minimised.

The study area for the air quality assessment was determined on the basis of where impacts on local air quality may occur from construction activities, from changes in the nature of road traffic during construction and operation of the proposed Scheme.

Sensitive human receptors for the air quality assessment are defined as those properties, schools, hospitals (including care homes) that are likely to experience a change in pollutant concentrations and/or dust nuisance. Sensitive ecological receptors are defined as those sites whose features have been designated as sensitive to air pollutants.

5.3.1 Consultation

Consultation via email was carried out to agree the proposed methodology, receptors and guidance with the Environmental Health Officer at Knowsley Council.

Table 5.2: Consultation summary

Consultee and date	Issue Raised	Summary of Response
Environmental Health Officer – 13 May 2021	Method and receptors selected for air quality assessment	None provided to date.

5.3.2 Method of Baseline Assessment

Existing or baseline ambient air quality refers to the concentration of relevant substances that are already present in the environment. These are present from various sources, such as industrial processes, commercial and domestic activities, road traffic and natural sources.

A desk-based review of the following data sources has been undertaken to determine the baseline air quality conditions around the proposed Scheme:

- Knowsley Council review and assessment reports and local air quality monitoring data¹¹;
- The Environment Agency (EA) register on industrial installations¹²; and
- The Defra Local Air Quality Management website¹³.

¹¹ Knowsley Council 2020 Air quality annual status report (ASR)

¹² Environment Agency; DEFRA data services platform; Available at <https://environment.data.gov.uk/public-register/view/search-industrial-installations>

¹³ Defra, Local Air Quality Management; <http://laqm.defra.gov.uk/>

This review identified the main sources of air pollution within 2 km of the proposed Scheme, the local air quality monitoring data for recent years and local background pollutant concentrations.

5.3.3 Method of Construction Assessment

The construction effects have been assessed using the qualitative approach described in the latest guidance by the Institute of Air Quality Management⁹ (IAQM). The guidance applies to the assessment of dust from construction/ demolition activities.

An ‘impact’ is described as a change in pollutant concentrations or dust deposition, while an ‘effect’ is described as the consequence of an impact. The main impacts that may arise during construction of the proposed Scheme are:

- dust deposition, resulting in the soiling of surfaces;
- visible dust plumes;
- elevated PM₁₀ concentrations as a result of dust generating activities on site; and
- an increase in NO₂ and PM₁₀ concentrations due to exhaust emissions from non-road mobile machinery (NRMM) and vehicles accessing the site.

The IAQM guidance considers the potential for dust emissions from dust-generating activities, such as demolition of existing structures, earthworks, construction of new buildings and trackout. Earthworks refer to the processes of soil stripping, ground levelling, excavation and land capping, while trackout is the transport of dust and dirt from the site onto the public road network where it may be deposited and then re-suspended by vehicles using the network. This arises when vehicles leave the site with dusty materials, which may then spill onto the road, or when they travel over muddy ground on site and then transfer dust and dirt onto the public road network.

For each of these dust-generating activities, the guidance considers three separate effects:

- annoyance due to dust soiling;
- harm to receptors; and
- the risk of health effects due to a significant increase in PM₁₀ exposure.

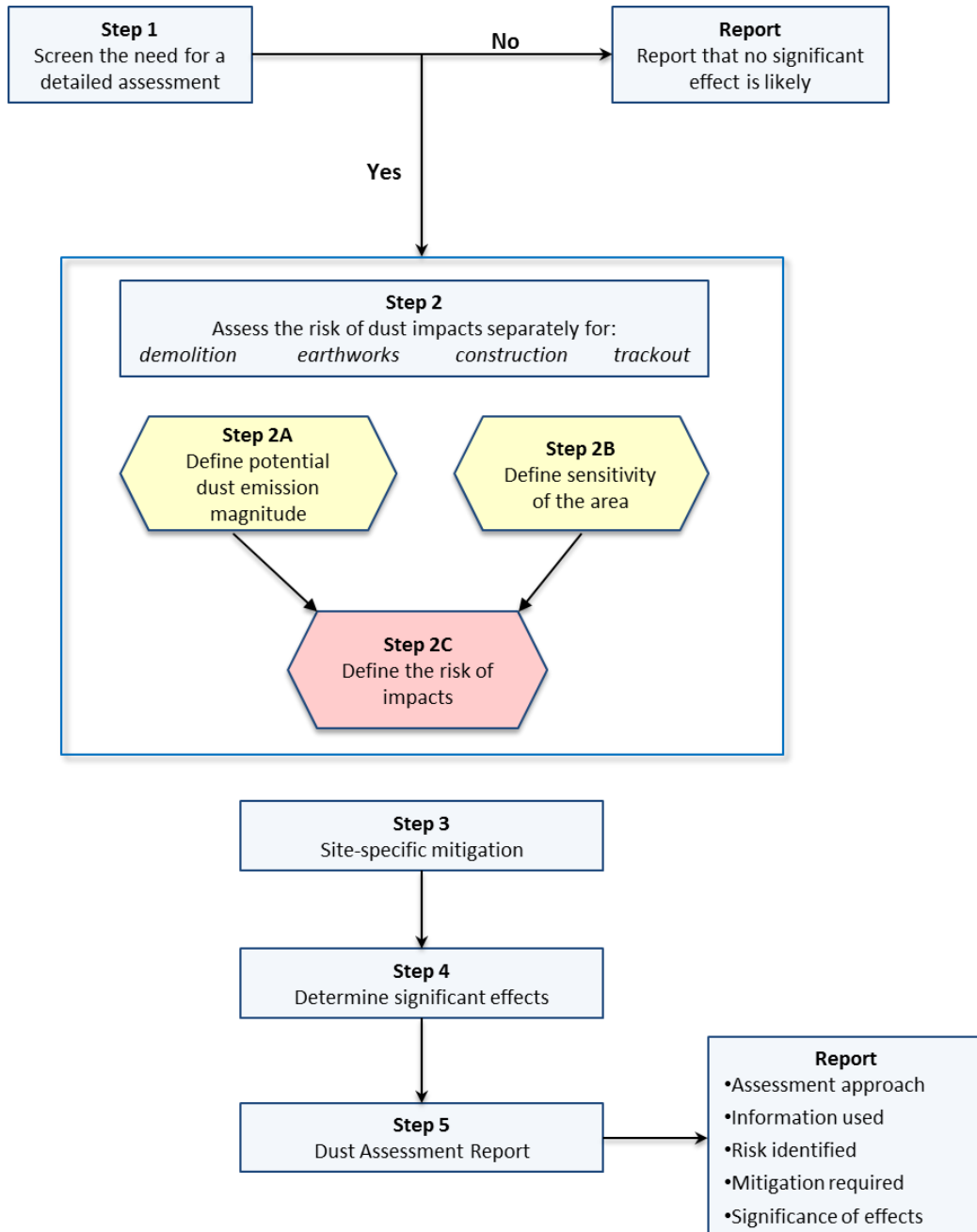
The receptors can be human or ecological and are selected based on their sensitivity to dust soiling and PM₁₀ exposure. Sensitive receptors are defined as those properties/schools/hospitals that are likely to experience a change in pollutant concentrations and/or dust nuisance due to the construction of the proposed Scheme.

The methodology takes into account the scale at which the above effects are likely to be generated (classed as small, medium or large), the levels of background PM₁₀ concentrations and the distance to the closest receptor, in order to determine the sensitivity of the area. This is then taken into consideration when deriving the

overall risk for the site. Suitable mitigation measures are also proposed to reduce the risk of the potential impacts on local air quality as a result of the construction works.

There are five steps in the assessment process described in the IAQM guidance. These are summarised in Image 5.1 and further description is provided in the following paragraphs.

Image 5.1: IAQM dust methodology



Step 1: Need for Assessment

The first step is the initial screening for the need for a detailed assessment. According to the IAQM guidance, an assessment is required where there are sensitive receptors within 350 m of the site boundary (for ecological receptors this is 50 m) and/or within 50 m of the route(s) used by the construction vehicles on the public highway and up to 500 m from the site entrance(s).

Step 2: Assess the Risk of Dust Impacts

This step is split into three sections as follows:

- 2A. Define the potential dust emission magnitude;
- 2B. Define the sensitivity of the area; and
- 2C. Define the risk of impacts.

Each of the dust-generating activities is given a dust emission magnitude depending on the scale and nature of the works (step 2A) based on the criteria shown in Table 5A.1 of Appendix 5A.

The sensitivity of the surrounding area is then determined (step 2B) for each dust effect from the above dust-generating activities, based on the proximity and number of receptors, their sensitivity to dust, the local PM₁₀ background concentrations and any other site-specific factors. Table 5A.2, 5A.3 and 5A.4 of Appendix 5A show the criteria for defining the sensitivity of the area to different dust effects.

The overall risk of the impacts for each activity is then determined (step 2C) prior to the application of any mitigation measures and an overall risk for the site derived using Table 5A.5 of Appendix 5A.

Step 3: Determine the Site-Specific Mitigation

Once each of the activities is assigned a risk rating, appropriate mitigation measures are identified. Where the risk is negligible, no mitigation measures beyond those required by legislation are necessary.

Step 4: Determine any Significant Residual Effects

Once the risk of dust impacts has been determined and the appropriate dust mitigation measures identified, the final step is to determine whether there are any residual significant effects. The IAQM guidance notes that it is anticipated that with the implementation of effective site-specific mitigation measures, the environmental effect will not be significant in most cases.

Step 5: Prepare a Dust Assessment Report

The last step of the assessment is the preparation of a dust assessment report. This forms part of this chapter (Section 5.6.1).

5.3.4 Construction Traffic

As the proposed Scheme is not within an AQMA, the following criteria from the EPUK/IAQM guidance¹⁰ have been used to determine whether a detailed air quality assessment is likely to be considered necessary for construction traffic:

- a change of Light Duty Vehicle (LDV) flows of more than 500 Annual Average Daily Traffic (AADT) movements; and
- a change of Heavy Duty Vehicle (HDV) flows of more than 100 AADT movements.

Meeting either of the criteria would indicate that detailed dispersion modelling of the road traffic emissions would be necessary.

The transport team for the project have confirmed that neither of the criteria above would be exceeded for this proposed Scheme. The average flows of LDVs are predicted to be a maximum of 300 AADT for the worst case 12 month average with 40 AADT for HDVs during the same period which are well below the screening thresholds.

5.3.5 Method of Operational Assessment

Operational air quality impacts from the proposed Scheme arise principally as a result of traffic changes on the road network. The significance of predicted impacts can then be determined in accordance with the methodology outlined in the EPUK/IAQM guidance¹⁰ (Section 5.3.14).

5.3.6 Road Traffic Emissions

The first stage in determining whether a detailed assessment was required was to compare the changes in traffic data to the screening criteria in the latest guidance by EPUK/IAQM guidance¹⁰. The criteria are detailed in Section 5.3.4.

Traffic data provided by the project transport team indicates that the thresholds will be exceeded along Headbolt Lane (west of the proposed Scheme) and south of Headbolt Lane on the A506 towards Kirkby. Additional roads have been modelled to assess potential changes to air quality along Headbolt Lane, east of the proposed Scheme and roads in Kirkby to allow for model verification.

Traffic data consist of 24-hour AADT flows, percentage HGVs and speeds for all road links. Modelled speeds were assumed to be 20kph for all junctions (which would be representative of congested conditions, a conservative scenario for emissions). Traffic data used in this assessment has been provided in Appendix 4A. The modelled road network is shown in Figure 5.1.

Vehicle emissions were calculated using Defra's Emissions Factor Toolkit (EFT) (version 10.1)¹⁴. As a pessimistic approach the future year modelling has been

¹⁴ Defra Emissions Factor Toolkit v10.1. Available at: <https://laqm.defra.gov.uk/review-and-assessment/tools/emissions-factors-toolkit.html>

carried out using 2019 vehicle emissions for all assessment scenarios, assuming no improvements in vehicle fleet.

5.3.7 Assessment Scenarios

The assessment scenarios are summarised below:

- 2018 baseline scenario for model verification;
- 2025 Do-Minimum (DM) scenario; and
- 2025 Do-Something (DS) scenario.

The 2018 baseline scenario represents the existing baseline conditions and is used to verify the model. The do-minimum (DM) scenario represents the future baseline conditions with committed developments in the area and represents opening year of the proposed development. The do-something (DS) scenario represents the future case for the operation of the scheme, i.e. do-something scenario in addition to development traffic. As noted, a pessimistic approach the future year modelling has been carried out using 2018 vehicle emissions for all assessment scenarios.

5.3.8 Sensitive Receptors

The modelling was undertaken to calculate predicted concentrations where sensitive receptors are located. Sensitive receptors are defined as those residential properties/schools/hospitals/businesses or areas where people may spend time that are likely to experience a change in pollutant concentrations and/or dust nuisance due to the construction or operation of the proposed Scheme.

A desktop study was undertaken in order to identify representative sensitive receptors along the roads in the vicinity of the proposed Scheme that required specific consideration during the assessment. Details of modelled receptors are provided in Table 5.3 and locations shown in Figure 5.3. Other sensitive receptors not adjacent to roads will experience less impact than those included in the model and so have not been included.

Table 5.3 Modelled receptors

Receptor ID	NGR (m)		Height (m)
	X	Y	
1	341040	399790	1.5
2	341117	399810	1.5
3	341620	399907	1.5
4	341234	399884	1.5
5	341165	399840	1.5
6	341042	399880	1.5
7	341742	399955	1.5
8	342114	400122	1.5
9	341863	400047	1.5
10	341221	399633	1.5

Receptor ID	NGR (m)		Height (m)
	X	Y	
11	341336	399679	1.5
12	341527	399765	1.5
13	341748	399854	1.5
14	341535	399878	1.5
15	342226	400187	1.5
16	341209	399520	1.5
17	341328	399431	1.5
18	341285	399309	1.5
19	340511	399755	1.5

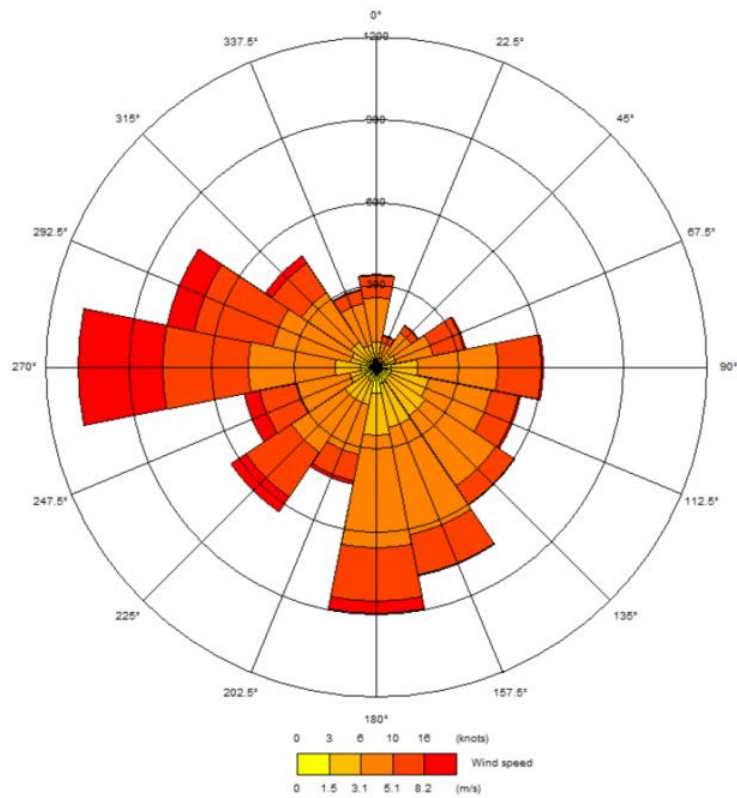
5.3.9 Meteorological Data

In order for the modelling to be representative of local conditions and to predict long-term averages, the dispersion model requires representative meteorological data. The meteorological data used in this assessment were from Liverpool Airport meteorological station. The data were collected over the period 1 January 2017 to 31 December 2019 (inclusive). Liverpool Airport is located approximately 17km south of the closest point of the proposed development. This meteorological site was chosen due to its proximity to the proposed Scheme.

Most dispersion models of roads cannot perform calculations in calm wind conditions, as the equations of dispersion require wind speeds to be above zero and have a wind direction (wind direction is not measured if wind speed is zero or close to it). ADMS-Roads 4.1 treats calm wind conditions by setting the minimum wind speed in the model to 0.75m/s. Defra's LAQM.TG16 guidance⁸ recommends that the meteorological data file is tested in a dispersion model and the relevant output log file checked to confirm the number of missing hours and calm hours that cannot be used by the dispersion model. This is important when considering predictions of high percentiles and the number of exceedances. The guidance recommends that meteorological data should only be used if the percentage of usable hours is greater than 75% and preferably 90%.

Hourly sequential observation data were used. The Liverpool Airport dataset includes 8,649 lines of usable hourly data (98.7%), out of a total of 8,760 hours in the year. This is above the 90% threshold, so meets the requirements of the Defra guidance and is adequate for the dispersion modelling. Image 5.2 presents the wind rose for Liverpool Airport data, 2019. It can be seen that the prevailing wind direction in the study area is from the west and south.

Image 5.2: Wind rose for Liverpool Airport, 2019



5.3.10 Other Input Parameters

The extent of mechanical turbulence (and hence, mixing) in the atmosphere is affected by the surface/ground over which the air is passing. Typical surface roughness values range from 1.5 m (for cities, forests and industrial areas) to 0.0001 m (for water or sandy deserts). In this assessment, the general land use in the local study area can be described as “open suburbia” with a corresponding surface roughness of 0.5 m. For the meteorological site a surface roughness value of 0.3 m was used, describing “Agricultural areas (max)”. This is considered representative of the areas.

The minimum Monin-Obukhov length is a model parameter which describes the extent to which the urban heat island effect limits stable atmospheric conditions. A Monin-Obukhov length of 10 m has been used in this dispersion modelling study. It is suggested in ADMS-Roads that this length is suitable for “small towns”. The same Monin-Obukhov length was used for the meteorological station site.

5.3.11 NO_x to NO₂ Conversion

The dispersion model predicts NO_x concentrations which comprise nitric oxide (NO) and nitrogen dioxide (NO₂). NO_x is emitted from combustion processes, primarily as NO with a small percentage of NO₂. The emitted NO reacts with oxidants in the air (mainly ozone) to form NO₂. NO₂ is associated with effects on human health. The air quality standards for the protection of human health are based on NO₂ rather than total NO_x or NO. A suitable NO_x:NO₂ conversion has been applied to the modelled NO_x concentrations in order to determine the impact of the NO_x emissions on ambient concentrations of NO₂.

LAQM.TG16⁸ details an approach for calculating the roadside conversion of NO_x to NO₂. This approach takes into account the difference between ambient NO_x concentrations with and without the proposed development, the concentration of ozone and the different proportions of primary NO₂ emissions in different years. This approach is available online as a spreadsheet calculator and has been used in this assessment (version 8.1, August 2020)¹⁵.

5.3.12 Car Parks

Information on car park movements was provided by the project design team in the form of the number of spaces per car park area. Information provided by the project transport consultants set out the number of movements for the car parks.

Emissions were calculated in accordance with the Cambridge Environmental Research Consultants (CERC) note on modelling car parks¹⁶.

¹⁵ Defra (2020) *NO_x to NO₂ calculator*. Available at: <https://laqm.defra.gov.uk/review-and-assessment/tools/background-maps.html#NOxNO2calc>

¹⁶ CERC. *Modelling car parks, 2004*. (Online) Available at: http://www.cerc.co.uk/user-area/assets/data/helpdesknote/CERC_note_54_Modelling_car_parks.pdf

Emission factors for vehicles were taken from Defra's EFT¹⁴, while cold start emissions were taken from the NAEI database¹⁷. The percentage of primary NO₂ emissions was also taken from the NAEI. A speed of 5kph was assumed in all car parks.

The location of the modelled car parks is shown in Figure 5.1.

5.3.13 Model Verification

Model verification refers to the comparison of modelled and measured pollutant concentrations at the same locations to determine the performance of the model. Should the majority of model results for NO₂ be within $\pm 25\%$ of the measured values and there is no systematic over or under-prediction of concentrations, then the LAQM.TG16⁸ guidance advises that no adjustment is necessary. If this is not the case, modelled concentrations are adjusted based on the observed relationship between modelled and measured NO₂ concentrations to provide a better agreement.

Modelled results may not compare as well at some locations for various reasons, including:

- errors/ uncertainties in model input data (e.g. traffic flows and speed data estimates);
- model set-up (including street canyons where applicable, road widths, location of monitoring sites);
- neglect of local effects (including queues, bus stops and street canyons);
- model limitations (treatment of surface roughness and meteorological data);
- uncertainty in monitoring data, notably diffusion tubes (e.g. bias adjustment factors and annualisation of short-term data); and
- uncertainty in emissions and emission factors.

The above factors were investigated as part of the model verification process to minimise the uncertainties as far as practicable. The model verification is based on the baseline model and the outcome is reported in section 5.6.2.

5.3.14 Impact Assessment and Significance Criteria

For the assessment of impacts and significance at sensitive human receptors, the approach described in the EPUK/IAQM guidance has been used. This is best practice for undertaking air quality assessments.

Impact descriptors are determined based on the magnitude of incremental change as a proportion of the relevant assessment level, in this instance the air quality standards. The change is then examined in relation to the predicted total pollutant concentrations in the assessment year and its relationship with the relevant air quality standard (Table 5.4).

¹⁷ NAEI (2019) (Online) Available at: <http://naei.beis.gov.uk/data/>

Table 5.4: Impact descriptors from EPUK/IAQM guidance

Predicted concentration relative to air quality standard	% Change in concentrations relative to air quality standard			
	1%	2-5%	6-10%	> 10%
< 75%	Negligible	Negligible	Minor	Moderate
76-94%	Negligible	Minor	Moderate	Moderate
95-102%	Minor	Moderate	Moderate	Major
103-109%	Moderate	Moderate	Major	Major
> 110%	Moderate	Major	Major	Major
Changes of less than 0.5% are described as negligible. Slight and substantial impacts from the EPUK/IAQM guidance have been called ‘minor’ and ‘major’ respectively for this assessment.				

The impact descriptors at each of the assessed receptors have been used as a starting point to make a judgement on the overall significance of effect of the proposed development, however other influences have also been accounted for, such as:

- the existing future air quality in the absence of the proposed Scheme;
- the extent of current and future population exposure to the impacts; and
- the influence and validity of any assumptions adopted when undertaking the prediction of impacts.

Professional judgement had been used to determine the overall significance of effect of the proposed Scheme. In circumstances where the proposed Scheme can be judged in isolation, the guidance suggests that a ‘moderate’ or ‘major’ impact is likely to give rise to a significant effect and a ‘negligible’ or ‘minor’ is not likely to result in a significance effect.

5.3.15 Operational Carbon Assessment

An estimation of total carbon emissions for a 60 year appraisal period has been calculated for the operational phase emissions from the proposed Scheme. The future fleet mix has been taken from the Department for Transport TAG Data book¹⁸ and scope 1 and scope 3 emission factors for petrol, diesel and electric vehicles has been taken from the Department for Business, Energy and Industrial Strategy (BEIS) UK Government GHG conversion factors for company reporting¹⁹.

The total traffic movements per day have been provided by the transport consultant for the project and an AADT of 1196 has been used as the total development flow. It was confirmed by the transport consultant that the catchment for the station is between one and two kilometres from the proposed Scheme. As a

¹⁸ Department for Transport TAG Data Book July 2020 v1.13.1

¹⁹ BEIS, DEFRA UK Government GHG conversion factors for company reporting version 1 2020

result a conservative assumption has been applied by using 2.5 km as the average distance travelled for each future trip.

5.4 Baseline Conditions

5.4.1 Sources of Pollution

Industrial air pollution sources are regulated through a system of operating permits or authorisations, requiring stringent emission limits to be met and ensuring that any releases to the environment are minimised or rendered harmless. Regulated (or prescribed) industrial processes are classified as Part A(1), A(2), Part B or Medium Combustion Plant (MCP) processes, and are regulated through the Pollution Prevention and Control (PPC) system^{20, 21, 22}. The larger more polluting processes are regulated by the Environment Agency (EA), and the smaller less polluting ones by the local authorities. Local authorities tend also to regulate only for emissions to air, whereas the EA regulates emissions to air, water and land.

There is one industrial Part (1)A process listed on the EA¹² website within 2 km of the proposed Scheme site:

- Faci UK Chemicals Limited (Grid reference: SJ3308099070), located 2 km south-east.

This has been permitted since 2014 for processes related to the production of metallic compounds. These emissions are unlikely to impact the air quality at the proposed Scheme site due to their distance in this urban environment.

Any impact of emissions from industrially regulated processes further away from the site are assumed to be represented in the background concentrations used, and therefore has been accounted for in the assessment.

In recent decades, atmospheric emissions from transport on a national basis have grown to match or exceed other sources in respect of many pollutants, particularly in urban areas.

The site is on a relatively small road (Headbolt Lane) with the main sources of vehicle pollution in the area being the A506.

5.4.2 Local Air Quality

The Environment Act 1995¹ requires local authorities to review and assess air quality with respect to the air quality standards for seven pollutants specified in the National Air Quality Strategy. Local authorities are required to carry out an assessment and produce an Annual Status Report of their area every year. Where air quality standards are not predicted to be met, local authorities must declare the

²⁰ Directive 2010/75/EU of the European Parliament and of the Council of 24 November 2010 on industrial emissions (integrated pollution prevention and control).

²¹ The Environmental Permitting (England and Wales) Regulations 2016, SI 2016/1154.

²² The Environmental Permitting (England and Wales) (Amendment) Regulations 2018, SI 2018/110

area an AQMA. In addition, local authorities are required to produce an Air Quality Action Plan, which includes measures to improve air quality within the AQMA.

Knowsley Council have not declared any AQMAs, the nearest AQMA to the proposed Scheme is 3 km east (Liverpool City AQMA declared due to exceedances of the annual mean NO₂ objective).

5.4.3 Local Monitoring

Knowsley Council undertakes both continuous and passive monitoring of air quality. There are five diffusion tube sites for NO₂ within 2 km of the proposed Scheme at the junction of County Road and Old Rough Lane. The nearest continuous monitor is located at the same junction. Table 5.5 presents the details of the monitoring sites and Table 5.6, Table 5.7 and Table 5.8 provides the monitoring data for 2019, while their locations are presented in Figure 5.3.

Diffusion tube monitoring started at the junction in 2019. During that year there were no exceedances of either NO₂ or PM₁₀ annual mean objectives.

Table 5.5: Monitoring site details

ID	Description	X	Y	Location type	Distance to kerb (m)	Height (m)
Diffusion tube monitoring						
K2	Outside Kirkby C of E School, Hall Lane	341165	398953	Roadside	6.4	2.4
K3	outside 12 Hall Drive	341317	399000	Roadside	1.6	2.4
K4	To rear of 12 Brakenhurst Grove	341464	398998	Roadside	3.0	2.4
K5	Junction of Old Rough Lane and County Road	341407	398988	Roadside	3.2	2.4
K6	On County Road near 18 Kelday Close	341426	398922	Roadside	1.1	2.4
Continuous monitoring						
Kirkby (new)	Old Rough Lane, Kirkby	341414	398991	Roadside	1.0	2.4

Table 5.6: Diffusion tube monitoring results (2019)

ID	Description	Annual mean NO ₂ (µg/m ³)
K2	Outside Kirkby C of E School, Hall Lane	26.9
K3	Outside 12 Hall Drive	25.3
K4	To rear of 12 Brakenhurst Grove	27.1
K5	Junction of Old Rough Lane and County Road	32.1
K6	On County Road near 18 Kelday Close	35.3

Table 5.7: Continuous annual mean monitoring (2019)

ID	Pollutant	($\mu\text{g}/\text{m}^3$)
Kirkby (new)	Annual mean NO ₂	24.8
	Annual mean PM ₁₀	37.6

Table 5.8: Continuous exceedance monitoring (2019)

ID	Pollutant	Number of exceedances
Kirkby (new)	Short term NO ₂	0
	Short term PM ₁₀	9

5.4.4 Background Concentrations

Background concentrations refer to the existing levels of pollution in the atmosphere, produced by a variety of sources, such as roads and industrial processes. Defra has produced estimates of background pollutant concentrations for NO_x, NO₂, PM₁₀ and PM_{2.5} for each 1 km by 1 km OS grid square for each local authority area²³. Background maps are available for 2018 and projected through to 2030.

Background pollutant concentrations for 2019 have been obtained for the grid squares surrounding the proposed Scheme and are shown in Table 5.9. It can be observed that the annual mean background concentrations are below the relevant air quality standards for all pollutants (NO₂, PM₁₀ and PM_{2.5}).

All monitoring in the area is at roadside locations, therefore it has not been possible to carry out a comparison of local background monitoring against the UK background mapped concentrations. The Defra mapped concentrations (without sector removal) have been used in this assessment.

Table 5.9: Defra background pollutant concentrations in 2019 around the proposed Scheme

OS grid square		Annual mean concentrations ($\mu\text{g}/\text{m}^3$)			
X	Y	NO _x	NO ₂	PM ₁₀	PM _{2.5}
386500	351500	18.8	13.9	13.1	8.6

5.5 Design Development and Impact Avoidance

The proposed Scheme would be a high-risk site in terms of construction dust risk to human health and dust soiling. In light of this, the best practice mitigation measures described in the IAQM construction dust guidance⁹ for high risk sites, and outlined below, are essential to avoid significant effects occurring. These measures are included in the outline CEMP (Appendix 2A).

²³ Defra, Background mapping data for local authorities (2018) <https://laqm.defra.gov.uk/review-and-assessment/tools/background-maps.html>

Communications

- Develop and implement a stakeholder communications plan that includes community engagement before work commences on site;
- Display the name and contact details of person(s) accountable for air quality and dust issues on the site boundary. This may be the environment manager/engineer or the site manager; and
- Display the head or regional office contact information.

Dust Management

- Develop and implement a Dust Management Plan (DMP), which may include measures to control other emissions, approved by the local authority. The level of detail will depend on the risk and should include the measures in this document.

Site Management

- Record all dust and air quality complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner, and record the measures taken;
- Make the complaints log available to the local authority when asked;
- Record any exceptional incidents that cause dust and/or air emissions, either on- or offsite, and the action taken to resolve the situation in the logbook; and
- Hold regular liaison meetings with other high-risk construction sites within 500m of the site boundary, to ensure plans are co-ordinated and dust and particulate matter emissions are minimised. It is important to understand the interactions of the off site transport/deliveries which might be using the same strategic road network routes.

Monitoring

- Undertake daily on site and off site inspection, where receptors (including roads) are nearby, to monitor dust, record inspection results, and make the log available to the local authority when asked. This should include regular dust soiling checks of surfaces such as street furniture, cars and window sills within 100 m of site boundary, with cleaning to be provided if necessary;
- Carry out regular site inspections to monitor compliance with the DMP, record inspection results, and make an inspection log available to the local authority when asked; and
- Increase the frequency of site inspections by the person accountable for air quality and dust issues on site when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions.

Preparing and maintaining site

- Plan site layout so that machinery and dust causing activities are located away from receptors, as far as is possible;
- Erect solid screens or barriers around dusty activities or the site boundary that are at least as high as any stockpiles on site;
- Fully enclose site or specific operations where there is a high potential for dust production and the site is active for an extensive period;
- Avoid site runoff of water or mud;
- Keep site fencing, barriers and scaffolding clean using wet methods;
- Remove materials that have a potential to produce dust from site as soon as possible, unless being re-used on site. If they are being re-used on site cover as described below; and
- Cover, seed or fence stockpiles to prevent wind whipping.

Operating vehicle/machinery and sustainable travel

- Ensure all vehicles switch off engines when stationary - no idling vehicles;
- Avoid the use of diesel or petrol powered generators and use mains electricity or battery powered equipment where practicable;
- Impose and signpost a maximum-speed-limit of 15 mph on surfaced and 10 mph on unsurfaced haul roads and work areas (if long haul routes are required these speeds may be increased with suitable additional control measures provided, subject to the approval of the nominated undertaker and with the agreement of the local authority, where appropriate); and
- Produce a Construction Traffic Management Plan to manage the sustainable delivery of goods and materials, as well as supporting sustainable travel (public transport, cycling, walking, and car-sharing) of construction staff.

Operations

- Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction, e.g. suitable local exhaust ventilation systems;
- Ensure an adequate water supply on the site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible and appropriate;
- Use enclosed chutes and conveyors and covered skips;
- Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate; and
- Ensure equipment is readily available on site to clean any dry spillages and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods.

Waste management

- Avoid bonfires and burning of waste materials.

Earthworks

- Re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces as soon as practicable;
- Use Hessian, mulches or trackifiers where it is not possible to re-vegetate or cover with topsoil, as soon as practicable; and
- Only remove the cover in small areas during work and not all at once.

Construction

- Avoid scabbling (roughening of concrete surfaces) if possible;
- Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place;
- Ensure bulk cement and other fine powder materials are delivered in enclosed tankers and stored in silos with suitable emission control systems to prevent escape of material and overfilling during delivery; and
- For smaller supplies of fine power materials ensure bags are sealed after use and stored appropriately to prevent dust.

Trackout

- Use water-assisted dust sweeper(s) on the access and local roads, to remove, as necessary, any material tracked out of the site. This may require the sweeper being continuously in use;
- Avoid dry sweeping of large areas;
- Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport;
- Inspect on site haul routes for integrity and instigate necessary repairs to the surface as soon as reasonably practicable;
- Record all inspections of haul routes and any subsequent action in a site logbook;
- Install hard surfaced haul routes, which are regularly damped down with fixed or mobile sprinkler systems, or mobile water bowsers and regularly cleaned;
- Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable);
- Ensure there is an adequate area of hard surfaced road between the wheel wash facility and the site exit, wherever site size and layout permits; and
- Access gates to be located at least 10m from receptors where possible.

The proposed Scheme will include electric vehicle parking, staff will be encouraged to travel by sustainable and active modes with high quality cycling facilities being provided and sustainable transport measures will be included in the Travel Plan (see Appendix 4B). Further details are provided in the Transport Assessment (see Appendix 4A).

5.6 Environmental Impacts and Significance of Effects

5.6.1 Construction dust

The proposed Scheme will be constructed on a site presently unoccupied by any existing property. Dust can be generated due to activities such as demolition, earthworks, construction and trackout.

Sensitivity of area

Most of the closest sensitive receptors are residential receptors which are considered “high sensitivity receptors” by the IAQM guidance⁹ for dust soiling. As there are 10 to 100 sensitive receptors within 20 m of the site boundary (shown in Figure 5.4) the areas sensitivity has been classified as high for dust soiling according to the IAQM guidance.

The annual mean background PM₁₀ concentration is less than 24µg/m³. As there are 10-100 receptors within 20 m of the site, the sensitivity of the area to human health impacts would be assigned as low, however taking a precautionary approach due to the long duration of works close to receptors it is considered suitable to apply the impact as medium. The overall sensitivity has been summarised as shown in Table 5.10.

There are no designated ecological receptors sensitive to dust within 50 m of the site boundary or within 50m of routes used by construction vehicles up to 500 m from the site entrance, and therefore the sensitivity of the area to ecological impacts is negligible.

Table 5.10: Sensitivity of the surrounding area to impacts on dust soiling and human health

Potential Impact	Sensitivity of the surrounding area			
	Demolition	Earthworks	Construction	Trackout
Dust Soiling	High	High	High	High
Human Health	Medium	Medium	Medium	Medium

Using the criteria set out in the risk of dust impacts table (Appendix 5A) the impacts on the area without mitigation are defined.

Dust emission magnitude

Following the methodology outlined in Section 5.3.3, each dust-generating activity has been assigned a dust emission magnitude as shown in Table 5.11. For

earthworks, it has been assumed that these will occur across the whole site area as a worst-case assumption.

Table 5.11: Dust emission magnitude for construction activities

Activity	Dust emission magnitude	Reasoning
Demolition	NA	No significant demolition required
Earthworks	Large	Total site area is around 166,926m ² 5-10 heavy vehicles operating at one time Moderately dust soil type
Construction	Large	Total building volume >100,000m ³ Potentially dusty construction material (e.g. concrete)
Trackout	Large	>50 HGV movements in any one day Moderately dusty surface

Risk of impacts

Taking into consideration the sensitivity of the area and the dust emission magnitude, the risk of impacts has been classified as high for all activities at worst (Table 5.12).

With the appropriate best practice mitigation measures as outlined in the outline CEMP (Appendix 2A) in place, there is likely to be a negligible effect from the dust-generating activities on site.

Table 5.12: Summary dust risk table prior to mitigation

Activity	Dust soiling risk prior to mitigation	Human health risk from dust prior to mitigation
Demolition	High	Medium
Earthworks	High	Medium
Construction	High	Medium
Trackout	High	Medium

5.6.2 Operation

This section provides the results of the assessment of effects from operation of the proposed Scheme on air quality.

Model Verification

This section sets out the results of the model verification undertaken for baseline year 2019 for the air quality assessment. There are six monitoring sites along the modelled road network.

The model verification was carried out using the NO₂ monitoring data from the sites at the junction of the A506 and A5208. These are all roadside monitoring locations along the modelled road network. The location of these verification sites is shown in Figure 5.3.

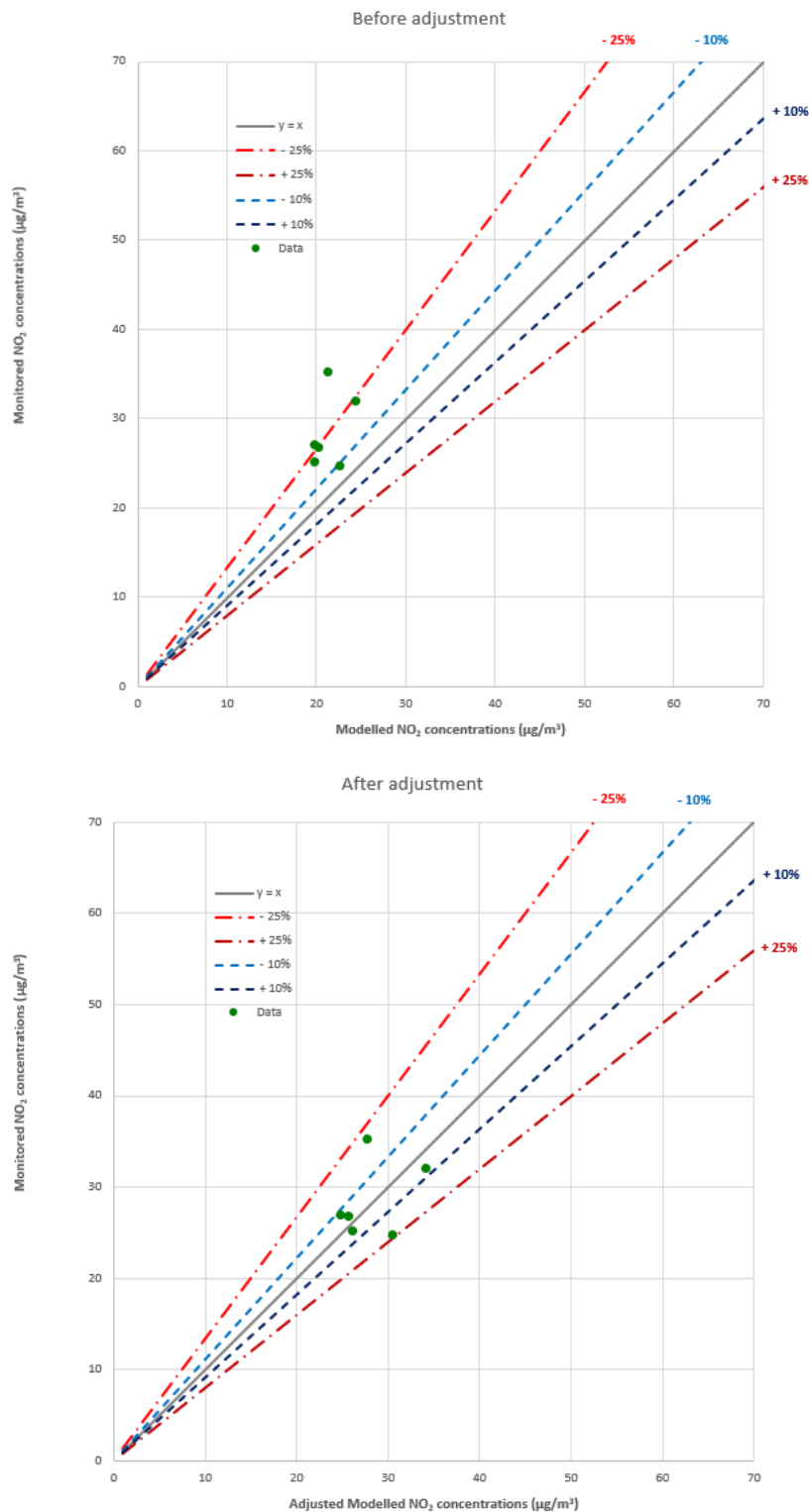
Monitoring data for 2019 at these sites was obtained from the local authority reports and compared with modelled concentrations at the same location. The model verification was undertaken following the methodology described in Defra's LAQM.TG(16) guidance⁸. The model has predicted both under and over predictions at the model verification sites.

A comparison of monitored and modelled annual mean NO₂ concentrations for 2019 before adjustment are presented in Table 5.13 with the graphical representation shown in Image 5.3. The percentage difference between the monitored and modelled results before adjustment is between -9.3% and -40.1%, indicating that the sites are exceeding the recommended guideline stated in LAQM.TG(16) guidance of $\pm 25\%$. Due to the underpredictions an adjustment factor of 2.16 has been applied to the results and the percentage difference following adjustment are within the recommended guideline stated in LAQM.TG(16) guidance of $\pm 25\%$.

Table 5.13: Comparison of modelled and monitored annual mean NO₂ concentrations

Site ID	Site type	Background NO ₂ concentration (µg/m ³)	Monitored NO ₂ concentration (µg/m ³)	Modelled NO ₂ concentration (µg/m ³)	% Difference (modelled - monitored)/monitored
Before adjustment					
K2	Roadside	15.3	26.9	20.2	-25.1%
K3	Roadside	13.9	25.3	19.7	-22.3%
K4	Roadside	15.3	27.1	19.7	-27.2%
K5	Roadside	15.3	32.1	24.4	-24.1%
K6	Roadside	15.3	35.3	21.2	-40.1%
Kirkby (new)	Roadside	15.3	24.8	22.5	-9.3%
After adjustment					
K2	Roadside	15.3	26.9	25.6	-4.9%
K3	Roadside	13.9	25.3	26.1	+3.1%
K4	Roadside	15.3	27.1	24.7	-8.9%
K5	Roadside	15.3	32.1	34.1	+6.1%
K6	Roadside	15.3	35.3	27.6	-21.8%
Kirkby (new)	Roadside	15.3	24.8	30.3	22.3%

Image 5.3: Graphs showing the model verification before and after adjustment



Operational Traffic Assessment

The predicted pollutant concentrations (NO₂, PM₁₀ and PM_{2.5}) from the assessment of operational traffic are presented in the sections below.

NO₂ concentrations

There were no exceedances of the annual mean NO₂ objective predicted as a result of the proposed Scheme and all changes were considered to be negligible. The results are shown in Table 5.14. The maximum predicted concentration occurred at receptor 1 with an annual mean NO₂ of 25.1µg/m³ in 2023 which is well below the objective.

Table 5.14: Annual mean NO₂ results

Receptor ID	DM 2023	DS 2023	Change	Impact descriptor
1	24.9	25.1	0.2	Negligible
2	21.4	21.8	0.4	Negligible
3	16.9	17.0	0.1	Negligible
4	18.4	18.8	0.5	Negligible
5	18.7	19.1	0.4	Negligible
6	23.2	23.4	0.2	Negligible
7	17.3	17.5	0.1	Negligible
8	14.2	14.3	0.1	Negligible
9	13.9	13.9	<0.1	Negligible
10	20.5	20.7	0.2	Negligible
11	15.6	15.7	0.1	Negligible
12	14.8	14.8	<0.1	Negligible
13	14.7	14.7	<0.1	Negligible
14	17.3	17.4	0.1	Negligible
15	13.8	13.9	0.1	Negligible
16	22.0	22.2	0.2	Negligible
17	18.6	18.7	0.1	Negligible
18	20.8	20.9	0.2	Negligible
19	14.1	14.1	<0.1	Negligible

PM₁₀ concentrations

All modelled changes in annual mean PM₁₀ concentrations were less than 0.1 µg/m³. The impact is considered to be negligible. The results are shown in

Table 5.15.

Table 5.15: Annual mean PM₁₀ results

Receptor ID	DM 2023	DS 2023	Change	Impact descriptor
1	13.9	13.9	0.0	Negligible
2	13.6	13.7	0.0	Negligible
3	13.3	13.3	0.0	Negligible
4	13.4	13.5	0.0	Negligible
5	13.5	13.5	0.0	Negligible
6	13.9	13.9	0.0	Negligible
7	13.4	13.4	0.0	Negligible
8	12.2	12.2	0.0	Negligible
9	12.4	12.5	0.0	Negligible
10	13.6	13.6	0.0	Negligible
11	13.2	13.2	0.0	Negligible
12	13.1	13.1	0.0	Negligible
13	13.1	13.1	0.0	Negligible
14	13.4	13.4	0.0	Negligible
15	12.2	12.2	0.0	Negligible
16	13.6	13.7	0.0	Negligible
17	13.4	13.4	0.0	Negligible
18	13.7	13.7	0.0	Negligible
19	13.0	13.0	0.0	Negligible

PM_{2.5} concentrations

All modelled changes in annual mean PM_{2.5} concentrations were less than 0.1 µg/m³. The impact is considered to be negligible. The results are shown in Table 5.16.

Table 5.16: Annual mean PM_{2.5} results

Receptor ID	DM 2023	DS 2023	Change	Impact descriptor
1	9.1	9.1	0.0	Negligible
2	8.9	8.9	0.0	Negligible
3	8.8	8.8	0.0	Negligible
4	8.8	8.8	0.0	Negligible
5	8.8	8.8	0.0	Negligible
6	9.1	9.1	0.0	Negligible
7	8.8	8.8	0.0	Negligible
8	7.8	7.8	0.0	Negligible
9	8.2	8.2	0.0	Negligible
10	8.9	8.9	0.0	Negligible
11	8.7	8.7	0.0	Negligible

Receptor ID	DM 2023	DS 2023	Change	Impact descriptor
12	8.6	8.6	0.0	Negligible
13	8.6	8.6	0.0	Negligible
14	8.8	8.8	0.0	Negligible
15	7.8	7.8	0.0	Negligible
16	8.9	8.9	0.0	Negligible
17	8.8	8.8	0.0	Negligible
18	9.0	9.0	0.0	Negligible
19	8.5	8.5	0.0	Negligible

5.6.3 Operational Carbon

The total emissions per year based on the DfT fleet projections to 2050 were calculated, the fleet projections were fixed after 2050 to assume no further improvement or change in fleet mix which is considered a conservative assumption.

The proposed Scheme is predicted to result in an additional 10,236 tonnes of CO₂e over a 60 year appraisal period as a result of vehicle emissions.

5.7 Mitigation

5.7.1 Mitigation of effects from construction

No mitigation measures in addition to those identified in Section 5.5 and included in the outline CEMP (Appendix 2A) have been identified.

5.7.2 Mitigation of effects from operation

All air quality impacts are predicted to be negligible during the operational phase therefore no mitigation is proposed.

5.8 Residual Effects

It is considered there would be no residual effects on air quality as a result of the proposed Scheme. Table 5.17 provides a summary of the effects.

Table 5.17: Summary of effects

Potential impact	Impact avoidance measures / embedded mitigation	Environmental effect without additional mitigation	Additional mitigation	Environmental effect after additional mitigation (residual effect)	Nature of effect
Construction dust at nearby sensitive receptors	Outline CEMP	Negligible	No additional mitigation proposed	Negligible	St, T, D
Operational phase impacts	No embedded mitigation proposed	Negligible	N/A	Negligible	LT,P, In

Contents

	Page
6 Noise and Vibration	2
6.1 Introduction	2
6.2 Planning policy context	2
6.3 Assessment method	4
6.4 Baseline conditions	11
6.5 Design development and impact avoidance	14
6.6 Environmental impacts and significance of effects	15
6.7 Mitigation	31
6.8 Residual effects	32
6.9 Limitations	35

6 Noise and Vibration

6.1 Introduction

This chapter presents an assessment of potential noise and vibration impacts associated with the proposed Headbolt Lane station scheme. A full description of the proposed Scheme is provided in Chapter 2: Scheme Description.

This chapter is supported by the following figures (see Volume II: Figures) and appendices (see Volume III: Technical Appendices):

- Figure 6.1: Noise and Vibration Receptor Locations;
- Appendix 6A: Terminology;
- Appendix 6B: Policy, Legislation, and Guidance;
- Appendix 6C: Baseline Information;
- Appendix 6D: Construction Assumptions; and
- Appendix 6E: Road Traffic Noise Assessment.

6.2 Planning policy context

This section summarises the relevant planning policy, legislation, standards, and guidance documents which have been considered as part of the assessment. Further detail and interpretation concerning these is provided in Appendix 6B.

6.2.1 National planning policy

The assessment has been undertaken with regard to the following national planning policy:

- National Planning Policy Framework¹;
- Noise Policy Statement for England²; and
- Planning Practice Guidance – Noise³.

6.2.2 Legislation, standards and guidance

The following legislation, standards and guidance have been considered and used as part of the assessment:

¹ Ministry of Housing, Communities & Local Government (2019); *National Planning Policy Framework*

² Department for Environment, Food & Rural Affairs (2010); *Noise Policy Statement for England*

³ Ministry of Housing, Communities & Local Government (2019); *Planning Practice Guidance - Noise*

Legislation

- Control of Pollution Act, 1974⁴;
- Environmental Protection Act, 1990⁵; and
- Noise Insulation (Railways and Other Guided Transport Systems) Regulations, 1996⁶.

Standards

- BS 4142:2014+A1:2019 Methods for rating and assessing industrial and commercial sound⁷;
- BS 5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites. Noise⁸;
- BS 5228-2:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites. Vibration⁹;
- BS 6841:2005 Guide to evaluation of human exposure to vibration in buildings. Vibration sources other than blasting¹⁰;
- BS 7385-2:1993 Evaluation and measurement for vibration in buildings. Guide to damage levels for groundborne vibration¹¹; and
- BS 8233:2014 Guidance on sound insulation and noise reduction for buildings¹².

Guidance

- Design Manual for Roads and Bridges LA111¹³;
- Calculation of Railway Noise (CRN)¹⁴;
- Calculation of Road Traffic Noise (CRTN), Department of Transport, Welsh Office, 1988¹⁵;

⁴ HM Government (1974); *Control of Pollution Act*

⁵ HM Government (1990); *Environmental Protection Act*

⁶ HM Government (1996); *Noise Insulation (Railways and Other Guided Transport Systems) Regulations*

⁷ British Standards Institute (2019); *Methods for rating and assessing industrial and commercial sound*

⁸ British Standards Institute (2014); *Code of practice for noise and vibration control on construction and open sites. Noise*

⁹ British Standards Institute (2014); *Code of practice for noise and vibration control on construction and open sites. Vibration*

¹⁰ British Standards Institute (2008); *Guide to evaluation of human exposure to vibration in buildings. Vibration sources other than blasting*

¹¹ British Standards Institute (1993); *Evaluation and measurement for vibration in buildings. Guide to damage levels for groundborne vibration*

¹² British Standards Institute (2014); *Guidance on sound insulation and noise reduction for buildings*

¹³ Highways England (2020); *Design Manual for Roads and Bridges LA111 – Noise and vibration (formerly HD213/11), Revision 2*

¹⁴ Department of Transport (1995); *Calculation of Railway Noise*

¹⁵ Department of Transport, Welsh Office (1988); *Calculation of Road Traffic Noise*

- World Health Organization (WHO) Guidelines for Community Noise, 1999¹⁶;
- WHO Night Noise Guidelines for Europe, 2009¹⁷;
- WHO Environmental Noise Guidelines for Europe, 2018¹⁸; and
- Institute of Environmental Management and Assessment (IEMA) Guidelines for Environmental Noise Impact Assessment¹⁹.

6.3 Assessment method

6.3.1 Consultation

Discussion and email correspondence with Knowsley Metropolitan Borough Council (KMBC) Environmental Protection Officer (EHO) was conducted to agree the assessment scope and approach to establishing a suitable baseline.

Table 6.1: Consultation summary

Consultee and date	Issue raised	Summary of response
Helen Bradshawe, KMBC Environmental Health, 22 April 2021	Proposed using predictions to establish baseline due to current traffic levels not being fully representative of typical (pre-COVID) levels. Proposed that fixed plant noise and PA system noise is controlled through planning conditions. Proposed assessing road and rail traffic noise using CRTN and CRN methodologies respectively. Proposed control of construction noise and vibration through a Noise and Vibration Management Plan ahead of construction phase.	Approach to baseline and fixed plant / PA noise acceptable. Raised issue of freight train noise and requested that this was included in baseline assessment. No response received regarding CRTN and CRN assessment methodologies, or construction management plan.

6.3.2 Sources of information and data

Due to the ongoing impacts of Covid-19 on travel behaviour, it is considered that environmental noise surveys undertaken at this time may not be representative of typical road traffic or rail traffic levels. Alternative sources of data have therefore been used to inform the baseline noise environment.

Baseline road traffic flow information has been provided by the transport consultant and is informed by surveys undertaken in 2014 and 2019. Refer to Chapter 4: Traffic and Transport for more information.

¹⁶ World Health Organization (1999); *Guidelines for Community Noise*

¹⁷ World Health Organization (2009); *Night Noise Guidelines for Europe*

¹⁸ World Health Organization (2018); *Environmental Noise Guidelines for Europe*

¹⁹ Institute of Environmental Management & Assessment (2020); *Guidelines for Environmental Noise Impact Assessment*

Information related to typical rolling stock and train operating times on the railway corridor has also been provided by the transport consultant.

6.3.3 Study area

The receptor locations considered for the assessment of construction noise and vibration, and for the assessment of operational rail, building services and public address system noise, are shown in Figure 6.1. The study area has been chosen to extend in all directions to incorporate the nearest residential receptors affected by the proposed Scheme.

The study area for the assessment of indirect road traffic noise effects associated with the proposed Scheme includes all road links considered within Chapter 4: Traffic and Transport.

6.3.4 Impact assessment and significance criteria

The following section describes the assessment methods applied, including the means by which noise and vibration levels have been predicted. The assessment approach takes account of the key policies, guidance and legislation listed in Section 6.2. Significance of the predicted impacts has been assessed by reference to criteria developed for each type of impact summarised below.

The assessment considers the impact of demolition / construction and operational noise and vibration on sensitive receptors.

The following concepts, taken from the Noise Policy Statement for England, are used in this assessment. Refer to Appendix 6B for a full explanation:

- NOEL (no observed effect level): the level below which no effect can be detected. In simple terms, below this level, there is no detectable effect on health and quality of life due to noise;
- LOAEL (lowest observed adverse effect level): the level above which adverse effects on health and quality of life can be detected; and
- SOAEL (significant observed adverse effect level): the level above which significant adverse effects on health and quality of life occur.

Where the overall noise exposure from the proposed Scheme exceeds the relevant SOAEL threshold at a specific receptor, that receptor is identified as being subject to a significant adverse impact on health and quality of life under Government noise policy, and is hence identified as a likely significant adverse effect.

Other factors, such as the number of dwellings affected and the magnitude of noise change, can result in impacts between the LOAEL and SOAEL thresholds being reported as likely significant effects in EIA terms. The EIA process requires that likely significant effects are identified along with the envisaged mitigation to avoid or reduce these significant effects.

Construction noise

Potential adverse effect thresholds in Government policy terms have been established based upon the ABC Method described in BS5228-1:2009+A1:2014. These thresholds, shown in Table 6.2, have been used to establish assessment criteria for average construction noise levels.

Table 6.2: Thresholds of potential effects in policy terms of construction noise at sensitive receptors

Effect threshold	Threshold value, 1 m in front of the relevant facade
LOAEL	Day: 65 dBL _{Aeq,daytime} Evening: 55 dBL _{Aeq,1hr} Night: 45 dBL _{Aeq,1hr}
SOAEL	Day: 75 dBL _{Aeq,daytime} Evening: 65 dBL _{Aeq,1hr} Night: 55 dBL _{Aeq,1hr}
Note: Day is 07:00 to 19:00, evening is 19:00 to 23:00 and night is 23:00 to 07:00	

Where the average construction noise level at the receptor is between the lowest and the significant observed adverse effect levels, the threshold of potential adverse effect in EIA terms is evaluated in accordance with Table 6.3.

Table 6.3: Threshold of potential significant effects in EIA terms due to construction noise at dwellings, according to ABC method in BS 5228-1:2009+A1:2014

Assessment category and threshold value period	Threshold value, dB(A)		
	Category A	Category B	Category C
Night-time (23:00 – 07:00)	45	50	55
Daytime (07:00 – 19:00) and Saturdays (07:00 – 13:00)	65	70	75
Other: Weekday evenings (19:00 – 23:00) Saturdays (13:00 – 23:00) Sundays (07:00 – 23:00)	55	60	65
Category A: threshold value to use when ambient noise levels (rounded to the nearest 5 dB) are less than these values Category B: threshold value to use when ambient noise levels (rounded to the nearest 5 dB) are the same as Category A values Category C: threshold value to use when ambient noise levels (rounded to the nearest 5 dB) are higher than Category A values.			

The adverse impact threshold is determined at a dwelling using the existing ambient noise level rounded to the nearest 5 dB. This is then used to determine the assessment category: A, B or C, which defines the adverse noise impact threshold. The predicted construction noise level is then compared to the appropriate noise impact threshold level. If the L_{Aeq} construction noise level exceeds the appropriate noise impact threshold level shown in Table 6.3 then an adverse impact with the potential to cause a significant effect is identified.

Having established if there is a potentially significant effect using the ABC method, the final assessment of significance is made by considering various other factors, such as the expected duration of the activity.

For non-residential receptors, significant effects would be evaluated on a receptor-by-receptor basis using established noise impact criteria for the type of receptor and consideration of other factors, such as the expected duration of the activity.

Construction vibration

BS 5228-2:2009+A1:2014 indicates that the threshold of perception in residential environments corresponds with a peak particle velocity (PPV) of 0.3 mm/s. The Standard also states that a complaint is likely where levels occur above 1.0 mm/s PPV at residential properties, but that this exposure can be tolerated if prior warning and explanation has been given to residents. Levels of vibration of 10 mm/s PPV and above are likely to be intolerable for any more than a very brief exposure to this level.

The overall significance of the effect is assessed by considering not only the criteria above, but also other factors such as the duration of exposure and the particular characteristics of the source.

Guidance on the impact of vibration on people in buildings is presented in BS 6472-1: 2008. Part 1 of this standard assesses the impact of vibration using the vibration dose value (VDV). This indicator takes into account how people respond to vibration in terms of frequency content, vibration magnitude and the number and duration of vibration events during an assessment period. For dwellings, vibration from construction is assessed using the criteria presented in Table 6.4.

The LOAEL values, corresponding to the threshold for a minor adverse impact in EIA terms, are taken as the lower end of the range of values for which BS 6472-1 indicates a 'low probability of adverse comment'. The SOAEL values are taken where a level of exposure is the lower value for 'adverse comment probable' in BS6472-1.

Table 6.4: Thresholds of potential effects of vibration for residential buildings (derived from BS 6472-1:2008)

Threshold (residential)	Impact classification	Vibration exposure	
		VDV, daytime (07:00 – 23:00) (m.s ^{-1.75})	VDV, night time (23:00 – 07:00) (m.s ^{-1.75})
LOAEL	Minor	0.2	0.1
-	Moderate	0.4	0.2
SOAEL	Major	0.8	0.4
Determined at the worst location on a normally loaded floor (usually the centre of the floor)			

The risk of damage to buildings from groundborne vibration is assessed using the criteria in Table 6.5, derived from BS 7385-2:1993. Below these levels, the probability of causing the lowest category of damage ('cosmetic', as defined in

BS ISO 4866:2010²⁰) tends towards zero. However, even this lowest damage category is much higher than the lowest perceptible levels.

Table 6.5: Vibration impact criteria for buildings (conservative criteria below which there is no risk of cosmetic damage)

Category of building	Peak particle velocity (mms ⁻¹) [1]	
	Transient vibration [2]	Continuous vibration [3]
Potentially vulnerable building	6	3
Structurally sound buildings	12	6
Notes:		
[1] At the building foundation		
[2] Transient relative to building response <i>e.g.</i> from percussive piling		
[3] Continuous relative to building response <i>e.g.</i> from vibratory piling, vibrating rollers		

Construction traffic noise

A hierarchy of impacts from traffic noise is given in DMRB LA 111. A potentially significant effect for road traffic noise is identified where the proposed Scheme would cause a 3 dB or greater increase in road traffic noise level, and where the Do-Minimum noise level is below the SOAEL. Where the Do-Minimum traffic noise level is above the SOAEL, any increase in level greater than 1 dB is identified as a potentially significant effect.

In terms of government policy, the significance thresholds for construction road traffic noise for this assessment are given in Table 6.6. These are consistent with construction noise criteria and higher than the effect levels for operational road traffic, since they relate to the temporary situation and will only occur for part of the construction programme.

Table 6.6: Thresholds of potential effects from construction road traffic noise in policy terms

Time period	Effect level (façade level), dBL _{Aeq,T}	
	LOAEL	SOAEL
Day (07:00 – 23:00)	65	75
Night (23:00 – 07:00)	45	55

Where an assessment has been based on the comparison of noise levels, it is carried out at a standard reference distance of 10m for the purpose of determining the magnitude of impact.

²⁰ British Standards Institute (2010); *Mechanical vibration and shock. Vibration of fixed structures. Guidelines for the measurement of vibrations and evaluation of their effects on structures*

Operational road and rail traffic noise

Adverse effect levels for the combined changes in road and rail traffic noise associated with the proposed Scheme are shown in Table 6.7. These have been set in accordance with Government noise policy (NPPF, and PPG-N) and with regard to the guidance from the WHO Environmental Noise Guidelines for Europe, WHO Night Noise Guidelines for Europe, the Noise Insulation Regulations 1975 (as amended), and the IEMA Guidelines for Environmental Noise Impact Assessment.

Table 6.7: Adverse effects from operational road and rail traffic noise in policy terms

Effect threshold	Threshold value, $dBL_{Aeq,T}$ (free-field)	
	Day (07:00 – 23:00)	Night (23:00 – 07:00)
Lowest observed adverse effect level (LOAEL)	50	40
Significant observed adverse effect level (SOAEL)	65	55

Maximum noise levels

While the assessment of noise impacts using the 16-hour and 8-hour continuous levels follows guidance and is aligned with policy, it does not take into account maximum noise levels that would occur due to passing trains. To assess this, noise data for appropriate future rolling stock have been obtained to determine the likely maximum noise levels from a pass-by.

There is no formal method by which to assess maximum noise levels and determine any potential significant effects. A threshold of 85 dBL_{AFmax} has therefore been adopted, based on precedent. The basis for this is the HS2 Phase One Environmental Statement, where this value is identified as a level which, if occurring at night, could lead to an adverse effect on restorative sleep.

Noise from fixed building services plant

Operationally, building services plant will be controlled by appropriate planning conditions to meet the appropriate noise level criteria relative to background noise at surrounding receptors. This will avoid potentially significant effects by securing adequate mitigation controls through planning conditions.

6.3.5 Sensitivity of receptors

The IEMA Guidelines for Environmental Noise Impact Assessment identifies noise-sensitive receptors and includes dwellings, schools, hospitals and commercial premises. For the purposes of this assessment, buildings used for permanent living (*i.e.* dwellings) are assigned the highest noise sensitivity.

Table 6.8 provides the proposed general hierarchy used to determine receptor noise sensitivity in this assessment.

Table 6.8: General ranking of noise sensitivity of receptors

Noise sensitivity	Receptor type
High	Residential, schools, hospitals

6.3.6 Magnitude of impact

DMRB LA 111 provides a basis for evaluating the magnitude of the impact caused by road traffic noise change both in the short-term and long-term. This assessment will focus on the long-term change as this is the likely worst-case scenario considering traffic growth.

The focus on long-term effects also relates to the evidence that underpins DMRB LA 111. This evidence shows that the reported sensitivity to small changes in noise levels (less than 3 dB(A)) may be partly attributed to an awareness of the changes in traffic rather than noise at the time a new road opens.

The hierarchy of magnitudes of impacts from operational noise associated with the proposed Scheme is shown in Table 6.9, and is taken from DMRB LA 111. The hierarchy is applicable to both increases and decreases in noise, and takes account of policy effect levels.

Where the overall 'end state' (*i.e.* the operational noise level of the proposed Scheme when completed) is below the SOAEL, the magnitude of the impact caused by a long-term change in noise levels attributable to the proposed Scheme is evaluated in accordance with Condition 1. These ranges have also been applied to any beneficial impacts when the 'end state' is below the LOAEL.

Where the baseline noise levels are greater than the relevant SOAEL, then there is increasing risk of likely health effects associated with long term (permanent) exposure. Therefore, it is considered appropriate to give greater weight to noise change where the existing baseline noise level is already high, *i.e.* in excess of the relevant SOAEL. If this is the case, the magnitude of the impact caused by a long-term change in noise levels attributable to the proposed Scheme is evaluated in accordance with Condition 2.

Table 6.9: Classification of magnitude of impact due to long-term noise level

Magnitude of impact in the long-term	Noise change, dBA	
	Condition 1: Where end-state of overall exposure is below the SOAEL	Condition 2: Where baseline noise level is above the SOAEL
No change	0	0
Very low	0.1 – 2.9	0.1 – 0.9
Low	3.0 – 4.9	1.0 – 2.9
Medium	5.0 – 9.9	3.0 – 4.9
High	10.0+	5.0+

6.3.7 Significant effects

The degree of noise and vibration-related effects are assessed using a combination of the sensitivity of the receptor and the magnitude of impact, as shown by the matrix in Table 6.10. Effects can be either adverse or beneficial.

Effects are considered as being ‘major’, ‘moderate’, ‘minor’ or ‘negligible’. ‘Major’ and ‘moderate’ effects are considered to be significant in an EIA context.

The final assessment of significance is based upon the indicated potential significance in tandem with consideration of additional factors, such as the duration, frequency of occurrence and sensitive facades affected.

Table 6.10: Degree of effect

Magnitude of impact	Sensitivity of receptor			
	High	Medium	Low	Very low
High	Major	Major	Moderate	Minor
Medium	Major	Moderate	Minor	Negligible
Low	Moderate	Minor	Negligible	Negligible
Very low	Minor	Minor	Negligible	Negligible
No change	Negligible	Negligible	Negligible	Negligible

6.4 Baseline conditions

6.4.1 Baseline noise climate

The proposed Scheme is located in an urban environment where the daytime noise climate is dominated by road and rail traffic noise. Road traffic is less busy at night-time but remains a prime source of noise, together with less frequent rail movements.

Due to the ongoing impacts of Covid-19 on travel behaviour, it is considered that environmental noise surveys undertaken at this time may not be representative of typical road traffic levels. Alternative sources of data have therefore been used to inform the baseline noise environment.

Baseline road traffic flow information has been provided by the transport consultant and is informed by surveys undertaken in 2014 and 2019. Refer to Chapter 4: Traffic and Transport for more information.

Information related to current passenger rolling stock and train operating times on the railway corridor have also been provided by the transport consultant.

All information used to inform the baseline noise environment is provided in full in Appendix 6C: Baseline Information.

6.4.2 Freight trains

Freight movements have been considered as separate from the noise modelling process; refer to Section 6.6.4 for a full discussion.

6.4.3 Receptor identification

For the purposes of assessing the impact of the proposed Scheme on the surrounding environment, assessment locations have been defined to represent groups of noise-sensitive receptors that are a) located close together, and b) are exposed to similar baseline noise levels. Figure 6.1 shows the assessment locations used. Table 6.11 below describes the noise-sensitive receptors that are represented by each assessment location. All receptors assessed within the study area represent residential properties.

Table 6.11: Assessment locations and corresponding noise-sensitive receptors

Assessment location ID	Area(s) represented	Receptor type
001	Deerbolt Way, Deerbolt Crescent, Hillpark Crescent	Residential (multiple small rows of houses)
002	Rowan Drive, Beech Close	Residential (row of houses)
003	Melling Way	Residential (row of houses)
004	County Road (N)	Residential (small row of houses)
005	County Road (S)	Residential (small row of houses)
006	Appleton Road (S)	Residential (small row of houses)
007	Appleton Road (NW)	Residential (small row of houses)
008	Appleton Road (NE)	Residential (small row of houses)
009	Brampton Close	Residential (small row of houses)
010	Fern Close (S)	Residential (group of houses)
011	Fern Close (Mid)	Residential (group of houses)
012	Fern Close (N)	Residential (group of houses)
013	Fern Close (E)	Residential (group of houses)
014	Langton Road (S)	Residential (small row of houses)
015	Headbolt Lane (between Southcroft Drive and Langton Road)	Residential (small row of houses)
016	Devonshire Close	Residential (small row of houses)
017	Ashburn Avenue	Residential (multiple small groups of houses)
018	Headbolt Lane (between Heatherfield Drive and Fallowfield)	Residential (multiple small groups of houses)
019	Headbolt Lane (between A506 County Road and Heatherfield Drive)	Residential (small row of houses)

Assessment location ID	Area(s) represented	Receptor type
020	Coniston Close (N)	Residential (multiple small rows of houses)
021	Coniston Close (S)	Residential (multiple small rows of houses)
022	Seathwaite Crescent	Residential (multiple small rows of houses)
023	Boyes Brow	Residential (multiple small rows of houses)
024	Buttermere Close (S)	Residential (small row of houses)
025	Buttermere Close (N)	Residential (small row of houses)

6.4.4 Baseline noise levels

Table 6.12 presents a summary of predicted noise levels at each assessment location during both day and night periods. Further detail on how these levels were obtained is presented in Appendix 6C: Baseline Information.

It has not been possible to obtain traffic flow information for the evening and weekend periods. Therefore, an accurate baseline noise level cannot be determined at these times. Therefore, a worst-case approach has been adopted by using the Category A threshold value of 55 dBL_{Aeq,day} to assess evening and weekend construction noise.

Table 6.12: Predicted baseline noise levels at assessment locations

Assessment location ID	Predicted baseline noise level, dBL _{Aeq,T}	
	Daytime (0700-2300)	Night (2300-0700)
001	54.6	50.3
002	54.1	49.8
003	51	46.4
004	62.8	58.2
005	59	54.9
006	49	44.5
007	57.5	52.9
008	55.7	51.1
009	50.5	45.9
010	45.8	41.2
011	46.4	41.9
012	57.3	52.6
013	55.1	50.4
014	55.8	51.3
015	66.5	62

Assessment location ID	Predicted baseline noise level, dBL _{Aeq,T}	
	Daytime (0700-2300)	Night (2300-0700)
016	58.6	54.1
017	48.6	44.1
018	58.4	53.9
019	62.3	57.8
020	54.3	49.8
021	63.5	59
022	52.6	48.1
023	61.7	57.2
024	47	42.4
025	52.8	48.3

6.5 Design development and impact avoidance

To control the level of noise to which sensitive receptors will be exposed, the design of stationary noise sources of a commercial/industrial nature (such as the proposed substation) will be conducted in accordance with the appropriate thresholds set relative to prevailing background noise levels at the closest noise-sensitive receptors.

The mitigation of this type of noise is uncontroversial and can therefore be secured by a suitably worded planning condition. The requirements of such a planning condition can then be discharged during detailed design of the proposed Scheme.

It is assumed that the Construction Environmental Management Plan, or CEMP (to be secured by planning condition) will ensure that best practicable means are employed and, despite the limitations, the approach taken is considered to be robust. Such measures as required by the Control of Pollution Act (CoPA) are summarised below:

- hours of working to be planned, taking into account the nature of land use in the areas concerned and duration of the work;
- working hours limited to Monday to Friday: 08:00 – 18:00; Saturday: 08:00 – 13:00; and on Sunday and Bank Holiday no noisy working (other than special works subject to prior agreement with KMBC).
- where practicable, quiet working methods should be employed, including the use of the most suitable plant, and suitably sized plant;
- haulage vehicles should not access the site outside of day time periods;
- equipment should be switched off when not required;
- internal haul routes should be well maintained and avoid steep gradients;
- the drop height of materials should be minimised;

- plant and vehicles should be started up sequentially rather than simultaneously;
- broadband (i.e. white noise) reversing alarms should be used rather than tonal alarms;
- the siting of plant should be considered to avoid noise being directed towards dwellings; and
- noise barriers in the form of temporary hoarding, stacks of materials such as bricks, timber or top soil, should be used to provide screening to nearby sensitive receptors.

6.6 Environmental impacts and significance of effects

6.6.1 Construction site noise

Construction programme

Noise levels from the rationalised construction phases presented in Table 6.13 have been predicted at the closest assessment locations to identify potential significant effects. Construction activities assumed to be taking place during each phase are detailed in Appendix 6D.

Table 6.13: Construction phases as used for assessment

Construction phase		Working hours
A	Temporary power supply	07:30 – 17:30
B	Hoarding installation	07:30 – 17:30
C	Main compound construction	07:30 – 17:30
D	Road rail access point (RRAP) installation	Sat 20:30 – Mon 05:30
E	Haul road construction	07:30 – 17:30
F	Bailey bridge install	07:30 – 17:30
G	Devegetation of rail corridor	Sun 08:00 – 18:00
H	Earthworks (Kingpost)	Sat 20:30 – Mon 05:30
I	Plain line install	Sat 20:30 – Mon 05:30
J	Track drainage	Sat 20:30 -Mon 05:30
K	Cable routing	20.30 – 05.30, 7 day working
L	LOC/signal, hardstandings and signage installation	20.30 – 05.30, 7 day working
M	Switches and crossings (S&C)	Sat 20:30 -Mon 05:30
N	Car park drainage	07:30 – 17:30
O	Car park construction	07:30 -17:30
P	Railway underbridge construction	24/7 working
Q	Platform construction	20.30 – 05.30, 7 day working
R	Station building construction	07:30 -17:30

Construction phase		Working hours
S	Rail systems install and commissioning	24/7 working
T	Kirkby Station decommissioning	07:30 -17:30

Predicted construction noise levels for each relevant phase of construction at the closest receptor to each activity are presented in Table 6.14, Table 6.15 and Table 6.16 for day, evening/weekend, and night periods respectively.

Predicted construction noise levels - day

Table 6.14: Predicted daytime construction noise levels during relevant construction phases

Construction phase	Closest receptor		Daytime noise level, dBL _{Aeq,T}			Potential EIA significant effect?	Policy effect
	ID	Name	Baseline	BS5228 ABC threshold	Activity noise level		
A	019	Headbolt Lane (W)	62.3	65	58.3	No	Below LOAEL
B	019	Headbolt Lane (W)	62.3	65	57.2	No	Below LOAEL
C	019	Headbolt Lane (W)	62.3	65	57.1	No	Below LOAEL
E	016	Devonshire Close	58.6	65	53.8	No	Below LOAEL
F	018	Headbolt Lane (N)	58.4	65	45.7	No	Below LOAEL
K	002	Rowan Drive	54.1	65	59.9	No	Below LOAEL
L	002	Rowan Drive	54.1	65	63.9	No	Below LOAEL
N	018	Headbolt Lane (W)	58.4	65	58.0	No	Below LOAEL
O	018	Headbolt Lane (W)	58.4	65	61.3	No	Below LOAEL
P	004	County Road (N)	62.8	65	60.2	No	Below LOAEL
R	012	Fern Close (N)	57.3	65	51.2	No	Below LOAEL
S	002	Rowan Drive	54.1	65	64.2	No	Below LOAEL
T	002	Rowan Drive	54.1	65	62.0	No	Below LOAEL

Predicted construction noise levels – evening and weekend

Table 6.15: Predicted evening and weekend construction noise levels during relevant construction phases

Construction phase	Closest receptor		Evening/weekend noise level, $dB_{L_{Aeq,T}}$			Potential EIA significant effect?	Policy effect level
	ID	Name	Baseline	BS5228 ABC threshold	Activity noise level		
D	008	Appleton Road (NE)	-	55	54.5	No	Below LOAEL
G	002	Rowan Drive	-	55	63.6	Yes	Exceeds LOAEL
H	002	Rowan Drive	-	55	68.9	Yes	Exceeds SOAEL
I	002	Rowan Drive	-	55	66.3	Yes	Exceeds SOAEL
J	002	Rowan Drive	-	55	59.9	Yes	Exceeds LOAEL
K	002	Rowan Drive	-	55	59.9	Yes	Exceeds LOAEL
L	002	Rowan Drive	-	55	63.9	Yes	Exceeds LOAEL
M	002	Rowan Drive	-	55	62.4	Yes	Exceeds LOAEL
P	004	County Road (N)	-	55	60.2	Yes	Exceeds LOAEL
Q	012	Fern Close (N)	-	55	54.4	No	Below LOAEL
S	002	Rowan Drive	-	55	64.2	Yes	Exceeds LOAEL

Predicted construction noise levels – night

Table 6.16: Predicted night-time construction noise levels during relevant construction phases

Construction phase	Closest receptor		Night noise level, $dB_{LAeq,T}$			Potential EIA significant effect?	Policy effect level
	ID	Name	Baseline	BS5228 ABC threshold	Activity noise level		
D	8	Appleton Road (NE)	51.1	55	54.5	No	Exceeds LOAEL
H	2	Rowan Drive	49.8	55	68.9	Yes	Exceeds SOAEL
I	2	Rowan Drive	49.8	55	66.3	Yes	Exceeds SOAEL
J	2	Rowan Drive	49.8	55	59.9	Yes	Exceeds SOAEL
K	2	Rowan Drive	49.8	55	59.9	Yes	Exceeds SOAEL
L	2	Rowan Drive	49.8	55	63.9	Yes	Exceeds SOAEL
M	2	Rowan Drive	49.8	55	62.4	Yes	Exceeds SOAEL
P	4	County Road (N)	58.2	55	60.2	Yes	Exceeds SOAEL
Q	12	Fern Close (N)	52.6	55	54.4	No	Exceeds LOAEL
S	2	Rowan Drive	49.8	55	64.2	Yes	Exceeds SOAEL

Assessment of daytime construction noise

Noise levels from construction activities taking place during the day are predicted to be below the adopted threshold values for a potential significant effect at all assessment locations. Therefore, no effects have been identified. In policy terms, noise levels are below the adopted LOAEL values.

Assessment of evening and weekend construction noise

Noise levels due to platform construction and RRAP installation are predicted to be below the adopted threshold values for a potential significant effect at all assessment locations during the evening and weekend period. Therefore, no significant effects have been identified for these activities. In policy terms, noise levels are above LOAEL but do not exceed the SOAEL threshold.

Major activities taking place along the rail corridor (earthworks widening and plain line install) are predicted to exceed the adopted thresholds at a number of assessment locations, indicating potential significant effects at properties on:

- Deerbolt Way, Deerbolt Crescent and Hillpark Crescent;
- Rowan Drive and Beech Close;
- County Road;
- Langton Road; and
- Headbolt Lane (between Southcroft Drive and Langton Road).

In policy terms, the predicted noise levels from these activities also exceed the SOAEL threshold. Taking into account the absolute levels, the level of exceedance of the assessment criteria and the durations of the activities in question, these are considered temporary adverse significant effects.

Noise levels from other activities taking place along the rail corridor (devegetation, track drainage, cable routing, LOC/signal and hardstandings, underbridge works) are also predicted to exceed the adopted thresholds at a smaller number of assessment locations, indicating potential significant effects at properties on:

- Deerbolt Way, Deerbolt Crescent and Hillpark Crescent;
- Rowan Drive and Beech Close;
- Fern Close; and
- County Road (N).

In policy terms, predicted noise levels from these activities are above LOAEL but do not exceed SOAEL. Taking into account the duration of events, the linear nature of the works and that the assessment represents a reasonable worst case in terms of distance to the activity, the adopted significance criteria are unlikely to be exceeded for greater than one continuous month at any property. Therefore, these potential effects are considered not significant but in policy terms need to be mitigated and minimised as far as practicable.

Noise from the switches and crossings (S&C) installation is predicted to exceed the adopted thresholds at a limited number of assessment locations, indicating potential significant effects at properties on Deerbolt Way, Deerbolt Crescent, Rowan Drive, and Beech Close. In policy terms, predicted noise levels from these activities are above LOAEL but do not exceed the SOAEL. Taking into account the very limited duration of these works, these potential effects are also considered not significant but in policy terms need to be mitigated and minimised as far as practicable.

Assessment of night-time construction noise

Noise levels due to platform construction and RRAP installation are predicted to be below the adopted threshold values for a potential significant effect at all assessment locations during the night-time period. Therefore, no significant effects have been identified for these activities. In policy terms, noise levels exceed the LOAEL but do not exceed the SOAEL threshold so will need to be mitigated and minimised as far as practicable.

Activities taking place along the rail corridor (earthworks widening, plain line install, revegetation, track drainage, cable routing, LOC/signal and hardstandings, rail systems installation) are predicted to exceed the adopted thresholds for a potential significant effect at assessment locations representing:

- Deerbolt Way, Deerbolt Crescent and Hillpark Crescent;
- Rowan Drive and Beech Close;
- County Road;
- Appleton Road, Fern Close and Limetree Road;
- Headbolt Lane (between Southcroft Drive and Langton Road); and
- Boyes Brow and Buttermere Close.

In policy terms, the predicted noise levels from these activities also exceed the SOAEL threshold and are therefore assessed as temporary adverse significant effects.

Noise levels from railway underbridge works are predicted to exceed adopted threshold values at a smaller number of assessment locations, indicating potential significant effects at properties on County Road and Fern Close. In policy terms, predicted noise levels from these activities exceed the SOAEL threshold and are therefore assessed as temporary adverse significant effects.

6.6.2 Construction site vibration

During construction, the reasonable worst case activity causing vibration has been assumed to be equivalent to continuous flight auger (CFA) piling²¹²². This results in a PPV of less than 1 mm/s at a horizontal distance of 10 m and less than 10 mm/s at 1 m.

The level of vibration during piling may be perceptible to people within their houses when the PPV is greater than 0.3 mm/s. At levels of 1.0 mm/s and above, BS 5228-2 notes that *“It is likely that vibration of this level in residential environments will cause complaint, but can be tolerated if prior warning and explanation has been given to residents.”*

All sensitive buildings are at least 20 m away from any potential piling works; therefore the likely vibration levels at these buildings will be well below the threshold of 6 mm/s for potential cosmetic damage and 1 mm/s for human exposure as outlined in Section 6.3.4. The construction vibration effects from piling have therefore been assessed as a minor impact and are therefore not a significant effect.

The vibration from compaction in terms of PPV has been determined by reference to Transport Research Laboratory Report 429²³, which is referenced in BS5228-2.

Vibration during vibratory compaction is predicted to be not greater than 4.1 mm/s PPV during the transient start-up and run-down situations and not greater than 2.6 mm/s for steady state situations at a distance of 20 m. Therefore, the potential vibration is well below the thresholds of potential cosmetic building damage. The potential impacts of compaction works would therefore be not significant in terms of building damage risk.

The calculated level of vibration during vibratory compaction may be clearly perceptible to people within their houses when the works are at their closest. However, the human disturbance effects associated with this level of vibration exposure could be tolerated by appropriate liaison with the building occupants providing prior warning to any works.

The construction vibration effects from vibratory compaction have therefore been assessed as not significant.

6.6.3 Construction road traffic noise

Construction site vehicles will be advised to leave the M6 motorway at Junction 26 and join the A506 towards Liverpool. Vehicles will then make a left turn onto

²¹ Hiller, D (2001); *A comparison of noise and vibration from percussive and bored piling. Proceeds of Underground Construction 2001*

²² Whilst piling is not currently anticipated to be required due to the ground conditions, a worst-case approach to the assessment has been undertaken in case piling is required as the design develops.

²³ Transport Research Laboratory (2000); *Groundborne vibration caused by mechanised construction works*

Headbolt Lane and a right turn shortly afterwards onto the site access road. It is assumed that site staff vehicles will be advised to take the same route.

The number of construction and site staff vehicles will vary throughout the construction programme depending on the phase of work. Typically, 50-70 construction vehicles per 24-hour period could be expected, along with 200-500 site staff vehicles. For a 5 week period during August 2022, these numbers will peak at 175 construction vehicles and 900 site staff vehicles, each making a trip to and from the site.

The predicted increase in traffic noise levels during the August 2022 peak of construction traffic is +2.5 dB on Headbolt Lane (west of site access) and +1.0 dB on the A506, County Road (north of Headbolt Lane); refer to Table 6.17 for details.

Table 6.17: Predicted noise increases and impacts due to construction site traffic

Road	Increase in noise due to construction traffic in worst month, dB	LOAEL/SOAEL	Impact
A506 County Road (north of Headbolt Lane)	+1.0	Exceeds LOAEL	Very low
Headbolt Lane (west of site access)	+2.5	Exceeds LOAEL	Very low

Although there is an increase in noise levels on both roads, the short-term change is less than 3 dB and noise levels remain below a SOAEL in each case. Therefore, the impact is classified as very low.

Noise effects on properties on Headbolt Lane and the A506 due to construction site traffic are therefore identified as not significant.

6.6.4 Operational freight noise

Freight trains currently operate on the line near to the proposed Headbolt Lane station. Trains are scheduled to access Knowsley Freight Terminal up to 5 times a day via a headshunt which currently terminates at a buffer stop just south of the proposed Northern Rail platform. Trains arrive at the headshunt from Rainford Junction and reverse into the freight terminal.

The existing buffer stop is located approximately 42 m from the nearest dwellings in Fern Close to the south. It is proposed to move the buffer stop south by 5 m to avoid the new platforms. This will necessitate realignment of around 100 m of the headshunt, bringing freight 5 m closer to these dwellings.

This realignment of the headshunt will increase freight noise levels at these dwellings to the south by around 1 dB. However, the overall noise level due to freight trains over the course of the day at the closest dwellings, assuming a reasonable worst case of 5 movements per day²⁴, is below the noise level

²⁴ It should be noted that the actual number of freight movements is typically fewer than five, as the freight runs according to demand rather than as scheduled.

experienced from road traffic. Furthermore, the noise levels due to passenger rail traffic will decrease due to the proposed Scheme.

Therefore, there is a negligible change in overall noise level experienced at the closest dwellings due to realignment of the freight headshunt and effects are assessed as not significant.

6.6.5 Operational road and passenger rail noise

The direct noise impacts due to rail noise from the proposed Scheme in operation, along with traffic on surrounding roads, have been predicted for all assessment locations.

The predicted noise levels associated with the proposed Scheme (2028 Do-Something (DS) scenario) have been assessed against future noise levels without the Scheme (2023 Do-Minimum (DM) scenario) to determine long-term noise impacts and potential significant effects in line with the assessment criteria outlined in Section 6.3.

The 2023 DM scenario noise levels account for future road traffic growth, including from committed developments.

Day (0700-2300)

Table 6.18 presents predicted operational noise levels, changes and impacts due to the proposed Scheme during the daytime period.

Table 6.18: Summary of operational noise impacts during daytime period

Location ID	Predicted daytime noise level, dBL _{Aeq,16hr}			Assessment		Policy effect
	2021 B'line	2023 DM	2028 DS	Change, DS - DM	Magnitude of impact	
001	54.6	54.6	53.2	-1.4	Very low	Below LOAEL
002	54.1	54.1	49.6	-4.5	Low	Below LOAEL
003	51.0	51.5	50.9	-0.7	Very low	Below LOAEL
004	62.8	63.6	62.9	-0.6	Very low	Exceeds LOAEL
005	59.4	60.2	59.4	-0.8	Very low	Exceeds LOAEL
006	49.0	49.8	49.2	-0.5	Very low	Below LOAEL
007	57.5	58.0	56.5	-1.5	Very low	Exceeds LOAEL
008	55.7	56.1	54.9	-1.2	Very low	Below LOAEL
009	50.5	50.8	50.3	-0.5	Very low	Below LOAEL
010	45.8	46.1	45.9	-0.2	No change	Below LOAEL
011	46.4	46.7	46.8	0.1	Very low	Below LOAEL
012	57.3	57.4	55.7	-1.7	Very low	Exceeds LOAEL
013	55.1	55.4	54.5	-0.9	Very low	Below LOAEL
014	55.8	55.9	56.1	0.2	Very low	Exceeds LOAEL

Location ID	Predicted daytime noise level, dBL _{Aeq,16hr}			Assessment		Policy effect
	2021 B'line	2023 DM	2028 DS	Change, DS - DM	Magnitude of impact	
015	66.5	66.6	66.8	0.3	Very low	Exceeds SOAEL
016	58.6	58.7	59.0	0.3	Very low	Exceeds LOAEL
017	48.6	49.0	49.2	0.2	Very low	Below LOAEL
018	58.4	58.5	58.8	0.4	Very low	Exceeds LOAEL
019	62.3	62.7	62.9	0.2	Very low	Exceeds LOAEL
020	54.3	55.4	55.5	0.1	Very low	Exceeds LOAEL
021	63.5	64.3	64.3	0.0	No change	Exceeds LOAEL
022	52.6	52.9	53.0	0.1	Very low	Below LOAEL
023	61.7	61.9	61.8	-0.1	Very low	Exceeds LOAEL
024	47.0	47.5	46.9	-0.6	Very low	Below LOAEL
025	52.8	52.7	52.2	-0.4	Very low	Below LOAEL

In general, locations are predicted to experience either a ‘very low’ increase in noise, or a ‘very low’ or ‘low’ decrease in noise.

Properties on Rowan Drive facing the railway will experience a decrease in overall rail noise levels due to the change from diesel to electric rolling stock. This is identified as a beneficial significant effect.

Other properties in this area (Deerbolt Way, Deerbolt Crescent, Hillpark Crescent) will experience smaller decreases in rail noise. These are minor beneficial effects and are therefore identified as not significant.

A number of properties to the south of the proposed Scheme (Fern Close, Limetree Road) will experience small increases in rail noise due to the proposed Scheme. The rail noise levels remain below road traffic noise from Headbolt Lane. Therefore, effects from daytime operational noise at these properties are identified as not significant.

A number of properties along Headbolt Lane directly to the north of the site, and on some streets leading from Headbolt Lane, will experience a small increase in overall noise levels due to an increase in road traffic associated with the proposed Scheme. Most of these properties will also experience a decrease in rail noise. Effects from daytime operational noise at these properties are identified as not significant.

Night (2300-0700)

Table 6.18 presents predicted operational noise levels, changes, and impacts due to the proposed Scheme during the night period.

Table 6.19: Summary of operational noise impacts during daytime period

Location ID	Predicted night noise level, dBL _{Aeq,8hr}			Assessment		Policy effect level
	2021 B'line	2023 DM	2028 DS	Change, DS - DM	Magnitude of impact	
001	50.3	50.3	49.2	-1.2	Very low	Exceeds SOAEL
002	49.8	49.8	45.4	-4.4	Low	Exceeds LOAEL
003	46.4	47.0	46.4	-0.6	Very low	Exceeds LOAEL
004	58.2	59.0	58.5	-0.6	Very low	Exceeds SOAEL
005	54.9	55.7	54.9	-0.8	Very low	Exceeds SOAEL
006	44.5	45.3	44.8	-0.5	Very low	Exceeds LOAEL
007	52.9	53.3	52.0	-1.3	Very low	Exceeds SOAEL
008	51.1	51.4	50.5	-1.0	Very low	Exceeds SOAEL
009	45.9	46.2	45.9	-0.4	Very low	Exceeds LOAEL
010	41.2	41.6	41.5	-0.1	Very low	Exceeds LOAEL
011	41.9	42.1	42.5	0.4	Very low	Exceeds LOAEL
012	52.6	52.7	52.3	-0.3	Very low	Exceeds SOAEL
013	50.4	50.7	50.7	0.0	Very low	Exceeds SOAEL
014	51.3	51.4	51.6	0.2	Very low	Exceeds SOAEL
015	62.0	62.1	62.4	0.3	Very low	Exceeds SOAEL
016	54.1	54.2	54.5	0.3	Very low	Exceeds SOAEL
017	44.1	44.5	44.9	0.4	Very low	Exceeds LOAEL
018	53.9	53.9	54.3	0.4	Very low	Exceeds SOAEL
019	57.8	58.2	58.4	0.2	Very low	Exceeds SOAEL
020	49.8	50.9	51.0	0.2	Very low	Below LOAEL
021	59.0	59.8	59.8	0.0	Very low	Exceeds SOAEL
022	48.1	48.4	48.5	0.1	Very low	Exceeds LOAEL
023	57.2	57.4	57.3	-0.1	Very low	Exceeds SOAEL
024	42.4	42.9	42.4	-0.5	Very low	Exceeds LOAEL
025	48.3	48.1	47.7	-0.4	Very low	Exceeds LOAEL

In general, locations are predicted to experience either a 'very low' increase in noise, or a 'very low' or 'low' decrease in noise.

Properties on Rowan Drive facing the railway will experience a decrease in overall rail noise levels due to the change from diesel to electric rolling stock. This is identified as a beneficial significant effect.

Other properties in this area (Deerbolt Way, Deerbolt Crescent, Hillpark Crescent) will experience smaller decreases in rail noise. These are minor effects and are therefore identified as not significant.

A number of properties to the south of the proposed Scheme (Fern Close, Limetree Road) will experience small increases in rail noise due to the proposed Scheme. The rail noise levels remain below road traffic noise from Headbolt Lane. Therefore, effects from daytime operational noise (combined road and rail traffic noise) at these properties are identified as not significant.

A number of properties along Headbolt Lane directly to the north of the site, and on some streets leading from Headbolt Lane, will experience a small increase in overall noise levels due to an increase in road traffic associated with the proposed Scheme. Most of these properties will also experience a decrease in rail noise. Effects from daytime operational noise at these properties are identified as not significant.

6.6.6 Fixed plant noise

Noise from stationary building services plant, including the proposed substation, will be controlled through design to achieve acceptable noise criteria relative to the existing baseline noise levels at the closest noise sensitive receptors.

KMBC has confirmed that noise due to fixed plant would be subject to a standard planning condition. It is likely that this would require fixed plant to achieve a rating sound level of 5 dB below typical background (L_{A90}) levels at the closest noise-sensitive receptors during both day and night periods. A penalty for tonality, impulsivity or other character would be included in determining the rating sound level.

6.6.7 Public address system

Noise from the public address (PA) system will be controlled through design to achieve acceptable noise criteria relative to the existing baseline noise levels at the closest noise sensitive receptors. KMBC confirmed that noise due to the PA system would be subject to a standard planning condition, likely to limit overall levels to below typical background noise levels in a similar approach to fixed plant noise.

As the PA system design is considerably advanced, it has been possible to estimate maximum unmitigated sound levels experienced at the closest dwellings using available information coupled with a reasonable worst-case set of operational assumptions. This has enabled an initial assessment of any likely noise impacts and whether further mitigation may be required.

Information on the public address system configuration has been obtained from the SISS Telecommunications GRIP 4 Design report²⁵ for the proposed Scheme.

The current system design for outdoor platform areas comprises a total of 55 loudspeakers configured into day and night zones. The loudspeaker models used are as follows:

²⁵ Arup (2021); 170248-ARU-REP-ETL-000002, revision A01

- Penton CELL10/T mounted to lighting columns (2 per column) at 2.5m height; and
- Penton Sentry 6ST/ENC mounted within waiting shelters on each platform.

For the purposes of a reasonable worst-case initial assessment, it has been assumed that there is no ambient noise sensing (ANS) system in operation, and that the speakers are operating at their maximum sound pressure level.

Table 6.20 and Table 6.21 show predicted PA system sound levels at the closest dwellings (Fern Close) during a typical worst case daytime and night-time period respectively.

Table 6.20: Estimated daytime sound levels at nearest dwellings due to PA system operation

	Platform		
	1	2	3
Penton CELL10/T Sound pressure level at 1m @ 1.25W, dBA	92		
<i>No. active speakers</i>	17	19	19
<i>Distance to worst affected dwelling (m)</i>	52	42	70
<i>% on-time*</i>	3.1%	3.1%	1.6%
Sound level at worst affected dwelling, dBL_{Aeq,16hr}	50	52	45
Combined sound level, dBL_{Aeq,16hr}	55		

*Assumes three 10-second announcements per train

Table 6.21: Estimated night-time sound levels at nearest dwellings due to PA system operation

	Platform		
	1	2	3
Penton CELL10/T Sound pressure level at 1m @ 1.25W, dBA	92		
<i>No. active speakers</i>	7	9	9
<i>Distance to worst affected dwelling (m)</i>	52	42	70
<i>% on-time*</i>	1.3%	1.3%	0.6%
Sound level at worst affected dwelling, dBL_{Aeq,16hr}	42	45	37
Combined sound level, dBL_{Aeq,8hr}	47		

*Assumes three 10-second announcements per train

Baseline ambient noise levels at Fern Close are predicted to be 56 dBL_{Aeq,16hr} (day) and 52 dBL_{Aeq,8hr} (night). Though predicted sound levels from the PA system are below these values, it is likely they would be close to or above background (L_{A90}) noise levels for the relevant time period and have characteristics that could be more intrusive than continuous noise sources. This is assessed as an adverse impacts and a potential adverse significant effect.

6.6.8 Surface car park

An assessment has been undertaken of the likely noise impact on dwellings along Headbolt Lane of vehicles using the 300-space car park. Data obtained from the transport consultant indicate an estimated 1196 daily vehicle movements on the access road. For the purposes of providing a reasonable worst-case assessment, it has been assumed that these are unique vehicle movements and therefore each performs two manoeuvres (arriving and leaving).

The closest row of parking spaces to the dwellings on Headbolt Lane is at a distance of approximately 40 m. Even assuming that all vehicles use this closest row, the cumulative sound level from low-speed vehicle movements over a typical daytime period is significantly below the noise level from traffic on Headbolt Lane, which lies between the dwellings and the car park and is the predominant source of noise for these dwellings.

Considering the above, noise effects at dwellings along Headbolt Lane from car park movements are identified as not significant.

6.6.9 Bus interchange

The proposed Scheme includes a bus interchange with two bus stop bays. The new bus stop bays are located approximately 90m north of the closest dwellings at Fern Close and Appleton Road.

A reasonable worst-case assumption of both bays being occupied continuously throughout the day by idling buses results in a sound level of approximately 48 dBL_{Aeq,16hr} at the closest dwellings. This is 7-9 dB below the predicted baseline ambient noise level experienced at these locations due to noise from the railway. Furthermore, it is highly likely in reality that a) both bays will not be occupied continuously throughout the day, and b) bus engines will be switched off when occupying the bays for more than a few seconds.

Considering the above, noise effects at dwellings at Fern Close and Appleton Road from buses using the bus interchange are identified as not significant.

6.6.10 Impact on the surrounding road network

Operation of the proposed Scheme will result in changes to traffic flows on nearby roads (primarily cars travelling to and from the new station car park), which may lead to increases in noise and possible indirect noise effects to receptors alongside the roads.

An assessment of noise level changes and potential indirect effects due to changes in traffic noise from the surrounding road network has been carried out using baseline and future traffic flow information produced by the transport consultant. The future Do-Minimum and Do-Something scenarios include traffic growth as a result of committed developments. Detailed results and outline assumptions are presented in Appendix 6E for all roads assessed.

The Basic Noise Level (BNL), calculated in accordance with the CRTN methodology, enables a direct comparison to be made of the change in noise level associated with particular sections of road.

Table 6.22 presents the changes in noise level between the 2028 Do-Something (2028DS) and 2023 Do-Minimum (2023DM) scenarios for each road. These changes have been used to establish the long-term magnitude of impact according to Table 6.9, having regard for whether the baseline noise level exceeds a SOAEL.

Table 6.22: Summary of predicted road traffic noise impacts on surrounding network from BNL calculations

Road name	Change in BNL, DS-DM, dB	Magnitude of impact
Bank Lane (north of Shevington's Lane)	0.0	No change
Shevington's Lane (W)	+0.1	Very low
Bank Lane (south of Shevington's Lane)	0.0	No change
Bank Lane (north of Headbolt Lane)	+0.1	Very low
Boyes Brow	0.0	No change
A506 County Road (N)	+0.1	Very low
A506 County Road (S)	+0.1	Very low
St Kevin's Drive	0.0	No change
Headbolt Lane (west of site access)	+0.5	Very low
Fallowfield	Low Flow	N/A
Headbolt Lane (east of site access)	+0.1	Very low
Headbolt Lane (E)	+0.1	Very low
Dale Lane	0.0	No change

Road name	Change in BNL, DS-DM, dB	Magnitude of impact
Pingwood Lane	0.0	No change
Shevington's Lane (E)	+0.1	Very low
Stopgate Lane	0.0	No change
Windermere Drive	Low Flow	N/A

Changes marked as “Low Flow” indicate that either the DM or DS scenarios contain traffic flows of less than 1000 vehicles per day for that road. The CTRN calculation methodology is not valid for flows below 1000 vehicles per day, and the change in BNL cannot therefore be calculated. However, for all roads where this is the case, the change in traffic flow between the DS and DM scenarios is less than +20%, indicating a probable change in noise level of less than +1 dB and therefore is a negligible impact.

All calculated impacts are negligible or less, and therefore indirect noise effects due to traffic increases on surrounding road networks are identified as not significant.

6.7 Mitigation

Prior to undertaking evening, weekend and night-time construction work, it is recommended that the contractor seek a Section 61 agreement with the Local Authority under the Control of Pollution Act for any night-time works. A Section 61 is a formal agreement between the contractor and the local authority, which allows the contractor and local authority to agree noise levels and hours of work.

To ensure that potential significant effects from PA system noise are avoided, further consideration of the design and layout of the PA system is required. It is anticipated that this will be undertaken at a more detailed design stage, and that once completed no significant effects will be identified.

Noise from stationary building services plant, including the proposed substation, will be controlled through design to achieve acceptable noise criteria relative to the existing baseline noise levels at the closest noise sensitive receptors.

KMBC has confirmed that noise due to fixed plant would be subject to a standard planning condition. It is likely that this would require fixed plant to achieve a rating sound level of 5 dB below typical background (L_{A90}) levels at the closest noise-sensitive receptors during both day and night periods. A penalty for tonality, impulsivity or other character would be included in determining the rating sound level.

6.8 Residual effects

Table 6.23 describes the anticipated effects of the proposed Scheme following the implementation of mitigation measures.

Table 6.23: Summary of noise and vibration effects

Potential impact	Impact avoidance measures / embedded mitigation	Environmental effect without additional mitigation	Additional mitigation	Environmental effect after additional mitigation (residual effect)	Nature of effect
Daytime construction noise	Use BPM and adherence to the CEMP, including public liaison.	Not significant	No additional mitigation proposed	Not significant	St, T, D
Evening and weekend construction noise	Use BPM and adherence to the CEMP, including public liaison. Section 61 agreement	Significant adverse	No additional mitigation proposed	Significant adverse	St, T, D
Night construction noise	Use BPM and adherence to the CEMP, including public liaison. Section 61 agreement	Significant adverse Significant adverse	No additional mitigation proposed	Significant adverse Significant adverse	St, T, D
Construction vibration	None proposed	Not significant	No additional mitigation proposed	Not significant	St, T, D
Operational combined road and passenger rail noise	None proposed	Significant beneficial	No additional mitigation proposed	Significant beneficial	Lt, P, D
Freight train noise	None proposed	Not significant	No additional mitigation proposed	Not significant	Lt, P, D
Fixed building services plant noise	Design to comply with noise limits secured by planning condition	Not significant	No additional mitigation proposed	Not significant	Lt, P, D
PA system noise	None proposed	Not significant	Further design to be undertaken to validate system performance	Not significant	Lt, P, D
Car park noise	None proposed	Not significant	No additional mitigation proposed	Not significant	Lt, P, D

Potential impact	Impact avoidance measures / embedded mitigation	Environmental effect without additional mitigation	Additional mitigation	Environmental effect after additional mitigation (residual effect)	Nature of effect
Bus interchange noise	None proposed	Not significant	No additional mitigation proposed	Not significant	Lt, P, D
Road traffic on surrounding network	None proposed	Not significant	No additional mitigation proposed	Not significant	Lt, P, In

6.9 Limitations

Due to the ongoing impacts of Covid-19 on travel behaviour, it is not considered that environmental noise surveys undertaken at this time will be representative of typical road traffic levels. Alternative sources of data have therefore been used to inform the baseline noise environment.

Baseline road traffic flow information has been provided by the transport consultant and is informed by surveys undertaken in 2014 and 2019. Refer to Chapter 4: Traffic and Transport for more information.

Several assessments are naturally limited to the level of design that is present at this stage. Noise from the PA system, fixed plant and construction activities will need additional consideration at later design stages to ensure the effects on nearby residents are minimised.

This assessment is primarily focused on mitigating and avoiding the likely significant adverse effects caused by the proposed scheme, rather than necessarily achieving the aims of Government noise policy. Further consideration may be required by others to ensure the aims of Government Noise Policy are achieved at all stages of the project lifecycle.

Contents

	Page
7 Ecology	2
7.1 Introduction	2
7.2 Planning Policy Context	3
7.3 Assessment Method	13
7.4 Baseline Conditions	22
7.5 Design Development and Impact Avoidance	32
7.6 Environmental Impacts and Significance of Effects	34
7.7 Mitigation	46
7.8 Residual Effects	46
7.9 Limitations	48

7 Ecology

7.1 Introduction

This chapter presents an assessment of potential impacts on ecology (Ecological Impact Assessment (EcIA)) associated with the proposed Headbolt Lane new station scheme, described in Chapter 2: Scheme Description.

This chapter is supported by the following appendices (see Volume II: Technical Appendices) and figures (see Volume III: Figures):

- Appendix 7A: NLG Ecology Ltd (2021) Preliminary Ecological Appraisal Report. 170248-BGC-REP-EEN-000001;
- Appendix 7B: NLG Ecology Ltd (2021) Riparian Mammal Habitat Suitability and Survey Report. 170248-BGC-SVY-EEN-000003;
- Appendix 7C: NLG Ecology Ltd (2021) Great Crested Newt (GCN) Pond Habitat Suitability Index (HSI) and eDNA Survey Report;
- Appendix 7D: NLG Ecology Ltd (2021) Bat Survey Report. 170248-BGC-SVY-EEN-000005; and
- Appendix 7E: Arup (2021) Biodiversity Net Gain Report.

The EcIA assesses the potential impact of the proposed Scheme on the ecological interest of the Site and the surrounding area. The assessment covers the potential for impact on habitats and species, with particular reference to any species or sites that are protected under national and international legislation.

The Site boundary dictates the area of direct and indirect disturbance to habitats and species. It is considered that these impacts would occur during construction (including demolition and site clearance) and the operational phase of the proposed Scheme.

Mitigation, compensation and enhancement measures for habitats and protected species have been recommended to reduce adverse impacts and where possible provide opportunities for overall net gain.

7.2 Planning Policy Context

Existing planning policy and guidance, international commitments, and legislation relevant to the protection, conservation and enhancement of nature conservation interests associated with the Site are critical to informing the baseline and assessment methodologies. These documents are listed below, and where national and local planning policies are specifically relevant to the Site.

7.2.1 National Planning Policy

The following paragraphs of the revised National Planning Policy Framework (NPPF) published in July 2021 are relevant to ecology:

NPPF Paragraph 20

Strategic policies should set out an overall strategy for the pattern, scale and quality of development, and make sufficient provision ⁽¹³⁾¹ for:

- (a) housing (including affordable housing), employment, retail, leisure and other commercial development;*
- (b) infrastructure for transport, telecommunications, security, waste management, water supply, wastewater, flood risk and coastal change management, and the provision of minerals and energy (including heat);*
- (c) community facilities (such as health, education and cultural infrastructure); and*
- (d) conservation and enhancement of the natural, built and historic environment, including landscapes and green infrastructure, and planning measures to address climate change mitigation and adaptation.*

NPPF Paragraph 120

Planning policies and decisions should:

- (a) encourage multiple benefits from both urban and rural land, including through mixed use schemes and taking opportunities to achieve net environmental gains – such as developments that would enable new habitat creation or improve public access to the countryside;*
- (b) recognise that some undeveloped land can perform many functions, such as for wildlife, recreation, flood risk mitigation, cooling/shading, carbon storage or food production;*
- (c) give substantial weight to the value of using suitable brownfield land within settlements for homes and other identified needs, and support appropriate opportunities to remediate despoiled, degraded, derelict, contaminated or unstable land;*

¹ This footnote refers to footnote 13 of the NPPF ‘In line with the presumption in favour of sustainable development.’

(d) promote and support the development of under-utilised land and buildings, especially if this would help to meet identified needs for housing where land supply is constrained and available sites could be used more effectively (for example converting space above shops, and building on or above service yards, car parks, lock-ups and railway infrastructure) ⁽⁴⁸⁾2; and

(e) support opportunities to use the airspace above existing residential and commercial premises for new homes. In particular, they should allow upward extensions where the development would be consistent with the prevailing height and form of neighbouring properties and the overall street scene, is well-designed (including complying with any local design policies and standards), and can maintain safe access and egress for occupiers.

NPPF Paragraph 131

Trees make an important contribution to the character and quality of urban environments, and can also help mitigate and adapt to climate change. Planning policies and decisions should ensure that new streets are tree-lined, that opportunities are taken to incorporate trees elsewhere in developments (such as parks and community orchards), that appropriate measures are in place to secure the long-term maintenance of newly-planted trees, and that existing trees are retained wherever possible. Applicants and local planning authorities should work with highways officers and tree officers to ensure that the right trees are planted in the right places, and solutions are found that are compatible with highways standards and the needs of different users.

NPPF Paragraph 153

Plans should take a proactive approach to mitigating and adapting to climate change, taking into account the long-term implications for flood risk, coastal change, water supply, biodiversity and landscapes, and the risk of overheating from rising temperatures ⁽⁵³⁾3. Policies should support appropriate measures to ensure the future resilience of communities and infrastructure to climate change impacts, such as providing space for physical protection measures, or making provision for the possible future relocation of vulnerable development and infrastructure.

NPPF Paragraph 154

New development should be planned for in ways that:

(a) avoid increased vulnerability to the range of impacts arising from climate change. When new development is brought forward in areas which are vulnerable, care should be taken to ensure that risks can be managed through

² This footnote refers to footnote 53 of the NPPF 'As part of this approach, plans and decisions should support efforts to identify and bring back into residential use empty homes and other buildings, supported by the use of compulsory purchase powers where appropriate.'

³ This footnote refers to footnote 48 of the NPPF 'In line with the objectives and provisions of the Climate Change Act 2008.'

suitable adaptation measures, including through the planning of green infrastructure; and

(b) can help to reduce greenhouse gas emissions, such as through its location, orientation and design. Any local requirements for the sustainability of buildings should reflect the government's policy for national technical standards.

NPPF Paragraph 174

Planning policies and decisions should contribute to and enhance the natural and local environment by:

(a) protecting and enhancing valued landscapes, sites of biodiversity or geological value and soils (in a manner commensurate with their statutory status or identified quality in the development plan);

(b) recognising the intrinsic character and beauty of the countryside, and the wider benefits from natural capital and ecosystem services – including the economic and other benefits of the best and most versatile agricultural land, and of trees and woodland;

(c) maintaining the character of the undeveloped coast, while improving public access to it where appropriate;

(d) minimising impacts on and providing net gains for biodiversity, including by establishing coherent ecological networks that are more resilient to current and future pressures;

(e) preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans; and

(f) remediating and mitigating despoiled, degraded, derelict, contaminated and unstable land, where appropriate.

NPPF Paragraph 175

Plans should: distinguish between the hierarchy of international, national and locally designated sites; allocate land with the least environmental or amenity value, where consistent with other policies in this Framework ⁽⁵⁸⁾; take a strategic approach to maintaining and enhancing networks of habitats and green infrastructure; and plan for the enhancement of natural capital at a catchment or landscape scale across local authority boundaries.

⁴ This footnote refers to footnote 58 of the NPPF 'Where significant development of agricultural land is demonstrated to be necessary, areas of poorer quality land should be preferred to those of a higher quality.'

NPPF Paragraph 179

To protect and enhance biodiversity and geodiversity, plans should:

(a) Identify, map and safeguard components of local wildlife-rich habitats and wider ecological networks, including the hierarchy of international, national and locally designated sites of importance for biodiversity ⁽⁶¹⁾<https://www.gov.uk/guidance/national-planning-policy-framework/15-conserving-and-enhancing-the-natural-environment-footnote56>⁵; wildlife corridors and stepping stones that connect them; and areas identified by national and local partnerships for habitat management, enhancement, restoration or creation ⁽⁶²⁾⁶; and

(b) promote the conservation, restoration and enhancement of priority habitats, ecological networks and the protection and recovery of priority species; and identify and pursue opportunities for securing measurable net gains for biodiversity.

NPPF Paragraph 180

When determining planning applications, local planning authorities should apply the following principles:

(a) if significant harm to biodiversity resulting from a development cannot be avoided (through locating on an alternative site with less harmful impacts), adequately mitigated, or, as a last resort, compensated for, then planning permission should be refused;

(b) development on land within or outside a Site of Special Scientific Interest, and which is likely to have an adverse effect on it (either individually or in combination with other developments), should not normally be permitted. The only exception is where the benefits of the development in the location proposed clearly outweigh both its likely impact on the features of the site that make it of special scientific interest, and any broader impacts on the national network of Sites of Special Scientific Interest;

(c) development resulting in the loss or deterioration of irreplaceable habitats (such as ancient woodland and ancient or veteran trees) should be refused, unless there are wholly exceptional reasons ⁽⁶³⁾<https://www.gov.uk/guidance/national-planning-policy-framework/15-conserving-and-enhancing-the-natural-environment-footnote58>⁷ and a suitable compensation strategy exists; and

⁵ This footnote refers to footnote 61 of the NPPF 'Circular 06/2005 provides further guidance in respect of statutory obligations for biodiversity and geological conservation and their impact within the planning system.'

⁶ This footnote refers to footnote 62 of the NPPF 'Where areas that are part of the Nature Recovery Network are identified in plans, it may be appropriate to specify the types of development that may be suitable within them.'

⁷ This footnote refers to footnote 63 of the NPPF 'Where areas that are part of the Nature Recovery Network are identified in plans, it may be appropriate to specify the types of development that may be suitable within them.'

(d) development whose primary objective is to conserve or enhance biodiversity should be supported; while opportunities to improve biodiversity improvements in and around developments should be integrated as part of their design, especially where this can secure measurable net gains for biodiversity or enhance public access to nature where this is appropriate.

NPPF Paragraph 181

The following should be given the same protection as habitats sites:

(a) potential Special Protection Areas and possible Special Areas of Conservation;

(b) listed or proposed Ramsar sites ⁽⁶⁴⁾<https://www.gov.uk/guidance/national-planning-policy-framework/15-conserving-and-enhancing-the-natural-environment-footnote59>⁸; and

(c) sites identified, or required, as compensatory measures for adverse effects on habitats sites, potential Special Protection Areas, possible Special Areas of Conservation, and listed or proposed Ramsar sites.

NPPF Paragraph 182

The presumption in favour of sustainable development does not apply where the plan or project is likely to have a significant effect on a habitats site (either alone or in combination with other plans or projects), unless an appropriate assessment has concluded that the plan or project will not adversely affect the integrity of the habitats site.

7.2.2 Local Planning Policy

The Knowsley Local Plan (2016)⁹ includes the following ecology policies relevant to the proposed Scheme:

SD1: Sustainable Development

1) When considering development proposals, a positive approach will be taken, which reflects the presumption in favour of sustainable development contained in the National Planning Policy Framework. Work will be undertaken proactively with applicants jointly to find solutions which mean that proposals can be approved wherever possible, and to secure development that improves the economic, social and environmental conditions in the area.

⁸ This footnote refers to footnote 64 of the NPPF ‘Potential Special Protection Areas, possible Special Areas of Conservation and proposed Ramsar sites are sites on which Government has initiated public consultation on the scientific case for designation as a Special Protection Area, candidate Special Area of Conservation or Ramsar site.’

⁹ Knowsley Local Plan: Core Strategy. A Development Plan Document. Adopted by resolution of the Council, 6 January 2016. Available at: <https://localplanmaps.knowsley.gov.uk/documents/knowsley-local-plan-adopted-core-strategy.pdf> Accessed: 01/04/21.

2) Planning applications that accord with the policies in this Local Plan (and any relevant policies in Neighbourhood Plans) will be approved without delay, unless material considerations indicate otherwise.

3) Where there are no policies relevant to the application or relevant policies are out of date at the time of making the decision then permission will be granted unless material considerations indicate otherwise – taking into account whether:

a) Any adverse impacts of granting permission would significantly and demonstrably outweigh the benefits, when assessed against the policies in the National Planning Policy Framework taken as a whole; or

b) Specific policies in that Framework indicate that development should be restricted.

CS8: Green Infrastructure

Maintenance and Enhancement of Knowsley's Existing Green Infrastructure

1) Knowsley's existing Green Infrastructure and its beneficial functions will be protected, managed and/or enhanced, primarily to:

a) Ensure more attractive and cleaner residential neighbourhoods;

b) Sustain and promote biodiversity (including designated sites, priority habitats and protected and endangered species) in accordance with importance and contribution to ecological networks;

c) Preserve the character and function of historic environments and valued landscapes;

d) Mitigate the effects of climate change and flood risk;

e) Mitigate air, water and noise pollution;

f) Provide local opportunities for sport, recreation and allotments; and

g) Provide sustainable transport linkages between residential neighbourhoods and easy access to employment and services.

2) To achieve the above, planning powers and other interventions will be used to:

a) Protect and enhance strategically important areas of greenspace;

b) Ensure an appropriate quantity and improved quality of locally important open spaces, including outdoor sports provision (and ancillary facilities of appropriate scale);

c) Promote effective movement of wildlife through a network of strategic green links, by protecting, maintaining and improving existing and new open spaces, water courses (including water quality) and biodiversity assets;

d) Protect, enhance and/or introduce biodiversity into existing areas of Green Infrastructure, through integration into the design of new development and public realm projects;

- e) Improve accessibility for communities to greenspace offering leisure and recreation opportunities;*
 - f) Protect and where possible improve green paths and cycleways linking residential areas, existing strategic areas of greenspace, employment locations, local community services and leisure facilities;*
 - g) Work in partnership with other districts and relevant bodies at a landscape scale to minimise the impact of development upon Knowsley's existing Page 82 Knowsley Local Plan: Core Strategy January 2016 biodiversity and geological assets, and sustain the protection afforded to internationally important sites, including supporting habitat, for biodiversity outside of the borough; and*
 - h) Deliver new integrated and functional Green Infrastructure that helps to mitigate and adapt to climate change, such as sustainable drainage systems, carbon capture and storage, soft landscaping and green roofs.*
- 3) Site allocations for greenspace will be identified in the Local Plan: Site Allocations and Development Policies document, with further guidance set out in the Developer Contributions Supplementary Planning Document or future Supplementary Planning Document as appropriate.*

Strategic Green Links

- 4) Knowsley's strategically important green links are:*
- a) Alt Corridor (Huyton) – stretching from Huyton Village through South Alt Park, Alt Park, Alt Meadows and into Stockbridge Village;*
 - b) Valley Corridor (Kirkby) – stretching through Valley Meadow, St. Chad's Park, Millbrook Park, Millennium Green and Mill Dam;*
 - c) Whiston to Cronton Corridor – stretching through Cronton, Stadt Moers Park and Whiston Greenway;*
 - d) Halewood Triangle – Halewood Park linkage with the Trans-Pennine Trail and to the national cycle network;*
 - e) M57 Green Belt Corridor; and f) Knowsley Hall Estate – including Knowsley Safari Park and Local Wildlife Sites.*

Green Infrastructure within the Liverpool City Region

- 5) Knowsley Council will work with partners to help deliver local and sub-regional programmes, initiatives and strategies to enhance Green Infrastructure. Approach to Green Infrastructure and New Development*
- 6) New development must be served by Green Infrastructure to meet the needs of residents and the local environment, in a manner which will:*
- a) Contribute to the creation of a high quality residential environment;*
 - b) Provide access to high quality open space for leisure and recreational purposes;*

c) Seek to protect, maintain and where possible enhance biodiversity within and around new developments according to their designation and significance to provide space for nature; and

d) Provide adequate mitigation and/or, as a last resort, compensation for Green Infrastructure or biodiversity loss, in circumstances where harm resulting from the development is otherwise unavoidable.

CS21: Greenspaces and Trees

Greenspace protection

1) In supporting the wider Green Infrastructure functions of urban greenspace in accordance with Policy CS8, the Council will provide and maintain quantitative, qualitative and accessibility standards for different types of public open space.

2) New development which would result in the loss of urban greenspace, will not be permitted unless at least one of the following criteria are met:

a) A surplus of provision for all types of greenspace would be maintained relative to local standards;

b) The land is considered unsuitable in terms of size, location or character to prevent or address individual deficiencies of different types of greenspace relative to local standards;

c) Appropriate mitigation is provided through replacement facilities of at least an equal quantity, quality and accessibility;

d) The development is required to improve greenspace provision or for ancillary facilities to support sport or recreation; or

e) Where the proposal relates to the loss of indoor or outdoor sports provision, and there is no evidence of future or continuing need for sports use, or alternatively only land incapable of forming a playing pitch or sporting facility is affected and its release accords with either clause 2)a) or 2)b).

3) Irrespective of whether criteria in 2) are met, unless the benefits of a proposal clearly outweigh the loss of urban greenspace, development will be resisted where it would significantly harm any existing or potential special qualities of greenspace in the area in terms of:

a) Visual amenity;

b) Residential amenity;

c) Biodiversity and environmental benefits;

d) Historical, cultural or community value;

e) Recreational benefits; or

f) Physical and/or visual linkages between adjoining urban greenspaces.

Local Greenspace Standards

4) The quantitative and accessibility standards for the provision of public open spaces within Substantial Residential Areas are set out in Table 9.1: Substantial Residential Area (SRA) Standards for Greenspace Quantity and Accessibility for the following greenspace typologies:

- a) Park and Garden;*
- b) Amenity Greenspace;*
- c) Provision for Children and Young People; and*
- d) Allotments.*

5) The Council's quantitative standards for Outdoor Sports Provision are set out in Table 9.2: Community Area Standards for Outdoor Sports Provision Quantity and Accessibility and seek to maintain an appropriate range of sites and address quantitative needs for individual sports at a Community Area level.

6) The Council will keep the standards of provision referred to above under review and if necessary publish revised standards in a future Local Plan document or Supplementary Planning Document.

Accessible and Quality Greenspaces

7) The Council will support improvements to existing and new areas of greenspace in accordance with best practice standards¹²⁷, to achieve the following requirements:

- a) Accessible, safe and secure locations for all members of the community to use;*
- b) Clean and well maintained facilities, equipment and open spaces; and*
- c) Conservation of natural features, wildlife, fauna, landscapes, buildings and other structural features, as appropriate.*

8) When considering proposals for new residential development, the Council will seek enhancements to greenspaces via on-site provision, new off site provision or enhancement of existing off site provision through developer contributions secured by legal agreement in accordance with Policy CS27: Planning and Paying for New Infrastructure, the Developer Contributions Supplementary Planning Document and/or a Community Infrastructure Levy Charging Schedule, as appropriate.

Local Green Spaces

9) Any Local Green Spaces Designations which are formally designated will be identified in the Local Plan: Site Allocations and Development Policies or future Neighbourhood Plans (if applicable). This designation will only be used where the greenspace concerned is:

- a) Reasonably close to the community it serves;*
- b) Demonstrably special to a local community and holds a particular local significance, for example because of its beauty, historic significance, recreational value (including as a playing field), tranquillity or richness of its wildlife; and*

c) Local in character and not an extensive tract of land.

Enhancement of Natural and Semi-Natural Greenspace and Tree Protection

10) The Council will encourage proposals for new development to incorporate:

- a) Retention of existing trees, woodland, vegetation and other habitat features which offer a positive contribution to the local environment in terms of visual amenity, recreation value or biodiversity/wildlife interest;*
- b) Appropriate planting of trees, other soft landscaping and installation of habitat features for the benefit of biodiversity; and*
- c) Adequate replacement provision where tree loss is unavoidable, comprising two additional trees for every tree lost and taking account of species and size.*

7.2.3 Other Relevant Legislation, Standards and Guidance

Relevant legislation to ecology includes the following:

- Wildlife and Countryside Act, 1981 (as amended);
- Countryside and Rights of Way Act, 2000;
- The Natural Environment and Rural Communities Act, 2006;
- The Protection of Badgers Act, 1992;
- Conservation of Habitats and Species Amendment (EU Exit) Regulations 2019;
- Council Directive (2009/147/EC) on the Conservation of Wild Birds (Birds Directive);
- The Hedgerow Regulations, 1997;
- National Planning Policy Framework, 2019;
- The ‘UK Post-2010 Biodiversity Framework’ 2012;
- UK Biodiversity Action Plan (UKBAP) / Section 41 Priority Habitats and Species;
- Biodiversity 2020: A strategy for England’s wildlife and ecosystem services, 2011;
- The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017; and
- Environment Bill, 2020.

Other Guidance

The EcIA for the proposed Scheme follows the published guidance by the Chartered Institute of Ecology and Environmental Management (CIEEM):

- CIEEM (2018) Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine version 1.1. Chartered Institute of Ecology and Environmental Management, Winchester.

7.3 Assessment Method

The assessment involves the following stages:

- scoping and consultation;
- identification of the potential receptors based on a 1 km study area from the Site;
- establish the ecological zones of influence of the proposed Scheme for each receptor identified;
- evaluation of ecological resources and features likely to be affected (the baseline environment);
- identification of the biophysical changes likely to affect valued ecological resources and features and an assessment of whether these biophysical changes are likely to give rise to a significant ecological impact;
- refinement of the proposed Scheme to incorporate ecological mitigation and enhancement measures to avoid, reduce or compensate for any significant adverse impacts; and
- assessment of the predicted residual impacts taking mitigation and enhancement measures into account and evaluation of the significance of the consequent residual effects.

The ecological zones of influence identified for each receptor identified include:

- an immediate zone of influence within the Site; and
- a wider zone of influence extending to all areas/features that may be affected by the proposed Scheme (the wider zones of influence utilised in relation to specific ecological features have been defined within Section 7.3.2; Table 7.2).

7.3.1 Consultation

A request for a scoping opinion was submitted, supported by a scoping report (Appendix 1B) Table 7.1 summarises the comments received from Knowsley Metropolitan Borough Council.

Table 7.1: Consultation Summary.

Consultee and date	Issue raised	Summary of response
Knowsley Metropolitan Borough Council (30/03/2021)	It was advised that the following should also form part of the ES: • The ES should provide information on a CEMP to be produced for the site in order to manage potential pollution risks (specifically in relation to watercourses and retained habitats), invasive species	An outline CEMP (Appendix 2A) is submitted with the planning application which includes all the mitigation relied on in the ecology chapter.

Consultee and date	Issue raised	Summary of response
	issues and protected species impacts. • Ecological issues should be considered both in isolation, and in combination with other nearby developments. • Mitigation measures should adopt the mitigation hierarchy (avoidance-mitigate-compensate). • A landscape strategy showing retained habitats and proposed habitat creation and planting would be required with any future EIA application. This would provide certainty of habitat loss and facilitate assessment of impacts. The landscape strategy should include the creation of new Priority Habitat grassland to replace that being lost and replacement tree planting along the section of the railway to be widened. • A habitat management plan is required and will provide a mechanism to secure necessary ecological compensation, mitigation and enhancements. • Biodiversity enhancements should be incorporated into the scheme design in line with NPPF and local plan policy CS8, and also in anticipation of mandatory net gain due for inclusion as part of the pending Environment Bill. The Defra Biodiversity metric should be used to assess net gain. This should form part of the ES.	The EcIA addresses in isolation effects. A separate cumulative chapter addresses in combination effects All mitigation conforms to the mitigation hierarchy A Landscape and Ecology Management Plan (Document ref no.: 170248-ARU-REP-EEN-000024) is submitted as part of the planning application and provides a strategy for the ecological and landscaping mitigation and management. The Landscape and Ecology Management Plan (Document ref no.: 170248-ARU-REP-EEN-000024) provides the strategy and habitat management plan for the site. The EcIA includes a wider Biodiversity Net Gain Assessment (Appendix 7E).

7.3.1 Sources of Information and Data

Desk-Based Study

Protected species and designated site records within a 1 km radius surrounding the Site were requested from Merseyside Biobank as part of the Preliminary Ecological Appraisal (PEA) (Appendix 7A) completed in March 2021. Ecological

data searches were also undertaken Defra's MAGIC website (<https://magic.defra.gov.uk/>).

A 2 km buffer from the Site boundary was used to search for statutory designated sites (including Special Protection Areas, Special Areas of Conservation, Ramsar, SSSI and Local Nature Reserves), Section 41 Priority Habitat and granted European Protected Species licences. SSSI Impact Risk Zones which fall within the Site boundary were assessed as to whether the type of proposed Scheme requires consultation with Natural England. The identified sites may extend beyond 2 km, as a consequence of the reasons for designation.

Ordnance Survey maps were also examined for the presence of known waterbodies within a 250 m radius of the Site.

Field Survey

The area of the Site in which field surveys were undertaken was based on the following:

- predicted/likely ecology and behaviour locally;
- accessibility; and
- radius of likely significant impacts.

Full survey methodologies including dates, weather and times are detailed in Appendix 7A to Appendix 7E. A summary is provided below.

Preliminary Ecological Appraisal

A field survey of the Site was originally undertaken in July 2020. A follow-up survey was carried out in March 2021 to include additional areas of the railway corridor. Habitats were identified using the standard Phase 1 Habitat survey methodology.¹⁰ As part of the field survey, the potential for the Site to support any legally protected or notable faunal species was also assessed. The potential for the Site to support each species or species group was assessed based on available desk study data, the known range of each species or species group, and the suitability of the habitats within the Site. Field signs or sightings of such species were recorded as observed.

In addition, the PEA surveyed for the presence of invasive plant species included on Schedule 9 of the Wildlife and Countryside Act 1981 (as amended). This included the presence of Japanese knotweed *Reynoutria japonica*, giant knotweed *Reynoutria sachalinensis*, *Reynoutria japonica* x *Reynoutria sachalinensis* (a hybrid knotweed) giant hogweed *Heracleum mantegazzianum* and Himalayan balsam *Impatiens glandulifera*.

¹⁰ Joint Nature Conservation Committee (JNCC) (2010). *Handbook for Phase 1 Habitat Survey. A technique for environmental audit*. Revised re-print. JNCC: Peterborough.

Biodiversity Net Gain

A field survey was conducted in July 2020, March and May 2021 to collect relevant habitat condition information for the Biodiversity Metric 2.0.¹¹

The habitats were assigned a UK Habitat Classification habitat type, which underpin the Biodiversity Net Gain (BNG) calculations.¹² As part of the field survey, condition assessments were performed in the field using the condition assessment protocol detailed in the Biodiversity Metric 2.0 technical supplement.¹³

The aquatic habitat field survey was also conducted in March and May 2021. This field survey consisted of a MoRPh assessment.¹⁴ The MoRPh survey technique involves an assessment of the quality of physical habitat and hydromorphological functioning of rivers and is used to provide a river condition value for the rivers and streams component of the BNG calculation.

Bat Surveys

Preliminary Bat Roost Suitability Assessment

A systematic search was undertaken of the exterior of trees and structures within the Site identified to have bat roost suitability (Appendix 7A). This was to identify potential or actual bat access points and roosting places and locate evidence of bats. These surveys also helped further inform the level of bat roost suitability and requirement for further bat activity surveys. Evidence such as live or dead specimens, bat droppings, urine splashes or fur-oil staining were searched for.

External tree and structure inspections were undertaken according to Bat Conservation Trust (BCT) Good Practice Guidelines.¹⁵

Bat Activity Surveys

Bat activity surveys were undertaken within the Site on structures identified to have bat roost suitability following the preliminary bat roost suitability assessment. The following bat roost suitability was assigned to structures and the number of bat activity surveys were subsequently undertaken in line with the identified suitability and current guidelines:¹⁵

- Low bat roost suitability: UB57 (Glovers Brow Bridge);

¹¹ Natural England (2019) The Biodiversity Metric 2.0 Calculation Tool. Available at: <http://publications.naturalengland.org.uk/publication/5850908674228224>

¹² UK Habitat Classification Working Group (2020) *UK Habitat Classification – Habitat Definitions V1.1*. Available at: <https://ukhab.org>.

¹³ Crosher, I., Gold, S., Heaven, M., Heydon, M., Moore, L., Panks, S., Cott, S., Stone, D., & White, N. (2019) *The Biodiversity Metric 2.0: Auditing and Accounting for Biodiversity Value: Technical Supplement* (Beta version, July 2019). Natural England.

¹⁴ Gurnell, A., England, J., Shuker, L. and Wharton, G. (2019) 'The MoRPh Survey: A Modular River Physical Survey for Citizen Scientists Field Guide, Available at: <https://modularriversurvey.org/>

¹⁵ Collins, J. (ed) (2016) *Bat Surveys for Professional Ecologists: Good Practice Guidelines* (3rd edn). The Bat Conservation Trust, London.

- Moderate bat roost suitability: UB56 (Millbrook Bridge).

Surveys were undertaken between May and June 2021 (Appendix 7D).

As stated, all bat surveys were undertaken in accordance with current guidance and by a Natural England Level 2 (CL18) bat survey licence holder. Dusk emergence surveys commenced approximately 30 minutes before sunset and continued until two hours after sunset or until it was considered all bats would have emerged. Pre-dawn surveys commenced two hours before sunrise and continued until sunrise or until it was considered all bats would have entered roosts.

An unnamed under pass situated between the M57 and River Alt crossing was identified to have moderate bat roost suitability. In addition, the River Alt bridge was not fully assessed due to access limitations. However, the troughing works proposed in proximity to these two structures were deemed unlikely to cause significant disturbance to roosting bats. Consequently no further surveys were undertaken (Appendix 7D).

Potential Roost Feature Survey - Tree

A single tree was identified to have bat roost suitability during the initial PEA survey (Appendix 7A). A Potential Roost Feature (PRF) survey was undertaken on this tree in June 2021 in compliance with current guidelines. The survey involved a detailed inspection of the PRFs using torches, mirrors and endoscopes in order to further assess their likely suitability for bats (Appendix 7D).

Water Vole Survey

A water vole *Arvicola amphibius*, survey was undertaken at Simonswood Brook¹⁶ and Kirkby Brook in September 2020 and April 2021 (Appendix 7B). The survey was undertaken in compliance with current guidelines¹⁷ during suitable weather conditions. The survey included a thorough search for signs of water vole undertaken on both banks of the watercourse and a minimum of 4 m from the bank top.

Signs searched for included:

- Sightings of individual water vole;
- Burrows;
- Feeding platforms and evidence of feeding;
- Food remains;
- Latrines; and
- Footprints.

¹⁶ Simonswood Brook is referenced as Mill Brook in the Riparian Mammal Habitat Suitability and Survey Report.

¹⁷ Dean, M., Strachan, R., Gow, D. and Andrews, R. (2016) The Water Vole Mitigation Handbook (The Mammal Society Mitigation Guidance Series). Eds Fiona Mathews and Paul Chanin. The Mammal Society, London.

Amphibians Survey

Two ponds were identified within 250 m of the Site (Pond 4-5 Appendix 1; Appendix 7C). Each pond was assessed as to the potential to support a breeding population of great crested newt *Triturus cristatus*. This assessment was undertaken using the Habitat Suitability Index (HSI) developed by Oldham *et al.* (2000)¹⁸ which considers several habitat/ecological parameters. Habitat variables measured include location, desiccation, water quality, macrophyte cover, terrestrial habitat quality, *etc.* A value is recorded for each parameter and combined to determine an index of breeding suitability for great crested newts. The HSI is represented by a value from 0 to 1, the higher the value the more likely it is that the waterbody may support breeding great crested newt.

Following consultation with the ecologist for Knowsley Planning Authority (Introduction; Appendix 7C) it was confirmed that eDNA surveys would be undertaken on ponds within 250 m of the major project works area (Appendix 7A for further detail). This amounted to the inclusion of two ponds within this scope (Pond 4 and 5; Appendix 7C). Pond 5 was recorded to be a fish stocked pond with no macrophytes recorded. Consequently, Pond 5 was scoped out of further eDNA survey.

A great crested newt eDNA survey was undertaken in April 2021 on Pond 4 (Appendix 1; Appendix 7C). The pond was sampled in compliance with current recommended guidelines.¹⁹ The samples were subsequently sent to an approved laboratory for analysis to determine whether the samples contained great crested newt eDNA.

7.3.2 Study Area

The study area includes all habitats that lie within the red line boundary (Chapter 2: Scheme Description). Species specific surveys were undertaken in areas of suitable habitat within the Site. The exact location of surveys is detailed within Appendices 7A to 7D.

Ecological Zone of Influence

The Ecological Zone of Influence (EZOI) is an area defined by the assessment in which there may be ecological features subject to impacts and subsequent effects as a result of the proposed Scheme.

The EZOI may vary for different ecological features and is defined based on the likely effects of the proposed Scheme (Table 7.2). The EZOI for habitats includes those habitats within and immediately adjacent to the Site boundary that may be affected by the proposed Scheme.

¹⁸ Oldham, R.S., Keeble, J., Swan, M.J., and Jeffcote, M., (2000) 'Evaluating the suitability of habitats for great crested newt (*Triturus cristatus*)' *Herpetological Journal* 10: 143-15.

¹⁹ Biggs, J., Ewald, N., Valentini, A., Gaboriaud, C., Griffiths, R.A., Foster, J., Wilkinson, J., Arnett, A., Williams, P. and Dunn, F. (2014) *Analytical and methodological development for improved surveillance of the Great Crested Newt. Defra Project WC1067*. Freshwater Habitats Trust: Oxford.

Table 7.2: Ecological Zone of Influence.

Ecological feature	EZoI (including distance from the Site boundary if EZoI extends outside the Site boundary)	Comments
Statutory and non-statutory designated sites	2 km	Direct and indirect impacts will be assessed on statutory and non-statutory designated sites. Direct and indirect impacts may occur during the construction and operational phase of the proposed Development.
Habitats	Within the Site and immediately adjacent to the boundary	Direct impacts on habitats will only occur within the Site. Immediately adjacent habitats may be affected indirectly, for example through impacts of increased noise or light spill from the Site during construction and operation.
Invasive plant species	Within the Site boundary	Works occurring on-site which may affect invasive species will be managed on-site through a species-specific method statement.
Water vole	Within the Site boundary	Direct impacts on watercourses are only likely to occur within the Site. This may result in loss of burrows, feeding habitats, as well as direct mortality of water vole using the burrows. Loss of habitat may also cause fragmentation of water vole populations and impact on breeding success. The watercourse identified on-site is culverted at both ends.
Hedgehog	Within the Site boundary	Direct impacts on suitable habitat within the Site.
Badgers	30 m	Badger <i>Meles meles</i> , sett tunnels typically extend up to 20 m from the sett entrance.
Bats	100 m	One tree with moderate bat roost suitability and two bridges with low bat roost suitability were identified within the Site boundary. The rail line and Kirkby Brook likely provide habitat for foraging and commuting bats. Disturbance to commuting and foraging bats within the surrounding habitats may occur through increased lighting and reduction in suitable corridors across the Site.
Breeding birds	100 m	Direct impacts on breeding birds will occur within the Site. Disturbance to breeding and foraging birds within surrounding habitats may occur through increased human disturbance and reduction in breeding habitat.
Amphibians	250 m	Direct impacts on suitable habitat within the Site which provides contiguous habitat from waterbodies within 250 m of the Site.

7.3.3 Impact Assessment and Significance Criteria

Ecological Impact Assessment Methodology

The prediction of impacts and residual effects has involved an assessment of the value of each ecological feature and an evaluation of the significance of impacts (both direct and indirect) in ecological terms.

The EcIA for the proposed Scheme follows the published guidance by CIEEM.²⁰ Firstly, the value of ecological features potentially affected by the Proposed Scheme is assessed. The ecological features present on the Site are assigned values within this section using a geographical scale of reference, according principally to their biodiversity value, plus any social, community or economic value that can be attributed to them, as well as their legal protection status.

Evaluation is based on both the baseline data established by survey and consultation, and the context of the records against the established criteria, appropriate policies and guidance. Furthermore, professional judgement is used, based on available information on that feature, such as local distribution and status, wider population trends and expert advice. Reference has also been made to UK and local Planning Policy as appropriate. Evaluation criteria are outlined in Table 7.3.

Table 7.3: Ecological Evaluation Criteria Based on Potential Geographic Significance.

Importance for ecology and nature conservation	Description
International and European	Statutory internationally designated sites identified through international conventions and European directives such as SPA, SAC, and Ramsar sites. Site supporting an internationally important population of a species or species assemblage.
National	Statutory nationally designated site such as SSSI and NNR. Sites supporting a nationally important population of a species or species assemblage.
Regional	Statutory designated Local Nature Reserves. Non-statutory designated sites identified in local plans such as LWS. Sites supporting a population of a species or species assemblage important in a regional context.
Metropolitan, County, vice-county or other local authority-wide area	Non-statutory designated sites given lower than regional importance for nature conservation. Sites supporting a population of a species or species assemblage important in a county context.
Local	Sites that have no formal designation but contain species or habitats that are important to the ecological integrity of the local area. Various approaches can be adopted for defining local importance, including assessment within a district or borough context or within a zone of influence.
The Site (red line boundary)	An ecological resource that would not fulfil the above criteria and is common within the local area and is of low intrinsic value.

Significance Criteria

In accordance with CIEEM guidance,²⁰ detailed assessment of impacts has been limited to ecological features considered to be of value at the 'local' level or

²⁰ CIEEM (2018) *Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine* version 1.1. Chartered Institute of Ecology and Environmental Management, Winchester.

above, other than where features of lesser value are subject to some form of legal protection or they act in combination to lead to a cumulative impact.

The potential positive and negative impacts on those resources are then identified and characterised with consideration to the following:

- **Magnitude** - quantification of impact, where possible, in terms of size, amount, intensity and volume, *e.g.* amount of habitat loss, percentage change to habitat area, percentage decline in species population.
- **Extent** - spatial or geographic area over which the impact/effect may occur.
- **Duration** - defined in relation to ecological characteristics (*e.g.* species lifecycle) as well as human timeframes. The duration of an activity may differ from the duration of the resulting effect caused by the activity.
- **Frequency and timing** - timing of the works in relation to critical life-stages or seasons, and how often an impact will occur.
- **Reversibility** - an irreversible effect is one from which recovery is not possible within a reasonable timescale or there is no reasonable chance of action being taken to reverse it. A reversible effect is one from which spontaneous recovery is possible or which may be counteracted by mitigation.

Magnitude of Change

Determining the magnitude of a change requires an understanding of how ecological features are likely to respond as a result of the proposed Scheme. This change can occur during construction or operational phases. For the purpose of this assessment, magnitude categories are defined in Table 7.4.

Table 7.4: Criteria for Assessing Magnitude of Change.

Magnitude	Definition
High	Permanent or long-term change (positive or negative) and / or large-scale change on integrity and / or conservation status of a feature.
Medium	Short or medium-term and / or medium- scale change (positive or negative) on integrity and / or conservation status of a feature.
Low	Temporary and / or small-scale change (positive or negative) on integrity and / or conservation status of a feature.
Negligible	Negligible change in integrity and / or conservation status.

Ecological Significance

According to CIEEM, for the purpose of EcIA, a 'significant effect' is an effect that either supports or undermines biodiversity conservation objectives for 'important ecological features' or for biodiversity in general. Conservation objectives may be specific (*e.g.* for a designated site), broad (*e.g.* national/local nature conservation policy), or more wide-ranging (enhancement of biodiversity).

Effects can be considered significant at a wide range of scales from international to local. In broad terms, significant effects encompass impacts on structure and function of defined sites, habitats or ecosystems and the conservation status of habitats and species (including extent, abundance and distribution).

Significant effects are qualified with reference to an appropriate geographic scale. For example, a significant effect on a SSSI is likely to be of national significance. However, the scale of significance of an effect may not be the same as the geographic context in which the feature is considered important. For example, an effect on a species which is on a national list of species of principal importance for biodiversity may not have a significant effect on its national population.

A level of confidence is also ascribed to the assessment based on the level of certainty in the evaluation of the ecological resource and the prediction of the potential impacts. The confidence level is considered to be high within this EcIA, unless otherwise stated.

To retain consistency with other chapters, Table 7.5 provides a matrix for evaluation of relative significance of effects. This is not included within the CIEEM guidelines for EcIA and does not replace the CIEEM EcIA guidelines.

Table 7.5: Matrix for Evaluation of Relative Significance of Effects.

Magnitude of impact	Ecological value		
	High (International and European and National)	Moderate (Regional and Metropolitan, County, vice-county or other local authority-wide area)	Low (Local and The Site (redline boundary))
High	Major	Moderate	Moderate or minor
Medium	Major	Moderate	Moderate or minor
Low	Major or moderate	Moderate or Minor	Minor
Very Low	Minor	Negligible	Negligible

7.3.4 Key Parameters for Assessment

The proposed station car park comprises approximately 300 spaces. Whilst the passive provision is not included as part of this assessment, this area has not been included as an area that could be enhanced or utilised as mitigation to offset loss of habitat elsewhere within the Site. This is to ensure that this area is not relied on for the assessment and subsequently may be lost to future development.

7.4 Baseline Conditions

The objective of a baseline assessment is to identify ecological features of value within the EZoI of the proposed Scheme which may be impacted by the proposed works during construction (including demolition) and operation.

7.4.1 Statutory Designated Sites

No statutory designated sites were identified within the Site or within 2 km radius surrounding the Site.

7.4.2 Non-Statutory Designated Sites

Eleven Local Wildlife Sites (LWS) were identified within 1 km radius surrounding the Site (Table 7.6). In addition, one Nature Improvement Area was identified.⁹

Table 7.6: Non-statutory Designated Sites Within 1 km of the Site.

Site	Location	Reason for designation
Kirkby Brook, including Mill Brook LWS	Runs underneath the existing rail track bridge (Millbrook Bridge) within the Site	The site supports neutral grassland, woodland, waterbodies, common amphibian species, notable invertebrate species and a population of water vole. The brook is hydrologically connected to Mill Brook, Westvale LWS and Simonswood Brook LWS.
Mill Brook, Westvale LWS	Runs underneath the existing rail track bridge (Millbrook Bridge) within the Site	The site supports neutral grassland, notable invertebrate species and a population of water vole.
River Alt and M57 Corridor Nature Improvement Area	Adjacent to the Site	An area identified within the Liverpool City Region Nature Improvement Area (NIA). ²¹ The purpose of NIA is to target habitat management and habitat creation opportunities.
Northwood Forest Hills LWS	0.4 km north-east	The site supports woodland and neutral grassland and notable plant species.
Wango Lane Wetland LWS	0.6 km south-west	An area of marsh and fen vegetation with developing willow <i>Salix</i> sp. carr. Located north of the rail line.
Simonswood Brook LWS	0.6 km north	The site supports neutral grassland, notable bird species and a population of water vole.
Meadow, Kirkby (Mill) Brook, South of Old Hall Lane LWS	0.7 km south	A meadow within a wet flush on the banks of Kirkby Brook. Sandstone exposures on the banks add to the diversity.
Kirkby Brook, Northwood LWS	0.8 km south-east	Open watercourse with habitat suitable for water vole.
Land East of Canal, North of Wango Lane, Waddicar LWS	0.9 km south-west	Diverse range of habitats and plant species of interest. Located north of the rail line.
River Alt, Kirkby LWS	1.0 km south-west	Open watercourse with habitat suitable for water vole.

²¹ Liverpool City Region (2015) Liverpool City Region Ecological Network Final Report.

Available at:

<https://www.wirral.gov.uk/sites/default/files/all/planning%20and%20building/Local%20plans%20and%20planning%20policy/Local%20Planning%20Evidence%20Base%20and%20Research/Wirral%20Documents/Reg%2018%20Issues%20and%20Options%202020/Environment%20and%20Climate%20Change/Liverpool%20City%20Region%20Ecological%20Network%20Study%202015/ECC14.1%20-%20Liverpool%20City%20Region%20Ecological%20Network%202015.pdf>

Accessed: 07/04/21.

7.4.3 Habitats

Desk Study

Section 41 (S41) Priority Habitat lowland acid grassland and lowland meadow were identified within the Site and deciduous woodland was identified adjacent to the Site in areas of existing rail line.

During the field survey, the habitats where lowland acid grassland and lowland meadow were historically recorded, were recorded to support neutral grassland with species more indicative of neutral conditions. The bankside vegetation along Kirkby Brook where lowland meadow was previously recorded was recorded to have extensive Himalayan balsam, common nettle *Urtica dioica*, and common hogweed *Heracleum sphondylium*, with limited diversity. The predominant grass species was cocksfoot *Dactylis glomerata*. Areas previously assigned as lowland acid grassland were also recorded to support species which favour higher soil nutrient levels, e.g. broadleaved dock *Rumex obtusifolius*, and common nettle. Consequently, the Site was not considered to support lowland acid grassland or lowland meadow meeting Priority Habitat criteria (Appendix 7A).

Field Surveys

The results of the Phase 1 Habitat survey are detailed in Appendix 7A. A summary of the key results of the Phase 1 Habitat survey are as follows. For consistency with the BNG assessment, the UK Habitat classification is used first, followed by the Phase 1 Habitat equivalent in parenthesis.

Grassland – Other Neutral Grassland (Tall Ruderal Vegetation)

An area of tall ruderal vegetation was identified within the Proposed Station Car Park.

Species recorded include ragwort *Jacobaea vulgaris*, red campion *Silene dioica*, immature silver birch *Betula pendula*, juvenile oak *Quercus* sp., common nettle, Himalayan balsam, rosebay willowherb *Chamerion angustifolium*, cow parsley *Anthriscus sylvestris*, common hogweed and rapeseed *Brassica napus*.

Grassland – Other Neutral Grassland (Semi-improved Neutral Grassland)

Areas of semi-improved grassland were recorded within the Proposed Station Car Park. A mix of mown and rank grassland was recorded.

Species recorded include sweet vernal grass *Anthoxanthum odoratum*, lesser stitchwort *Stellaria graminea*, great willowherb *Epilobium hirsutum*, ragwort, sorrel *Rumex acetosa*, thistle *Cirsium arvense*, common nettle, yarrow *Achillea millefolium*, cocksfoot, ribwort plantain *Plantago lanceolata*, dandelion *Taraxacum* sp., common hogweed, bindweed *Convolvulus arvensis*, dock *Rumex* sp., rosebay willowherb, white dead-nettle *Lamium album*, hawkbit *Leontodon* sp., borage *Borago officinalis*, mallow *Malva sylvestris*, herb Robert *Geranium robertianum*, garlic mustard *Alliaria petiolata*, bird's foot trefoil *Lotus corniculatus*, selfheal *Prunella vulgaris*, chickweed *Stellaria media*, bramble

Rubus fruticosus agg., red fescue *Festuca rubra*, pineapple weed *Matricaria discoidea*, Yorkshire fog *Holcus lanatus*, and creeping buttercup *Ranunculus repens*.

Grassland – Other Neutral Grassland (Poor semi-improved Neutral Grassland)

Poor semi-improved neutral grassland was recorded within the Proposed Station Car Park.

Species recorded include white clover *Trifolium repens*, ragwort, ribwort plantain, dandelion, Yorkshire fog, creeping buttercup, black medick *Medicago lupulina*, and shining cranesbill *Geranium lucidum*.

Urban Amenity Grassland (Amenity Grassland)

Managed amenity grassland was recorded within the Proposed Station Car Park.

Grassland communities were predominated by perennial ryegrass *Lolium perenne*, cocksfoot and broadleaved dock.

Heathland and Shrub – Bramble Scrub/Mixed Scrub (Dense Scrub)

An area of dense scrub comprising bramble, Himalayan balsam, nettle and sweet vernal grass was recorded within the Proposed Station Car Park.

Dense scrub along the railway corridor was recorded to include hawthorn *Crataegus monogyna*, cherry *Prunus* sp., elder *Sambucus nigra*, ash *Fraxinus excelsior*, field rose *Rosa arvensis* and oak.

Scrub was also recorded along the railway embankments. Species recorded include goat willow *Salix caprea*, sycamore *Acer pseudoplatanus*, silver birch, elder, common lime *Tilia x europaea*, Lombardy poplar *Populus nigra* 'Italica', field maple *Acer campestre*, cherry, privet *Ligustrum vulgare*, field rose, hawthorn, gooseberry *Ribes uva-crispa* and Leyland cypress *Cupressus x leylandii*.

Urban – Vacant/Derelict Land/Bare ground (Bare Ground)

An area of bare ground was recorded to the north-east of the Existing Kirkby station. Species also recorded include buddleja *Buddleja davidii*, bramble, dock, rosebay willowherb, hop *Humulus lupulus* and Japanese knotweed *Fallopia japonica*.

Woodland and forest (Woodland)

Woodland and forest – other woodland; broadleaved (Broadleaved woodland)

Semi-mature plantation woodland was recorded along the north and south rail embankments of the railway corridor to the southwest of Kirkby station. The woodland is dominated by oak *Quercus* sp., and sycamore *Acer pseudoplatanus* with occasional hawthorn.

Scattered semi-mature broadleaved trees were recorded within dense scrub between Kirkby station and Headbolt Lane.

Running Water

Kirkby Brook runs through the Proposed Station Car Park. It is culverted at either end. The water was recorded to be slow flowing with a silty channel bed approximately 30 cm deep.

Invasive Plant Species

Himalayan balsam was recorded along the banks of Kirkby Brook. Japanese knotweed was recorded to the north-east of the existing Kirkby station.

Urban – Built Linear Features (Urban Built Environment)

Associated infrastructure was recorded within the railway corridor and the Existing Kirkby Station. This included ballast stone and associated trackway, bridge structures, watercourse crossing points and tarmac pedestrian walkways through the proposed station and car park site.

7.4.4 Protected/Notable Species

Desk Study

Records from the last ten years are summarised below.

Notable Plant Species

Two notable plant species were identified within 1 km radius of the Site (Table 7.7).

Table 7.7: Notable Plant Species Identified Within 1 km of the Site.

Species	Designated as
Fringed water-lily <i>Nymphoides peltata</i>	Nationally scarce. Excludes rare species qualifying under the main IUCN criteria.
Bluebell <i>Hyacinthoides non-scripta</i>	Wildlife and Countryside Act 1981 (as amended), Schedule 8

Invasive Plant Species

Himalayan balsam and Japanese knotweed were recorded within 1 km of the Site.

Bats

One species of bat was identified within 1 km radius; common pipistrelle *Pipistrellus pipistrellus*, and an unspecified pipistrelle *Pipistrellus* sp.

Water Vole

Water vole records were identified within Simonswood Brook.

Red Squirrel

Red squirrel *Sciurus vulgaris*, was recorded within the housing estate to the north of the Site.

Brown Hare

One record of brown hare *Lepus europaeus*, was identified to the north of the Site.

Badger

One record of badger *Meles meles*, was identified within 1 km of the Site.

Hedgehog

Four records of hedgehog *Erinaceus europaeus*, were identified.

Amphibians

Great crested newt *Triturus cristatus*, and common frog *Rana temporaria*, records were identified within 1 km of the Site.

Field Surveys

Bats

Full results of the PRF and bat activity surveys are detailed in Appendix 7D.

Bat Activity Surveys

No confirmed bat roosts were recorded during the 2021 bat activity surveys for both UB57 Glovers Brow Bridge and UB56 Millbrook Bridge.

Due to the proximity of suitable foraging habitat and the potential roost feature recorded within UB56 Millbrook Bridge, roosting bats have been taken forward for further assessment using the precautionary principle.

Pipistrelle *Pipistrellus* sp., bats were recorded foraging along the adjacent watercourse and adjacent tree lines during the bat activity surveys. The habitat recorded within the Site; dense scrub, scattered trees and watercourse, provides moderate suitability for foraging and commuting bats. Foraging and commuting bats have been taken forward for further assessment.

PRF Survey

One mature Lombardy poplar *Populus nigra 'Italica'*, was assessed to have moderate bat roost suitability during a preliminary ground level roost assessment. An updated endoscope survey recorded the feature to have significantly rotted since the initial; inspection and no cavity was present beyond the rotten limb. The tree was subsequently downgraded to negligible bat roost suitability (Appendix 7D).

Water Vole

Simonswood Brook

No signs of water vole were recorded within Simonswood Brook during the surveys. A number of rat *Rattus norvegicus*, droppings and footprints were recorded.

Himalayan balsam dominated the watercourse. Suitable foraging vegetation such as reed canary grass *Phalaris arundinacea*, were recorded in isolated sections of the brook.

Kirkby Brook

No signs of water vole were recorded within Kirkby Brook during the surveys. Extensive signs of rat were recorded including burrows, droppings and footprints.

Himalayan balsam and bramble dominated the banks of the brook. Suitable foraging vegetation such as reed canary grass were recorded in isolated sections of the brook, predominantly at the eastern extent.

Red Squirrel

Habitat within the Site was not deemed suitable for red squirrel due to the lack of trees within the Site and coniferous woodland which is favourable within the wider landscape. Consequently, red squirrel are scoped out of any further assessment within this EcIA.

Brown Hare

Habitat within the Site was not deemed suitable for brown hare due to the urban landscape surrounding the Site. Consequently, brown hare are scoped out of any further assessment within this EcIA.

Badger

No evidence of badger *Meles meles*, was recorded during the field survey. One record of badger was identified within the desk study. Due to the density of scrub on the rail embankments, there is the possibility that signs or setts may have been obscured. Consequently, badger are taken forward for further assessment.

Hedgehog

The scrub habitat within the Site provides opportunities for refuge for hedgehog and the grassland provides a foraging resource. Consequently, hedgehog are taken forward for further assessment.

Breeding Birds

The scrub and scattered trees provide opportunities for nesting and foraging for common breeding birds. Consequently, common breeding bird are taken forward for further assessment.

Reptiles

South facing rail embankments and habitat mosaic of scrub, woodland and open grassland are present within the Site. However, no records were identified within 1 km. In addition, the Proposed Station Car Park area is highly disturbed, and no

suitable refugia opportunities were identified within the Site. Consequently, reptiles are scoped out of any further assessment within this EcIA.

Amphibians

The calculations and results of the HSI assessment are detailed in Table 2; Appendix 7C. In summary, Pond 4 was identified to have good suitability and Pond 5 was identified to have poor suitability.

Pond 4 tested negative for the presence of great crested newt eDNA. It was concluded that great crested newts are likely absent from areas within the major project works area. However, notable tadpoles were recorded within Pond 4 and therefore the waterbody is likely a breeding pond for amphibian species such as frog and toad *Bufo bufo*. Suitable connective habitat exists between Pond 4 and the Site. Consequently, amphibians are taken forward for further assessment.

Summary of Baseline

Based on the results of surveys undertaken, ecological features which were determined to be, present and progressed through to assessment, or likely absent and not considered further; are detailed in Table 7.8. Four non-statutory designated sites are scoped out due to the following combination of factors:

- the distance of the designated site from the Site;
- the qualifying features of the Site and lack of complementary habitat on-site; and
- the lack of suitable habitat connecting the designated site and the Site.

Table 7.8: Impact Assessment Status of Ecological Features.

Ecological feature	Summary of baseline	Further assessment	Geographic level of importance
Kirkby Brook, including Mill Brook	Hydrologically connected to Kirkby Brook which runs through the Site.	Non-statutory designated site – taken forward for further assessment.	Regional
Mill Brook, Westvale LWS	Hydrologically connected to Kirkby Brook which runs through the Site.	Non-statutory designated site – taken forward for further assessment.	Regional
River Alt and M57 Corridor Nature Improvement Area	An area identified within the Liverpool City Region NIA.	Scoped out due to the area being targeted as a strategic area for habitat management and habitat creation opportunities. The Site does not fall within this area and therefore there are no direct impacts from the proposed Scheme.	N/A
Simonswood Brook LWS	Hydrologically connected to Kirkby	Non-statutory designated site –	Regional

Ecological feature	Summary of baseline	Further assessment	Geographic level of importance
	Brook which runs through the Site.	taken forward for further assessment.	
River Alt, Kirkby LWS	Hydrologically connected to Simonswood Brook.	Non-statutory designated site – taken forward for further assessment.	Regional
Northwood Forest Hills LWS	Woodland and neutral grassland with notable plant species.	Scoped out due to a combination of factors including: - the distance of the designated site from the Site - the qualifying feature of the site and lack of complementary habitat on-Site; and - the lack of suitable habitat connecting the designated site and the Site.	N/A
Wango Lane Wetland LWS	Marsh and fen vegetation with developing willow.		
Meadow, Kirkby (Mill) Brook, South of Old Hall Lane LWS	A meadow within a wet flush on the banks for Kirkby Brook		
Kirkby Brook, Northwood LWS	Open watercourse suitable for water vole. This section of Kirkby Brook is located upstream of the section within the Site.		
Land East of Canal, North of Wango Lane, Waddicar LWS	Diverse range of habitats and plant species of interest.		
Priority Habitat lowland acid grassland and lowland meadow	Previously recorded within the Site. However, field surveys recorded the presence of neutral grassland with abundant indicators of enriched soils.	Scoped out from further assessment.	N/A
Priority Habitat deciduous woodland	Areas of priority habitat deciduous woodland lie adjacent to the Site along the rail corridor.	Priority habitat – taken forward for further assessment.	Regional
Other neutral grassland (tall ruderal vegetation/semi-improved grassland and poor semi-improved grassland)	Located within the Proposed Station Car Park.	Habitat in the local setting of a landscape dominated by urban land – taken forward for further assessment.	Local
Urban amenity grassland (amenity grassland)	Areas of regularly managed grassland with low species diversity.	Scoped out from further assessment.	N/A
Heathland and shrub – bramble/mixed scrub (dense scrub)	Areas of scrub within unmanaged greenspaces and along the railway corridor.	Habitat in the local setting of a landscape dominated by urban land – taken forward for further assessment.	Local

Ecological feature	Summary of baseline	Further assessment	Geographic level of importance
Urban – Vacant/Derelict Land/Bare ground (bare ground)	Area of bare ground supporting common plant species.	Scoped out from further assessment.	N/A
Woodland and forest (woodland)	Areas of plantation woodland and scattered semi-mature broadleaved trees were recorded within the Site.	Habitat in the local setting of a landscape dominated by urban land – taken forward for further assessment.	Local
Running water	Kirkby Brook runs through the proposed station and car park site.	Hydrological connectivity to the LWS – taken forward for further assessment.	Regional
Urban built linear features (urban built environment)	Built up infrastructure within the railway corridor.	Scoped out from further assessment.	N/A
Invasive plant species	Japanese knotweed, and Himalayan balsam identified within the Site.	Negligible importance but brought forward in view of the legislation.	
Bats (roosts)	No confirmed roosts within structures identified to have bat roost suitability. However suitable foraging habitat is located in close proximity to UB56 Millbrook Bridge.	Taken forward for further assessment.	Local
Bats (foraging and commuting)	Scrub, scattered trees and watercourse provide moderate suitability for foraging and commuting bats within the Site.	Taken forward for further assessment.	Local
Water vole	No signs of water vole recorded within watercourses within the survey area.	Scoped out from further assessment.	N/A
Red squirrel	Desk study records of red squirrel within 1km. Habitat within the Site was not recorded to be favourable for red squirrel.	Scoped out from further assessment.	N/A
Brown hare	Desk study records of brown hare within 1km. Habitat within the Site was not recorded to be favourable for brown hare.	Scoped out from further assessment.	N/A

Ecological feature	Summary of baseline	Further assessment	Geographic level of importance
Badger	One records of badger was identified in the desk study record. The grassland provides foraging opportunities for badger.	Taken forward for further assessment	Local
Hedgehog	Areas of suitable habitat for hedgehog exist within the scrub habitat throughout the Site.	S41 species – taken forward for further assessment.	Local
Breeding birds	No recent desk study data returned records of common breeding birds, however common breeding birds are likely to be present in areas of scrub and trees throughout the Site.	Taken forward for further assessment.	Local
Reptiles	No recent desk study data records of reptiles. Lack of suitable refugia within the Site and Proposed Station Car Park highly disturbed.	Scoped out from further assessment.	N/A
Amphibians	Negative great crested newt eDNA results for Pond 4. Tadpoles were recorded within Pond 4, with suitable habitat connectivity between the waterbody and the Site.	Taken forward for further assessment.	Local

7.5 Design Development and Impact Avoidance

The following documents and standard best practice guidelines will be adhered to during the construction and operational phases:

- Construction Environmental Management Plan (CEMP) (Outline CEMP; Appendix 2A);
- Pollution Prevention Guidelines²²;

²² Department for Environment, Food & Rural Affairs and Environment Agency (2019) Guidance: Pollution prevention for businesses. Available at: <https://www.gov.uk/guidance/pollution-prevention-for-businesses> Accessed: 08/04/21.

- Embedded mitigation prescribed in Chapter 5: Air Quality;
- Embedded mitigation prescribed in Chapter 6: Noise & Vibration; and
- Embedded mitigation prescribed in the Light Obtrusion Assessment (170248-ARU-REP-EEN-000023).

The Outline CEMP (Appendix 2A) outlines the mechanism for implementation of relevant ecological mitigation measures designed to avoid and reduce impacts to designated sites, habitats and species during the construction phase of the proposed Scheme. Key actions/measures which will be included in the CEMP include:

- programming Site/vegetation clearance outside the bird nesting season (March – August) to avoid impacts on breeding birds;
- inspection of UB56 Millbrook Bridge from a Mobile Elevating Work Platform (MEWP) by a licenced bat ecologist a minimum three months prior to construction activities;
- provision of Site toolbox talks and training to all Site personnel prior to construction so that all personnel are aware of the key requirements of the CEMP;
- presence of an ECoW on-site during implementation of key mitigation measures;
- procedures for a call out service of the appointed ECoW during construction works;
- preparation of specific Method Statements detailing best practice working methods to avoid adversely impacting ecological features on-site; and
- application of site specific mitigation measures to reduce dust emitting activities.

The following measures to minimise potential impacts of additional lighting and noise during construction on-site will be implemented where possible, and are detailed within the CEMP:

- all lighting will be directed on equipment only and directed away from suitable foraging habitat such as retained scrub and trees;
- the lights used for construction will be set at low illumination levels whilst maintaining a safe working environment;
- upward lighting will be minimised to reduce light pollution;
- the height of the lighting columns will be limited to reduce light spillage;
- noise screens will be used where possible;
- machines will be turned on sequentially to reduce the impact of sudden noises;
- plant will be turned off when not in use; and
- ensure silencers are fitted to exhausts.

A Landscape and Ecology Management Plan (LEMP) (170248-ARU-REP-EEN-000024) has been developed to ensure that proposed enhancement and creation of habitats are maintained post-construction.

7.6 Environmental Impacts and Significance of Effects

This section provides an assessment of predicted impacts of the proposed Scheme on important habitats and species, considering the avoidance, best practice management measures and implementation of a LEMP highlighted in Section 7.5. In accordance with the CIEEM guidance,²⁰ detailed assessment of impacts has been limited to ecological features considered to be of importance at the ‘local’ level or above.

The assessment is based on a combination of magnitude of change likely to result from the proposed Scheme at the Site and the sensitivity of the feature.

7.6.1 Construction

The construction methods include earthworks. These works are anticipated to involve site clearance, erection of new buildings associated with the new station, installation of roads, road and foot bridges, SuDS/drainage features, pedestrian and cycle routes, creation of landscaping, car parking, railway line upgrade works and decommissioning works at the existing Kirkby Station.

The potential impact of these construction activities on important ecological features include:

- direct mortality of species;
- habitat loss;
- habitat fragmentation and physical restriction to species movement;
- disturbance from noise, vibration, light and dust; and
- habitat degradation due to pollution, changes to hydrology, sedimentation *etc.*

Impacts on Designated Sites

Kirkby Brook, including Mill Brook LWS

Kirkby Brook, including Mill Brook LWS is located underneath the existing rail track bridge (Millbrook Bridge) within the Site.

The designated site will not be directly impacted by construction works as land-take from the designated site is not required. However, works are proposed on the bridge including replacement of the top of the spandrel walls with robust kerb units and general repairs to the masonry. These works may act as a source of pollution during construction works given the location of the bridge over the watercourse. A change in water quality may impact on the functioning of the ecosystem within the designated site and have impacts on the habitats and species

which it supports. However, the likelihood of such an event occurring is considered to be low. To avoid pollution impacts during construction the CEMP details pollution prevention guidelines which construction work will adhere to. Therefore, the effect on habitats and species supported at Kirkby Brook, including Mill Brook LWS is considered to be negligible. This is not significant in line with the CIEEM EcIA guidelines.

Mill Brook, Westvale LWS

Mill Brook, Westvale LWS is located underneath the existing rail track bridge (Millbrook Bridge) within the Site and hydrologically linked to Kirkby Brook, including Mill Brook LWS.

The designated site will not be directly impacted by construction works as land-take from the designated site is not required. However, works are proposed on the bridge including replacement of the top of the spandrel walls with robust kerb units and general repairs to the masonry. These works may act as a source of pollution during construction works given the location of the bridge over the watercourse. A change in water quality may impact on the functioning of the ecosystem within the designated site and have impacts on the habitats and species which it supports. However, the likelihood of such an event occurring is considered to be low. To avoid pollution impacts during construction the CEMP details pollution prevention guidelines which construction work will adhere to. Therefore, the effect on habitats and species supported at Mill Brook, Westvale LWS is considered to be negligible. This is not significant in line with the CIEEM EcIA guidelines.

Simonswood Brook LWS

Simonswood Brook LWS is located approximately 0.6 km north of the Site.

The designated site will not be directly impacted by construction works as land-take from the designated site or immediately adjacent habitat is not required. However, there is hydrological connectivity to Kirkby Brook, including Mill Brook LWS and Mill Brook, Westvale LWS. Consequently, the proposed works on Mill Brook Bridge may act as a source of pollution during construction works. A change in water quality may impact on the functioning of the ecosystem within the designated site and have impacts on the habitats and species which it supports. However, the likelihood of such an event occurring is considered to be low. To avoid pollution impacts during construction the CEMP details pollution prevention guidelines which construction work will adhere to. Therefore, the effect on habitats and species supported at Simonswood Brook LWS is considered to be negligible. This is not significant in line with the CIEEM EcIA guidelines.

River Alt, Kirkby LWS

River Alt, Kirkby LWS is located approximately 0.5 km south of the Site.

The designated site will not be directly impacted by construction works as land-take from the designated site or immediately adjacent habitat is not required. However, there is hydrological connectivity to Simonswood Brook LWS. Consequently, the proposed works on Mill Brook Bridge may act as a source of

pollution during construction works. A change in water quality may impact on the functioning of the ecosystem within the designated site and have impacts on the habitats and species which it supports. However, the likelihood of such an event occurring is considered to be low. To avoid pollution impacts during construction the CEMP details pollution prevention guidelines which construction work will adhere to. Therefore, the effect on habitats and species supported at River Alt, Kirkby LWS is considered to be negligible. This is not significant in line with the CIEEM EcIA guidelines.

Priority Habitat Deciduous Woodland

Priority habitat deciduous woodland is located adjacent to the Site along the rail corridor.

Deciduous woodland will not be directly impacted by construction works as land-take from areas of assigned Priority habitat are not required. The proposed works within the Site in areas adjacent to Priority habitat deciduous woodland include minor works such as installation of cables in existing surface ducts, installation of concrete foundation and hardstanding for LOC cabinet. Masonry works and replacement of the spandrel walls at UB56 Millbrook Bridge are proposed. However, these works do not require removal of any trees within the S41 Priority Habitat deciduous woodland located to the south of the redline boundary. Vegetation clearance is proposed to the north side of the bridge on both wing walls. These works are not considered to have any indirect impacts on areas of Priority Habitat deciduous woodland. Consequently, the effect on Priority habitat deciduous woodland is considered to be negligible, and not significant. This is not significant in line with the CIEEM EcIA guidelines.

Impacts on Habitat

Loss of Habitat

The Biodiversity Net Gain assessment (Appendix 7E) details habitat retention, enhancement, loss and creation within the site.

Table 7.9 details approximate change in area of habitat on-site which are considered to be of local value or better, following implementation of the landscaping elements of the proposed Scheme.

Table 7.9: Summary of Habitat Area Prior to Construction and Following Implementation of Design

Habitat type	Approximate area of important habitat prior to construction (ha)	Areas of retained habitat (ha)	Area of removed habitat (ha)	Approximate area of habitat creation on-site based on BNG assessment (ha)	Approximate area of habitat enhancement of retained areas on-site based on BNG assessment (ha)	Final habitat area following implementation of design (ha)
Grassland – Other neutral grassland	4.38	1.04	2.92	1.6	0.42	3.06
Heathland and shrub – bramble/mixed scrub	2.2	0.44	1.76	0	0	0.44
Woodland and forest – other woodland; broadleaved	0.45	0.32	0.13	0	0	0.32
Native species-rich hedgerow	N/A	N/A	N/A	0.54km	0	0.54km
Scattered native broadleaved trees	N/A	N/A	N/A	0.02	0	0.02

Areas of retained grassland which were recorded to be poor semi-improved will be enhanced by seeding with a native grassland mix. Native species rich hedgerows will be planted on the periphery of the site to provide connectivity through the site and additional areas for foraging and nesting birds, foraging and commuting bats and habitat for hedgehog and amphibians. In addition, scattered broadleaved trees will be planted within the hedgerow and along the peripheral boundaries.

A LEMP has been developed to ensure that proposed enhancement and creation of habitats are maintained post-construction. This includes maintenance of newly created hedgerows, planted trees, enhancement of retained grassland and management of invasive plant species (170248-ARU-REP-EEN-000024).

The effects of habitat loss of bramble/mixed scrub and other woodland broadleaved across the Site following implementation of the design is considered to be negligible and not significant.

However, the overall loss of 2.92 ha of other neutral grassland, is considered to be minor adverse. This is significant at the local level, in line with the CIEEM EcIA guidelines.

Disturbance to Habitats

Retained habitat may be subject to increased noise and lighting, which may affect breeding birds, foraging and commuting bats, hedgehogs and amphibians.

Contiguous habitats identified outside the Site boundary but within the EZoI may also be affected by construction works through encroachment, disturbance from lighting and noise and pollution pathways. Watercourses outside the Site but hydraulically linked to watercourse/s located within the Site boundary may also be affected.

Measures to minimise potential impacts of pollution, lighting and noise during construction will be implemented and are detailed in the CEMP (Outline CEMP; Appendix 2A).

Therefore, the effect of disturbance through increased lighting, noise and construction activities is considered to be negligible, and not significant.

Impacts on Protected and Notable Species

Bats

Loss of Roosts

No confirmed roosts were identified during the bat activity surveys. Due to the proximity of foraging habitat to UB56 Millbrook Bridge, as a precautionary measure, an inspection of the potential roost feature utilising a MEWP will be undertaken by a licenced ecologist. These measures are to minimise potential impacts on roosting bats and are detailed within the CEMP (Outline CEMP; Appendix 2A).

Therefore, the effect of loss of bat roosts is considered to be negligible, and not significant.

Loss of Habitat for Foraging/Commuting Bats

Vegetation removal along the railway embankments will be required for the proposed track widening. In addition, the construction of the Proposed Station Car Park will result in loss of grassland which bats may use to forage.

Areas of retained habitat within the Site will be enhanced to provide a higher botanical diversity within the Site. Enhancement will include using species which are nectar rich and attractive to invertebrates, therefore providing a foraging resource for bats. In addition, the planting of hedgerows and trees will provide additional foraging/commuting habitat.

The overall scale of loss of 2.92 ha grassland, 1.76 ha scrub and 0.32 ha woodland across the Site on bats is considered to be minor adverse. The temporal effects of clearance and time for new habitat to reach maturity is considered to be a small scale of loss. However, with the enhancement of grassland and planting of native hedgerows and trees, this is deemed to mitigate the loss of existing foraging habitat. Consequently, the loss of habitat within the Site for bats as a result of construction is considered to be negligible and not significant.

Disturbance Impacts on Foraging/Commuting Bats

Bats utilising the railway as a foraging and commuting corridor will have habituated to disturbance from existing trains and artificial lighting from surrounding urban areas. Artificial lighting is located along the footpath which runs through the Proposed Station Car Park. Therefore, any bats utilising this area for foraging/commuting will already be subject to existing artificial lighting. Construction works may result in additional lighting being installed, e.g. for security. In addition, during winter, lighting may be used on-site to extend the working hours.

Measures to minimise potential impacts of additional lighting on-site will be implemented and are detailed within the CEMP (Outline CEMP; Appendix 2A) *e.g.* all lighting will be directed on equipment only and directed away from suitable foraging habitat such as retained scrub and trees.

Disturbance from noise and vibration during construction works, specifically earthworks (Chapter 6 Noise & Vibration) may disturb commuting bats.

Measures to reduce noise and vibration during construction will be implemented and are detailed within the CEMP (Outline CEMP; Appendix 2A) *e.g.* plant will be turned off when not in use.

Therefore, the effect of disturbance on foraging/commuting bats is considered to be negligible, and not significant.

Badger

Limited foraging resource for badger is restricted to the grassland within the Site. Construction works will lead to a loss of grassland. However, more suitable foraging resource is available in the wider rural landscape. In addition, due to the

lack of evidence of badger utilising the Site and one record of badger identified in the desk study records from 2010, disturbance impacts on foraging badger is considered to be negligible, and not significant.

Hedgehog

Loss of Habitat for Hedgehog

Construction works will lead to vegetation removal along the railway embankment and within the Proposed Station Car Park.

Suitable habitat which will be unaffected by the proposed Scheme exists within the wider landscape. The enhancement of retained grassland and creation of hedgerows through the Site will provide mitigation for the habitat loss of scrub and grassland. In addition, log piles will be installed on the peripheral areas of the Proposed Station Car Park to provide potential resource for hedgehog. Log piles will also attract invertebrates such as molluscs, which form an important foraging resource for hedgehogs.

Therefore, the effect of habitat loss on hedgehog is considered to be negligible, and not significant.

Disturbance Impacts for Hedgehog

As stated with bats, construction works may result in additional lighting being installed, *e.g.* for security. In addition, during winter, lighting may be used on-site to extend the working hours. Hedgehogs utilising habitat which is retained adjacent to the works area may be impacted by additional lighting.

Measures to minimise potential impacts of additional lighting on-site will be implemented and are detailed within the CEMP (Outline CEMP; Appendix 2A).

Therefore, the effect of disturbance on hedgehogs is considered to be negligible, and not significant.

Breeding Birds

Loss of Habitat for Breeding/Foraging Breeding Birds

The Site provides habitat for common breeding bird such as blackbird *Turdus merula*, and dunnock *Prunella modularis*. Vegetation removal along the railway embankment and scrub within the Proposed Station Car Park will result in loss of habitat for common breeding birds.

The loss of scrub and trees will be compensated for through the planting of trees and hedgerows within the Site. These measures will provide foraging and nesting resources for breeding birds.

The overall loss of 1.76 ha scrub and 0.32 ha woodland across the Site for breeding birds is considered to be minor adverse. The temporal effects of clearance and time for new habitat to reach maturity is considered to be a small scale of loss. However, in line with bats, the creation of native hedgerows and scattered broadleaved trees is deemed to mitigate the loss of existing habitat for

breeding and foraging. Consequently, the loss of habitat within the Site for birds as a result of construction is considered to be negligible and not significant.

Disturbance impacts on Breeding/Foraging Breeding Birds

As stated with bats, the Site is subject to an existing level of background noise and lighting commensurate with an urban location. However, disturbance factors are likely to increase during construction which may specifically affect breeding birds. The effects of significant increased lighting on retained vegetation may lead to impacts on breeding birds such as disrupting the long-term circadian rhythm that dictates the onset of the breeding season.²³

Increased levels of noise and vibration during construction works, specifically earthworks (Chapter 6: Noise & Vibration) may also disturb birds whilst nesting (March-August) leading to nest abandonment and breeding failure.

Implementation of measures relating to foraging/commuting bats is the same for breeding birds *i.e.* measures to minimise potential impacts of additional lighting on-site and measures to minimise noise and vibration (Outline CEMP; Appendix 2A). Therefore, effects of disturbance from increased lighting and noise and vibration on breeding/foraging breeding birds is considered to be negligible, and not significant.

Amphibian

Loss of Habitat for Common Amphibians

Construction works will lead to vegetation removal along the railway embankment and within the Proposed Station Car Park.

Precautionary working measures to avoid accidental injury or death to amphibian species will be included within the CEMP.

The enhancement of retained grassland and creation of hedgerows through the Site will provide mitigation for the habitat loss of scrub and grassland. In addition, the creation of log piles on the periphery of the Proposed Station Car Park will provide refugia for amphibians.

Therefore the effect of habitat loss on amphibians is considered to be negligible, and not significant.

Invasive Plant Species contamination

Invasive plant species including Himalayan balsam and Japanese knotweed were identified on-site (TN2, TN8 and TN13; Figure 1; Appendix 7A). These species must be managed/controlled appropriately during the construction phase of the proposed Development as they may be spread off-site which is an offence under the Wildlife and Countryside Act 1981 (as amended).

Given that the spread of invasive species can change over a short period of time, an update survey of the Site is recommended to understand the extent of invasive species prior to construction commencing. A method statement will be produced

²³ Pollard, A. (2009) Visual constraints on bird behaviour. University of Cardiff.

to prevent the spread and control of these species within and off-site. Removal of invasive species will also constitute a potential enhancement to the ecology of the Site. The effect would therefore be negligible, and not significant.

A summary of the assessment of construction related impacts following embedded design is outlined within Table 7.10.

Table 7.10: Construction Related Impacts Following Embedded Design.

Nature of impact	Receptor geographic importance	Significance of effects	EcIA significance	Confidence level
Pollution of Kirkby Brook, including Mill Brook	Regional	Negligible	Not significant	High
Pollution of Mill Brook, Westvale LWS	Regional	Negligible	Not significant	High
Pollution of Simonswood Brook LWS	Regional	Negligible	Not significant	High
Habitat loss – Grassland – other neutral grassland	Local	Minor, adverse	Significant	High
Habitat loss – heathland and shrub – bramble/mixed scrub	Local	Negligible	Not significant	High
No net loss or gain – woodland and forest – other coniferous woodland	Local	Negligible	Not significant	High
Habitat loss – woodland and forest – other broadleaved	Local	Negligible	Not significant	High
Disturbance to habitat from noise and light	Local	Negligible	Not significant	High
Bat – loss or roost	Local	Negligible	Not significant	High
Foraging/commuting bats – loss of habitat	Local	Negligible	Not significant	High
Badger - disturbance	Local	Negligible	Not significant	High
Hedgehog – loss of habitat	Local	Negligible	Not significant	High
Breeding birds – loss of habitat	Local	Negligible	Not significant	High
Breeding birds – disturbance	Local	Negligible	Not significant	High
Amphibian – loss of habitat	Local	Negligible	Not significant	High
Invasive plant species spread	N/A	Negligible	Not significant	High

7.6.2 Operation

Operational impacts at the Site include those relating to the usage of the Site post-construction. This includes the operation of new roads and infrastructure, SuDS/drainage features, buildings for commercial use, new pedestrian and cyclist

routes, landscaping and car parking. All effects during the operational stage are anticipated to be permanent.

Habitat loss and fragmentation occur as a result of the construction phase of the proposed Scheme. Therefore, these impacts are not re-assessed in relation to the operational phase.

The potential effects of operational activities on important ecological features include:

- habitat degradation including pollution, sedimentation and / or changes to hydrology;
- disturbance to species and habitats; and
- habitat fragmentation and physical restrictions to species movements.

Impacts on Designated Sites

There is the potential for hydrological impacts on Kirkby Brook and Mill Brook due to changes in drainage regime, which may impact on the ecological functioning of the brooks.

The drainage system will be designed to ensure that these hydrological impacts are managed (Chapter 9: Flood Risk).

Therefore, the effect of changes in hydrology on the ecological functioning of Kirkby Brook and Mill Brook is considered negligible, and not significant.

Impacts on Habitats

The locations of the Site is situated within an urban environment. Potential impacts on retained habitats during the operational phase are anticipated to be related to potential for pollution impacts from surface water run-off into Kirkby Brook and Mill Brook and potential change in air quality.

As outlined above, the drainage system will be designed to ensure surface water drainage from the urban environment will be managed and not cause adverse impacts on Kirkby Brook and Mill Brook (Chapter 9: Flood Risk). None of the habitats identified within the Site are sensitive to changes in potential air quality. In addition, potential impacts from air quality during the operation phase are deemed to be negligible (Chapter 5: Air Quality).

Therefore, the effect of pollution and change in air quality on retained habitats is considered negligible, and not significant.

Impacts on Protected and Notable Species

Bats

Disturbance impacts on Commuting/Foraging Bats

The Site is located within an urban environment and streetlighting is already present along the existing footpath. However, due to additional road, footpath, infrastructure and station buildings, an increase in quantity and intensity of artificial lighting will occur across the Site. This may impact on foraging/commuting bats through severing corridors and reducing the suitability of areas for bats to forage and commute.

The additional proposed lighting to that already existing will be confined to the proposed car park, road, station and footpath. The illumination contours illustrate light will be concentrated around these developed areas (170248-ARU-REP-EEN-000023). No additional lighting along Kirkby Brook is proposed. Due to the urban setting of the Site, this additional lighting is not considered to have an adverse effect on existing populations of bats utilising the Site for foraging and commuting.

Therefore, the effect of disturbance impacts from lighting on commuting/foraging bats is considered to be negligible, and not significant.

Hedgehog

Disturbance Impacts on Hedgehog

The Site is currently a public amenity space and subject to levels of disturbance from local walkers. Following development of the proposed Scheme, areas of suitable retained habitat are unlikely to be subject to additional disturbance as a result of the Proposed Station Car Park. As with bats, the additional proposed lighting to existing levels will be confined to the proposed car park, road, station and footpath. The illumination contours illustrate light will be concentrated around these developed areas (170248-ARU-REP-EEN-000023). No additional lighting is proposed within areas of retained habitat outside of the Proposed Station Car Park.

Therefore, the effect of disturbance impacts from lighting on hedgehog is considered to be negligible, and not significant.

Breeding Birds

Disturbance Impacts on Breeding Birds

As stated with bats, the quantity and intensity of artificial lighting is anticipated to increase across the Site. This may potentially impact on nesting birds.

Tree planting and hedgerows are proposed across the Proposed Station Car Park which will provide additional opportunities for nesting birds. No additional lighting is proposed on retained habitat areas or those outside of the Proposed Station Car Park, i.e. proposed car park, road, station and footpath. In addition, due to the urban setting of the Site, this additional lighting is not considered to

have an adverse effect on existing populations of breeding birds utilising the Site for nesting.

Therefore, the effect of disturbance impacts from lighting on breeding birds is considered to be negligible, and not significant.

Amphibians

Disturbance Impacts on Amphibians

The Site is currently subject to levels of disturbance from local walkers. Following development of the proposed Scheme, areas of suitable retained habitat are unlikely to be subject to additional disturbance as a result of the Proposed Station Car Park. As with bats, the additional proposed lighting to that already existing will be around the proposed car park, road, station and footpath. The illumination contours illustrate light will be concentrated around these developed areas (170248-ARU-REP-EEN-000023). No additional lighting is proposed within areas of retained habitat out with the Proposed Station Car Park.

Therefore, the effect of disturbance impacts from lighting on amphibians is considered to be negligible, and not significant.

A summary of the assessment of operation related impacts following embedded design is provided in Table 7.11.

Table 7.11: Operation Related Impacts.

Nature of impact	Receptor geographic importance	Significance of effects	EcIA significance	Confidence level
Pollution of Kirkby Brook, including Mill Brook	Regional	Negligible	Not significant	High
Pollution of Mill Brook, Westvale LWS	Regional	Negligible	Not significant	High
Pollution and air quality impact on retained habitats	Local	Negligible	Not significant	High
Foraging/commuting bats - disturbance	Local	Negligible	Not significant	High
Hedgehog - disturbance	Local	Negligible	Not significant	High
Breeding birds - disturbance	Local	Negligible	Not significant	High
Amphibians – disturbance	Local	Negligible	Not significant	High

7.7 Mitigation

Himalayan balsam was recorded throughout the Proposed Station Car Park. It is proposed that Himalayan balsam is managed and removed from within areas of retained habitat, including along Kirkby Brook. This will enhance site biodiversity and ensure habitats are not dominated by invasive species.

7.8 Residual Effects

7.8.1 Construction Phase

The likely construction impacts on ecological features following the implementation of embedded design are outlined in Table 7.12.

It is considered that all potential residual effects will be negligible or not significant once embedded design has been implemented. The exception is the loss of 2.92 ha other neutral grassland.

Table 7.12: Residual Significance of Effects – Construction Phase.

Potential impact	Impact avoidance measures / embedded mitigation	Environmental effect without additional mitigation	Additional mitigation	Environmental effect after additional mitigation (residual effect)	Nature of effect	Potential impact
Habitat loss – Grassland – other neutral grassland	Creation of 1.6 ha of neutral grassland and enhancement of 0.42 ha of neutral grassland.	Minor adverse	No additional mitigation to off-set beyond the already embedded design which includes enhancement of retained grassland and management of Himalayan balsam	Minor adverse	Lt, P, D	Significant

7.8.2 Operational Phase

No significant effects were identified at the operational phase; consequently, there are no residual effects from the operation phase.

7.9 Limitations

The use of third-party information to inform the Ecology Chapter has been assumed to be accurate at the time of writing, unless otherwise specified.

Contents

	Page
8 Landscape and Visual Impact Assessment	2
8.1 Introduction	2
8.2 Planning Policy Context	2
8.3 Assessment Method	9
8.4 Consultation	16
8.5 Baseline Conditions	17
8.6 Design Development and Impact Avoidance	25
8.7 Environmental Impacts and Significance of Effects	25
8.8 Mitigation	30
8.9 Residual Effects	30
8.10 Limitations	32

8 Landscape and Visual Impact Assessment

8.1 Introduction

This chapter has been prepared by Gillespies LLP. It presents an assessment of potential impacts on the landscape and on visual receptors associated with the proposed Headbolt Lane station, car park and railway line upgrade (hereafter referred to as the ‘proposed Scheme’), described in Chapter 2: Scheme Description.

This chapter is supported by the following figures (see Volume II: Figures) and appendices (see Volume III: Technical Appendices):

- Figure 8.1: Proposed Station and Car Park Site;
- Figure 8.2: Study Area and Viewpoint Location Plan;
- Figure 8.3: Bare Earth ZTV;
- Figure 8.4: Google Earth Station Viewshed;
- Figure 8.5: Google Earth Car Park Lighting Viewshed;
- Figure 8.6: Landscape Designations Plan;
- Figure 8.7: National Character Areas;
- Figure 8.8: Photomontages;
- Appendix 8A: LVIA Methodology; and
- Appendix 8B: Viewpoint Assessment.

8.2 Planning Policy Context

This section outlines the planning and policy context of the proposed Scheme relevant to the landscape and visual impact assessment (LVIA).

Planning applications are assessed against a planning policy framework, which consists of the Government’s National Planning Policy Framework (NPPF) and the adopted Local Development Plan.

Plan makers (in this case Knowsley Council) who are responsible for a Local Plan but also community groups who may be working on a neighbourhood plan) must have regard to national policies and advice contained in the guidance when developing their plans. Therefore, local and neighbourhood plans may reflect what the guidance says about certain topics.

8.2.1 National Planning Policy

National Planning Policy Framework

The NPPF places design quality at the forefront of the national agenda for the planning and development process, stating in Section 12 that planning policies and decisions should ensure that development:

- 'a) will function well and add to the overall quality of the area, not just for the short term but over the lifetime of the development;*
 - b) are visually attractive as a result of good architecture, layout and appropriate and effective landscaping;*
 - c) are sympathetic to local character and history, including the surrounding built environment and landscape setting, while not preventing or discouraging appropriate innovation or change (such as increased densities);*
 - d) establish or maintain a strong sense of place, using the arrangement of streets, spaces, building types and materials to create attractive, welcoming and distinctive places to live, work and visit;*
 - e) optimise the potential of the site to accommodate and sustain an appropriate amount and mix of development (including green and other public space) and support local facilities and transport networks; and*
 - f) create places that are safe, inclusive and accessible and which promote health and well-being, with a high standard of amenity for existing and future users; and where crime and disorder, and the fear of crime, do not undermine the quality of life or community cohesion and resilience.'*
- (NPPF Para. 127)*

Paragraph 128 of the NPPF emphasises that design quality should be considered throughout the evolution and assessment of individual proposals and that early discussion between applicants, the local planning authority and local community about the design and style of emerging schemes is important for clarifying expectations and reconciling local and commercial interests.

Section 15 of the NPPF (Conserving and enhancing the natural environment) requires planning policies and decisions to contribute and enhance the natural environment by:

- a) protecting and enhancing valued landscapes, sites of biodiversity or geological value and soils (in a manner commensurate with their statutory status or identified quality in the development plan);*
- b) recognising the intrinsic character and beauty of the countryside, and the wider benefits from natural capital and ecosystem services – including the economic and other benefits of the best and most versatile agricultural land, and of trees and woodland;*

- c) maintaining the character of the undeveloped coast, while improving public access to it where appropriate;*
- d) minimising impacts on and providing net gains for biodiversity, including by establishing coherent ecological networks that are more resilient to current and future pressures;*
- e) preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans; and*
- f) remediating and mitigating despoiled, degraded, derelict, contaminated and unstable land, where appropriate. (NPPF Para. 170)*

Section 16 of the NPPF (Conserving and enhancing the historic environment) makes it clear that the Government attaches great weight to the conservation of the historic environment, stating that new development should make a positive contribution to local character and distinctiveness and explore opportunities to draw on the contribution made by the historic environment to the character of a place.

National Planning Practice Guidance

The NPPG adds further context to the NPPF and it is intended that the two documents should be read together. The key categories of the NPPG in relation to the LVIA are:

- Environmental Impact Assessment published in May 2020 - Explains requirements of the Town and Country Planning (Environmental Impact Assessment) Regulations 2017¹;
- Light Pollution (November 2019) - advises on how to consider light within the planning system; and
- Natural Environment (July 2019) - explains key issues in implementing policy to protect and enhance the natural environment, including local requirements.

8.2.2 Local Planning Policy

KMBC's spatial planning strategy is set out in a number of different documents which together make up the development plan. The Local Plan includes 'Development Plan Documents' adopted under the Planning and Compulsory Purchase Act 2004. In Knowsley, this includes the Local Plan Core Strategy, Local Plan Site Allocations and Development Policies and Merseyside and Halton Joint Waste Local Plan, accompanied by a Local Plan Proposals Map Policies

¹ Ministry of Housing, Communities and Local Government. (2017) Town and Country Planning (Environmental Impact Assessment) Regulations.

Map. While these documents are being finalised, the Local Plan also includes the Saved Policies of the Knowsley Replacement Unitary Development Plan (2006).

Knowsley Local Plan Core Strategy

The Knowsley Local Plan Core Strategy², adopted in January 2016), is the main document in the Local Plan and sets out the vision, objectives and policies, which will guide development within KMBC up to the year 2028.

The Core Strategy includes the following policies, which are intended to protect or enhance the quality or the landscape and are of relevance to the LVIA. The relevant clauses are set out below.

Policy CS8: Green Infrastructure explains that:

'The Council actively conserves and manages Green Infrastructure to enhance its quality, connectivity and accessibility, and to create new areas where needed. The general approach towards Green Infrastructure is supported by national guidance, which recognises the need to maintain and enhance the 'green and blue infrastructure' – trees, plants, absorbent surfaces, streams, ponds and rivers. This helps to mitigate climate change, promote biodiversity and prevent flooding. Furthermore new development in Knowsley will require improvements to the Green Infrastructure network, both to meet the needs of residents and to counteract the effects of new hard infrastructure (roads, sewers and utilities etc.). Policy CS8 (in conjunction with Policy CS21: Greenspaces and Trees) will help secure these improvements.' (Para. 5.81)

Section 6 of the policy states that:

'New development must be served by Green Infrastructure to meet the needs of residents and the local environment, in a manner which will:

- a) Contribute to the creation of a high quality residential environment;*
- b) Provide access to high quality open space for leisure and recreational purposes;*
- c) Seek to protect, maintain and where possible enhance biodiversity within and around new developments according to their designation and significance to provide space for nature; and*
- d) Provide adequate mitigation and/or, as a last resort, compensation for Green Infrastructure or biodiversity loss, in circumstances where harm resulting from the development is otherwise unavoidable.'*

Policy CS12: Principal Regeneration Area Tower Hill explains that:

'To meet the priorities for Kirkby, there is a specific policy for the Tower Hill area of Kirkby, which adjoins the site for the proposed Development. The policy is intended to deliver significant change and new development to address the high levels of deprivation in one of the most vulnerable areas of Knowsley, with

² Knowsley Metropolitan Borough Council. (2016) Knowsley Local Plan Core Strategy.

particular focus on addressing the existing unbalanced housing market. ' (Para. 6.34)

Section 1 of the policy states that:

'Comprehensive redevelopment and improvement of the Tower Hill Principal Regeneration Area, will be facilitated, including (in no order of priority):

- a) New housing development, to provide a wider choice of housing accommodation to meet local housing needs;*
- b) Enhanced design quality and site layout providing improved integration with surrounding areas and Kirkby Town Centre;*
- c) Small scale enhancements to retail, employment, leisure, education, health and community facilities, appropriate to the scale and function of a local centre to complement that of Kirkby Town Centre;*
- d) Public realm enhancements as a key feature of Green Infrastructure focused upon significant improvements to quality, accessibility and integration with new development;*
- e) Infrastructure improvements, including enhanced public transport provision and maximising opportunities for walking and cycling to create accessible linkages in Tower Hill and linking to surrounding areas; and*
- f) Flexibility to integrate and safeguard the potential delivery of a new transport interchange, including a new rail station and Park and Ride to the south of Headbolt Lane. '*

Policy CS19: Design Quality and Accessibility in New Development explains that:

'There is considerable scope for new development to improve the quality of place and character within Knowsley, by promoting attractive design of new buildings and spaces. ' (Para. 9.2)

Section 1 of the policy states that:

'To enhance the local distinctiveness, identity and accessibility of places, new development within Knowsley will be expected to:

- a) Respond to and integrate positive characteristics of immediate surroundings, including local materials, scale, mass, form, layout, alignment and density of the existing built environment;*
- b) Complement and enhance (where possible), existing landscape, topography, Green Infrastructure; and features of local importance and historic interest;*
- c) Consider provision of landmark buildings and additional detailing at and adjacent to main gateways, movement corridors, town centres and strategic regeneration opportunities;*
- d) Create spaces and places as a focal point, accommodating social interaction and active lifestyles, including provision and integration of high quality public*

realm and open spaces, public art (as appropriate); and landscaping which promotes biodiversity and integrates existing local habitats;

e) Provide safe, secure and convenient routes for movement (including signage), with priority for walking, cycling and public transport, to meet the access needs of all users, particularly pedestrians, cyclists, less mobile people and the elderly; and

f) Integrate effectively with existing development and link to existing shopping and service provision; and g) Demonstrate community engagement during the design phase of major development proposals. '

Section 2 of the policy states that:

'To maintain a good standard of amenity for all existing and future occupants of land and buildings, development proposals will be required to:

a) Avoid unacceptable impacts on existing residents, business occupiers, and future occupiers;

b) Minimise crime, fear of crime and anti-social behaviour, including good levels of natural surveillance and security; and c) Accommodate future maintenance and long term management requirements. '

Policy CS21: Greenspace and Trees explains that:

'Open and greenspaces have a key role in the protection of the environment, providing habitats for flora and fauna, and enhancing the health and wellbeing of communities by encouraging physical activity and exercise. ' (Para. 9.22)

Section 10 of the policy states that:

'The Council will encourage proposals for new development to incorporate:

a) Retention of existing trees, woodland, vegetation and other habitat features which offer a positive contribution to the local environment in terms of visual amenity, recreation value or biodiversity/wildlife interest;

b) Appropriate planting of trees, other soft landscaping and installation of habitat features for the benefit of biodiversity; and

c) Adequate replacement provision where tree loss is unavoidable, comprising two additional trees for every tree lost and taking account of species and size. '

Knowsley Replacement Unitary Development Plan

The Knowsley Replacement Unitary Development Plan was adopted in June 2006. Under the transitional arrangements for moving to the Local Plan system, all but four of the 82 individual UDP policies were 'saved' by the Secretary of State on 12 June 2009. An additional three UDP policies were replaced on adoption of the Merseyside and Halton Joint Waste Local Plan. A further 36 policies were deleted on adoption of the Local Plan Core Strategy.

This leaves 39 UDP Policies, which continue to be saved. Of these, the following is of relevance to the LVIA.

Policy Env3: Light Pollution explains that:

'The lighting of developments is important for security and safety reasons. However, different forms of lighting, from street lighting to security lighting, increasingly and unnecessarily pollute today's environment. Poorly designed or badly aimed lights that are responsible for 'sky-glow' can have detrimental effects on wildlife, astronomical interests, highway safety and reduce the feeling of remoteness in rural areas.' (Para. 13.17)

The policy states that:

'Development requiring external lighting must satisfy the following criteria:

- a) The lighting scheme proposed is the minimum required for security and working purposes to undertake the task;*
- b) There would be no unacceptable impact on visual amenity in the surrounding area;*
- c) The scheme will not have an unacceptable effect on road safety;*
- d) The scheme will not harm wildlife; and*
- e) There will be no unacceptable loss of residential amenity.'*

Supplementary Planning Documents

Supplementary Planning Documents (SPD) sets out the KMBC's aspirations and expectations for design standards in new development and complement the policies within the Local Plan. SPDs are prepared to assist the interpretation of policies within the statutory development plan and provide more detailed guidance to developers on specific development issues. The guidance in SPDs is a material consideration in determining planning applications. The documents of relevance to this topic chapter are:

Other documents, which are relevant to this LVIA are the following Supplementary Planning Documents (SPDs), all of which are material considerations in the determination of planning applications:

- Design Quality in New Development Supplementary Planning Document (January 2016) - prepared to provide the overarching context for design in the borough, and highlights borough wide issues which should be taken into account in designing new development;
- Trees and development Supplementary Planning Guidance (June 2016) - explains the Council's approach in relation to trees and development, setting out guidance relating to:
 - promoting best practice for proposals incorporating trees and landscaping within new developments;
 - development proposals affecting existing trees, woodlands and other vegetation;
 - requirements for detailed survey of all existing trees; and
 - requirements for provision of replacement trees

- Tower Hill (Kirkby) Action Area (April 2007) - designed to guide the regeneration of the Tower Hill area of Kirkby. Its vision is to ‘Put the Heart Back into Tower Hill’ with the core objective of delivering a high quality, secure environment that has unique identity.

8.2.3 Other Relevant Legislation, Standards and Guidance

The approach and methodology used in the preparation of this LVIA is based on guidance provided in the Guidelines for Landscape and Visual Impact Assessment Third Edition (GLVIA3)³. GLVIA3 is the established best practice guidance for landscape and visual impact assessment.

The LVIA has also been carried out in accordance with, and with reference to the following:

Assessment Guidance

- Christine Tudor, Natural England. An Approach to Landscape Sensitivity Assessment – to Inform Spatial Planning and Land Management⁴;
- Christine Tudor, Natural England. An Approach to Landscape Character Assessment⁵; and
- Landscape Institute. TGN 06/19 Visual Representation of Development Proposals⁶.

8.3 Assessment Method

The topic specific LVIA methodology is described in detail at Appendix 8A.

8.3.1 Definitions

The term ‘landscape’ in the context of this LVIA is taken to mean the physical, aesthetic and perceptual characteristics of the built-up area, including the buildings, the open greenspaces, and the relationship between buildings and open spaces.

Landscape character and resources are considered to be of importance in their own right and are valued regardless of whether they are seen by people. Effects on views and visual amenity as perceived by people are clearly distinguished from, although closely linked to, effects on landscape character and resources. Landscape and visual assessments are therefore separate, although linked, processes.

³ Landscape Institute and Institute of Environmental Management & Assessment (2013), Guidelines for Landscape and Visual Impact Assessment, 3rd Edition (GLVIA3).

⁴ Christine Tudor, Natural England. (2019) An Approach to Landscape Sensitivity Assessment – to Inform Spatial Planning and Land Management.

⁵ Christine Tudor, Natural England. (2014) An Approach to Landscape Character Assessment.

⁶ Landscape Institute. (2019) TGN 06/19 Visual Representation of Development Proposals.

- landscape impacts can arise from physical change, such as changes associated with the demolition of the existing buildings, removal of trees or the development of the new structures. These physical changes may result in changes to the distinctive character of the landscape and how it is experienced. With respect to landscapes designated or valued for their aesthetic or townscape quality, such changes can affect the purpose of the designation or their perceived value; and
- visual impacts are changes to the composition of people's views or visual amenity caused by the appearance and prominence of the proposed Scheme in those views. They can occur both during the day or at night depending on the type of development and extent of night-time lighting.

8.3.2 Scope of the Assessment

The EIA Regulations are clear that when preparing an LVIA, the emphasis should be on likely significant effects and stress that the assessment should be in proportion to the scale of the project and the nature of its likely effects. This does not mean that effects should be ignored or their importance minimised, rather that the scope of the assessment should be tailored from the outset.

The scope of the assessment was informed by pre-application consultation with KMBC's Landscape Planning Officer, the Scoping Opinion and the professional judgement of the assessment team. It includes:

- effects on the physical landscape;
- effects on the landscape character of the site and its immediate surroundings;
- effects on views and visual amenity experienced by visual receptors (people) at representative viewpoints within the surrounding settlement; and
- effects of night-time lighting.

Effects not included in the LVIA are:

- potential effects, which were not considered likely to give rise to significant effects and were therefore not included in the assessment. This includes effects arising from the railway line works, which are unlikely to give rise to significant landscape or visual effects;
- effects on the key characteristics and/ or special qualities, or views from designated landscapes or townscapes as there are none either within the Site or within a 0.75 km radius, beyond which potentially significant effects are unlikely to occur; and
- effects on visual receptors that have minimal and/ or very distant visibility, and are therefore unlikely to experience effects, that could be considered significant.

8.3.3 Photographs and Photomontages

For each of the agreed viewpoints, high resolution GPS located photographs were taken and panoramic images produced by 'stitching together' together a number

of single-frame images. These are used to illustrate the Viewpoint Assessment included as Appendix 8C.

To represent the context and outline and extent of the development, five annotated visualisations and a wireline image were produced.

The images and their locations, which are included as Figure 8.8, are presented as two related sheets: baseline photograph and photomontage. These are presented at the same size to allow direct comparison.

8.3.4 Sources of Information and Data

Desk-Based Study

The data sources used for the assessment include the following:

- Ordnance Survey (OS) 1:10,000, 1:25,000, base mapping;
- OS Terrain® 5 mid-resolution height data (DTM);
- Google Earth Pro aerial photography and terrain modelling; and
- KMBC's interactive mapping (website) showing environmental designations, features and planning policy).

Other documents, which provided useful baseline information included:

- Natural England's Landscape Character Areas; and
- KMBC's (2004) Landscape Character assessment of Knowsley Metropolitan Borough.

Field Survey

Field survey work was carried out on 22 April 2021 and records were made in the form of field notes and photographs. Weather conditions were dry with good visibility, and the trees were partially in leaf. The survey work included visits to the Site, viewpoints and walkover surveys in and around the Site to consider potential effects on landscape character and on views from the surrounding area.

8.3.5 Study Area

The extent of the study area for the visual assessment, which is shown in Figure 8.2, was informed by the surrounding urban environment, and by the physical scale of the proposals and the likely distance over which it would be sufficiently visible to give rise to significant effects. It was also informed by preparation of Zones of Theoretical Visibility Maps (ZTVs). Figure 8.3 shows the bare earth ZTV for the station building and car park lighting. This does not take into account the screening effects of built development or vegetation and as such represent the worst-case visibility. In reality, views from the surrounding area towards the proposed Scheme would be partially or fully obscured by intervening buildings and vegetation. This is better illustrated by Figure 8.4 and 8.5. These show the ZTVs for the station building and car park lighting superimposed onto Google

Earth. Once intervening screening elements and features are taken into account, the extent of potential visibility becomes much smaller and restricted mainly to the site and its immediate surrounds.

As shown in Figure 8.1, new housing development now covers the open greenspace at Northwood between the railway line and Roughwood Drive in the Mulberry Park development, and north of Headbolt Lane between Oakworth Close and Langton Road in the Highfield Place development. This is not shown on the Google Earth base plans used for the ZTVs because the terrain data used for the ZTVs predates the 2019 Google Earth satellite imagery. The effect of this new housing on the ZTVs is to further contain the views to the north and south-east, which are shown on the ZTV for the station, car park lighting and substation superimposed onto Google Earth.

The study area extends 750 m from the outside edge of the proposed station and car park site. Although the railway line works extend beyond this distance to the west, these are not anticipated to give rise to any significant landscape or visual effects and therefore are not discussed further in the assessment.

An examination of the study area and ZTVs (backed up by field verification) was used to identify six viewpoints, which were agreed with the KMBC's Landscape Officer as being representative of typical views from the surrounding area towards the Site. The viewpoints are listed in Table 8.2, shown on Figure 8.2 and presented in the Viewpoint Assessment at Appendix 8C. They are all publicly accessible locations.

Within the 750 m study area, the landscape assessment focussed on local landscape character, i.e. the Site and its immediate surroundings. This is because any change to the character of the Site is highly unlikely to give rise to significant adverse effects on the wider character of the wider urban area.

8.3.6 Impact Assessment and Significance Criteria

The topic specific LVIA methodology is described in detail at Appendix 8A and should be referred to when reviewing the findings of this assessment to gain a clear understanding of how judgements on value, susceptibility, magnitude and significance were made.

Establishing the Baseline

The first stage in the assessment was to establish the existing nature of the landscape and visual environment in the study area. This information formed the basis for the subsequent impact assessment. It included the following:

- a review of landscape planning designations and policy;
- an understanding of the Site in the wider study area: its constituent elements; its character and the way that this varies spatially; its geographic extent; any designations which apply to it; condition; the way that it is experienced; and, the value attached to it; and

- an understanding of the areas from which the proposed Scheme may be visible, the different groups of people (visual receptors) who may be affected and, where possible, an estimate of their numbers, the places that would be affected and the nature (value) of the views and visual amenity currently experienced at those locations.

The assessment was undertaken through a combination of desk-study and field observations. The baseline landscape character also utilised information from the Landscape Character assessment of Knowsley Metropolitan Council (2004) and the National Character Area Profiles⁷ prepared by Natural England.

Identification and Assessment of Effects

The key aspects of the proposed Scheme were considered against the baseline conditions to allow the potential significant landscape and visual effects on the following receptors to be predicted:

- landscape receptors, including the constituent elements of the Site's landscape, its aesthetic or perceptual qualities and the character of the landscape; and
- visual receptors or the people who could be affected by changes in views and visual amenity at different locations.

The effects and their significance were then identified by establishing and describing the changes resulting from the different components of the proposed Scheme on individual landscape or visual receptors. This took account of both the nature or sensitivity of the receptor and the nature or magnitude of the change likely to occur.

Each judgement was determined by a combination of quantitative and qualitative assessment using professional judgement accompanied by a clearly explained rationale.

To determine the level of importance of each landscape effect, the separate judgements about the sensitivity of the landscape or visual receptors and the magnitude of landscape effect were combined to allow a final judgement to be made about whether or not the effect is considered significant. Whilst paragraph 3.33 of GLVIA3 notes that it is not essential to establish thresholds of significance, for the purpose of this assessment, effects have been summarised into four categories of significance – negligible, minor, moderate and major.

The design and appearance of the proposed Scheme and how it sits within the landscape of the Site, ultimately affects how any effects are likely to be perceived. Effects may be adverse or beneficial and may be affected by mitigation or enhancement.

⁷ Natural England Natural Character Area Profiles. Available at <https://www.gov.uk/government/publications/national-character-area-profiles-data-for-local-decision-making/national-character-area-profiles>. Accessed 01/05/2021

The four levels of effect are broadly defined in Table 8.2 and also classified as beneficial or adverse. Any effect classed as moderate or major is considered significant and therefore a material consideration in the decision making process.

Table 8.1: Levels of importance of landscape and visual effects

Category	Description	Category
Beneficial effect of major importance	The proposed Scheme would be in keeping with and would provide a major improvement to the character of the landscape or the value of an existing view. The effect is likely to be long-term and affect a relatively large area and/ or relatively large number of people.	Beneficial effect of major importance
Beneficial effect of moderate importance	The proposed Scheme would be in keeping with and would provide a noticeable improvement to the character of the landscape or the value of an existing view.	Beneficial effect of moderate importance
Beneficial effect of minor importance	The proposed Scheme would be in keeping with and would provide a perceptible improvement in the character of the landscape or the value of an existing view. The effect is likely to be long-term and affect a relatively small area and/ or relatively few people.	Beneficial effect of minor importance
Negligible	The proposed Scheme would be barely perceptible and have very little effect on the character of the landscape or the value of the existing view.	Negligible
Adverse effect of minor importance	The proposed Scheme would cause a perceptible deterioration in the character of the landscape or the value of an existing view. The effect is likely to be long-term and affect a relatively small area and/ or relatively few people.	Adverse effect of minor importance
Adverse effect of moderate importance	The proposed Scheme would cause a noticeable deterioration in the character of the landscape or the value of an existing view.	Adverse effect of moderate importance

Category	Description	Category
Adverse effect of major importance	The proposed Scheme would be the dominant feature and cause a major deterioration in the character of the landscape or the value of an existing view. The effect is likely to be long-term and affect a relatively large area and/ or relatively large number of people.	Adverse effect of major importance

It should be emphasised that, because landscape and visual effects are not quantifiable, each of the four categories covers a broad range of effects and represents a continuum or sliding scale. Where intermediate ranges are given e.g. ‘moderate/ major’, it does not refer to an effect which varies across the threshold range. Instead it indicates an effect which does not fall within the ‘major’ category but is nevertheless at the higher end of moderate and bordering on major.

Duration and Reversibility of Effects

The duration of the likely effects is defined as follows:

- short term – temporary during construction and decommissioning only (zero to five years);
- medium term – declining after the end of construction due to the effect of mitigation measures, and no longer felt after 15 years; and
- long term – effects still felt 15 years after construction, and no longer declining.

Reversibility is a judgement about whether the particular effect is reversible in the long term. In this case, the proposed Scheme is in perpetuity therefore the operational effects are described as long term and irreversible.

Visual effects of the proposed Scheme are considered during operation at the opening year and assume implementation of embedded mitigation planting.

Residual visual effects of the proposed Scheme are considered when any specific mitigation planting proposals would have established fifteen years after the opening year.

Mitigation Measures and Residual Effects

The purpose of mitigation is to avoid, reduce and where possible, remedy or offset any significant adverse effects resulting from the proposed Scheme. The most effective mitigation measures are ones which are integral to the scheme. A distinction is therefore made between landscape measures designed as an intrinsic part of the scheme (primary or embedded measures) (see Section 8.6) and those which are intended to specifically counter any residual negative effects of the development (secondary measures) (Section 8.9).

Residual effects are those effects which remain after mitigation. The level of importance and significance of these effects are assessed using the methods outlined previously.

8.4 Consultation

The details of specific issues raised in relation to the LVIA during the consultation process with the KMBC's Landscape Officer are set out in Table 8.1.

Table 8.2: Consultation Summary

Consultee and date	Issue raised	Summary of response
15.04.21 – Brief telephone conversation with Landscape Officer	Discussed concerns regarding the scale and design of the car park and arranged follow up call. Also requested the latest layout plan.	Concerns regarding the design of the car park are noted and the landscape plan has been designed to provide screening of the car park.
26.04.21 - Teams meeting with Landscape Officer	Agreed six viewpoint locations on which to base the assessment of visual effects. Agreed that KMBC would investigate who requested the nighttime lighting assessment in Scoping Opinion. I explained that the site and Headbolt Lane are already well lit and the difference in light levels between the existing and proposed lighting may be too small for there to be any value in us assessing it using a qualitative approach. Discussed the use of wirelines to illustrate the likely effect of the car park proposals on views. Discussed KMBC's concerns regarding the size and layout of car park.	LVIA to include the six agreed viewpoint locations. Email dated 27.04.21 - KMBC advised that they would require a measured impact including lumen information and isolux drawings. To be actioned outwith the LVIA. Email dated 27.04.21 - KMBC noted that there has been no specific advice on the method of capturing the development changes within the LVIA; as such there has been no request for wireframe only views to capture proposals. KMBC also noted that the use of wireframes would not be adequate to illustrate the effects of the development, particularly the car park, and requested photomontage views to capture the impact of the car park on the proposals.

8.4.1 Key Parameters for Assessment

The following discipline specific assumptions were made in relation to the proposed Scheme design and are outlined below to demonstrate how the proposed Scheme was assessed.

Study Area

Based on the ZTVs and site survey, the study area shown in Figure 8.2 was identified. This extends 750 m from the outside edge of the Site. Although the railway line works extend beyond this distance to the west, they not anticipated to give rise to any significant landscape or visual effects and therefore were not included in the assessment.

Landscape Proposals

The assessment assumes the landscape proposals shown on Figure 2.15 are implemented. It then assesses the operational effects at year of opening and at year 15, when the planting proposals shown in the landscape plan have had chance to establish to circa 8 – 9 m high.

Viewpoints

In accordance with GLVIA3, site assessment was undertaken from six publicly accessible viewpoints. These were not intended to illustrate every possible location from where there might be a view of the proposed Scheme, but rather to present a selection of views from a variety of directions and distances to inform decisions about the scheme's likely landscape and, in particular, visual effects. No access to private properties was sought and no assessment of views from upper storey windows was made (other than an occasional commentary about possible views).

Photography used to illustrate the viewpoints and presented in the Viewpoint Assessment at Appendix 8C was undertaken in April 2021. The vegetation was partially in leaf so the assessors used professional expertise and experience to predict the likely winter visibility i.e. the realistic worst case scenario.

Geographic and Temporal Parameters

For the purposes of the visual assessment, distances are defined as follows:

- close or near distance view (0 -100 m);
- middle distance view (100 -1000 m); and
- long or distant view (1 km or more).

8.5 Baseline Conditions

8.5.1 Site Location

The proposed station and car park site currently comprises an area of open amenity greenspace approximately 900 m north-east of the centre of Kirkby (Grid Ref: SJ 41308 99815).

The Site is bound by Headbolt Lane to the north and the A506 Bank Lane/ County Road to the west. A railway line, operated by Northern Rail, forms the southern boundary to the Site, with areas of new housing beyond.

Kirkby Brook, flows in a south-westerly direction through the Site before joining Simonswood Brook, which flows north-south through Millbrook Park Millennium Green to the west.

A tarmac footpath broadly follows the course of the brook through the Site and although illuminated at night, is not a public right of way and does not appear on the interactive KMBC website.

8.5.2 Wider Context

The Site is situated in the Tower Hill area of North Kirkby in the Borough of Knowsley, close to the borough boundaries of Sefton and West Lancashire. Tower Hill was a rural area up until the 1970's when a large public housing estate was built to accommodate part of the overspill from Liverpool. During the 1980's the medium and high rise core was demolished. During the 1990's the remaining low-rise housing was remodelled to alleviate access problems and improve the environment.

Since 2000, the area north of Shevington's Lane has been developed to provide a private housing area comparable in size to the original public housing estate. This housing area is effectively a large village with clearly definable boundaries and the potential to evolve into a desirable and sustainable suburban settlement. Although this area is popular with its new residents, it is a cul-de-sac development with no community facilities or public transport penetration and there is a reliance on private car travel.

The Tower Hill Action Area lies north of the railway line, with Shevington's Lane forming its northern boundary. It is at the northernmost part of the borough, close to the West Lancashire border.

To the south of the railway line, the Northwood Area of Kirkby is similar in character to Tower Hill, with mid to late 20th century large public and private housing estates interspersed with pockets of open greenspace, particularly concentrated along the rail line.

The aerial photograph in Figure 8.1 shows how the proposed station and car park site is situated between railway line to the south and Headbolt Lane to the north. The Site is one of several areas of greenspace found along the Simonswood/ Kirkby Brook corridors linking Tower Hill and the North of Kirkby to the Kirkby Town Centre and College. To the south of the railway, is a linear greenspace, which forms part of Mersey Forest's Northwood Woodland Creation project. New housing development now covers the open greenspace between the railway line and Roughwood Drive, and between Oakworth Close and Langton Road.

Situated to the west of the Site, Millbrook Park Millennium Green is a large area of open parkland with semi natural grassland and woodland. It is of high recreational value and also forms part of Kirkby's main strategic greenspace. It is the only urban green corridor (Valley Corridor), linking through to Kirkby town

centre. It is designated as Kirkby Brook/ Mill Brook Local Wildlife Site (LWS) and a Regionally Important Geological and Geomorphological Site (RIGS), due to the stream course and banks, which are rich in plants with exposures of sandstone in places and wet flushes. Much of the park comprises a large open area of mown neutral grassland with peripheral broad-leaved woodland, hedgerow, tall herb and individual semi-mature trees. There are also three large areas of acid grassland located on the raised areas of land at the extreme northern and southern parts of the park. Some of the open grassland is prone to flooding and has been developed as wet grassland habitats to increase the biodiversity. It is also a key habitat for locally rare species of plants and animals and the exposed sandstone rock face near the church is also a rare feature in the Borough. Effects on the designated nature conservation sites are assessed in Chapter 7: Ecology.

The park links to many other greenspaces, including Mill Dam Park to the north, the fields to the north of the railways line, the neighbouring St. Chad's Gardens to the south, and Kirkby Valley, which extends out to the M57.

8.5.3 Designated Landscapes

Landscapes, or individual components of the landscape, may be protected under a range of statutory or local designations. Figure 8.6 shows that there are no designated sites within the study area but there are some small areas of National Forest Inventory Woodland (NFI Woodland) either side of the railway line within Millbrook Park Millennium Green and within the amenity greenspace near Dale Lane at the eastern end of the proposed Scheme. These woodlands are not designated but are recorded on the National Forest Inventory Map for GB and monitored regularly by the Forestry Commission. The map covers all forest and woodland area over 0.5 hectare with a minimum of 20% canopy cover (or the potential to achieve it) and a minimum width of 20 m.

8.5.4 Landscape Character

Landscape character is defined as the distinct recognisable and consistent pattern of elements in the landscape that makes one landscape different from another. Such elements include landform, land use, vegetation cover, field boundaries, settlement patterns and types of buildings, roads, railways and public rights of way.

National Landscape Character

Natural England provides a series of profiles for England's 159 National Character Areas (NCAs). These are areas that share similar landscape characteristics, and which follow natural lines in the landscape rather than administrative boundaries. This makes them a good decision-making framework for the natural environment.

The Site falls within NCA Profile: 58 Merseyside Conurbation as shown in Figure 8.7.

NCA Profile 58: Merseyside Conurbation, as its name suggest, is a predominantly urban and suburban landscape, reflecting major industrial, commercial and

residential expansion from the 18th century onwards. The large large-scale development of Kirkby is wholly a product of the period since 1952.

The Merseyside Conurbation occupies a low-lying but gently rolling platform punctuated by low sandstone ridges and bisected by the lower estuary of the River Mersey. The dominant influence of urban development, however, overrides much of the underlying geology and landform.

The Mersey Forest covers much of the area, encouraging the establishment of new community woodland and other greenspace, recognising the important quality of life benefits these features provide.

There is a dense settlement pattern with areas of housing, industry and commercial development, interlinked by an extensive transport infrastructure. Pockets of farmland remain on the fringes of the urban areas, often in arable or horticultural cultivation, although subject to the pressures of the urban fringe. An extensive network of green infrastructure is interspersed throughout this largely urban area. Local Wildlife Sites, Local Nature Reserves, parks, canals, cemeteries, gardens, golf courses and allotments are all important refuges for wildlife, while providing places of relative tranquillity for people to enjoy.

There is pressure for development and regeneration within the Merseyside Conurbation NCA. Challenges exist in ensuring the area's natural environment is resilient enough to meet these demands. Securing and enhancing green infrastructure provides an opportunity to deliver the benefits of a high-quality, healthy natural environment, including managing surface waters and reducing flood risk; adapting urban environments for climate change resilience; enabling healthy activity, recreation and social cohesion; and conserving the area's distinctive biodiversity, landscape and heritage.

The NCA Profile provides several Statements of Opportunity, including:

‘SEO 2: Provide a network of green infrastructure to create a high-quality urban environment that underpins economic and social wellbeing, improves resilience to climate change, supports biodiversity, and provides recreational and educational opportunities.’

‘SEO 3: Plan to connect habitats across the urban fabric, creating corridors and stepping stones for wildlife, to enhance the landscape, create local routes for walking and cycling, and provide accessible natural greenspaces for people close to where they live and work.’

Regional Landscape Character

A Landscape Character Assessment for Knowsley Metropolitan Borough was published in 2004 and today forms part of the evidence base for the Core Strategy.

The Knowsley Landscape Character Assessment identifies and describes the character and distinctiveness of the Boroughs landscape. The report sets the context in terms of both national and local planning policy and establishes links with the Merseyside Historic Characterisation Project. Six landscape character types and seven landscape character areas are identified. However, the Site and its

immediate surroundings are classed as urban and were excluded from the assessment.

Local Landscape Character

Landform

The landform of the Site comprises a shallow valley along the course of the Kirkby Brook, which flows in a south-westerly direction to a confluence with Simonswood Brook within Millbrook Park Millennium Green. The stream falls from around 25 mAOD in the east to 20 mAOD near Simonswood Brook. The rolling valley sides rise to a high point of 30 mAOD near Headbolt Lane and are steepest at the eastern end of the Site.

Site Boundaries

The Site is bound to the west by the A506 Bank Lane/ County Road, beyond which is an area of greenspace that extends into Millbrook Park Millennium Green. To the north and east, residential properties and a small area of open greenspace to the north of Headbolt Lane form the northern boundary of the Site. To the south is the vegetated corridor of the railway line with Mersey Forest's Northwood Woodland Creation project and housing beyond.

Access and Public Rights of Way

The site is not fenced and can also be accessed at many points from the A506 Bank Lane/ County Road and Headbolt Lane. A non-designated footpath, runs from Headbolt Lane through the site to the A506 County Road. The footpath crosses Kirkby Brook in two locations and is illuminated at night by lighting columns circa 4-5 m tall. The Site is used as a shortcut and also for informal recreation including dog walking.

Vegetation

The Site is mainly open and comprises short mown grass with meadow grass and occasional scrub along the course of Kirkby Brook and on part of the valley side to the south of the watercourse. A few mature trees and five recently-planted standard trees are found along the boundary of the Site with the A506 County Road. The main vegetation, however, is found along the railway corridor and comprises scrub and mature trees, which provide some visual screening between the housing areas at Tower Hill and Northwood.

8.5.5 Landscape Value

The application site is an area of open greenspace that is not covered by any designations and has very limited historic environment interest. There is some ecological value in terms of protected species but any likely effects will be mitigated. The existing character and the appearance of the site contributes to the wider setting of the surrounding housing and visually separates the Northwood and Tower Hill areas of Kirkby.

The site is valued by the local community and is considered to be of medium landscape value.

8.5.6 Visual Baseline

The ZTVs for the station building and the car park lighting columns presented in Figure 8.4 and Figure 8.5, show the area from which the proposed Scheme is likely to be visible.

As shown in Figure 8.1, new housing development now covers the open greenspace at Northwood between the railway line and Roughwood Drive in the Mulberry Park development, and north of Headbolt Lane between Oakworth Close and Langton Road in the Highfield Place development. This is not shown on the Google Earth base plans used for the ZTVs because the terrain data used for the ZTVs predates the 2019 Google Earth satellite imagery. The effect of this new housing is to further contain the views to the north and south-east compared to what is shown in the ZTVs.

The extent of visibility for the proposed Scheme is mainly determined by the distribution of buildings and mature vegetation surrounding the Site. Given the relatively flat nature of the landform and scale of development proposed, views of the proposed Scheme will be mainly restricted to those properties close to the application site. This includes views from nearby properties in and around Boyes Brow, Headbolt Lane and the A506 Bank Lane/ County Road. It also includes views from houses on the edge of the new residential developments at Mulberry Park and Highfield Place.

Visual Receptors

Visual receptors are the people who live in or visit the area and who will have views of the proposed development. The assessment focuses on those receptors who are likely to be most sensitive to the effects of the proposed development. These include:

- occupants of residential properties on the north side of Boyes Brow;
- occupants of residential properties on the north side of Headbolt Lane, including people living in the new housing development at Highfield Close;
- occupants of residential properties on the west side of the A506 County Road close to the existing railway line underbridge;
- occupants of residential properties on the south side of the railway line, including people living in the new housing developments off St Kevin's Drive and Mulberry Park; and
- occupants of vehicles and pedestrians using the A506 Bank Lane/ County Road and Headbolt Lane.

To inform the assessment of effects, six representative viewpoints were selected and agreed with KMBC's Landscape Architect as best representing the range of views available from public vantage points. It is recognised that there is always the potential to include more viewpoints but, in line with best practice guidance (GLVIA3), the number and distribution was selected to be representative of locations where significant visual effects are likely to be experienced as a result of the proposed Scheme.

The location of these viewpoints is shown in Figure 8.2, with an assessment of the effects likely to be experienced (undertaken through field survey) provided at Appendix 8C. Table 8.3 lists the viewpoints and provides an assessment of their sensitivity (which combines a judgement on the susceptibility of the receptor and the value of the existing view).

Table 8.3: Schedule of viewpoints

Viewpoint number	Viewpoint title	Reason for selection	Grid reference
VP 01	Junction of Bassenthwaite Avenue with Boyes Brow	To represent the views experienced by receptors including occupants of the properties around the Bassenthwaite Avenue/ Boyes Brow junction whose attention or interest is likely to be focussed on the view. It also represents the views experienced by transient users of the nearby roads, whose attention may be partially focussed on the view but it will not be their primary focus.	E 341564 N 399867
VP 02	Junction of Heathfield Drive with Headbolt Lane	To represent the views experienced by receptors including occupants of the properties off Heathfield Drive on Apollo Crescent and Ashburn Drive whose attention or interest is likely to be focussed on the view. It also represents the views experienced by transient users of the nearby roads, whose attention may be partially focussed on the view but it will not be their primary focus.	E 34117 N 399827
VP 03	Junction of Fallowfield Lane with Headbolt Lane	To represent the views experienced by receptors including occupants of the properties around the Headbolt Lane/	E 341298 N 399915

Viewpoint number	Viewpoint title	Reason for selection	Grid reference
		Fallowfield Lane junction whose attention or interest is likely to be focussed on the view. It also represents the views experienced by transient users of the nearby roads, whose attention may be partially focussed on the view but it will not be their primary focus.	
VP 04	Chatham Terrace off Headbolt Lane	To represent the views experienced by receptors including occupants of the new properties fronting onto Chatham Terrace whose attention or interest is likely to be focussed on the view. It also represents the views experienced by transient users of Headbolt Lane, whose attention may be partially focussed on the view but it will not be their primary focus.	E 341564 N 399867
VP 05	Mulberry Park Near Lime Tree Road	To represent the views experienced by receptors including occupants of the new properties at Mulberry Park in Northwood, which front onto the newly created grassed amenity area between the railway and the housing, and whose attention or interest is likely to be focussed on the view.	E 341544 N 399783
VP 06	A506 County Road near railway underbridge	To represent the views experienced by receptors including occupants of the properties fronting	E 341173 N 399599

Viewpoint number	Viewpoint title	Reason for selection	Grid reference
		onto County Road whose attention or interest is likely to be focussed on the view. It also represents the views experienced by transient users of the A506 County Road, whose attention may be partially focussed on the view but it will not be their primary focus.	

8.6 Design Development and Impact Avoidance

The proposed Scheme is described in Chapter 2: Scheme Description and the landscaping proposals are shown on Figure 2.15. This shows a variety of tree and shrub and native hedgerow planting across the Site, which is designed to help integrate the proposed Scheme into its surroundings and lessen any landscape and visual effects. Whilst these do not represent a fully resolved design and still have to be designed in detail, for the purposes of the assessment, they are assumed to have been implemented.

Any existing trees to be retained on site, will be protected in accordance with BS 5837:2012 Trees in relation to design, demolition and construction

8.7 Environmental Impacts and Significance of Effects

The assessment of landscape and visual effects follows the methodology outlined in Section 8.3 and presented as Appendix 8A. The assessment assumes that all construction and operation stage mitigation measures are implemented. It also assumes that all any standard or industry best practice mitigation measures will be adopted (e.g. protection of trees in accordance with BS 5837:2012 Trees in relation to design, demolition and construction).

No visualisations were prepared to accompany the assessment of construction effects, as the landscape and visual effects likely to arise during the construction phase of the proposed Scheme will be short term and temporary.

Six visualisations were prepared to illustrate the effects of the proposed Scheme during operation and are included as Figure 8.8.

8.7.1 Construction

The construction period will last for less than five years and is therefore considered to be short term and temporary. The likely landscape and visual effects of construction will vary depending upon the nature of operations being carried

out. The main components of construction likely to affect landscape character and visual amenity include the following:

- site clearance and vegetation removal;
- site access and haulage routes;
- mobile construction plant;
- fixed construction plant such as cranes;
- excavators, compressors and lorries;
- disposal of waste materials;
- construction of new highway and junction alterations where new roads link to existing infrastructure;
- excavation and installation of drainage and below ground services;
- construction of buildings;
- works to landscaped areas;
- stockpile and material storage areas;
- site compound and protective hoardings; and
- temporary lighting.

Landscape Effects

The site is valued by the local community and is considered to be of medium landscape value. It is well used and there is little evidence of inappropriate or anti-social use. As open greenspace, it is of high susceptibility to the type of development proposed. When combined with the medium value, the sensitivity of the Site is considered to be high. This means that the attributes that make up the character of the landscape offer limited opportunities for accommodating the proposed change without its key characteristics of openness and rolling valley landform being fundamentally altered, leading to a different landscape character.

Construction operations will give rise to a large magnitude of effect on the landscape. The activity from construction machinery, movement and clustering of vehicles and workforce on site, as well as alterations to the landform to accommodate the car park and vegetation loss will substantially alter the character and appearance of the amenity greenspace. Most of the site will be affected, therefore the magnitude of landscape change during construction will be high.

Combined with the high sensitivity of the landscape, the level of effect during construction will be **major adverse**. This effect is considered significant but will be short term and temporary.

Visual Effects

Sensitive visual receptors closest to the construction works, include residents and road users:

- along or close to Boyes Brow (VP 01);
- along or close to Headbolt Lane (VP 02, VP 03 and VP 04);
- along or close to Lime Tree Road and Fern Close (VP 05); and
- close to the existing railway underbridge on the A506 County Road (VP 06).

Major adverse (significant) visual effects during the construction phase are anticipated where these sensitive visual receptors will experience a high magnitude of change in their view. This includes occupants of residential properties and road users along or close to Headbolt Lane as represented by VP 02 and VP 03. These receptors will potentially have extensive, open and elevated views of the construction works to the south of Headbolt Lane.

Moderate adverse (significant) visual effects during construction are anticipated where views are more distant, oblique and/ or partially obscured by intervening vegetation. This includes occupants of residential properties and road users along or close to Boyes Brow (VP 01), Chatham Terrace off Headbolt Lane (VP 04), Lime Tree Road (VP 05), Fern Close (VP 05), and the existing railway underbridge on the A506 County Road (VP 06). The predicted effects on residents and road users along or close to Boyes Brow will result from a combination of the works on the main site and also the railway line works adjoining the open green space to the south of Boyes Lane. This will include removal of existing mature trees and shrubs along the embankment.

8.7.2 Operation

Effects occurring during the operational phase are considered to be long term but largely reversible and will arise from the introduction of the following:

- railway line upgrade to a twin track and associated infrastructure (third line electrification, signalling etc);
- supply bulk point and substation to accommodate electrification of rail corridor upgrades and for the new station;
- a new station located on land at Headbolt Lane;
- a new car park and associated structures (signage, waiting shelters and car park lighting⁸) and to service the new station;
- new vehicular and pedestrian access including two footbridges over Kirkby Brook and a road bridge to access each section of the car park;
- increased traffic flow along Headbolt Lane; and
- associated landscaping.

⁸ The design and layout of the external lighting system complies with Dark Skies criteria limiting the upward lighting component.

Landscape Effects

National Landscape Character

At a national scale, the Site represents a very small element in a much larger landscape character unit, the NCA Profile 58: Merseyside Conurbation. The landscape within NCA Profile 58 will therefore not experience any adverse effects from the proposed Scheme.

Regional Landscape Character

The landscape character of the Site and the settlement of Kirkby are classed as urban and therefore not assessed within the Knowsley Landscape Character Assessment, which identifies and describes the character and distinctiveness of the Borough's landscape. Notwithstanding this, the scale and nature of the development within a developing suburban area are such that there will be no adverse effects on landscape character at a regional level.

Local Landscape Character

Year 1

At a local scale the character of the Site will be transformed from an area of attractive and open, amenity greenspace into a large area of car parking around a new station and its associated infrastructure. Although Kirkby Brook will be retained, the valley landform through which it flows will be substantially altered to accommodate the car park. A new footpath and bridges over Kirkby Brook will be introduced together with a new entrance road into the Site from Headbolt Lane.

The openness of the Site means that there is little existing vegetation to provide some initial integration of the development into its surroundings. The proposed Scheme will completely change the character and appearance of the Site, therefore the magnitude of landscape change during operation will be high. Combined with the high sensitivity of the landscape, the level of effect on local landscape character during operation will be **major adverse**. This effect is considered significant, long-term and irreversible.

Year 15

Landscape proposals including a native mixed hedgerow at the back of footpath along the A506 County Road and Headbolt Lane and tree and shrub planting within the Site will, in time, provide some softening of the proposed Scheme and partially integrate the station and car park into its surroundings. The proposals will also lessen the indirect effects on the character of the surrounding housing areas to the north of the Site, which will lose much of their green setting.

The major adverse effect anticipated at Year 1, will therefore lessen as the planting matures and the proposed Scheme becomes better integrated into its surroundings. Based on this, by Year 15 the effect will reduce to **moderate adverse**. This effect is considered significant, long-term and irreversible.

Visual Effects (Year 1)

On completion of the proposed Scheme, the change in appearance of the Site from open amenity green space to a station with its associated car park and infrastructure represents a substantial alteration in the appearance of the Site. The precise effects will depend on the proportion of the view affected, the proximity of the development and the presence or otherwise of intervening landform vegetation or built development.

As with construction effects, significant visual effects are likely to be experienced by residents and road users closest to the Site, including the following:

- along or close to Boyes Brow (VP 01);
- along or close to Headbolt Lane (represented by VP 02, VP 03 and VP 04);
- along or close to Lime Tree Road and Fern Close (VP 05); and
- close to the existing railway underbridge on the A506 County Road (VP 06).

No major adverse effects are anticipated to arise during operation.

Moderate adverse (significant) visual effects during operation are anticipated where the proposed Scheme would be conspicuous and result in a noticeable change to the character and quality of the existing view and how it is perceived. Typically this would be where receptors experience a medium magnitude of change in their view. This includes occupants of residential properties and road users along or close to Boyes Brow (VP 01) and Headbolt Lane (VP 02 and VP 03). These receptors will potentially have extensive, open and elevated views of the station, car park and railway line upgrade, which will substantially alter their outlook. The predicted effects on residents of Boyes Brow (VP 01) will result from a combination of the station and associated car park, but also the railway line upgrade adjoining the open green space to the south of Boyes Lane.

Minor adverse (non-significant) visual effects during operation are anticipated where views are more distant, oblique and/ or partially obscured by intervening vegetation. This includes occupants of residential properties and road users along or close to Chatham Terrace off Headbolt Lane (VP 04) Lime Tree Road (VP 05), Fern Close (VP 05), and the existing railway underbridge on the A506 County Road (VP 06).

Visual Effects (Year 15)

By Year 15, with the maturing of the proposed landscaping around and within the Site, the moderate adverse effects identified above will reduce to **minor adverse** (non-significant). The exception will be for occupants of residential properties and road users along or close to Boyes Brow (VP 01), who in the absence of landscape planting, will continue to have direct views across the existing open greenspace to the security fence, retaining wall and embankment along the railway line upgrade. The effect on these receptors will remain **moderate adverse**. This effect is considered significant, long-term and irreversible.

The effects identified above as minor adverse (VPs 04,05, and 06) will also reduce, but due to the long term changes to the view, will remain in the **minor adverse** category rather than reducing to negligible. These effects are considered non-significant, but long-term and irreversible.

8.8 Mitigation

Mitigation measures in the form of tree and shrub planting within the amenity open green space to the south of Boyes Lane could be introduced to reduce the anticipated moderate adverse effect likely to be experienced at Year 15 by residents and road users along or close to Boyes Brow as represented by VP 01. These measures would, in time, partially obscure views of the railway line security fence, retaining wall and embankment. They would also lessen the visual disturbance caused by passing trains. By Year 15, the effect would reduce to **minor adverse**. This effect is considered significant, long-term and irreversible.

8.9 Residual Effects

For a number of receptors, particularly those along or close to Headbolt Lane, the effects of the proposed Scheme will be significant and adverse in the short term. In the longer term, as the new planting matures, the car park and station will be better accommodated into the landscape and the effects will reduce and become non-significant. Table 8.4 is a summary of the predicted effects on local landscape character and on views.

Table 8.4: Summary of Effects

Potential impact	Impact avoidance measures / embedded mitigation	Environmental effect without additional mitigation	Additional mitigation	Environmental effect after additional mitigation (residual effect)	Nature of effect
Loss of key landscape characteristics, including openness and rolling valley landform.	Implementation of the landscape plan	Major adverse (significant)	No additional mitigation proposed	Major adverse (significant)	Lt, P, D, IN
Viewpoint 01: Junction of Bassenthwaite Avenue with Boyes Brow.	Implementation of the landscape plan	Moderate adverse (significant).	Tree and shrub planting to screen retaining wall and security fence.	Minor adverse (not significant)	Lt, P, IN
Viewpoint 02: Junction of Heathfield Drive with Headbolt Lane.	Implementation of the landscape plan	Moderate adverse (significant) reducing to minor adverse (non-significant) after 15 years when landscaping matures.	No additional mitigation proposed	Moderate adverse (significant) reducing to minor adverse (non-significant) after 15 years when landscaping matures.	Lt, P, IN
Viewpoint 03: Junction of Fallowfield Lane with Headbolt Lane.	Implementation of the landscape plan	Moderate adverse (significant) reducing to minor adverse (non-significant) after 15 years when landscaping matures.	No additional mitigation proposed	Moderate adverse (significant) reducing to minor adverse (non-significant) after 15 years when landscaping matures.	Lt, P, IN
Viewpoint 04: Chatham Terrace off Headbolt Lane.	Implementation of the landscape plan	Minor adverse (non-significant) at both Year 1 and Year 15.	No additional mitigation proposed	Minor adverse (non-significant) at both Year 1 and Year 15.	Lt, P, IN
Viewpoint 05: Mulberry Park near Lime Tree Road	Implementation of the landscape plan	Minor adverse (non-significant) at both Year 1 and Year 15.	No additional mitigation proposed	Minor adverse (non-significant) at both Year 1 and Year 15.	Lt, P, IN
Viewpoint 06: A506 County Road near Existing Railway Underbridge.	Implementation of the landscape plan	Minor adverse (non-significant) at both Year 1 and Year 15.	No additional mitigation proposed	Minor adverse (non-significant) at both Year 1 and Year 15.	Lt, P, IN

8.10 Limitations

In accordance with GLVIA3, site assessment was undertaken from six publicly accessible viewpoints. These are not intended to illustrate every possible location from where there might be a view of the proposed Scheme, but rather to present a selection of views from a variety of directions and distances to inform decisions about the proposed Scheme's likely landscape and, in particular, visual effects.

Due to time constraints, photographs were taken in April 2021 when deciduous trees and hedges were coming into leaf. Whilst ideally they should have been taken in winter following leaf fall, when the potential screening effect of broadleaf vegetation is at a minimum, this did not affect the Landscape Architect's professional judgement which is made based on desktop and site based surveys in different weather conditions and times of the day.

No substantial information gaps were identified during the preparation of the LVIA, and it is considered that there is sufficient information to enable an informed decision to be taken in relation to the identification and assessment of likely substantial environmental effects on townscape and visual amenity.

The assessment was restricted to publicly accessible areas and no access to private properties was gained during the survey. As such the study was limited to ground floor assessments of views and townscape only.

The assessment was based on the schematic landscape proposals shown in Figure 2.15 prepared by others

The assessment was prepared by chartered landscape architects from Gillespies LLP, with the exception of the visualisations presented in Figure 8.8, which were prepared by others.

Contents

	Page
9 Flood Risk	2
9.1 Introduction	2
9.2 Planning Policy Context	2
9.3 Assessment Method	5
9.4 Key parameters for assessment	11
9.5 Baseline Conditions	11
9.6 Design Development and Impact Avoidance	16
9.7 Environmental Impacts and Significance of Effects	17
9.8 Mitigation	20
9.9 Residual Effects	20
9.10 Limitations	24

9 Flood Risk

9.1 Introduction

This chapter of the ES presents an assessment of potential flood risk impacts associated with the proposed Headbolt Lane station, described in Chapter 2: Scheme Description of the ES.

This chapter describes the baseline conditions of flood risk for the proposed Scheme and the methodology used to assess potential impacts during the construction and operational phases. The results of the assessment will be presented in addition to mitigation or monitoring, where considered necessary.

This chapter is supported by the following figures (see Volume II: Figures) and appendices (see Volume III: Technical Appendices) and the ES Chapter should be read in conjunction with them:

- Figure 9.1: Flood Zones across the Site;
- Appendix 9A: Flood Risk Assessment (FRA); and
- Appendix 9B: Node points along Kirkby Brook.

9.2 Planning Policy Context

9.2.1 National Planning Policy

Flood Risk Regulations 2009

The Flood Risk Regulations 2009 require the assessment and management of flood risk in England and Wales. The regulations designate a Local Lead Flood Authority (LLFA) and impose duties on the Environment Agency (EA) and LLFAs to prepare a number of documents including:

- Preliminary Flood Risk Assessments;
- Flood Hazard and Flood Risk Maps; and
- Flood Risk Management Plans.

Flood and Water Management Act 2010

The Flood and Water Management Act 2010 makes provision for water, including provision about the management of risks in connection with flooding and coastal erosion.

Water Act 2003

Amends the Water Resources Act 1991 and the Water Industry Act 1991 and makes various provisions including with respect to compensation under Section

61 of the Water Resources Act 1991, and more broadly in connection with land drainage, flood defence, pollution of controlled waters etc.

National Planning Policy Framework (NPPF) (2019)

NPPF provides a framework within which local people and their accountable councils can produce their own distinctive local and neighbourhood plans. Section 14, titled “Meeting the challenge of climate change, flooding and coastal change” relates to flooding. The document aims to direct development away from areas at highest risk of flooding. It does this by formulating a risk-based approach towards flooding to be adopted at all levels of planning.

The NPPF requires that the ‘Sequential Test’ is applied during the planning process. The Sequential Test aims to ensure that preference for developable land is given to land that has the lowest risk of flooding, based on the data available. The starting point for the ‘Sequential Test’ is the system of ‘Flood Zoning’. This is a system that assesses the risk posed by rivers and in coastal areas estuaries and the sea. This information is collected and made available by the EA and the Local Planning Authority (LPA).

The Sequential Test requires that development should only be considered within Flood Zone 2 if there are no appropriate development sites in Flood Zone 1. Development in Flood Zone 3 should only be considered if development is not possible in Flood Zone 2; assuming development in Flood Zone 1 has also been ruled out.

9.2.2 Local Planning Policy

Knowsley Local Plan Core Strategy (2016)

Knowsley Local Plan Core Strategy sets out the vision, objectives and policies that will guide development within Knowsley up to 2028. Within the document, development policies highlight the need to consider flood risk including:

- Policy CS2 – Development Principles: “Minimising negative impact upon flood risk”;
- Policy CS8 – Green Infrastructure: “Mitigate the effects of climate change and flood risk”;
- Policy CS24 – Managing Flood Risk:
 - New development that may cause an unacceptable risk of flooding on site or elsewhere will not be permitted;
 - New development should preferably be located in areas of low probability of flooding. New development in areas of medium or high flood risk will only be permitted if it cannot be located in an area of lower flood risk and if the exception test has been compiled; and
 - Development within or affecting an area larger than 1 hectare (ha) shall undertake a FRA.

- New development shall include flood mitigation measures derived from Strategic Flood Risk Assessment (SFRA), FRA or local strategy; and
- Drainage of new development shall reduce surface water run-off rates to greenfield.

Knowsley Council and Sefton Council Level 1 Strategic Flood Risk Assessment (2009)

The SFRA was produced for Knowsley Council (also referred to as Knowsley Metropolitan Borough Council (KMBC)) and Sefton Council and is hybrid of a Level 1 assessment for the combined areas with a more detailed assessment. The detailed assessment includes elements of a Level 2 SFRA comprising specified regeneration/development areas and sites; and sites identified in the strategic land assessment and employment land study.

Knowsley Council Preliminary Flood Risk Assessment (PFRA) (2011)

The PFRA was produced in 2011 with the purpose of recording and reviewing past flooding and possible future flooding from local flood sources.

KMBC Level 2 Strategic Flood Risk Assessment (SFRA) (2012)

The SFRA was produced in 2012 and builds upon the findings of the Level 1 SFRA. The purpose of the assessment is to provide more information regarding the nature of flood risk at a number of sites being considered for allocation in Knowsley's Local Plan.

KMBC Local Flood Risk Management Strategy (LFRMS) (2017)

The LFRMS was undertaken in 2017 with the aim to ensure that the overall context of the National Flood & Coastal Erosion Risk Management Strategy is met through Knowsley's management of local flood risk.

9.2.3 Other Relevant Legislation, Standards and Guidance

Design Manual for Roads and Bridges

The assessment has been carried out in broad alignment with the Design Manual for Roads and Bridges (DMRB) LA 113 Road drainage and the water environment (formerly HD 45/09) (referred to hereafter as 'LA 113') and DMRB LA 104 Environmental assessment and monitoring and also makes use of professional judgment where applicable. The DMRB methodology is specifically designed for assessing the impacts of road or bridge construction on the water environment and therefore sections of it are not applicable to the proposed Scheme. Despite this, the DMRB methodology is widely used for all types of construction schemes and benefits from being recognised by regulators.

LA 113 provides the methodology and criteria for identifying likely impacts of a proposed road project on the water environment and predicting their magnitude and the significance of the resulting effects.

Other guidance documents

Guidance from the UK Government on Flood risk and coastal change (2014) has been used to determine the flood risk vulnerability categories for receptors which has informed the sensitivity assigned to receptors¹.

9.3 Assessment Method

9.3.1 Consultation

An EIA Screening and Scoping Report was prepared and submitted to KMBC in their capacity as the Lead Local Flood Authority in February 2021. The EIA Screening and Scoping Report sets out the intention to scope out a water resources and flood risk chapter as minimal expects were anticipated. In response, KMBC believed that a Flood Risk chapter should be undertaken as part of the EIA to ensure the impacts the works are sufficiently assessed. Further details of the comments raised in the EIA Screening and Scoping Response are detailed in Table 9.1.

Table 9.1: Consultation Summary

Consultee and date	Issue Raised	Summary of Response
KMBC, February 2021	There are a number of watercourse crossings which, as part of this development will be installed, removed or replaced/modified in addition to a new open span bridge for the proposed access road over Kirkby Brook, a Main River maintained by the EA. The impacts of the works have not been sufficiently addressed and there is no quantifiable evidence in the submission to relieve concerns on flood risk grounds.	The proposed Scheme does not include removal, replacement or modification to the watercourse crossings. The impact of the installation of the new road bridge and new footbridge over Kirkby Brook on flood risk will be addressed in this assessment. Development of the proposed bridges is currently ongoing. Details will be provided at subsequent design stages.
KMBC, February 2021	Sufficient evidence and quantifiable data should be presented to demonstrate that the proposed crossings are sufficient and will not increase flood risk elsewhere. It needs to be demonstrated that any structure over a main river has the capacity to take the 1 in 100 year flood flow plus climate change (CC) projection and freeboard and the proposals will not impact the EA's ability to maintain the Main River for flood risk purposes.	The proposed crossings will lie outside of the 1 in 100 year flood zone plus climate change factor (+35%) thus not negatively impacting the flood routing within an exceedance event.

¹ UK Government, Flood risk and coastal change, March 2014 [Online]. Available: <https://www.gov.uk/guidance/flood-risk-and-coastal-change#Table-2-Flood-Risk-Vulnerability-Classification> [last accessed 10/06/2021]

9.3.2 Sources of Information and Data

Desk-Based Study

The flood risk baseline data for the study area has been obtained from publicly available desktop resources and hydraulic modelling:

- Government flood maps for planning²;
- EA Flood Risk Maps for Surface Water in England – December 2019³;
- EA hydraulic modelling (2017) (sent to Arup);
- Arup Flood Risk Assessment A03 April 2021 (170248-ARU-REP-ECV-000003) (Appendix 9A);
- KMBC PFRA 2011⁴;
- KMBC SFRA 2012⁵;
- Ground Investigation Factual Report by CC Geotechnical Ltd 2020; and
- 2020 InoRail Topographical Survey.

9.3.3 Study Area

The study area for assessment is shown in Figure 9.1. This includes the area to the north of the railway line and south of Headbolt Lane. The study area does not include the entire redline boundary as although modifications are also proposed to the existing railway and Kirkby Station west of the proposed station and car park site, these works are within the existing railway corridor. These works do not include modifications to drainage systems of the railway, and these elements are not assessed as part of this assessment.

The study area considered within this assessment reflects the nature and extent of activities associated with the construction and operation of the proposed Scheme. Where activities are expected to cause impacts outside of the study area, these areas are also considered.

² UK Government. *Flood maps for planning* [online]. Available at: <https://flood-map-for-planning.service.gov.uk/>. Accessed: 10/06/21

³ Environment Agency. *Flood Risk Maps for Surface Water* [online]. Available at: <https://environment.maps.arcgis.com/apps/MapSeries/index.html?appid=bfe44552ba1849d594de7b40fdcfa685>. Accessed: 11/06/2021

⁴ Knowsley Council 2011. *Preliminary Flood Risk Assessment* [online]. Available at: http://www.knowsley.gov.uk/pdf/EB16_PreliminaryFloodRiskAssessment.pdf. Accessed: 11/06/2021

⁵ Knowsley Metropolitan Borough Council 2012. *Level 2 Strategic Flood Risk Assessment* [online]. Available at: <https://www.knowsley.gov.uk/knowsleycouncil/media/Documents/kmbc-level-2-strategic-flood-risk-assessment-vol-1-and-2-dec-2016.pdf>. Accessed: 11/06/2021.

9.3.4 Impact Assessment and Significance Criteria

Impact Assessment

As set out in Section 9.2, this assessment has been carried out following the approach outlined in LA 113 and LA 104. The assessment also draws on guidance from the UK Government on Flood risk and Coastal Change (2014).

LA 113 provides a standard methodology for the assessment which has the following key steps:

- Step 1 – Identification of flood risk receptors within the study area. Flood risk receptors are assessed against criteria defining vulnerability;
- Step 2 – Identification of potential impacts to the flood risk receptors from construction/operation is undertaken;
- Step 3 – An assessment of the potential magnitude of any construction or operation impacts on the receptor is undertaken; and
- Step 4 – Assessment of overall significance of any effects to receptors due to impacts and a description of the potential significance of effect values.

Construction

The assessment of construction impacts follows the guidance set out in LA 113, which recommends that construction impacts are considered using the source – pathway – receptor approach.

The potential impacts of construction on and from flooding have been assessed based on typical construction methods and sequencing. Impacts associated with foul drainage are detailed in the FRA, Appendix 9A.

Operation

The assessment of operational impacts has considered the potential for impacts on and from flooding. The assessment has considered information contained within the drainage strategy for the Site. Impacts associated with foul drainage are detailed in the FRA (see Appendix 9A).

Significance Criteria

The significance of effects has been estimated based upon criteria developed from Arup's extensive professional experience of carrying out EIA for Water Resources and Flood Risk, taking into account relevant industry guidance.

Sensitivity

The sensitivity of each receptor within the study area (defined in Section 9.3.3) was determined according to the DMRB criteria set out in Table 9.2. This has been adapted from Table 3.70 of LA 113 to add further details on the type of

development within each flood risk vulnerability classification group, taken from Government Flood risk and coastal change guidance (2014)⁶.

Table 9.2: Criteria for defining the sensitivity of the receptors and flood risk vulnerability classification

Receptor sensitivity	Typical Criteria	Flood risk vulnerability classification	Type of development
Very high	Nationally significant attribute of high importance	Essential infrastructure	Essential transport infrastructure (including mass evacuation routes) which has to cross the area at risk. Essential utility infrastructure which has to be located in a flood risk area for operational reasons, including electricity generating power stations and grid and primary substations; and water treatment works that need to remain operational in times of flood. Wind turbines.
		Highly vulnerable development	Police and ambulance stations; fire stations and command centres; telecommunications installations required to be operational during flooding. Emergency dispersal points. Basement dwellings. Caravans, mobile homes and park homes intended for permanent residential use. Installations requiring hazardous substances consent. (Where there is a demonstrable need to locate such installations for bulk storage of materials with port or other similar facilities, or such installations with energy infrastructure or carbon capture and storage installations, that require coastal or water-side locations, or need to be located in other high flood risk areas, in these instances the facilities should be classified as 'Essential Infrastructure').
High	Locally significant attribute of high importance	More vulnerable development	Hospitals Residential institutions such as residential care homes, children's homes, social services homes, prisons and hostels. Buildings used for dwelling houses, student halls of residence, drinking establishments, nightclubs and hotels. Non-residential uses for health services, nurseries and educational establishments. Landfill and sites used for waste management facilities for hazardous waste.

⁶ UK Government, 2014. Guidance: Flood risk and coastal change [online]. Available at: <<https://www.gov.uk/guidance/flood-risk-and-coastal-change#Table-2-Flood-Risk-Vulnerability-Classification>> Accessed: 10/06/2021

Receptor sensitivity	Typical Criteria	Flood risk vulnerability classification	Type of development
			Sites used for holiday or short-let caravans and camping, subject to a specific warning and evacuation plan.
Medium	Of moderate quality and rarity	Less vulnerable development	Police, ambulance and fire stations which are not required to be operational during flooding. Buildings used for shops; financial, professional and other services; restaurants, cafes and hot food takeaways; offices; general industry, storage and distribution; non-residential institutions not included in the 'more vulnerable' class; and assembly and leisure. Land and buildings used for agriculture and forestry. Waste treatment (except landfill* and hazardous waste facilities). Minerals working and processing (except for sand and gravel working). Water treatment works which do not need to remain operational during times of flood. Sewage treatment works, if adequate measures to control pollution and manage sewage during flooding events are in place.
Low	Lower quality	Water-compatible development	Flood control infrastructure. Water transmission infrastructure and pumping stations. Sewage transmission infrastructure and pumping stations. Sand and gravel working. Docks, marinas and wharves. Navigation facilities. Ministry of Defence installations. Ship building, repairing and dismantling, dockside fish processing and refrigeration and compatible activities requiring a waterside location. Water-based recreation (excluding sleeping accommodation). Lifeguard and coastguard stations. Amenity open space, nature conservation and biodiversity, outdoor sports and recreation and essential facilities such as changing rooms. Essential ancillary sleeping or residential accommodation for staff required by uses in this category, subject to a specific warning and evacuation plan.

Magnitude

The potential effects on receptors resulting from the potential impacts of the proposed Scheme have been qualitatively described and assessed.

The approach used to assess magnitude of impacts on flood risk features considers the change to the receptor. This considers the severity of impact of the proposed Scheme, together with the vulnerability of the receptor to change.

Table 9.3 summarises the potential magnitude of any construction or operation impact on the receptor, as per Table 3.71 of LA 113.

Table 9.3: Criteria for estimating the magnitude of an effect on a receptor

Magnitude	Description
Major Adverse	Results in loss of attribute and/or quality and integrity of the attribute.
Moderate Adverse	Results in effect on integrity of attribute, or loss of part of attribute
Minor Adverse	Results in some measurable change in attributes, quality or vulnerability
Negligible	Results in effect on attribute but of insufficient magnitude to affect the use or integrity
Minor Beneficial	Results in some beneficial effect on attribute or a reduced risk of negative effect occurring
Moderate Beneficial	Results in moderate improvement of attribute quality
Major Beneficial	Results in major improvement of attribute quality
No Change	No loss or alteration of characteristics, features and elements; no observable impact in either direction.

Significance

By combining the magnitude of impact (or change) and the sensitivity of each receptor, an assessment has been made of the significance of effect, considering the possibility and nature of mitigation. The resultant effects may be either negative (adverse), positive (beneficial) or neutral, depending on the nature of the impact.

The significance of effect upon the receptor is assessed using the matrix in Table 9.4, which is based upon Table 3.8.1 of LA 104. Effects are defined on a nine-point scale (very large beneficial, large beneficial, moderate beneficial, slight beneficial, neutral, slight adverse, moderate adverse, large adverse or very large adverse).

Where the matrix suggests more than one likely outcome, for instance slight or moderate, professional judgement has been used in conjunction with the descriptors in Table 9.4 to arrive at a robust conclusion.

Table 9.4: Significance matrix

Environmental value (sensitivity)	Magnitude of impact (degree of change)					
		No change	Negligible	Minor	Moderate	Major
	Very High	Neutral	Slight	Moderate or Large	Large or Very Large	Very Large
	High	Neutral	Slight	Slight or Moderate	Moderate or Large	Large or Very Large
	Medium	Neutral	Neutral or Slight	Slight	Moderate	Moderate or Large
	Low	Neutral	Neutral or Slight	Neutral or Slight	Slight	Slight or Moderate
	Negligible	Neutral	Neutral	Neutral or Slight	Neutral or Slight	Slight

Effects of Moderate, Large and Very Large significance represent a significant effect. Moderate, Large and Very Large adverse effects represent a significant effect that require mitigation, and function as means for the decision maker to take account of the likely significant effects of the proposed Scheme.

9.4 Key parameters for assessment

As described in Section 9.3.3 the study area does not include the entire redline boundary as, although modifications are also proposed to the existing railway and Kirkby Station west of the proposed station and car park site, these works are within the existing railway corridor. These works do not include modifications to drainage systems of the railway, and these elements are not assessed as part of this assessment. Key elements of the proposed Scheme that have been considered within this chapter include:

- two proposed outfalls to Kirkby Brook;
- two proposed attenuation tanks;
- two flow control devices to restrict discharge to 5 l/s at each outfall;
- proposed road bridge over Kirkby Brook; and
- proposed footbridge over Kirkby Brook.

9.5 Baseline Conditions

9.5.1 Surface Water Features

Kirkby Brook flow through the Site from east to west and is a designated EA Main River. The river crosses under the Kirkby Branch Railway and emerges into

the Site to the east before turning west and heading downstream in a westerly direction and exiting the Site under the A506.

9.5.2 Topography

Site information is based on a 2020 Topographical Survey undertaken by InoRail Ltd. Ground levels vary between 28-30m AOD along the northern boundary and between 22-31m AOD along the southern boundary. Kirkby Brook forms a valley within the Site with a bed level varying between 20-25m AOD.

9.5.3 Baseline Flood Risk

Fluvial Flood Risk

Flood risk can be classified in terms of probability. The references below to degrees of river and sea flood risk are expressed in terms of Annual Event Recurrence (AER) probability. This reflects the likelihood of an event occurring in any single year, with less frequent and more extreme events having a lower AER probability (and vice versa). This is an alternative means to 'Return Periods' to express flood risk. For comparative purposes, degrees of flood risk are defined by the EA and can be summarised as:

- Flood Zone 1 - An AER of 0.1% (equivalent to a 1 in 1,000 year return period) or lower chance of occurrence each year from river or sea flooding sources;
- Flood Zone 2 - An AER of between 1% and 0.1% (equivalent to between a 1 in 100 and 1 in 1,000 year return period) chance of happening each year for river flooding sources. An AER of between 0.5% and 0.1% (equivalent to between a 1 in 200 and 1 in 1,000 year return period) chance of occurrence each year for sea flooding sources; and
- Flood Zone 3 - An AER of 1% (equivalent to a 1 in 100 year return period) or greater chance of occurrence each year for river flooding sources. An AER of 0.5% (equivalent to a 1 in 200 year return period) or greater chance of happening each year for sea flooding sources.

Flooding from watercourses is usually caused by prolonged or intense rainfall, which generates high volumes of water. This can overwhelm the capacity of the river channels as a flood flow and as a result, spill into floodplain areas of river valleys.

EA Flood Maps for Planning indicates that the Site is located predominantly within Flood Zone 1 (less than a 1 in 1,000 year annual probability of river or sea flooding). Small parts of the Site are located within Flood Zone 2 (between 1 in 100 and 1 in 1,000 annual probability of river flooding or between 1 in 200 and 1 in 1,000 annual probability of sea flooding) and Flood Zone 3 (1 in 100 or greater annual probability of river flooding or 1 in 200 or greater annual probability of flooding from the sea). However these areas are concentrated within the immediate vicinity of the watercourse Kirkby Brook. The Flood Zones across the Site are shown in Figure 9.1.

Hydraulic modelling data was provided from the EA showing flood flows and river levels for node points along Kirkby Brook at different return periods, as shown in Table 9.5..

The SFRA undertaken in 2012 by KMBC supports the displays from the EA Flood Maps confirming that the fluvial flood extents are limited to the area immediately surrounding Kirkby Brook.

The Site does not appear to benefit from any flood defences.

Table 9.5: Kirkby Brook Node Point Data

Node point	Flood Flow (m3s-1) and Level (mAOD) data for a range of annual probability of flooding													
	0.1% + Climate Change (+30%)		0.1%		1% + Climate Change (+70%)		1% + Climate Change (+35%)		1% + Climate Change (+30%)		1.0%		4.0%	
	Level	Flow	Level	Flow	Level	Flow	Level	Flow	Level	Flow	Level	Flow	Level	Flow
ea01214_KRBY01_3215	22.09	8.89	21.71	6.99	21.69	6.86	21.52	5.82	21.50	5.67	21.23	4.23	21.01	3.08
ea01214_KRBY01_3224	22.2	8.86	21.87	6.96	21.85	6.84	21.75	5.80	21.74	5.65	21.58	4.21	21.44	3.07
ea01214_KRBY01_3262	22.3	8.7	22.11	6.84	22.10	6.72	22.02	5.71	22.01	5.57	21.90	4.14	21.80	3.02
ea01214_KRBY01_3378	23.55	5.03	23.49	3.90	23.48	3.88	23.43	3.61	23.42	3.59	23.34	3.32	23.27	2.82
ea01214_KRBY01_3435	23.88	7.81	23.82	6.15	23.82	6.08	23.82	5.10	23.82	5.00	23.82	3.79	23.77	2.78
ea01214_KRBY01_3487	24.84	5.24	24.63	5.22	24.62	5.24	24.45	4.95	24.43	4.85	24.28	3.70	24.15	2.71
ea01214_KRBY01_3549	25.61	3.04	25.53	3.03	25.52	3.04	25.47	3.03	25.45	3.03	25.30	3.04	25.03	2.63
ea01214_KRBY01_3642	25.91	6.6	25.83	5.40	25.83	5.39	25.77	4.53	25.76	4.37	25.68	3.36	25.58	2.49

Surface Water (Pluvial) Flood Risk

Surface water flooding is a result of water flowing over the ground surface, which has yet to enter a natural drainage channel, an artificial drainage system or the natural substrate. It is often a result of very intense and short rainfall events but can also be produced during mild rainfall events when drainage systems are at capacity or blocked, or when the ground is already saturated. Surface water flooding (sometimes referred to as flash flooding) occurs when the rainfall rate is greater than the infiltration rate, causing surface water to be stored above ground. This can result in the inundation of low-lying areas and can also be related to sewer flooding, excessive groundwater and infrastructure failure.

Surface water flood risk can also be classified in terms of probability. For comparative purposes, the following degrees of flooding risk have been classified for surface water:

- Very Low Risk: Each year, this area of land has a less than 1 in 1,000 (0.1%) chance of flooding;
- Low Risk: Each year, this area of land has between 1 in 1,000 (0.1%) and 1 in 100 (1%) chance of flooding;
- Medium Risk: Each year, this area has between a 1 in 100 (1%) and 1 in 30 (3.3%) chance of flooding; and
- High Risk: Each year, this area has greater than 1 in 30 (3.3%) chance of flooding.

The EA surface water flood map indicates there is a very low risk of surface water flooding across the majority of the Site. Areas of increased flood risk are concentrated to the areas in the immediate vicinity of Kirkby Brook.

The EAs surface water flood risk map is based on rainfall modelling applied to the Site topography. It is therefore expected that where the EA identify an area of increased flood risk, this is classified as 'low'.

Further information was requested from KMBC on historic flooding at the Site however KMBC stated that historic records are not kept.

Artificial Drainage Systems

Artificial drainage flooding can occur due to poorly maintained or low capacity drainage systems.

KMBC (as the LLFA) confirmed that there were no records of highway drainage flooding.

United Utilities sewer records indicate surface water and foul water public sewer networks within the Site boundary. A 900 mm surface water sewer discharges into Kirkby Brook at the east of the Site. A 525 mm surface water sewer also discharges to the brook at the west of the Site.

Highway drainage records indicate a 225 mm surface water sewer crossing the Site at the western boundary.

Groundwater Flood Risk

Flooding from groundwater can occur when the level of water within the rock or soil that makes up the land rises.

KMBCs PFRA indicates that the Site is not at risk from groundwater flooding.

The ground investigation factual report for the Site was issued by CC Geotechnical Ltd in November 2020. Groundwater was encountered in six of the twelve window sample boreholes at the Site and in three of the five cable percussive boreholes during four groundwater monitoring rounds between 30th September 2020 and 18th November 2020. Boreholes across the site were generally dry, with water levels varying between 2.52 m below ground level (m bgl) (railway embankment toe) and 0.27 m bgl (railway embankment crest).

Tidal Flood Risk

Tidal flooding occurs in coastal areas during exceptionally high tide events.

Due to the location of the Site, it is not at risk from tidal flooding which has been confirmed in KMBC SFRA in 2016.

Historical Flood Risk

The LLFA hold no record of historical flooding or any surveyed historic flood levels for Site. However, they stated that it does not necessarily mean flooding has not occurred in the past. No records of historical flooding were obtained by desk review of available sources.

9.6 Design Development and Impact Avoidance

Design Development

The proposed station building and substation are to be set at a level of approximately 30 m AOD and 27 m AOD respectively. The hydraulic modelling data shows flood level recorded in the vicinity of the proposed station building and substation for the 1% annual exceedance probability with climate change (35%) is 23.88 m. The proposed levels will reduce the flood risk to proposed Scheme elements, as detailed in the FRA, Appendix 9A.

In addition, the proposed bridges constructed over Kirkby Brook will have abutments positioned beyond the extents of the highest modelled flood scenario. The bridges crossing Kirkby Brook are expected to have a design life of 120 years. The minimum soffit levels shall therefore be positioned above the 0.1% annual exceedance probability flood level of Kirkby Brook, with a further allowance for climate change. In accordance with CD 356⁷, an additional freeboard allowance of 600 mm shall be applied above the maximum flood level

⁷ CD 356: Design of Highways Structures for Hydraulic Action, Rev01, Highways England, 2020

to determine the minimum soffit level. Proposed sections for the road bridge and footbridge can be found in the flood risk assessment.

A surface water drainage strategy has been developed based on KMBC guidance which aims to maintain discharge rates into Kirkby Brook at greenfield run-off rates applicable to the catchment or 5l/s; whichever is greater. The strategy includes storage for use during storm events, as appended to the FRA in Appendix 9A.

Impact Avoidance Mitigation

Measures to reduce construction impacts including temporary drainage and silt management are considered standard practice and have been included in an Outline CEMP (see Appendix 2A). Required measures will be detailed in the relevant Construction Method Statements which will be subject to appropriate consents and agreed with the Environment Agency and Lead Local Flood Authority. It has been assumed that these measures would be carried out and have been incorporated into the impact assessment presented in this chapter. Measures beyond standard practice are typically considered to be mitigation.

During construction, the contractor should adhere to industry standard practice working methods and mitigation measures set out in the relevant Construction Industry Research and Information Association (CIRIA) publications, the EA's Pollution Prevention Guidelines (PPG) (withdrawn in 2015) and their replacement series Guidance for Pollution Prevention (GPPs). These plans, methods and measures (specifically GPP1, GPP2, GPP5 GPP21, GPP22, GPP26 and PPG6) would reduce the likelihood of flooding during construction.

Opportunities for Sustainable Drainage Systems (SuDS) and landscaping for flood attenuation will be sought through the design development, where possible.

9.7 Environmental Impacts and Significance of Effects

9.7.1 Construction

Fluvial Flood Risk

No potential impacts have been identified.

Surface Water Flood Risk

Construction activities would include removal of topsoil, raising of land, preparation of Site roads, establishment of areas for construction materials, construction of foundations and areas of hard standing. Compaction of the ground caused by construction materials and vehicles and an increase in the extent of impermeable surfaces associated with elements of the proposed Scheme including car parking, station and access roads has the potential to increase surface water

run-off across the Site. Surface water run-off has the potential enter Kirkby Brook and cause flooding on Site as well as downstream.

However, these effects would be managed through measures set out in the outline CEMP. Measures within the CEMP include, but are not limited to, measures to intercept run-off from areas of construction. In addition, temporary surface water drainage will be introduced during construction and as part of the phasing plan for development, the permanent surface water drainage strategy would be introduced in advance of creation of new areas of hardstanding. Incorporating the phasing of development and working practices within the CEMP (as detailed in Section 9.6) that would reduce surface water run-off risks, the potential magnitude of impact is anticipated to be **Negligible**. Therefore, for the existing receptors on Site including the railway corridor of Very High value and residential areas downstream of High value, the magnitude of effect is **Negligible**, the effect would be **Slight adverse** and not significant. For the existing areas of green space on Site of Low value, the magnitude of effect is **Negligible**, the effect would be **Neutral** and not significant.

Artificial Drainage System

During construction there will be no changes made to the surface water drainage system therefore no potential impacts have been identified.

Groundwater Flood Risk

As the Site is not at risk of groundwater flooding in the baseline conditions and there are no elements of construction that would increase the groundwater flood risk no potential impacts have been identified.

Tidal Flood Risk

As the Site is not at risk of tidal flooding in the baseline conditions and there are no elements of construction that would increase the tidal flood risk no potential impacts have been identified.

9.7.2 Operation

Fluvial Flood Risk

Fluvial flood risk is shown to be constrained to the immediate vicinity of Kirkby Brook. The proposed vehicular bridge and footway bridge have the potential to constrain the flow through Kirkby Brook. However, the abutments of the bridge will be positioned beyond the extents of the 1 in 100 year flood zone (+ climate change) this not impacting the flood routing within an exceedance event. In addition, the soffit levels shall be a minimum of 600 mm above the maximum modelled flood level. For more details refer to the FRA.

The additional elements of the proposed Scheme are located outside of the flood extent and are positioned significantly higher than Kirkby Brook due the topography of the Site where the brook sits within a valley.

Due the positioning of the bridge abutments outside of the highest modelled flood scenario and soffit level positioning above the 0.1% annual exceedance probability flood level (with allowance for climate change), the risk of fluvial flooding to existing and proposed receptors is **Negligible**. Therefore, for the proposed railway corridor and proposed substation of Very High value and residential areas downstream of High value, the magnitude of effect is **Negligible**, the effect would be **Slight adverse** and not significant. For the proposed station and proposed car parks of Medium value, the magnitude of effect is **Negligible**, the effect would be **Neutral** and not significant. For the existing areas of green space on Site of Low value, the magnitude of effect is **Negligible**, the effect would be **Neutral** and not significant.

Surface Water Flood Risk

Once operational, the hard standings created as part of the development proposals could cause an increased volume and rate of surface water run-off across the Site into the receiving Kirkby Brook when compared to the existing situation. The proposed surface water drainage system comprises two catchment areas, northern and southern, due to the severance imposed by Kirkby Brook. The northern catchment includes the car parking (and future car park extension) and access routes. The southern catchment includes parking, drop-off facilities, station building, substation, platforms, public realm and track drainage. The northern catchment and southern catchment will drain to attenuation tanks beneath the car parking areas and discharge to Kirkby Brook via a flow control device and petrol interceptor. The surface water drainage strategy can be found in Appendix 9A.

It was agreed with KMBC that flow from the attenuation tanks will be restricted to discharge into Kirkby Brook at greenfield run off rates or 5 l/s, whichever is greatest. The attenuation volumes required to achieve the agreed discharge rates for the Site are presented in the FRA in Appendix 9A. KMBC guidance requires flows up to the 1 in 30 year critical rainfall event are retained within the drainage system. However, in the absence of detailed proposals to understand exceedance flows resulting from 100-year return period rainfall events, it has been assumed that 100-year return period volumes shall be held within the Site drainage systems. Attenuation volumes may be reduced during detailed design to accommodate 30-year return period if it can be demonstrated that exceedance flows for the 100-year return period can be safely managed within the curtilage of the Site with minimal risk to people or property.

Considering the measures included within the surface water drainage, the risk of surface water flooding to existing and proposed receptors is **Negligible**. Therefore, for the proposed railway corridor and proposed substation of Very High value and residential areas downstream of High value, the magnitude of effect is **Negligible**, the effect would be **Slight adverse** and not significant. For the proposed station and proposed car parks of Medium value, the magnitude of effect is **Negligible**, the effect would be **Neutral** and not significant. For the existing areas of green space on Site of Low value, the magnitude of effect is **Negligible**, the effect would be **Neutral** and not significant.

Artificial Drainage Systems

Impacts associated with the surface water drainage system have been addressed in the preceding section.

Groundwater Flood Risk

As the Site is not at risk of groundwater flooding in the baseline conditions and there are no elements of the proposed development that would increase the groundwater flood risk no potential impacts have been identified.

Tidal Flood Risk

As the Site is not at risk of tidal flooding in the baseline conditions and there are no elements of the proposed development that would increase the tidal flood risk no potential impacts have been identified.

9.8 Mitigation

The assessment has not identified any adverse impacts during construction or operation therefore additional mitigation is not required.

9.9 Residual Effects

Providing the design measures and impact avoidance measures discussed in Section 9.6 are correctly implemented to address the potential effects summarised Section 9.7, no significant effects on or from flooding during construction or operation are anticipated.

Table 9.6: Summary of Effects

Potential impact	Impact avoidance measures / embedded mitigation	Environmental effect without additional mitigation	Additional mitigation	Environmental effect after additional mitigation (residual effect)	Nature of effect
Construction					
Surface water flood risk to railway corridor (Very High) from construction activities	No mitigation required	Slight Adverse	No additional mitigation proposed	Slight Adverse	St, T, D
Surface water flood risk to residential areas (High) from construction activities	No mitigation required	Slight Adverse	No additional mitigation proposed	Slight Adverse	St, T, D
Surface water flood risk to existing areas of green space (Low) from construction activities	No mitigation required	Neutral	No additional mitigation proposed	Neutral	St, T, D
Operation					
Fluvial flood risk to proposed railway corridor (Very High) during operation	No mitigation required	Slight Adverse	No additional mitigation proposed	Slight Adverse	Lt, P, D
Fluvial flood risk to proposed substation (Very High) during operation	No mitigation required	Slight Adverse	No additional mitigation proposed	Slight Adverse	Lt, P, D

Potential impact	Impact avoidance measures / embedded mitigation	Environmental effect without additional mitigation	Additional mitigation	Environmental effect after additional mitigation (residual effect)	Nature of effect
Fluvial flood risk to existing residential areas (High) during operation	No mitigation required	Slight Adverse	No additional mitigation proposed	Slight Adverse	Lt, P, D
Fluvial flood risk to proposed station (Medium) during operation	No mitigation required	Neutral	No additional mitigation proposed	Neutral	Lt, P, D
Fluvial flood risk to proposed car parks (Medium) during operation	No mitigation required	Neutral	No additional mitigation proposed	Neutral	Lt, P, D
Fluvial flood risk to existing areas of green space (Low) during operation	No mitigation required	Neutral	No additional mitigation proposed	Neutral	Lt, P, D
Surface water flood risk to proposed railway corridor (Very High) during operation	No mitigation required	Slight Adverse	No additional mitigation proposed	Slight Adverse	Lt, P, D
Surface water flood risk to proposed substation (Very High) during operation	No mitigation required	Slight Adverse	No additional mitigation proposed	Slight Adverse	Lt, P, D
Surface water flood risk to existing residential areas (High) during operation	No mitigation required	Slight Adverse	No additional mitigation proposed	Slight Adverse	Lt, P, D

Potential impact	Impact avoidance measures / embedded mitigation	Environmental effect without additional mitigation	Additional mitigation	Environmental effect after additional mitigation (residual effect)	Nature of effect
Surface water flood risk to proposed station (Medium) during operation	No mitigation required	Neutral	No additional mitigation proposed	Neutral	Lt, P, D
Surface water flood risk to proposed car parks (Medium) during operation	No mitigation required	Neutral	No additional mitigation proposed	Neutral	Lt, P, D
Surface water flood risk to existing areas of green space (Low) during operation	No mitigation required	Neutral	No additional mitigation proposed	Neutral	Lt, P, D

9.10 Limitations

- Hydraulic modelling has not been undertaken for the proposed Scheme. Data and hydraulic modelling from the EA has been used to inform the assessment.
- For the assessment of construction impacts, where construction methods and sequencing information are not available, standard construction practices are assumed.
- Any third-party information, including the readily available data sources and input from external consultations has been assumed to be accurate at the time of writing.

10 Ground conditions

10.1 Introduction

This chapter presents an assessment of potential impacts on ground conditions associated with the proposed Headbolt Lane Station scheme, described in Chapter 2: Scheme Description.

This chapter is supported by the following figures (see Volume II: Figures) and appendices (see Volume III: Technical Appendices):

- Figure 10.1: Local Geological Site;
- Appendix 10A: Existing Track Geo-environmental Desk Study, Skelmersdale Rail Link, Mott MacDonald, 139606-MMD-REP-EGE-000001, March 2020;
- Appendix 10B: Geo-environmental Desk Study, Headbolt Lane Station, Mott MacDonald, 139606-MMD-REP-EGE-000003, August 2018; and
- Appendix 10C: Ground Investigation Report, 170248 Headbolt Lane New Station GRIP4, Arup, 170248-ARU-REP-EGE-000001, January 2021.

10.2 Planning Policy Context

10.2.1 National Planning Policy

National planning policy is set out in the National Planning Policy Framework 2019 (NPPF (19))¹. The underlying principle of the NPPF (19) is a presumption in favour of sustainable development. It requires that both geology and ground conditions are considered as a resource and that the effects that they may have, including as a result of contamination, are taken into account in the planning process. Key to this assessment are paragraphs 170, 178-9 and 183.

The National Planning Practice Guidance (PPG) for land affected by contamination has been produced by the Government to support the NPPF (19). Paragraph: 007, Reference ID: 33-007-20190722, Revision date: 22nd July 2019 of the PPG states that if contamination could be an issue: *“applicants should provide proportionate but sufficient Site investigation information (a risk assessment) prepared by a competent person to determine the existence or otherwise of contamination, its nature and extent, the risks it may pose and to whom/what (the ‘receptors’) so that these risks can be assessed and satisfactorily reduced to an acceptable level”*.

¹ Ministry of Housing Communities & Local Government (2019) National Planning Policy Framework, revised February 2019. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/810197/NPPF_Feb_2019_revised.pdf

Paragraph: 007, Reference ID: 33-007-20190722, Revision date: 22 July 2019 of the PPG goes on to state that the risk assessment should “*identify the potential sources, pathways and receptors (‘pollutant/ contaminant linkages’) and evaluate the risks. This information will enable the local planning authority to determine whether more detailed investigation is required, or whether any proposed remediation is satisfactory*”.

10.2.2 Local Planning Policy

The Knowsley Local Plan Core Strategy² (adopted in January 2016) is the main document in the Local Plan and sets out the vision, objectives and policies, which will guide development within KMBC up to the year 2028.

The Core Strategy includes the following policies, which are of relevance to ground conditions. The relevant clauses are set out below.

Paragraph 5.82 of Policy CS8: Green Infrastructure states that:

‘Many of Knowsley’s greenspaces perform secondary Green infrastructure functions and are extremely important for the local community as locations for sporting, recreational and other community uses. They also have a valuable role improving the borough’s natural and built environment. The spaces also include 72 sites designated as Local Wildlife Sites (LWS) or Local Geological Sites (LGS). These designations are non-statutory but reflect the locally important nature conservation interest within the sites and are supplemented by other designations which include Priority habitats’

Section 1 of the policy states:

‘Knowsley’s existing Green Infrastructure and its beneficial functions will be protected, maintained and/or enhanced, primarily to:

- a) Ensure more attractive and cleaner residential neighbourhoods;*
- b) Sustain and promote biodiversity (including designated sites, priority habitats and protected and endangered species) in accordance with importance and contribution to ecological networks;*
- c) Preserve the character and function of historic environments and valued landscapes;*
- d) Mitigate the effects of climate change and flood risk;*
- e) Mitigate air, water and noise pollution;*
- f) Provide local opportunities for sport, recreation and allotments; and*
- g) Provide sustainable transport linkages between residential neighbourhoods and easy access to employment and services.’*

² Available at (accessed 19th May 2021):

<https://localplanmaps.knowsley.gov.uk/documents/knowsley-local-plan-adopted-core-strategy.pdf>

Knowsley Replacement Unitary Development Plan

The Knowsley Replacement Unitary Development Plan was adopted in June 2006. Under the transitional arrangements for moving to the Local Plan system, all but four of the 82 individual UDP policies were 'saved' by the Secretary of State on 12 June 2009. An additional three UDP policies were replaced on adoption of the Merseyside and Halton Joint Waste Local Plan. A further 36 policies were deleted on adoption of the Local Plan Core Strategy.

This leaves 39 UDP Policies, which continue to be saved. Of these, Policy ENV5: Contaminated Land is of relevance to ground conditions and explains that:

'Previously developed sites may have been affected by past land use in such a way that may cause harm to human health or the environment. Such sites need to be brought back into beneficial use in line with the Government's policy on regeneration of brownfield sites.' (Para. 13.22)

The policy states that:

'1. New development will not be permitted if there is existing contamination on the site which could, as a result of the proposed development, place the occupiers or users of the development, ecological systems, the water environment or surrounding land uses at unacceptable risk.

2. Where there is evidence that a site may be unacceptably affected by contamination, proposals shall be accompanied by a site investigation report and schedule of remedial measures.

3. Where remedial measures are necessary then a verification report must be submitted before the development is brought into use to demonstrate that remedial work has been satisfactorily completed.

4. Where ongoing monitoring and risk assessment are necessary, reports must be submitted to the Council on an agreed basis. The developer must undertake any further investigations or remedial measures which the risk assessment shows to be required.'

10.2.3 Other Relevant Legislation, Standards and Guidance

Other guidance documents that have been used in the preparation of this assessment are:

- Environment Agency, Land Contamination: risk management³;
- Environment Agency (2009) Updated technical background to the CLEA model. Science Report SC050021;
- Environment Agency (2006) Remedial Targets Methodology: Hydrogeological Risk Assessment for Land Contamination;
- HSE (2012) The Control of Asbestos Regulations;

³ Available at (accessed 19th May 2021): <https://www.gov.uk/guidance/land-contamination-how-to-manage-the-risks>

- CIRIA (2014) Asbestos in soil and made ground: a guide to understanding and managing risks. Publication C733;
- CIRIA (2007) Assessing risks posed by hazardous ground gases to buildings, C665;
- British Standards Institute (2019) BS8485:2015+A1:2019: Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings (+A1:2019);
- Building Research Establishment (2005) Special Digest 1: Concrete in aggressive ground, third edition;
- Building Research Establishment (2004) Report 465: Cover systems for land regeneration: thickness of cover systems for contaminated land;
- Building Research Establishment (2003) Report 456: Control of dust from construction and demolition activities;
- Environment Agency (2002) National Groundwater and Contaminated Land Centre: Piling into Contaminated Sites; and
- Environment Agency (2001) Piling and Penetrative Ground Improvement Methods on Land Affected by Contamination: Guidance on Pollution Prevention. NC/99/73.

10.3 Assessment Method

10.3.1 Consultation

A formal scoping report was issued to Knowsley Council on 18th February 2021 and the council's scoping opinion was received on 30th March 2021, responses on ground conditions are provided in Table 10.1.

Table 10.1: Consultation summary

Consultee and date	Issue Raised	Summary of Response
Knowsley Council 30 th March 2021	Impact on Local Geological Site	The potential impact on the Local Geological Site has not been assessed. The proposed construction of two footbridges and an access road over Kirkby Brook may have significant implications on this geological feature which need to be addressed. This needs to be included within the scope of the Environmental Statement.
	Contaminated Land	All available documents should be submitted with any planning application to ensure all relevant information is reviewed as part of the planning process. Based on the submission submitted to date it is considered that ground conditions could result in significant environmental effects and therefore should be scoped into the EIA.

10.3.1 Sources of Information and Data

Desk-Based Study

Desk-based assessments have been produced by Mott MacDonald which cover the site and include detailed descriptions of the site and the site history:

- Existing Track Geo-environmental Desk Study, Skelmersdale Rail Link, Mott MacDonald, 139606-MMD-REP-EGE-000001, March 2020 (NB the site is within study area 1 of this report) – provided in Appendix 10A; and
- Geo-environmental Desk Study, Headbolt Lane Station, Mott MacDonald, 139606-MMD-REP-EGE-000003, August 2018 – provided in Appendix 10B.

Field Survey

An intrusive ground investigation was completed on site by CC Geotechnical Ltd (CCG) between August and September 2020. A ground investigation report has been produced by Arup which provides an interpretation of the data collected by the ground investigation⁴.

10.3.2 Study Area

The study area includes all land that lies within the red line boundary (see Chapter 2: Scheme Description) plus land up to 250 m beyond. Intrusive ground investigation has been undertaken within the Site. The exact location of investigation is detailed within the report provided in Appendix 10C.

10.3.3 Impact Assessment and Significance Criteria

Receptors

Table 10.2 sets out the sensitivities that have been assigned to typical land quality receptors and resources of relevance to the site and used in this assessment. The criteria used have been developed using industry guidance combined with professional experience.

Table 10.2: Receptor value and sensitivity

Designation	Receptors
High	Geology: International designated sites of geological value (e.g. UNESCO World Heritage Sites, Global Geoparks). Rare and of national importance with little potential for replacement (e.g. geological SSSI) Human Health: Very sensitive land use such as residential, schools and playing fields Controlled Waters: Catchment or surface water bodies of high quality⁵ and/or Principal aquifers with high to minor vulnerability. Likely to be

⁴ Ground Investigation Report, 170248 Headbolt Lane New Station GRIP 4, Arup, 170248-ARU-REP-EGE-000001, January 2021 – provided in Appendix 10C

⁵ As defined in the Water Framework Directive (WFD)

Designation	Receptors
	groundwater protection zone SPZ1 (inner or outer source protection zone) with short travel times to sources or sensitive watercourses Property*: Essential buildings and services e.g. strategic underground space
Medium	Geology: Regionally Important Geological Sites with limited potential for replacement (e.g. RIGS). Human Health: Retail and business parks (public and work places), allotments and market gardens Controlled Waters: Catchment or surface water bodies of moderate quality, and/or Secondary A aquifers with moderate to low vulnerability. Likely to be SPZ2 and 3 for potable water supplies Property*: Buildings, structures and infrastructure susceptible to potential gas accumulation
Low	Geology: Geology of local importance / interest with potential for replacement (e.g. Local Geological Sites, non-designated geological exposures). Human health: Public open space, commercial developments, construction workers with acute exposure Controlled waters: Surface water bodies of low quality. Secondary B and undifferentiated aquifers with low vulnerability. Likely to be SPZ3 (Total catchment source protection zone). Unproductive strata with no apparent abstraction use, including aquifers affected by saline intrusion Property*: Buildings, structures and infrastructure susceptible to potential gas accumulation
Very Low	Geology: No geological exposures, little / no local interest Human health: Industrial development Controlled waters: Secondary B aquifer, undifferentiated aquifers, surface water bodies of poor quality
* Professional judgement will need to be applied when judging property sensitivity. For example, the loss of a commercial warehouse or barns may be deemed as less significant when compared with a listed building.	

Magnitude of Impacts

Impacts have been assessed during the construction and operational phase of the proposed Scheme. Where possible, impacts have been assessed using site-specific data. Where no site-specific data is available, impacts have been assessed qualitatively. Table 10.3 provides examples of impacts which are of relevance to the ground conditions assessment, together with their classification.

Table 10.3: Classification of impacts

Magnitude	Definition	Receptors (example of impact)
High	Severe or substantial alteration to a key receptor such that the post-development character/composition attributes will be fundamentally changed	Geology: Loss of geological feature / designation and/or quality and integrity, severe damage to key characteristics, features or elements. Human health: Introduction/removal of contamination resulting in acute change in risk to health based on the potential effects on the critical human health receptor

Magnitude	Definition	Receptors (example of impact)
		Controlled waters: Introduction/removal of pollution to a Principal aquifer within a SPZ (inner and outer) or potable supply characterised by a breach of drinking water standards (DWS) Property: Complete failure of a building or structure including the services infrastructure.
Medium	Loss of alteration to one or more key receptors of the baseline conditions such that post development character/ compositions/ attributes of the baseline will be materially changed	Geology: Partial loss of geological feature/designation, potentially adversely affecting the integrity; partial loss of/damage to key characteristics, features or elements. Human health: Introduction of contamination resulting in chronic damage to health Controlled waters: Pollution of a Principal aquifer outside a SPZ characterised by a breach of DWS Property: Significant damage to a building or structure including the services infrastructure impairing their function.
Low	A small 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	Geology: Minor measurable change in geological feature / designation attributes, quality or vulnerability; minor loss of, or alteration to, one (maybe more) key characteristics, features or elements Human health: Introduction of contamination resulting in minimal short-term effects to health Controlled waters: Low levels of pollution to a principal aquifer outside a SPZ, or pollution of a Secondary A/B aquifer Property: Damage to buildings/structures, foundations and services but not sufficient to impair their function or unsafe for occupation.
Very Low	Very little change from baseline conditions. Change barely distinguishable, approximating to a “no change” situation	Geology: Very minor loss or detrimental alteration to one or more characteristics, features or elements of geological feature / designation. Overall integrity of resource not affected. Human health: No appreciable impact on health Controlled waters: No appreciable impact on pollution or water quality Property: No appreciable damage to buildings/structures, foundations and services.

Significance of Effects

The matrix for the determination of the significance of effects is presented in Table 10.4. The effects significance is derived from the sensitivity of the receptors and the magnitude of the impact as defined above.

By establishing these factors, the matrix will aid in the determination of the overall significance of effects.

Table 10.4: Matrix defining the relative significance of effects

Magnitude of Impact	Sensitivity/Importance of Receptor			
	High	Medium	Low	Very Low
High	Major	Major	Moderate	Minor
Medium	Major	Moderate	Minor	Negligible
Low	Moderate	Minor	Negligible	Negligible
Very Low	Minor	Negligible	Negligible	Negligible

10.4 Baseline Conditions

10.4.1 Site history

A detailed description of the site history is provided in the desk study reports provided in Appendix 10A and 10B.

The existing railway line is shown in its present day alignment on the earliest mapping reviewed which dates from 1850. The line was initially constructed as a two track railway as part of the Liverpool to Bury line which opened in 1848. Historical mapping indicates the line reduced from a two to a one track railway between 1962 and 1972.

The earliest mapping reviewed, dating from 1850, shows the proposed station and car park site to be occupied by agricultural land with a sandstone quarry identified as Mercer's Delf located within the centre of this area, to the north of Kirkby Brook which is shown flowing through the centre of the site from east to west. A small building identified as Tanpit House is located in the north off Headbolt Lane.

The 1902 mapping shows the quarry to be no longer present and further development of buildings on the northern boundary of the site adjacent to Headbolt Lane. The quarry is assumed to have been infilled.

Mapping from 1972 shows the western portion of Kirkby Brook to have been realigned to its present day alignment; presumably as part of works for construction of the A506 and Headbolt Lane which bounds the site in its present day alignment.

Mapping dating from 1990 no longer shows Tanpit House to be present. The crest of the hill on the northern boundary with Headbolt Lane appears to have moved southwards, suggesting a change of ground levels.

10.4.2 Published geology

The geology across the site has been inferred from recent British Geological Survey mapping as described in the desk study reports.

Superficial Geology

Along the rail alignment between Kirkby Station and Underbridge 56 superficial deposits are generally absent in the west with the eastern half of this section underlain by Glacial Till. Alluvium is present in the vicinity of Underbridge 56 associated with Kirkby Brook.

Between Underbridge 56 and the proposed station and car park area superficial deposits are absent, however wind blown sands of the Shirdley Hill Sand Formation are indicated to be present at the eastern site boundary. It is anticipated that the extent of the Shirdley Hill Sand Formation deposits may extend to the west towards Kirkby Brook and may contain some layers of peat.

No made ground is indicated to be present on the site from geological mapping however, given the site's history and current land use, made ground is anticipated to be present along the entire rail alignment associated with the railway development. Made ground is also anticipated to be present within the proposed station and car park site associated with historical development including the former quarry.

Bedrock

The bedrock beneath the site comprises the Wilmslow Sandstone of the Sherwood Sandstone Group. Immediately to the west of Kirkby Station is a northwest-southeast trending fault with the Chester Formation of the Sherwood Sandstone Group present to the west of the fault line. The Chester Formation is also indicated to subcrop approximately 400 m to the south of the proposed station and car park site.

10.4.3 Local Geological Site

A section of the Kirkby Brook within the proposed station and carpark site is designated as a Local Geological Site (LGS) as shown on Figure 10.1. The LGS is known as Kirkby Brook Waterfall and comprises Kirkby Brook between the A506 in the west and the existing footpath to Headbolt Lane in the east⁶.

It is understood that the LGS comprises a good outcrop example of the Wilmslow Sandstone Formation.

10.4.4 Hydrogeology

The Environment Agency classifies the Shirdley Hill Sand Formation and Alluvium as Secondary A Aquifers, an aquifer supporting water supplies at a local scale. The Glacial Till deposits are classified as unproductive strata.

The Wilmslow Sandstone Formation and Chester Formation are classified as Principal Aquifers, an aquifer which can provide a high level of water storage and may provide water supply and/or base river flow on a strategic scale.

⁶ Knowsley Council Local Plan Policies Map <https://localplanmaps.knowsley.gov.uk/>

The site is located within a groundwater Source Protection Zone (SPZ) 3, with several abstractions located to the north and south. The nearest groundwater abstractions are located approximately 2 km to the north of the rail alignment.

10.4.5 Hydrology

The closest surface water features to the site are Kirkby Brook which flows beneath the rail corridor in culvert and through the proposed station and carpark site and Simonswood Brook which flows beneath the rail corridor at Underbridge 56.

10.4.6 Mining and mineral extraction

The site does not lie within a Coal Authority Coal Mining Reporting Area.

There is one BGS recorded mineral site located in the centre of the proposed station and carpark site. This is reported to be Mercer's Delf which was an opencast sandstone quarry. The quarry is understood to have ceased operating in the late 1800s and the historical mapping indicates it was infilled in the early 1900s.

10.4.7 Ground conditions

An intrusive ground investigation was undertaken across the site in 2020 by CCG. The results of the ground investigation are discussed in the Arup ground investigation report (Appendix 10C) and have been used to develop an understanding of the ground conditions at the site.

Rail corridor

The exploratory holes undertaken within the existing rail corridor encountered a range of ground conditions influenced by superficial and bedrock geology and the presence of earthworks (embankments and cuttings) associated with the rail construction.

The ground conditions encountered beneath the site are summarised in Table 10.5.

Table 10.5: Summary of general ground conditions encountered within rail corridor

Stratum	Depth to top (m bgl)	Thickness (m)	Stratum description	Comment
Made Ground Deposits				
Made ground - Ballast	0 – 0.2	0.2 - 1	Dirty or very dirty ballast, although a thin layer of clean ballast present at ground level in some locations	
Made ground – Granular	0 – 0.8	0.1 - 1.2	Typically comprises a layer of ashy fill, described as brown silty	

Stratum	Depth to top (m bgl)	Thickness (m)	Stratum description	Comment
Trackbed Material			sandy gravel underlain by a layer of brown silty gravelly sand.	
Made ground - Cohesive embankment fill	0.75 – 1.6	0.55 – 4.4	Brown sandy gravelly silty clay	Within embankment areas only
Made ground – Granular embankment fill	0.9	4.6	Medium dense brown silty gravelly sand	Localised areas within embankment
Drift Deposits				
Glacial Till - Cohesive	0.85 – 5.2	0.1 – 3	Soft to stiff brown slightly sandy silty clay	Typically absent beneath east of rail corridor
Glacial Till - Granular	4 – 4.7	0.4 – 0.5	Loose to medium dense brown silty sand	Typically absent beneath east of rail corridor
Solid Geology				
Sandstone	0.25 – 5.5	0.1 – 1.5 (max proven thickness)	Typically a completely weather sandstone recovered as a silty gravelly sand over a weathered reddish brown sandstone	

Groundwater was encountered within the superficial deposits in localised areas between depths of 0.27 m and 2.4 m bgl and depths between 0.34 and 2.52 m bgl in the sandstone.

Proposed station and carpark site

The ground conditions encountered beneath the proposed station and carpark site are summarised in Table 10.6.

Table 10.6: Summary of general ground conditions encountered within proposed station and carpark

Stratum	Depth to top (m bgl)	Thickness (m)	Stratum description	Comment
Made Ground				
Topsoil	0	0.05 – 0.5		
Made Ground - Granular	0.05 – 1.4	0.5 – 1.6 (proven) 3.1 (unproven)	Predominantly coarse-grained material comprising dark brown silty gravelly fine to medium sand with brick, ceramic and plastic inclusions	Deeper made ground 2 to 3.1m recorded in location of former quarry

Stratum	Depth to top (m bgl)	Thickness (m)	Stratum description	Comment
Made Ground - Cohesive	0 – 0.8	0.25 - 1	Sandy slightly gravelly silty clay	
Solid Geology				
Sandstone	0.5 – 3.5+	2.4 (max proven)	Weathered reddish brown sandstone recovered as silty gravelly sand.	

Groundwater was encountered within the sandstone in localised areas between depths of 1.35m and 1.65m bgl.

10.4.8 Contamination sources

Soil contamination

The main potential source of contamination within the site is made ground associated with historical development within the site including the infilled quarry and railway. In addition, historical uses of the site and the surrounding area may also be potential sources of contamination.

The 2020 CCG ground investigation included chemical analysis of soil for contaminants which would be expected to be present based on the land-use history. The resulting soil data were reviewed and the contaminant concentrations in soil assessed by with respect to their potential impact on the health of future site users.

The assessment of soil contamination was carried out by Arup in line with UK good practice guidance, using Generic Assessment Criteria (GAC) appropriate for the proposed land use as a commercial development. The assessment is provided in the ground investigation report in Appendix 10C.

The assessment of soil data concluded that concentrations of contaminants measured in the soil were below values that might be regarded as posing a risk to future site users for a commercial development.

Controlled Waters contamination

The main potential source of groundwater contamination within the site is the made ground associated with the site development and contamination associated with historical releases and spills. Chemical analysis data for soils, surface water and groundwater samples collected during the CCG 2020 ground investigation were reviewed and the contaminant concentrations assessed with respect to their potential impact on the quality of groundwater within the bedrock and the adjacent Kirkby Brook surface watercourse.

The impact of groundwater contamination on the health of future site users during operation has not been assessed, as the groundwater will not be used as a water supply to the proposed development within the site.

The assessment of controlled waters contamination was carried by Arup in line with current UK good practice guidance, using published water quality guideline values principally comprising freshwater Environmental Quality Standards (EQS) and UK drinking water standards (DWS). The assessment is provided in the ground investigation report provided in Appendix 10C.

The controlled waters generic quantitative risk assessment identified that elevated concentrations of manganese and selenium recorded in groundwater were likely be naturally occurring rather than indicative of any significant contamination.

When compared to the freshwater EQS concentrations of PAHs were elevated in the groundwater and in the surface water from the Kirkby Brook. While it was considered possible that the made ground beneath the site may be a contributory source, no significant hydrocarbon contamination was recorded within the soils.

Ground gas contamination

Standpipes installed in the 2020 ground investigation were monitored for the presence of grounds gases such as methane and carbon dioxide.

Carbon dioxide levels within the made ground recorded elevated concentrations in some wells with a maximum concentration of 13.2%. No methane, carbon monoxide or hydrogen sulphide detected. The gas flow rates recorded were negligible (<0.1 l/hr) in all boreholes suggesting that ground gases are not being generated in significant quantities.

Unexploded ordnance (UXO)

A pre-desk study assessment for unexploded ordnance (UXO) was obtained from Zetica as part of the previous desk study work undertaken (see Appendix 10A and 10B). This did not identify any UXO risks on or affecting the site and concluded that a detailed desk study was not necessary. As such the site is considered to be situated in an area with a low risk potential from UXO.

10.4.9 Potential receptors to contamination

The following potential receptors have been identified within or of relevance to the proposed scheme:

- Human receptors:
 - construction workers involved with the development;
 - users of nearby sites;
 - future site users.
- Controlled waters receptors:
 - Kirkby Brook;
 - groundwater within the Sherwood Sandstone Principal aquifer and Shirdley Hill Sand Formation Secondary aquifer.

10.4.10 Potential contamination pathways

During the construction the following pathways may link sources of contamination at the site to identified receptors:

Human health pathways

- inhalation of soil and dust generated as a result of the disturbance of ground within the Site (on- and off-site);
- inhalation of vapours, odours and gases from the ground (on- and off-site);
- ingestion of soil, soil-derived dust and groundwater; and
- dermal contact with soils and groundwater.

Controlled waters pathways

- leaching and infiltration into groundwater from exposed soil during earthworks and excavation;
- lateral flow of contaminated groundwater into Kirkby Brook; and
- leaks and spills from the temporary storage of fuels during construction which may enter groundwater via vertical flow.

During the opening and operational phase of the proposed Scheme, the following pathways may link sources of contamination on the site to receptors:

Human health pathways

- migration of gases and vapours into confined spaces, and accumulation to explosive or toxic concentrations.

10.4.11 Baseline conceptual model

The baseline conceptual model (CM) is summarised in Table 10.7.

Table 10.7: Summary of baseline conceptual model for the site

Sources	→	Pathways	→	Receptors
Contaminated made ground	→	Ingestion of soils, fibres or dust	→	Maintenance workers Site operatives
	→	Ingestion of dissolved contamination in groundwater/leachate	→	
	→	Dermal contact with soils	→	
	→	Inhalation of dust and fibres, including spores	→	
Contaminated groundwater	→	Leaching of contaminated fill in unsaturated zone and vertical infiltration	→	Groundwater

Sources	→	Pathways	→	Receptors
	→	Leaching and vertical migration	→	Groundwater in bedrock and superficial deposits
	→	Lateral migration of dissolved phase contamination	→	Kirkby Brook Groundwater in bedrock and superficial deposits
Ground gases	→	Inhalation following ingress into enclosed spaces	✗	Maintenance workers Site operatives

10.4.12 Construction phase conceptual model

A conceptual model has been developed for the construction phase of the proposed Scheme and is presented in Table 10.8. This presents the potential sources, receptors and pathways during the construction phase of the proposed Scheme.

Table 10.8: Conceptual model for the construction phase

Possible source		Pathway		Receptor
Contaminated made ground	→	Inhalation of soil, fibres and soil dust Inhalation of vapours and odour	→	Construction workers Users of adjacent sites
		Ingestion of soil and dust Dermal contact with soil	→	Construction workers
		Leaching of exposed soils	→	Groundwater
Contaminated groundwater	→	Inhalation of vapours	✗	Construction workers
		Dermal contact with groundwater	→	Groundwater not considered as a potential vapour source
		Ingestion of groundwater	→	
		Lateral migration of groundwater	→	Kirkby Brook Groundwater
Ground gases (e.g. methane, carbon dioxide, hydrogen sulphide)	→	Inhalation of gases in confined spaces Accumulation of gases to explosive concentrations in confined spaces	→	Construction workers
Pollutants resulting from construction (such as fuels)	→	Leakage into soil and groundwater	→	Groundwater
		Direct runoff	→	Kirkby Brook

10.4.13 Operational phase conceptual model

A conceptual model has been developed for the operational phase of the proposed scheme and is presented in Table 10.9.

Table 10.9: Conceptual model for the operational phase

Possible Source		Pathway		Receptor	Comment
Contaminated made ground	→	Inhalation of soil and soil dust Inhalation of vapours	✗	Future users	Pathway removed during construction as a result of the Scheme Design
		Ingestion of soil and soil-derived dust	✗		
		Dermal contact with soil and soil dust	✗		
		Leaching of exposed soils	✗	Groundwater	Pathway removed/reduced during construction as a result of the Scheme Design
Contaminated groundwater	→	Inhalation of vapours	✗	Future users	No pathway - groundwater will not be exposed at surface in proposed development Groundwater not considered as a potential vapour source
		Dermal contact with groundwater	✗		
		Ingestion of groundwater	✗		
		Lateral migration of groundwater	✗	Kirkby Brook Groundwater	Source of any contamination will be depleted as a result of construction and scheme design
Ground gases (e.g. methane, carbon dioxide, hydrogen sulphide)	→	Inhalation of gases in confined spaces Accumulation of gases to explosive concentrations in confined spaces	→	Future site users	Pathway controlled by measures in Scheme Design

10.5 Design Development and Impact Avoidance

An EIA has been carried out which considered the potential impacts of the proposed Scheme on the surrounding environment without mitigation, except for those control measures which are inherent in the development proposals, which are presented in Table 10.10.

Table 10.10: Control measures during construction

Potential exposure pathway	Example control measures during construction
H&S management during construction	
Inhalation of soil-derived dust (which may contain contaminants such as metals, asbestos fibres, PAH) by construction workers and adjacent site users.	Dust generated from areas of contaminated soils during dry weather is a potential means for migration of contaminants to both site workers and adjacent site users. Dust suppression measures are presented in the draft CEMP. Use of appropriate site controls, abatement measures and monitoring will mitigate against potential risks.
Generation of airborne asbestos fibres from asbestos-	ACMs may be present in site soils. It is likely that the greatest potential risks will be during excavation and processing of the

Potential exposure pathway	Example control measures during construction
containing soils and asbestos-containing materials (ACMs) presenting a risk via inhalation to construction workers and adjacent site users.	infill materials, when they are disturbed and may allow fibres to be released into ambient air. Therefore, works will need to be carried out by a suitably qualified experienced contractor and employ methods to control risks to on-site workers and adjacent site users.
Exposure of construction workers to infill and groundwater (which may contain contaminants such as asbestos, metals, PAH) via dermal contact, ingestion, and inhalation of vapours.	Contractors working on the Site will require appropriate Health and Safety briefings on the types of contaminants known to exist on-site and the possibility of unexpected contamination. Procedures should be in place in the event that unexpected contamination is encountered. Contractors should be provided with personal protective equipment (PPE) appropriate for the contamination expected.
Environmental protection during construction	
Exposure of soils during removal of existing hardstanding and increased potential for leaching and infiltration into groundwater	Sequencing of the earthworks to minimise the amount of soil exposed at any one time.

Ground contamination risk assessment is presented in the ground investigation report in Appendix 10C. The report includes a remediation strategy which will be implemented during the construction works.

10.6 Environmental Impacts and Significance of Effects

10.6.1 Construction

Human health

A plausible pollutant linkage has been identified relating to construction workers and adjacent site users as a result of the excavation of potentially contaminated materials, which may generate contaminated dust and vapour, or result in exposure to contamination, via dermal contact and ingestion. The concentrations of contaminant measures in soil and groundwater were typically below values which might be regarded as posing an acute risk to construction workers.

During site development excavations appropriately trained staff must observe excavated material. If any suspected asbestos is encountered specialist advice must be sought and measures must be implemented to manage suspect material.

With the implementation of the inherent mitigation measures outlined in Table 10.10 and implemented by the CEMP, the magnitude of the impact during construction is assessed to be very low. The effect via these pathways is assessed to be negligible for construction workers and adjacent site users and therefore not significant.

Ground gases may pose a risk to construction workers and adjacent site users in enclosed or confined spaces. It is possible that disturbance of the ground during

construction and activities such as compaction may result in a temporary worsening of ground gas risks compared to baseline. On the basis of current assessments (see Appendix 10C) the magnitude of impact is assessed to be low for construction workers and very low for users of adjacent developments. The effect is assessed to be negligible to construction workers and adjacent site users and therefore not significant.

Controlled waters

A potential pollutant linkage has been identified during earthworks as a result of the exposure of contaminated soils, which could result in a temporary increase in infiltration of rainwater and consequently an increase in the leaching of contaminants into groundwater or allow direct run-off of contaminants into groundwater where it is encountered during deep excavation. The value of the receptors, in this case the groundwater, is considered to be medium. With the implementation of the inherent mitigation measures outline in Table 10.10 and implemented by the CEMP, and scheme design which will reduce infiltration in shallow soils, the magnitude of impact during construction is assessed to be very low and the effect would be negligible and not significant.

Any additional contamination that leaches into the groundwater during construction has the potential to migrate laterally into the Kirkby Brook, where it could impact on the water quality. The sensitivity of these receptors is medium. With the inherent control measures implemented by the CEMP, the magnitude of impact during construction would be very low and the effect would be negligible and not significant.

Local geological site

A footbridge and a road bridge will be constructed over the Kirkby Brook Waterfall LGS within the proposed station and carpark site. The bridges will span the brook and no works within the stream itself are proposed. The construction works will be undertaken outside the Environment Agency 8 m easement as far as is practicable and therefore the scheme design will not impact the LGS.

The value of the receptor is considered to be low. The magnitude of impact would be low and the effect negligible and not significant.

10.6.2 Operation

Human health

The proposed site use means that there is little potential that site users will come into contact with the soils on site.

The conceptual model for operation in Section 10.4.13 identified that many of the plausible pollutant linkages that are present at baseline will be broken during operation, as a result of the implementation of the measures inherent in the scheme design.

The ground gases methane, carbon dioxide, hydrogen sulphide and carbon monoxide pose a potential risk to existing adjacent site users and workers in the proposed development. No significant ground gases have been identified at the site and the magnitude of impact is assessed to be very low for users of the proposed development. The effect during operation without mitigation is assessed to be negligible which is not considered significant.

In areas of soft landscaping site-won soils must be validated to demonstrate they are suitable to remain at surface or a clean cover layer must be placed over site won soils.

10.7 Mitigation

10.7.1 Construction phase

The construction phase assessment took into account the control measures, which reduced the significance of many of the identified environmental impacts to negligible or minor.

To protect receptors during construction, the control measures will be outlined in an outline Construction Environmental Management Plan (CEMP) for the proposed Scheme that will be adopted by the construction contractor (Appendix 2A). The contractor will prepare a Materials Management Plan for the proposed Scheme.

In areas of the Site which have been subject to historical development, the Site preparation work will include the systematic excavation of the made ground to remove obstructions and contamination sources.

Material will be reused by placing it to achieve the required development levels and in accordance with an agreed geotechnical and chemical specification. Only soils that have been validated as meeting the required re-use criteria will be used in the earthworks.

With these measures being adopted, the magnitude of impacts during construction would be negligible.

10.7.2 Operational phase

A plausible pollutant linkage has been identified between sources of ground gas and new buildings constructed within the Site. Gas risk assessment has concluded the site is at low risk from ground gases and ground gas protection measures will not be required in new buildings on the site.

The possible effects associated with ground gases are considered to be negligible.

10.8 Residual Effects

The summary of the assessment and the residual effects for the construction phase and operational phase are displayed in Table 10.11, including embedded mitigation within the outline CEMP and the scheme design.

Table 10.11: Summary of Effects

Potential impact	Impact avoidance measures / embedded mitigation	Environmental effect without additional mitigation	Additional mitigation	Environmental effect after additional mitigation (residual effect)	Nature of effect
Construction Phase					
Contaminated infill – inhalation of soil, dust and vapour to construction workers	CEMP	Negligible	No additional mitigation proposed	Negligible	St, T
Contaminated infill – inhalation of soil, dust and vapour to users of adjacent sites	CEMP	Negligible	No additional mitigation proposed	Negligible	St, T
Contaminated infill – ingestion of soil, dust and groundwater by construction workers	CEMP	Negligible	No additional mitigation proposed	Negligible	St, T
Contaminated infill – dermal contact with soil and groundwater by construction workers	CEMP	Negligible	No additional mitigation proposed	Negligible	St, T
Contaminated infill – leaching of exposed soils to groundwater	CEMP	Negligible	No additional mitigation proposed	Negligible	St, T
Contaminated groundwater – lateral migration into Kirkby Brook affecting water quality	CEMP	Negligible	No additional mitigation proposed	Negligible	St
Ground gases – inhalation of gases in confined spaces or explosion risk to construction workers	CEMP	Negligible	No additional mitigation proposed	Negligible	St, T
Ground gases – inhalation of gases in confined spaces or	CEMP	Negligible	No additional mitigation proposed	Negligible	St

Potential impact	Impact avoidance measures / embedded mitigation	Environmental effect without additional mitigation	Additional mitigation	Environmental effect after additional mitigation (residual effect)	Nature of effect
explosion risk to users of adjacent sites					
Local Geological Site – damage to site during construction	No works within Kirkby Brook included in scheme design. 8m easement to be maintained during construction as far as practicable	Negligible	No additional mitigation proposed	Negligible	N/A
Operational Phase					
Ground gases – inhalation in confined spaces/explosion hazard to future site users	No mitigation required	Negligible	No additional mitigation proposed	Negligible	Lt

Contents

	Page
11 Cumulative Impact Assessment	2
11.1 Introduction	2
11.2 Planning Policy Context	2
11.3 Cumulative Impact Assessment	3
11.4 Assessment of Combined Effects	4
11.5 Cumulative Effects	6
11.6 Cumulative Effects Assessment	13
11.7 Limitations	15

11 Cumulative Impact Assessment

11.1 Introduction

This chapter describes the cumulative impacts associated with the proposed Scheme. It draws together the impacts outlined in Chapters 4 - 10 of this ES, and looks at the inter-relationship between individual topic impacts and relevant developments within the surrounding area. Where these links have the potential to give rise to additional impacts (either cumulative or combined), the effect of these impacts on defined sensitive receptors is identified.

Combined effects occur whereby different impacts attributable to the proposed Scheme ('direct impacts') act upon a particular receptor. An example of this could include the combined effects of noise and air quality on a residential area.

Cumulative effects arise where the proximity of two or more developments result in a receptor being affected by multiple developments. Those impacts which are considered to generate a non-significant effect in isolation, may result in a significant effect when combined with other potential non-significant environmental effects of one or more projects.

11.2 Planning Policy Context

The requirement for cumulative impact assessment is outlined in the 2017 EIA Regulations:

Schedule 4, Part 5 of the Town and Country Planning (EIA) Regulations 2017 requires "*A description of the likely significant effects of the development on the environment resulting from, inter alia:*

- (a) the construction and existence of the development, including, where relevant, demolition works;*
- (b) the use of natural resources, in particular land, soil, water and biodiversity, considering as far as possible the sustainable availability of these resources;*
- (c) the emission of pollutants, noise, vibration, light, heat and radiation, the creation of nuisances, and the disposal and recovery of waste;*
- (d) the risks to human health, cultural heritage or the environment (for example due to accidents or disasters);*
- (e) the cumulation of effects with other existing and/or approved projects, taking into account any existing environmental problems relating to areas of particular environmental importance likely to be affected or the use of natural resources;*
- (f) the impact of the project on climate (for example the nature and magnitude of greenhouse gas emissions) and the vulnerability of the project to climate change;*
- (g) the technologies and the substances used.*

The description of the likely significant effects on the factors specified in regulation 4(2) should cover the direct effects and any indirect, secondary, cumulative, transboundary, short-term, medium-term and long-term, permanent and temporary, positive and negative effects of the development. This description should take into account the environmental protection objectives established at Union or Member State level which are relevant to the project, including in particular those established under Council Directive 92/43/EEC(1) and Directive 2009/147/EC(2)."

The assessment has been undertaken in accordance with these Regulations.

11.3 Cumulative Impact Assessment

11.3.1 Overview

The cumulative impact assessment follows guidance set out in the Institute of Environmental Management and Assessment (IEMA) 'State of Environmental Impact Assessment Practice in the UK' Report.

IEMA's Report recognises two major sources of cumulative effects:

- Combined effects (also known as intra-project effects): These effects occur where a single receptor is affected by more than one source of effect arising from different aspects of a project. An example of a combined effect would be where a local resident is affected by dust, noise and traffic disruption during the construction of a project, with the results being a greater nuisance than each individual effect alone; and
- Cumulative effects (also known as inter-project effects): These effects occur as a result of a number of developments, which individually might not be significant, but when considered together could result in a significant cumulative effect on a common receptor, and will include developments separate from and related to the project.

Combined effects are considered in Section 11.4 and cumulative effects are considered in Section 11.5 below.

11.3.2 Assessment Method

There is no standard methodology available by which the cumulative and combined effects of a development can be assessed. Additionally, the extent to which effects of other developments can be assessed quantitatively is dependent on the level of information available about those developments. Subsequently, such effects are assessed by professional judgement, taking into account industry best practice guidance, on a per topic basis. Further information as to how this judgment is applied is explained in the relevant specialist chapters (Chapters 4–10). However, where enough information regarding the other developments exist, it may be possible to use modelling or standard assessment matrices. Impacts are quantified where possible, but where environmental assessment information regarding other developments is not available or uncertain, the assessment is necessarily qualitative.

The consideration of cumulative and combined assessment assumes that the mitigation identified in Chapters 4 to 10 is applied, i.e. residual effects (after mitigation) are discussed in this chapter.

Cumulative and combined effects are assessed to be neutral, minor (not significant), moderate or major (significant). An effect will be categorised as significant, only where the effect of two or more developments are greater than the effects of each development individually. The size of the other developments are also taken into account in consideration of their cumulative effects.

Where applicable, the assessment considers all developments that have potential to give rise to cumulative effects with the proposed Scheme together, as a worse case. This assessment excludes existing operational developments in the surrounding area, as these are accounted for in the baseline conditions which have been established as part of the main assessment within Chapters 4-10 of this ES.

11.4 Assessment of Combined Effects

11.4.1 Identification of Potential Effects

Combined effects may occur where a common receptor is being affected by two or more effects reported in different specialist assessments e.g. the two separate impacts may interact or combine to result in a combined effect. The first step in the assessment has been to consider where there is potential for a combined effect to occur. An overview of where potential combined effects may interact or combine between technical assessments may occur is provided in Table 11.1 below. It should be noted that an 'X' in the table denotes that a potential combined effect could occur, however, this does not mean that a combined effect will definitely arise.

Table 11.1: Potential for combined effects*

	T&T	AQ	N&V	Ecol	LVIA	FR	GC
Traffic & transport		X					
Air quality	X		X	X			
Noise & vibration	X	X		X	X		
Ecology		X	X		X		X
LVIA				X			
Flood risk							
Ground conditions				X			

*T&T: Traffic and Transport, AQ: Air Quality; LVIA: Landscape and Visual; N&V: Noise and Vibration; Ecol: Ecology; FR: Flood Risk; GC: Ground Conditions

The second step, taking account of the above, has been to review the results of the specialist assessments to identify potential common receptors and residual effects

which they are predicted to experience. The specialist assessments reported in the ES have identified a number of effects which could occur as a result of the construction and operation of the proposed Scheme.

It should be noted that where only one effect has been identified for a particular receptor or only one topic has identified effects on that receptor there is no common receptor and therefore no potential for a combined effect to occur. Combined effects have therefore only been identified where more than one specialist assessment chapter has identified a residual effect of minor significance or greater on an individual or group of common receptors.

Potential common receptors have been identified following a review of the specialist chapters. Table 11.2 below provides a summary of the common receptors which have been identified, the residual effects defined in Chapters 4 – 10 and the potential for interactions with other topics.

Table 11.2: Potential common receptors

Topic	Potential Common Receptor(s)	Potential Interaction
Traffic and Transport	No potential common receptors have been identified	No significant residual effects identified by the traffic assessment
Air Quality	Potential common ecological receptors and residential receptors	No significant residual effects identified by the air quality assessment
Noise and Vibration	Potential common ecological receptors and residential receptors	Significant adverse residual effects during evening, weekend and night construction exist. The impact of construction noise alongside other effects has been considered for ecological receptors within the ecology chapter, and therefore have already taken account of in-combination effects. There is not considered to be potential for in-combination effects on human receptors from air quality and noise.
Ecology	Identifies all ecological receptors that could be affected by effects identified in other chapters	Where other specialist assessments have identified an impact, which results in a combined effect, (i.e. noise), the impact has been assessed in the ecology chapter and is therefore not considered to be an additional combined effect.
Landscape and Visual	No potential common receptors have been identified	Significant adverse residual effects predicted to occur however no common

Topic	Potential Common Receptor(s)	Potential Interaction
		receptors with other topics identified.
Flood Risk	No potential common receptors have been identified	No residual effects identified by the flood risk chapter.
Ground Conditions	No potential common receptors have been identified	No residual effects identified by the ground conditions chapter.

11.5 Cumulative Effects

This section provides a description of the cumulative effects which may arise from the proposed Scheme when considered alongside other future developments in proximity to the Site.

The objective is to identify whether impacts from several developments which individually might be insignificant, could cumulatively result in a significant effect upon specific receptors, as outlined in section 11.3.

11.5.1 Cumulative Impact Assessment Method

Best practice dictates that cumulative assessments of this nature should have regard for those proposed developments that are ‘reasonably foreseeable’ (i.e. usually under construction or with planning permission, as specified in guidance such as IEMA’s Guidelines for Environmental Impact Assessment). This is further clarified in the Planning Practice Guidance (EIA) which states that:

“The local planning authorities should always have regard to the possible cumulative effects arising from any existing or approved development.”

The study area which has been considered for the cumulative effects has been developed with consideration of the predicted extent of impacts associated with the proposed Scheme. The area has been defined by the specialist authors of each chapter, and a precautionary approach has been adopted in defining these areas to help ensure that all potentially significant effects (including cumulative effects) have been identified.

An initial screening exercise was undertaken to identify potential developments within the area for consideration within the cumulative impact assessment. This process identified other developments within a 1 km radius to create an initial list for consideration. Consultation was also undertaken with the LPA to agree the other developments to be considered in the cumulative assessment and those which were to be included as committed developments (i.e. consented developments that are not yet operational). Table 11.4 includes the full list of cumulative developments considered and the reasons for screening in or out for assessment.

It should be noted that this chapter does not consider cumulative traffic and transport impacts, as the model utilised for the traffic modelling already included all committed developments (including those in the emerging Local Plan but not already consented).

Therefore, the assessment of traffic and transport impacts, and the resultant effects, already account for the traffic likely to be generated by committed developments in the area (see Chapter 4: Traffic and Transport and Appendix 4A).

This list of committed developments was subsequently screened based on the potential for an impact to occur (e.g. townscape and visual impacts have potential to occur over a greater distance than, for example, noise or archaeology impacts) and a refined list was developed for further, more detailed consideration by topic specialists.

11.5.2 Consultation

As part of the EIA scoping process, consultation has been undertaken with statutory consultees. Appendices 3A provides the full Scoping Opinion. Detail relevant to cumulative effects is provided in Table 11.3 below.

Table 11.3: Consultation Correspondence

Consultee and date	Summary of Response
Email to Mark Quinn on the 10 th May 2021 to agree the list of other developments to be considered in the cumulative impact assessment	On the Pre app/ screening opinion out Highways Team advised that the following committed developments should be incorporated into the TA: • Tower Hill – 15/00570/HYB – Phases 1 and 2 built and Phase 3 (18/00288/REM) has approximately two thirds of dwellings left to build. • St Kevin’s Drive – 17/00201/FUL – approximately half to two thirds of all the dwellings left to build for Phases 1 to 4. • Bank Lane – 13/00393/OUT & 14/00874/REM – almost fully built (approx. 200 dwellings). • Kirkby Town Centre redevelopment – 17/00559/FUL – mostly built. • East Maghull residential extension in Sefton - http://pa.sefton.gov.uk/online-applications/ using application number DC//2017/01532 • Academy Business Park, Lees Rd, Knowsley Industrial Park – 20/00146/REM & 19/00337/OUT • Sonae, Moss Lane, Knowsley Industrial Park – 15/00417/OUT & 18/00776/HYB & 20/00124/FUL

11.5.3 Potential for Cumulative Effects

Table 11.4 below provides an overview of the long list of other developments considered for the potential to give rise to cumulative impacts with the proposed Scheme. These developments can be viewed in Figure 11.1.

Table 11.4: Committed developments considered in the cumulative impact assessment

Description	Application Reference Number	Approx. distance from proposed Scheme and direction
Construction of a hard play area and the installation of a footpath and erection of a 2.4m high single gate in an existing fence line	19/00326/FUL	0.7 km SE
Construction of 3G artificial turf pitch together with perimeter fencing, floodlighting, storage container, and associated areas of hardstanding	18/00550/FUL	0.8 km S
Reserved matters application pursuant to 15/00570/HYB for the erection of 158 no. dwellings and associated works - approval sought for access, layout, scale, appearance and landscaping	18/00288/REM	Adjacent to site - NE
Hybrid application comprising full application for erection of 200 dwellings, laying out of public open space and associated works; outline application for erection of maximum of 158 no. dwellings and associated works (all matters reserved for future approval)	15/00570/HYB	Adjacent to site - NE
17/00559/FUL - erection of a mixed-use development, comprising a foodstore and non-food retail shops (use class a1), food & drink and leisure uses (use classes a3/a5/d2), petrol filling station, car parking, landscaping, highway improvements and other associated works (including 3 no. Electricity substations) on land bound by Norwich way, hall lane, county road and Irlam drive; and the construction of a car park together with associated works on land off Cherryfield drive and Cherryfield crescent) - to allow for elevational changes to foodstore, units 2, 5-9, 14 and 15; merging of units 3 and 4 to form one larger unit; alterations to layout and design of petrol filling station; alterations to car parking and service areas	17/00559/FUL	0.7 km S
Erection of 173 dwellings together with vehicular access from St Kevin's drive, associated works, public open space and stopping up of 2 no. roads and 1 no. footpath.	17/00201/FUL	Adjacent to site - SE

Erection of 43 affordable dwellings (comprising single and two storey dwellings, and two storey apartments) together with new highway and access, car parking, curtilage works and boundaries	17/00343/FUL	0.9 km E
Erection of 3no. (2bed) terraced houses together with associated works	20/00283/FUL	0.7 km E
Erection of 2 semi-detached dwellings & associated works	20/00058/FUL	0.7 km E
Demolition of former church and creation of 75-bed care home with associated parking together with creation of 7no car parking spaces and turning head for dwellings at Deycroft avenue.	17/00257/FUL	0.6 km SE
Erection of three storey affordable extra care scheme building comprising 100 apartments with communal facilities, 16 one-bedroom affordable flats, 6 affordable bungalows and 48 affordable houses together with associated works and infrastructure.	17/00308/FUL	0.95 km SE
Hybrid application to create a training campus for Liverpool football club & improvements to the Eddie McArdle community pitches comprising: (i) full planning application for construction of: a single storey side extension to existing academy indoor pitch; first floor extension & external alterations to main academy building; upgraded external training ground pitches; construction of 499 seat spectator stand; upgrade community pitches; landscaping; pedestrian & cycle link; & associated infrastructure (including access roads, drainage, parking, fences & external lighting); including highway closure of Moss lane (ii) outline planning application for construction of: a training centre building; a family building; a grounds maintenance building; community changing facility & a covered pitch (external appearance reserved for future approval)	17/00324/HYB	1.15 km SE
Extension to car park together with installation of 2.4 metre high fencing and CCTV cameras to existing building	17/00160/FUL	0.9 k m S
Extension to existing car park together with external lighting including two floodlit columns	17/00741/FUL	0.9 k m S
Erection of a mixed-use development, comprising a foodstore and non-food retail shops (use class a1), food & drink and leisure uses (use classes a3/a5/d2), petrol filling station,	17/00559/FUL	0.9 k m S

car parking, landscaping, highway improvements and other associated works (including 3 no. electricity substations) on land bound by Norwich way, hall lane, county road and Irlam drive; and the construction of a car park together with associated works on land off Cherryfield drive and Cherryfield crescent		
Erection of a portal framed building, single storey electrical switch building, widening of internal access road and alterations to car park to create a logistics training centre including forklift driver training.	16/00373/FUL	1 k m SW
Erection of 50no. dwellings & associated works.	16/00663/FUL	0.5 km W
Demolition of existing building and erection of single storey building including community space, office accommodation, and café	17/00522/KMBC1	0.5 km W
Development comprising of a HGV trailer park, training building (d1), storage building (b8) with link extension and associated mounded earthworks, landscaping and ecology park.	2019/0892/FUL	1 k m NE
Erection of a 3 storey building for use as a multi-screen cinema (sui generis use) and 3 no. food and drink units (for use as cafés or restaurants (use class e) or pubs or drinking establishments (sui generis use), outdoor seating area, service yard, car parking area, revised access to service yard and car parking area, hard and soft landscaping and other associated works	20/00400/KMBC1	1 km S
Erection of 8 no. (2 bed) dwellings together with associated private amenity space, parking, access and landscaping / boundary treatments	20/00348/FUL	1 km E
Erection of 2no telecommunication masts (8 metres high) , 1no telecommunications cabinet and associated works	19/00629/FUL	1 km W
Hybrid application seeking full planning permission for the demolition of existing buildings and the erection of 841 residential dwellings (c3), new vehicular accesses off poverty lane, public open space and ancillary infrastructure and outline planning permission for an older persons housing scheme (c2, c3) and ancillary infrastructure with all matters reserved.	DC/2017/01532	2.75 km NW

Outline planning application for the demolition of weighing station and the erection of 5 industrial units (use class b1(c)/b2/b8); 7 trade counter units (b8 use); 1 self-storage facility (b8 use); 1 retail/food unit (use class a1/a3/a5) and 1 drive-thru unit (use class a1/a3/a5) together with car parking and associated works.	20/00146/REM & 19/00337/OUT	2 km SE
Outline application for the erection of up to 74,322 sq. m of b1/b2/b8 floor space - approval sought for access only at this stage, (appearance, landscaping, layout and scale to be reserved for future approval)	15/00417/OUT & 18/00776/HYB & 20/00124/FUL	1.6 km ESE
Outline planning permission for the erection of up to 207 dwellings and public open space (access to be considered at this stage all other matters reserved for future approval)	13/00393/OUT & 14/00874/REM	0.6 km NW

11.5.4 Developments Taken Forward for Cumulative Impact Assessment

Following the review of the long list of developments in Table 11.4 above, the following developments are considered to be of such a nature and proximity to the Site to have the potential to generate cumulative impacts when considered in context with the proposed Scheme:

- 18/00288/REM - reserved matters application pursuant to 15/00570/HYB for the erection of 158 no. dwellings and associated works - approval sought for access, layout, scale, appearance and landscaping.
- 17/00201/FUL – erection of 173 dwellings together with vehicular access from St Kevin's drive, associated works, public open space and stopping up of 2 no. roads and 1 no. footpath.
- 14/00874/REM – outline planning permission for the erection of up to 207 dwellings and public open space (access to be considered at this stage all other matters reserved for future approval).
- 2019/0892/FUL - development comprising of a HGV trailer park, training building (d1), storage building (b8) with link extension and associated mounded earthworks, landscaping and ecology park.
- 17/00559/FUL - erection of a mixed-use development, comprising a foodstore and non-food retail shops (use class a1), food & drink and leisure uses (use classes a3/a5/d2), petrol filling station, car parking, landscaping, highway improvements and other associated works (including 3 no. Electricity substations) on land bound by Norwich way, hall lane, county road and Irlam drive; and the construction of a car park together with associated works on land off Cherryfield drive and Cherryfield crescent) - to allow for elevational changes to foodstore, units 2, 5-9, 14 and 15; merging of units 3 and 4 to form one larger unit; alterations to layout and design of petrol filling station; alterations to car parking and service areas.
- 15/00417/OUT & 18/00776/HYB & 20/00124/FUL - outline application for the erection of up to 74,322 sq. m of b1/b2/b8 floor space - approval sought for access only at this stage, (appearance, landscaping, layout and scale to be reserved for future approval).
- DC/2017/01532 - hybrid application seeking full planning permission for the demolition of existing buildings and the erection of 841 residential dwellings (c3), new vehicular accesses off poverty lane, public open space and ancillary infrastructure and outline planning permission for an older persons housing scheme (c2, c3) and ancillary infrastructure with all matters reserved
- 19/00337/OUT - outline planning application for the demolition of weighing station and the erection of 5 industrial units (use class b1(c)/b2/b8); 7 trade counter units (b8 use); 1 self-storage facility (b8 use); 1 retail/food unit (use class a1/a3/a5) and 1 drive-thru unit (use class a1/a3/a5) together with car parking and associated works.

These have therefore been subject to further review regarding the nature of predicted impacts. The location of the developments is shown in Figure 11.1.

11.6 Cumulative Effects Assessment

11.6.1 Cumulative Traffic and Transport Effects

Any cumulative traffic and transport effects associated with the construction phase will be sufficiently managed and mitigated through the implementation of a Construction Traffic Management Plan which will be agreed with KMBC.

KMBC Highways has been consulted with during scoping discussions regarding the Transport Assessment. Through scoping, KMBC has confirmed the committed developments that require consideration in order to assess the potential cumulative traffic impacts during the operational phase of the development.

The agreed committed developments have been included within the baseline traffic data. No further committed developments therefore require consideration within in terms of cumulative traffic and transport effects.

11.6.2 Cumulative Air Quality Effects

Any cumulative air quality effects associated with the construction phase will be sufficiently managed and mitigated through the implementation of a Construction Environmental Management Plan (CEMP) which will be agreed with KMBC.

The air quality assessment is inherently cumulative as the traffic data used has included committed developments. The potential cumulative effects of the proposed Scheme on air quality have therefore been taken into consideration within the assessment.

11.6.3 Cumulative Noise and Vibration Effects

Any cumulative noise and vibration effects associated with the construction phase will be sufficiently managed and mitigated through the implementation of a Construction Environmental Management Plan (CEMP) which will be agreed with KMBC.

The noise and vibration assessment is inherently cumulative as the traffic data used has included committed developments. The potential cumulative effects of the proposed Scheme on noise and vibration have therefore been taken into consideration within the assessment.

11.6.4 Cumulative Ecology Effects

Cumulative effects can result from individually insignificant, but collectively significant actions taking place over a period of time in a concentrated location. Actions can incrementally give rise to a significant effect or be associated with effects authorised under different consent processes', which when connected, give rise to a significant effect.

The cumulative effects on ecological features of conservation importance to be assessed in this section include:

- Habitat loss.

This assessment of cumulative impacts is undertaken on the understanding that the proposed Scheme is delivered in line with the design proposed which includes embedded mitigation and that suitable mitigation schemes have been developed for each of the other developments in the cumulative assessment.

Developments scoped out from further assessment Table 11.4 are due to the following combination of factors:

- the distance of developments from the proposed Scheme;
- the lack of complimentary habitat on developments; and
- the lack of suitable habitat connecting the developments and the proposed Scheme.

Cumulative Effects from Construction

No developments listed in Section 11.5.4 are considered to cause a cumulative effect during construction.

Cumulative Effects during Operation

No residual impacts were identified for the proposed Scheme. Therefore, cumulative effects in-combination with other developments is considered negligible/not significant.

11.6.5 Cumulative Landscape and Visual Impact Effects

From a landscape and visual perspective, there are no developments of such a nature and proximity to the Site to have the potential to generate cumulative impacts when considered in context with the proposed Scheme.

11.6.6 Cumulative Flood Risk Effects

The assessment of cumulative impacts assumes that the other developments will be delivered in accordance with the same environmental standards and require the appropriate level of mitigation at construction and operation to meet regulatory requirements. Therefore, it is predicted that the cumulative impacts are no greater than those from the proposed Scheme in isolation.

11.6.7 Cumulative Ground Condition Effects

The assessment of cumulative impacts assumes that the other developments will be delivered in accordance with the same environmental standards and require the appropriate level of mitigation at construction and operation to meet regulatory

requirements. Therefore, it is predicted that the cumulative impacts are no greater than those from the proposed Scheme in isolation.

11.7 Limitations

Limitations encountered during the individual assessments are outlined within Chapters 4-10.

Due to the availability of information for some of the developments identified for consideration, comprehensive data (e.g. traffic generation, predicted noise) were not available for some developments. Subsequently, conclusions were based on professional judgement, industry best practice guidance and knowledge of similar schemes or estimations of likely effects based on the information available to date. This is not likely to affect the robustness of the assessment.

Contents

	Page
12	Summary of Significant Effects, Mitigation and Monitoring
12.1	Introduction
12.2	Environmental Effects, Mitigation and Monitoring

12 Summary of Significant Effects, Mitigation and Monitoring

12.1 Introduction

This chapter provides a summary of the residual environmental effects, during the construction and operational phases, of the proposed Scheme, and details the mitigation proposals outlined in the technical chapters (Chapters 4-10).

The assessment has been undertaken with cognisance of impact avoidance which have been embedded into the proposed Scheme design in order to avoid potential impacts. Details of impact avoidance measures incorporated into the design of the proposed Scheme and relied on in the assessments are described in the respective technical Chapters 4-10.

Mitigation measures can be classified into three distinct forms, which are:

- measures to prevent or avoid significant adverse effects on the environment;
- measures to reduce significant adverse effects on the environment; and
- measures to remedy significant adverse effects on the environment through enhancement.

In this ES, primary (referred to as embedded mitigation) and tertiary mitigation (often referred to as standard practice) is detailed within Section 6: Design Development and Impact Avoidance of each technical chapter. Standard best practice construction measures that are inherent to any development (tertiary mitigation), and are therefore relied on in the assessments, are all included in Appendix 2A: Outline Construction Environmental Management Plan (CEMP). The Outline CEMP should therefore form a condition of the outline planning permission to ensure that the measures relied on in the technical chapters are implemented.

Secondary mitigation that has been identified through the technical chapters with the aim of reducing any environmental effects is detailed within Section 8: Mitigation of each technical chapter and summarised in Table 12.1.

12.2 Environmental Effects, Mitigation and Monitoring

Table 12.1 below summarises the potential residual **significant** environmental effects of the proposed Scheme that have been identified by the individual technical chapters. The table also summarises any additional (secondary) mitigation measures that have been identified in the technical chapters.

For the purposes of this ES, an effect is considered to be significant if it is assessed to be moderate (adverse or beneficial); or major (adverse or beneficial).

A description of the nature of the effects (e.g. short term, direct etc) is provided within Chapter 3: EIA Assessment Methodology.

As required by Schedule 4 of the EIA Regulations Table 12.1 also details recommended monitoring where a mitigation required to avoid or reduce a significant adverse impact requires monitoring to ensure its effectiveness.

Table 12.1: Summary of potential residual significant effects

Development stage	Potential impact	Impact avoidance measures / embedded mitigation	Environmental effect without additional mitigation	Additional mitigation	Effect after additional mitigation (residual effect)	Nature of effect	Recommended monitoring (if applicable)
Chapter 4: Traffic and Transport							
Construction	No significant residual effects during construction.						
Operation	Pedestrian delay – increase in operational vehicle movements and increase in number of pedestrians crossing on Headbolt Lane.	Improvement to local pedestrian network and crossing facilities, which will cumulatively reduce pedestrian delay. Framework Travel Plan	Moderate beneficial	N/A	Moderate beneficial	Lt, P, D	N/A
Chapter 5: Air Quality							
Construction	No significant residual effects during construction.						
Operation	No significant residual effects during operation.						
Chapter 6: Noise and Vibration							
Construction	Evening and weekend construction noise	Use BPM and adherence to the CEMP,	Significant adverse	No additional mitigation proposed	Significant adverse	St, T, D	N/A

Development stage	Potential impact	Impact avoidance measures / embedded mitigation	Environmental effect without additional mitigation	Additional mitigation	Effect after additional mitigation (residual effect)	Nature of effect	Recommended monitoring (if applicable)
		including public liaison. Section 61 agreement					
Construction	Night construction noise	Use BPM and adherence to the CEMP, including public liaison. Section 61 agreement	Significant adverse	No additional mitigation proposed	Significant adverse	St, T, D	N/A
Operation	Operational combined road and passenger rail noise	N/A	Significant beneficial	N/A	Significant beneficial	Lt, P, D	N/A
Chapter 7: Ecology							
Construction	Habitat loss – Grassland – other neutral grassland	Creation of 1.6 ha of neutral grassland	Minor adverse	No additional mitigation to off-set the already embedded design which includes enhancement of retained grassland and management	Minor adverse (significant)	Lt, P, D	N/A

Development stage	Potential impact	Impact avoidance measures / embedded mitigation	Environmental effect without additional mitigation	Additional mitigation	Effect after additional mitigation (residual effect)	Nature of effect	Recommended monitoring (if applicable)
				of Himalayan balsam			
Operation	No significant residual effects during operation.						
Chapter 8: Landscape and Visual Impact Assessment							
Construction	Loss of key landscape characteristics, including openness and rolling valley landform.	Implementation of the landscape plan	Major adverse (significant)	No additional mitigation proposed	Major adverse (significant)	Lt, P, D, IN	N/A
Operation	Viewpoint 01: Junction of Bassenthwaite Avenue with Boyes Brow.	Implementation of the landscape plan	Moderate adverse (significant).	Tree and shrub planting to screen retaining wall and security fence.	Minor adverse (not significant)	Lt, P, IN	N/A
Operation	Viewpoint 02: Junction of Heathfield Drive with Headbolt Lane.	Implementation of the landscape plan	Moderate adverse (significant) reducing to minor adverse (non-significant) after 15 years when landscaping matures.	No additional mitigation proposed	Moderate adverse (significant) reducing to minor adverse (non-significant) after 15 years when landscaping matures.	Lt, P, IN	N/A

Development stage	Potential impact	Impact avoidance measures / embedded mitigation	Environmental effect without additional mitigation	Additional mitigation	Effect after additional mitigation (residual effect)	Nature of effect	Recommended monitoring (if applicable)
Operation	Viewpoint 03: Junction of Fallowfield Lane with Headbolt Lane.	Implementation of the landscape plan	Moderate adverse (significant) reducing to minor adverse (non-significant) after 15 years when landscaping matures.	No additional mitigation proposed	Moderate adverse (significant) reducing to minor adverse (non-significant) after 15 years when landscaping matures.	Lt, P, IN	N/A
Chapter 9: Flood Risk							
Construction	No significant residual effects during construction.						
Operation	No significant residual effects during operation.						
Chapter 10: Ground Conditions							
Construction	No significant residual effects during construction.						
Operation	No significant residual effects during operation.						