



QA

Royal Brunswick Park

Environmental Statement - Volume 1: Main Text & Figures

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1.0 INTRODUCTION

- 1.1 This Environmental Statement (ES) accompanies a hybrid planning application for a phased mixed-use scheme on a site comprising known as Royal Brunswick Park in the London Borough of Barnet. The ES has been prepared on behalf of Comer Homes Group (the 'applicant').

PROPOSED DEVELOPMENT

- 1.2 The proposed development is for:

'Hybrid planning application for the phased comprehensive redevelopment of the North London Business Park to deliver a residential-led mixed use development. The detailed element comprises up to 466 residential units in five blocks reaching 9 storeys, the provision of a 5 form entry secondary school, a gymnasium, a multi-use sports pitch and associated changing facilities and improvements to open space and transport infrastructure, including improvements to the access from Brunswick Park Road and; the outline element comprises up to 1,967 additional residential units in buildings ranging from three to twelve storeys, up to 7,148 sqm of non-residential floor space (use Class E) and 20,250sqm of open space. Associated site preparation/enabling work, transport infrastructure and junction work, landscaping and car parking.'

PLANNING HISTORY

- 1.3 The site benefits from an existing hybrid planning permission (HPP) which was granted in on appeal in February 2020 (Barnet Council reference 15/07932/OUT and PINS reference APP/N5090/W/17/3189843). Further details of the planning history are set out below.
- 1.4 An ES was prepared in support of this application in 2015 (the 2015 ES).
- 1.5 Following the preparation of the 2015 ES further associated reports were prepared in 2016 and 2017 to reflect changes in the number of units and the scale and massing of the proposed development.
- 1.6 The planning description was amended in 2017 to the following:

'Hybrid planning application for the phased comprehensive redevelopment of the North London Business Park to deliver a residential led mixed-use development. The detailed element comprises 360 residential units in five blocks reaching eight storeys, the provision of a 5 Form Entry Secondary School, a gymnasium, a multi-use sports pitch and associated changing facilities, and improvements to open space and transport infrastructure, including improvements to the access from Brunswick Park Road, and; the outline element comprises up to 990 additional residential units in buildings ranging

from two to nine storeys, up to 5,177 sq m of non-residential floor space (Use Classes A1-A4, B1 and D1) and 2.54 hectares of public open space. Associated site preparation/enabling works, transport infrastructure and junction works, landscaping and car parking.'

- 1.7 Following the refusal of the application in September 2017 an ES Addendum was prepared in 2018 to provide further environmental information to support an appeal as a result of a request from the planning inspectorate in March 2018.
- 1.8 HPP (Planning ref: 15/07932/OUT) was then granted for the site on the 24th February 2020 by the Secretary of State following appeal. The HPP was granted for:
- *'Hybrid planning application for the phased comprehensive redevelopment of the North London Business Park to deliver a residential led mixed-use development. The detailed element comprises 376 residential units in five blocks reaching eight storeys, the provision of a 5 Form Entry Secondary School, a gymnasium, a multi-use sports pitch and associated changing facilities, and improvements to open space and transport infrastructure, including improvements to the access from Brunswick Park Road, and; The outline element comprises up to 824 additional residential units in buildings ranging from two to eleven storeys, up to 5,177 sq m of non-residential floorspace (Use Classes A1-A4, B1 and D1) and 2.9 hectares of public open space, Associated site preparation/enabling works, transport infrastructure and junction works, landscaping and car parking, as amended (IR10) to;*
 - *Hybrid planning application for the phased comprehensive redevelopment of the North London Business Park to deliver a residential led mixed-use development. The detailed element comprises 360 residential units in five blocks reaching eight storeys, the provision of a 5 Form Entry Secondary School, a gymnasium, a multi-use sports pitch and associated changing facilities, and improvements to open space and transport infrastructure, including improvements to the access from Brunswick Park Road, and; the outline element comprises up to 990 additional residential units in buildings ranging from two to nine storeys, up to 5,177 sq m of non-residential floor space (Use Classes A1-A4, B1 and D1) and 2.54 hectares of public open space. Associated site preparation/enabling works, transport infrastructure and junction works, landscaping and car parking.'*
- 1.9 In consideration of the existing planning permission on the site, the current proposal has taken on board the Inspector's comments from the 2020 appeal, and has evolved through further pre-application engagement and collaboration with officers over the course of 2021, including several meetings with local planning, design and highways officers, a Design Review Panel, meetings with the Greater London Authority and Transport for London and various public engagement exercises. Further details around consultation are provided in Chapter 4.0 of this ES.

SITE DESCRIPTION

Location

- 1.10 The site is bounded by the East Coast Mainline railway along the entire western boundary, whilst the New Southgate Cemetery is adjacent to the eastern boundary. Properties to the north and south are predominantly residential, typically characterised by two/three storey suburban detached, semi-detached and terraced housing. The site does not contain any listed buildings, nor is it located within a Conservation Area.
- 1.11 A site location plan is provided in Appendix 1.1.

Access and Transport links

- 1.12 The site has two principle entry and exit points, to the south onto Oakleigh Road South, and to the East on to Brunswick Park Road. A redundant and unused site entry and exit point is positioned on the northern boundary of the site, opening on to Ashbourne Avenue and connecting to Russell Lane.
- 1.13 The site is bound on the southern boundary by the East Coast Mainline railway.
- 1.14 The site is bound on the eastern side by New Southgate Cemetery (not adjacent, but on the opposite side of Brunswick Park Road) and to the south-eastern and north-eastern boundaries by low-density two-storey terraced and semi-detached residential dwelling, of a typology typical of the area.

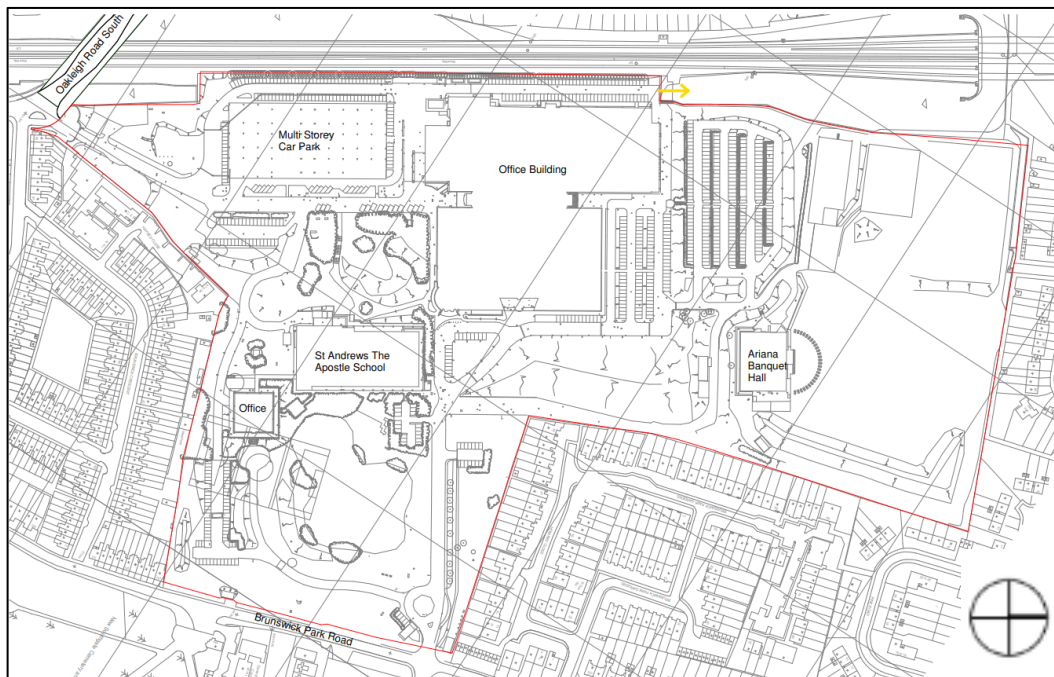
Topography

- 1.15 The site slopes steeply from the low point of the site, onto Brunswick Park Road (48.0m AOD) to the northern area of the site as it exits to Ashbourne Avenue (72.0m AOD), a level difference across the site of 24m (6 residential storeys).

Current Use of Site

- 1.16 The existing site plan is shown in the figure below and Appendix 1.2.

Figure 1.1 Existing Site Plan



- 1.18 Current structures on site include circa 380, 000 square foot of office buildings, an above-ground car-parking structure, and an office building currently in use as a secondary school; a Free School opened in the last number of years, Saint Andrew the Apostle Greek Orthodox School. Numerous other small structures occupy the site, including security huts, a banqueting hall and unoccupied office buildings.
- 1.19 A substantial lake occupies the lower section of the site. The lake is a man-made structure and dates from the mid-1980s. It serves as an attenuating pond, with surface water run-off draining to the pond from the lands above. The lake was originally developed in two tiers, with a pumped waterfall, however the pump has not been used in recent times and the upper lake is now dry and overgrown with vegetation.
- 1.20 A number of Tree Preservation Orders (TPO) are in place on the site (see Appendix 8.4).

THE ENVIRONMENTAL STATEMENT

- 1.21 The Environmental Impact Assessment is a systematic process during which potential significant environmental impacts from a proposed development project are identified, assessed and the scope for minimising potential impacts are presented to the relevant decision maker (the 'competent authority') within an ES accompanying a planning application.
- 1.22 The ES forms part of a set of reports that support the planning application for the proposed development. In addition to the ES and the necessary forms, plans and drawings, the planning application will also be accompanied by a number of stand-alone documents. A full list of the documents provided as part of the planning application may

be found within the Planning Statement, including details regarding how those documents have been submitted (for example, as stand-alone reports or as Technical Appendices in Volume 2 to the ES). The main documents that form the planning application and are not within the ES as either Technical Chapters or Appendices include:

- Design and Access Statement;
- Design Principles Document;
- Planning Statement;
- Statement of Community Involvement;
- Affordable Housing and Viability Statement;
- Energy Statement including Overheating Assessment;
- Circular Economy Statement;
- Whole Life-Cycle Carbon Assessment;
- Sunlight/ Daylight Assessment;
- Wind and Microclimate Assessment; and
- Utilities Strategy.

1.23 The ES is structured as follows:

- Volume 1: Main Text and Figures;
- Volume 2: Technical Appendices; and
- Volume 3: Non-Technical Summary.

1.24 The main findings of the assessment are reported in the topic specific Chapters of this document as set out below:

- Access and Transport (Chapter 6.0);
- Air Quality (Chapter 7.0);
- Biodiversity (Chapter 8.0);
- Archaeology and Cultural Heritage (Chapter 9.0);
- Drainage and Water Environment (Chapter 10.0);
- Ground Conditions (Chapter 11.0);
- Townscape and Visual (Chapter 12.0);
- Noise and Vibration (Chapter 13.0);
- Waste Matters (Chapter 14.0);
- Socio-economic (Chapter 15.0); and

- Cumulative Impacts (Chapter 16.0).

ES AVAILABILITY AND COMMENTS

- 1.25 The Town and Country Planning (Development Management Procedure, Listed Buildings and Environmental Impact Assessment) (England) (Coronavirus) (Amendment) Regulations 2020¹ came into force on 14th May 2020 and make temporary provisions for ESs to be made available in digital format on a website instead of physical copies at a named address, if it is not reasonably practicable to make physical copies available at a named address for reasons connected to the effects of coronavirus, including restrictions on movement. A digital copy of the ES is available through the Barnet Council website (www.barnet.gov.uk²). In addition, electronic copies (CD or USB flash drive) of the full ES are available free of charge from:

Greengage Environmental Ltd.

Telephone: 020 3544 4000

Email: info@greengage-env.com

- 1.26 Comments on the planning applications should be forwarded to Barnet Council at the address below:

Barnet Council

1st floor

2 Bristol Avenue

NW9 4EW

REFERENCES

- 1 Town and Country Planning (Development Management Procedure, Listed Buildings and Environmental Impact Assessment) (England) (Coronavirus) (Amendment) Regulations 2020
- 2 Barnet Council (2020); Find and Comment on Planning Applications.
<https://www.barnet.gov.uk/planning-and-building/planning/find-and-comment-planning-applications>

2.0 PROPOSED DEVELOPMENT

DETAILS OF PLANNING APPLICATION

2.1 The following section sets out the design principles of the proposed development. A full description of the development proposals can be found within the Design and Access Statement submitted as part of the application.

Design Principles

- 2.2 A summary of the relevant design principles is provided in Table 2.1 below.
- 2.3 The Royal Brunswick Park development has been designed around the concept of character areas with careful design of connections and public open space. A summary of the Character Areas is given in paragraph 2.7 below.
- 2.4 A masterplan, along with other relevant application drawings, are provided at Appendix 2.1.

Table 2.1 Design Principles

Design Matter	Design Proposal
Application Area	Total application area 163,640sqm Phase 0 (school) – 19,027sqm Phase 1 – detailed application area 36,537sqm Phase 2 -5 – outline application area 108,076sqm
Number of Dwellings	Detailed application: 466 units. Outline application: 1,967 units. Total: 2,433 units
Non – Residential Floorspace	<ul style="list-style-type: none"> • 960 sqm nursery; • 2,353 sqm workspace, of which 10% is proposed to be affordable; and • 3,835 sqm flexible non-residential floorspace, which could be used for community use, medical use, retail, offices, cafes etc.
Incubator Space (included in above non-residential floorspace figure)	Small-scale offices included appropriate for start-up businesses
Design Matters	
Building Heights	Houses at 2-to-3 storeys are proposed along the low density fringe where the proposed development adjoins existing neighbours. Apartments in the central area of the site, adjacent to the railway line, are taller buildings, rising to a

Design Matter	Design Proposal
	general height of 12 levels. Localised architectural features can be proposed within a maximum of 12 levels.
Housing Zones – fringe of development	Low density fringe where the proposed development adjoins existing neighbours, with the use of traditional house and-garden housing types.
Housing Zones – Centre of development	Centre of the site, away from existing neighbours, apartments are proposed, set around generous landscaped parks.
House & Apartment Sizes	Apartment sizes proposed are compliant with sizes outlined in the London Plan.
Affordable Housing	The extent of affordable housing delivery on the site is yet to be concluded and will be subject to viability appraisal. The form of buildings proposed provides opportunities for a range of dwelling sizes and tenures to be delivered as required.
Community Aspects	
School Provision	5 Form Entry Secondary School, a gymnasium, a multi- use sports pitch and associated changing facilities. A new all-weather multi use games pitch and Roof-top Multi Use Games Area (MUGA).
Community facilities	Provision for flexible and substantial community space is included as part of the proposals, which would include dedicated workspace including some at affordable rates, a large nursery, and flexible space for alternative retail, community and commercial uses. Specific Use Detail is to be proposed at Reserved Matters for Phases 2-5.
Play areas	Within Phase 1 an equipped Neighbourhood Area of Play is located within the Lakeside Park adjacent to New Brunswick Avenue. Doorstep Playable Space and Neighbourhood Playable Space with minimum sizes of 5,103 sqm. The total neighbourhood play space is 2,571 sqm with a further 2,532 sqm of doorstep playable space in communal courtyards.
Public Open Space	Circa 20,520 sqm of public open space
Population of new development	Approximately 5,501 new residents and 437 employees, as set out in Chapter 15.0: Socio-economic
Construction Matters	
Phasing of the proposed development	Built out over 5 Phases commencing in 2022: <ul style="list-style-type: none"> Phase 0 – School; Phase 1 – 466 residential units;

Design Matter	Design Proposal
	<ul style="list-style-type: none"> Phase 2 – 155 residential units; Phase 3 – 485 residential units; Phase 4 – 735 residential units; and Phase 5 – 592 residential units.
Construction Period	For the purposes of the ES this has been assumed to be 2022 – 2031 (proposed opening year).
Buildings demolished	All current buildings and structures on the site will be demolished.
Access Matters	
Access into the site	Reuse of existing routes into the site at the Southern boundary junction with Oakleigh Road South and at the road frontage to Brunswick Park Road where a new roundabout access is proposed.
Pedestrian and cycle access into the site	Connection at Ashbourne Avenue, connecting to Russell Lane, is proposed for pedestrian, cycle and emergency traffic only.
Connections through the site	Primary connections through the site are organised in a formal 'Parkway' space, serving to promote the first experience of a 'sense of place'.
Planted Connections	Routes connecting into the Parkway, from Oakleigh Road South and Brunswick Park Road, are conceived as heavily planted green 'Boulevard' routeways.
Parking	Basement Car Parking to be provided for all residential units in accordance with Barnet Parking Standards.
Off-site junction improvements	New roundabout on Brunswick Park Road. Improved entrance to the school.
Bus route & stops	Existing bus services are available on Brunswick Park Road and Oakleigh Road providing an up to 8 minute frequency service in the peak hours to Southgate, Millbrook Park, Edgware, Arnos Grove, Barnet and Walthamstow.
Public Open Space, Parkland and Tree Retention	
New Park Spaces	3 Main Parks - Masterplan designed around existing trees to maximise retention.
Accessible Landscapes	Tiered Gardens addressing level changes in the topography of the site.
Provision of Play Space	<ul style="list-style-type: none"> Four Locally Equipped Areas of Play. Doorstep Play provision to all residential blocks.

Design Matter	Design Proposal
Retention of Lake	The site contains an existing surface water attenuation lake and this will be re-designed to reflect the proposed landscape masterplan. The proposed development will utilise Sustainable Drainage Systems (SuDS) in accordance with best practice guidance.

Character Areas

- 2.5 The Landscape Masterplan (Appendix 2.1) layout has been derived from a consideration of principle connections, memorable Public Spaces at the important junctions of these connections, and a careful attention to detail of the quality of proposed new public streets.
- 2.6 Public Parkland is a key feature of the masterplan and all new residential blocks have been designed to have aspect onto green space of differing character. The new public parkland is principally offered to provide general outdoor amenity, sport and play space. It is also an important visual and environmental amenity, acting as a 'green lung' to the new community.
- 2.7 In order to assist the proposed development of the character description of these new places and spaces, titles have been attached to the major public areas and connecting route ways.
- New Brunswick Park – This central parkland (split into north and south) is a large and enclosed major new public park. It is centrally located at the intersection of the primary routes through the site and, as such, forms the 'genius loci' of the new community of dwellings.
 - Parkway - The Parkway is the central spine of circulation running throughout the Masterplan and an important route experienced daily by a large portion of new residents. The Masterplan strategy is to recognise this importance and respond with generosity of dimension, an abundance of tree planting and a high quality of material.
 - New Brunswick Avenue - Two new approach routes into the site are proposed. New Brunswick Avenue is a route that connects Brunswick Park Road (existing) with the New Brunswick Park and onward Masterplan connections. It is conceived as a double-tree lined Boulevard that passes the opening vista into Brunswick Lakeside Park.
 - Oakleigh Avenue - Similar to New Brunswick Avenue, Oakleigh Avenue connects the new spaces within the Masterplan to Oakleigh Road South. The existing character of mature trees can be retained and augmented on Oakleigh Avenue to establish a mature and sylvan character at this Masterplan entry point.

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- Brunswick Lakeside Park -Brunswick Lakeside Park is a new public park space that is framed around the existing lake on site. The Lakeside Park acts as a buffer between the proposed new school and residential areas and is conceived as a less formal area than New Brunswick Park.
- 2.8 Character Areas have been identified based on how the masterplan has proposed the distribution of open space, building mass and circulation routes within the masterplan site.
- 2.9 The definition of Character Areas within the masterplan has evolved over the course of the design. It is envisaged that 5 principle character areas within the masterplan are to be provided:
- New Brunswick Park, comprised of:
 - New Brunswick Park (South);
 - New Brunswick Park (North);
 - Brunswick Lakeside Park;
 - Northern Homezones; and
 - Oakleigh Avenue Gardens.
- 2.10 Movement within the masterplan has been considered as the connection of parkland spaces with green routes. It is not conceived that the masterplan will become part of the wider public street network, albeit the site does act as a vehicle connection between Oakleigh Road and Brunswick Park Road.
- 2.11 Passive discouragement of traffic passing through is proposed in the masterplan through design features in the public landscape. Vehicles are nonetheless free to use all primary and secondary streets within the masterplan, and a traditional arrangement of streets provide with parallel parking for visitors is proposed in most streets of the masterplan. Tertiary streets will be typically used only by residents for access.
- 2.12 The masterplan does open up the site to pedestrian traffic, both for new residents leaving and entering the site, with a variety of access locations and for the wider community as a new permeable pedestrian environment.
- 2.13 New connections include the Oakleigh Road and Brunswick Park Road entrances, as well as a new pedestrian and cycle connection to the north of the site at Ashbourne Avenue.
- 2.14 Multiple route options within the site are presented to pedestrians, allowing access to all public parkland space as well as the non-residential floorspace supporting the new community.

- 2.15 Car parking for the residential blocks is provided in the basement of apartment blocks in order to reduce on street parking and result in an improvement the quality of the outdoor environment.

SUSTAINABILITY AND ENERGY STRATEGY

- 2.16 The following measures that have been incorporated in Phase 0-1 and will be embedded into the detailed design for Phase 2-5 will reduce greenhouse gas emissions during the construction and operation of the proposed development:
- Material procurement will be undertaken with sustainable principles in mind including a number of measures which will reduce embodied emissions from materials as outlined in the Whole Life Carbon Assessment completed for the application;
 - The energy strategy for the Phase 1-5 will aim to achieve a CO₂ emission reduction target of 22% beyond the Building Regulations Part L (based on SAP 2012 estimates) and an emission of reduction target of 52% (based on SAP10 estimates) by implementing a variety of measures in accordance with the Mayor's Energy Hierarchy;
 - The energy strategy for Phase 0 will aim to achieve a CO₂ emission reduction target of 58.3% beyond the Building Regulations Part L (based on SAP 2012 estimates) and an emission of reduction target of 35% (based on SAP10 estimates) by implementing a variety of measures in accordance with the Mayor's Energy Hierarchy;
 - Measures to encourage sustainable transport uptake will be embedded into the design of the proposed development including:
 - Provision of Electric Vehicle Charging Points (EVCP) throughout the site in accordance with London Plan requirements;
 - Improved pedestrian routes and public realm throughout the site and the provision of new cycle lanes;
 - The provision of 160 long stay and 12 short stay cycle spaces for Phase 0, 901 cycle spaces for Phase 1 and additional cycle parking provision for Phase 2 - 5 to be confirmed at reserved matters stage; and
 - A Travel Plan will be implemented to encourage sustainable transport uptake for all future site users.

Air Source Heat Pumps

- 2.17 A hybrid heat network, led by Air Source Heat Pump (ASHPs) and supplemented by gas-fired boilers, will serve all new dwellings in Phases 1-5. The total 40 ASHPs for the scheme will be located on the roof of Block D in Phase 1 as centralised plant.
- 2.18 Photovoltaic panels were previously proposed for the HPP development in order to achieve the required emissions reductions. However, this option has not been taken forward for the proposed development due to practical constraints in terms of roof area.

CLIMATE CHANGE ADAPTATION

- 2.19 The following measures have been embedded into the design of the proposed development to support with its adaptation to climate change.

Overheating Risk

- 2.20 The buildings have been designed in accordance with the cooling hierarchy to reduce the risk of overheating and to avoid the specification of active cooling in the dwellings. Internal heat generation would be minimised by insulating all hot water pipes beyond Building Regulation standards, installing 100% low energy lighting, and installing energy efficient equipment where applicable.
- 2.21 External heat gains would be minimised by providing shading devices such as balconies and external blinds, specifying glazing with a solar transmittance value that has been carefully considered to strike the balance between useful solar gain in the winter and unwanted solar gain in the summer and providing elements with high thermal mass.
- 2.22 Passive ventilation has been designed for by avoiding small, south facing single façade units where possible, including openable windows to all rooms and fitting mechanical ventilation heat recovery systems with a by-pass for summer mode operation.
- 2.23 Overheating risk in communal areas would be mitigated by locating parts of the communal areas on external walls, installing opening ventilators to allow the areas to be cooled passively, eliminating heating distribution pipework, and providing ventilation to corridors in summer.

Surface Water Flooding and Water Shortages

- 2.24 Measures to minimise surface water flooding through the proposed drainage strategy which will include a 40% climate change allowance for 1 in 100 year storm events and reduce potable water consumption are described in Chapter 10.0: Drainage and Water Environment and associated appendices.

ALTERNATIVES

2.25 Regulation 18(3) and paragraph 2 of the EIA Regulations 2017¹ stipulate that ESs must include 'A description of the reasonable alternatives (for example in terms of development design, technology, location, size and scale) 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, including a comparison of the environmental effects.' Therefore, where feasible, alternatives to the development proposals have been considered within the scenarios below:

- 'Do Nothing' scenario;
- Alternative locations; and
- Alternative designs.

'Do Nothing' Scenario

2.26 The 'Do Nothing' scenario would generally assume that no development is carried out and the current status of the application site remains unaltered. However, given the site history, there is also the potential for the HPP development to come forward in the absence of the proposed development. The effects associated with those alternative proposals are assessed and set out in the 2015 ES and associated Addenda.

2.27 Despite the land zoning and a sustained effort to attract office occupiers over the last decade by the current landowner, office tenants have not taken up space in the North London Business Park.

2.28 The St Andrew the Apostle Free School, a secondary school, established itself on the site in the last number of years, occupying a converted office building. The accommodation is adequate, but temporary and insufficient to provide for the growing school population.

2.29 The site is currently underutilised as many of the buildings on-site are unoccupied. Further to this, the site is identified in the Draft Local Plan¹ as a location for the development of 1,000 homes, a school, multi-use sports pitch and employment space (site number 2). To bring no development on site is not considered an acceptable alternative, as this scenario would fail to deliver the aspirations within local policy.

Alternative Locations

2.30 The applicant owns the site and therefore alternative locations have not been considered. Furthermore, as is referenced above the site is identified in the Draft Local Plan as a location for the development of 1,000 homes, a school, multi-use sports pitch and employment space (site number 2).

Alternative Designs

- 2.31 The design team has sought to include Barnet Council in the design process in so far as early consultation through the pre-application process. Further to this stakeholders from the local community have been consulted and their input sought. The public consultation process is detailed in Statement of Community Involvement submitted with the application with relevant details provided in Chapter 5.0 of this ES.
- 2.32 Discussion on how environmental assessments have informed the design proposals is also provided in each technical Chapter (Chapter 6.0-16.0) where relevant.

HPP Masterplan Evolution

- 2.33 The HPP masterplan was commenced in 2013 and underwent a long process of planning engagement. A summary of the key design evolution associated with the HPP Masterplan is provided in Table 2.2 below.

Table 2.2 Key Design Evolution Amendments for HPP Masterplan

Design Matter	Key Design Amendments
Central Building	Interrogation of the orientation, form & ground level relationship of the central mixed-use community building.
Northern Homezones	Simplification of the layout & frontages facing streets, including elimination of blank gables & improved link to Ashbourne Avenue.
Oakleigh Road Entrance	Building reposition (setback) to respect existing tree positions.
Southern Masterplan Area	'Tightening up' of masterplan to organize simple courtyard blocks overlooking an orthogonal street pattern of 'traditional' street character.
Tree Preservation	A recasting of the masterplan layout to ensure a higher quantum of tree preservation can be enabled
Design of the School	Increased setback from Brunswick Park Road, Increased open space provision for the school, vastly increased tree preservation & the provision of a building 'shield' to the rear gardens of Brunswick Crescent (off site).

- 2.34 The HPP Masterplan is shown in Figure 2.1 below.

Figure 2.1 HPP Masterplan**2021 Masterplan Evolution**

- 2.35 Given the considerable amount of time elapsed since the original design of the masterplan was undertaken, in November 2020, the design and planning team took the opportunity to explore the density of the scheme in light of emerging policy and guidance.

2.36 Within the area of the detailed planning consent, a review of the approved layouts was undertaken to determine how internal layout efficiency within the blocks could be improved. The following initial principles were established:

- the mix of units should stay generally the same as the HPP, although the opportunity to increase the percentage of 3-bed units across this area was explored.
- the HPP contained generously planned units. Any re-design would ensure that units remained comfortably in excess of minimum space standards prescribed through the London Plan.

Review of Detail Area Layouts

2.37 Efficiency gains were mostly targeted on a reduction of the non-net space, such as cores, circulation, corridors etc.

2.38 No more than 8 units per core would be provided, or in the cases of connecting corridors, 2 cores would serve no more than 16 units.

2.39 Example amendments are shown below.

Figure 2.2 Typical Plan Blocks E and F (HPP)



Figure 2.3 Typical Plan Blocks E and F Proposed Design Amendments (November 2020)



Review of Outline Masterplan Area Layouts

- 2.40 The outline areas of the masterplan were analysed to determine what target apartment count on site could be possible if the metric analysis of the detail phase areas were applied to the outline phase area. The result of this identified the potential for circa 2,500 units across the full phase development.

Additional Height in Masterplan

- 2.41 The November 2020 Design Review also explored the principle of achieving additional height across the masterplan in the context of the appeal decision. The image below is a suggestion of where additional height could be achieved across the site without harming the townscape justification for the development quantum or affecting any residential neighbours, summarised as follows:
- The positioning of the additional storeys is on the basis that this height is not proximate to any sensitive receptors including the closest residential neighbours;
 - The height is located so that any additional shadow cast by the buildings does not unduly affect levels of sunlight and daylight received by the public open spaces;
 - With regard to the townscape and visual impact assessment prepared for the HPP, there is scope to accommodate additional height in specific locations across the masterplan without causing townscape harm which has informed the location of the uplifts.
- 2.42 It was calculated that the additional height identified in the adjacent image would result in an additional 400-500 residential dwellings across the site.

Figure 2.4 Full Phase Masterplan with Suggested Building Heights



Increased Floor Heights in the Masterplan

- 2.43 All layout alterations from the HPP masterplan are within the envelope of the existing consent. The position of window fenestration and balcony positions is proposed to change, however it is the intention to maintain the provision of high quality and durable façade materials permitted in the extant consent- brick, glazing provided in floor to ceiling proportion, stone and metalwork.

Final Proposed Masterplan

- 2.44 The final proposed Masterplan for this submission is provided in Appendix 2.1 along with other relevant application drawings.

REFERENCES

- 1 Barnet Council (2020); Barnet Draft Local Plan (Reg 18).

3.0 EIA METHODOLOGY

THE EIA REGULATIONS AND NEED FOR EIA

- 3.1 The EIA is a systematic process during which potential significant environmental impacts from a proposed development project are identified, assessed and the scope for minimising potential impacts are presented to the relevant decision maker (the 'competent authority') within an ES accompanying a planning application.
- 3.2 The aim of the EIA is to provide the competent authority (in this case Barnet Council) with the information necessary to consider potential environmental impacts, to ascertain whether these are acceptable and to secure mitigation measures to minimise these impacts prior to granting relevant consents.

The EIA Regulations

- 3.3 The revised EIA Directive (2014/52/EU) adopted by the European Parliament in 2014 was transposed into UK law through the EIA Regulations 2017¹ on 16th May 2017. The EIA Regulations 2017¹ apply to the assessment of environmental impacts that are likely to arise from certain types of public and private projects subject to requirements for statutory consents, referred to in the directives as 'development consents.'

The Need for an EIA

- 3.4 The proposed development does not fall under the description of a Schedule 1 Development as defined by the EIA Regulations 2017 that would automatically require a formal EIA. However, the proposed development, to which this ES relates, does fall within the description of the following sub-category of Schedule 2 and exceeds the corresponding threshold in column 2 of the table in Schedule 2 in that it includes more than 150 dwellings:

'Infrastructure projects' – urban development projects, including the construction of shopping centres and car parks, sports stadiums, leisure centres and multiplex cinemas (category 10(b) of Schedule 2)).

- 3.5 Due to the nature of the proposals and precedent for EIA for the HPP, it was considered that the development would be determined as an 'EIA Development', having regard to the factors in Schedule 3. Consequently, the client has committed to undertaking EIA for this application and has not sought an EIA screening opinion. Accordingly, the applicant has carried out an EIA and has provided an ES with this planning application.
- 3.6 It is the responsibility of the applicant to provide all the necessary information and to compile the ES for the EIA. Once submitted, the competent authority responsible for

authorising the relevant development should publicise the availability of the ES (and any related additional information) to potentially interested parties, such as statutory and non-statutory consultees and the public, so as to enable their opinions on the project and ES to be represented in the planning process.

- 3.7 Greengage Environmental Ltd have been commissioned by the applicant to prepare the ES, in line with the current EIA Regulations 2017¹ and EIA best practice.

THE ENVIRONMENTAL STATEMENT

Scoping

- 3.8 The process of scoping determines the topics or areas of potential likely impacts to be addressed and the geographical area and timeframe over which they will be considered. It sets out the methods to be used to determine the likely significant environmental effects that will arise as a result of the operation of the proposed development. The scoping process also enables certain potential impacts to be scoped out as not being likely to give rise to significant environmental effects.
- 3.9 To assist with determining the scope of this EIA, a review was undertaken of the scope of the 2015 ES (and associated Addenda). All topics scoped in to the 2015 ES have been assessed in this ES with the exception of Sustainability. Rationale for excluding a specific Sustainability ES Chapter is set out in the Table 3.1.
- 3.10 Given the proposed increased buildings heights associated with the proposed development compared to the HPP scheme, Wind Microclimate and Daylight/Sunlight have been undertaken in support of this submission. Rationale for their inclusion in or exclusion from the ES is also provided in Table 3.1 below.
- 3.11 A review was also undertaken of environmental topics introduced in the EIA Regulations 2017 that were not previously assessed with rationale for their inclusion in or exclusion from the ES also provided in Table 3.1 below.
- 3.12 Following this review, a number of key environmental considerations were identified that required detailed assessment within the ES including:
- Access and Transport;
 - Air Quality;
 - Biodiversity;
 - Archaeology and Cultural Heritage;
 - Drainage and Water;
 - Ground Conditions;
 - Townscape and Visual;

- Noise and Vibration;
- Waste Matters;
- Socio-economic; and
- Cumulative Impacts.

Table 3.1 Scoping Table

Topic	Scoped In/ Out for further assessment	Justification
Topics Previously Scoped into 2015 ES (and associated Addenda)		
Sustainability	Out	<p>This Chapter of the 2015 ES did not previously identify any likely significant effects and instead brought together sustainability matters that have been covered in the various specialist technical chapters.</p> <p>This Chapter has therefore been scoped out of the ES given that an overview of the sustainability strategy and measures to reduce greenhouse gas emissions and adapt to climate change is provided in Chapter 2.0: Proposed Development.</p>
Topics Previously Scoped Out of 2015 ES (and associated Addenda)		
Wind Microclimate	Out	<p>This has been scoped out of this ES as a standalone Pedestrian Level Wind Microclimate Assessment has been prepared which identified wind mitigation measures including changes to the location of building entrances and provision of thoroughfares. These will be incorporated into the design at reserved matters stage.</p>
Daylight & Sunlight	Out	<p>This has been scoped out of this ES as a standalone Daylight & Sunlight report has been prepared.</p> <p>The Daylight/ Sunlight assessment has considered the additional Vertical Sky Component effects of the proposals. In addition to Daylight/ Sunlight report has also considered the additional shading that will occur to the shared amenity space at the podium levels across the proposed development.</p> <p>The Daylight/ Sunlight report has identified that there is potential for the proposed development to achieve high levels of compliance for internal daylighting through careful design and enjoy amenity levels similar to the HPP.</p>
Topics Introduced in 2017 EIA Regulations		
Climate Change	In	<p>The greenhouse gas impacts of the proposed development will be mitigated through design embedded mitigation as described in the Sustainability and Energy Statement, Whole Life Carbon Assessment, Transport Assessment and Travel Plan.</p> <p>In addition, the proposed development has been designed to adapt to climate change as overheating mitigation is</p>

		<p>considered as part of the Sustainability and Energy Statement and the proposed drainage strategy will incorporate a 40% climate change allowance.</p> <p>Therefore, Climate Change has been scoped out of the ES and an overview of measures to reduce greenhouse gas emissions and adapt to climate change is provided in Chapter 2.0: Proposed Development.</p>
Human Health	In	<p>The potential for human health impacts is assessed as part of this ES as part of other topic chapters within the following ES Chapters:</p> <ul style="list-style-type: none"> • Chapter 7.0: Air Quality: <ul style="list-style-type: none"> o Paragraphs 7.47-7.57; • Chapter 13.0: Noise and Vibration: <ul style="list-style-type: none"> o Paragraphs 13.85 -13.130; • Chapter 15.0: Socio-economic <ul style="list-style-type: none"> o Paragraphs 15.126 – 15.128 and 15.142 for primary healthcare impacts.
Risk	Out	<p>Risk Assessments are used to determine the vulnerability of the proposed development to major accidents and/or disasters. The requirement for risk assessments was first introduced in England in the 2017 version of the EIA Regulations due to the broad range of development types included within the EIA Regulations such as power stations where the need to assess vulnerability is far greater. On the basis of a site review, risk assessment has been scoped out.</p>

Guidance Documents

- 3.13 In addition to the EIA Regulations 2017, the ES has been prepared with reference to currently available good practice, where appropriate, including:
- The Government’s Online Planning Practice Guidance²;
 - Guidelines for Environmental Impact Assessment by IEMA³;
 - The Note on Environmental Impact Assessment Directive for Local Planning Authorities by ODPM⁴; and
 - Topic specific guidance referred to in each Technical Chapter of this ES where appropriate.

The Structure of the ES

- 3.14 The ES comprises:
- Volume 1: Main Text and Figures;
 - Volume 2: Technical Appendices; and

- Volume 3: Non-Technical Summary.
- 3.15 The main findings of the assessment are reported in the topic specific Chapters of this document as set out below:
- Access and Transport (Chapter 6.0);
 - Air Quality (Chapter 7.0);
 - Biodiversity (Chapter 8.0);
 - Archaeology and Cultural Heritage (Chapter 9.0);
 - Drainage and Water Environment (Chapter 10.0);
 - Ground Conditions (Chapter 11.0);
 - Townscape and Visual (Chapter 12.0);
 - Noise and Vibration (Chapter 13.0);
 - Waste Matters (Chapter 14.0);
 - Socio-economic (Chapter 15.0); and
 - Cumulative Impacts (Chapter 16.0).
- 3.16 The legal minimum requirements for the content of an ES are set out in Regulation 18 (3) and Schedule 4 (where relevant) of the EIA Regulations 2017¹. The location of information in this ES specified in Regulation 18 (3) and Schedule 4 is identified in Table 3.2 below.

Table 3.2 Location of Information within the ES

Requirement of Regulations 18(3) and Schedule 4 of the 2017 EIA Regulations for the inclusion in Environmental Statements		Location of Information in this ES
Regulation 18 (3)		
(a)	A description of the proposed development comprising information on the site, design, size and other relevant features of the development.	Volume 1: Chapter 2.0: Proposed Development and Site Context
(b)	A description of the likely significant effects of the proposed development on the environment.	Volume 1: Chapters 6.0-16.0
(c)	A description of any features of the proposed development, or measures envisaged in order to avoid, prevent or reduce and, if possible, offset likely significant adverse effects on the environment.	Volume 1: Chapters 6.0-16.0
(d)	A description of the reasonable alternatives studied by the developer, which are relevant to the proposed development and its specific characteristics, and an indication of the main reasons for	Volume 1: Chapter 2.0 Proposed Development and Site Context

Requirement of Regulations 18(3) and Schedule 4 of the 2017 EIA Regulations for the inclusion in Environmental Statements		Location of Information in this ES
	the options chosen, taking into account the effects of the development on the environment.	
(e)	A non-technical summary of the information referred to in subparagraphs (a) to (d).	Volume 3: Non-Technical Summary
(f)	Any additional information specified in Schedule 4 relevant to the specific characteristics of the particular development or type of development and to the environmental features likely to be significantly affected.	Volume 1: Chapters 6.0-16.0
Schedule 4		
1	A description of the development, including in particular: (a) a description of the location of the development; (b) a description of the physical characteristics of the whole development, including, where relevant, requisite demolition works, and the land-use requirements during the construction and operational phases; (c) a description of the main characteristics of the operational phase of the development (in particular any production process), for instance, energy demand and energy used, nature and quantity of the materials and natural resources (including water, land, soil and biodiversity) used; (d) an estimate, by type and quantity, of expected residues and emissions (such as water, air, soil and subsoil pollution, noise, vibration, light, heat, radiation and quantities and types of waste produced during the construction and operation phases.	Volume 1: Chapters 2.0, 7.0-8.0, 10.0-11.0, 13.0-14.0.
2	A description of the reasonable alternatives (for example in terms of development design, technology, location, size and scale) 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, including a comparison of the environmental effects.	Volume 1: Chapter 2.0 Proposed Development and Site Context
3	A description of the relevant aspects of the current state of the environment (baseline scenario) 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.	Volume 1: Chapter 2.0 Proposed Development and Site Context and Technical Chapters 6.0-15.0.
4	A description of the factors specified in regulation 4(2) likely to be significantly affected by the development: population, human health, biodiversity (for example fauna and flora), land (for example land take), soil (for example organic matter, erosion, compaction, sealing), water (for example hydromorphological changes, quantity and quality), air, climate (for example greenhouse gas emissions, impacts relevant to adaptation), material assets, cultural heritage, including architectural and archaeological aspects, and landscape.	Volume 1: Chapters 6.0-16.0.

Requirement of Regulations 18(3) and Schedule 4 of the 2017 EIA Regulations for the inclusion in Environmental Statements	Location of Information in this ES
<p>5</p> <p>A description of the likely significant effects of the development on the environment resulting from, inter alia:</p> <ul style="list-style-type: none"> (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. <p>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).</p>	<p>Volume 1: Chapters 6.0-16.0.</p>
<p>6</p> <p>A description of the forecasting methods or evidence, used to identify and assess the significant effects on the environment, including details of difficulties (for example technical deficiencies or lack of knowledge) encountered compiling the required information and the main uncertainties involved.</p>	<p>Volume 1: Chapters 6.0-16.0.</p>
<p>7</p> <p>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 (for example the preparation of a post-project analysis). 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.</p>	<p>Volume 1: Chapters 6.0-16.0.</p>
<p>8</p> <p>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. Relevant information available and obtained through risk assessments pursuant to EU legislation such as Directive 2012/18/EU(3) of the European Parliament and of the Council or Council Directive</p>	<p>On the basis of a site review, risk assessment has been scoped out as this is not considered</p>

	Requirement of Regulations 18(3) and Schedule 4 of the 2017 EIA Regulations for the inclusion in Environmental Statements	Location of Information in this ES
	2009/71/Euratom(4) or UK environmental assessments may be used for this purpose provided that the requirements of this Directive are met. Where appropriate, this description should include measures envisaged to prevent or mitigate the significant adverse effects of such events on the environment and details of the preparedness for and proposed response to such emergencies.	relevant to the proposed development.
9	A non-technical summary of the information provided under paragraphs 1 to 8.	Volume 3: Non-Technical Summary
10	A reference list detailing the sources used for the descriptions and assessments included in the environmental statement.	Volume 1: Chapters: Chapters 6.0-16.0.

- 3.17 All abbreviations are presented in the relevant Chapters of the ES.
- 3.18 Where referenced, supporting material is appended within Volume 2: Technical Appendices.
- 3.19 A Non-Technical Summary of this ES is contained in Volume 3: Non-Technical Summary.

METHODOLOGY

Baseline and Future Conditions

- 3.20 The current baseline conditions, including the sensitivity and importance of those environmental aspects likely to be significantly affected by the proposed development, has been ascertained to provide a context for the analysis. The baseline conditions were measured in quarter two/three 2021 unless specifically stated within the Technical Chapters (6.0-16.0). The baseline conditions establish a benchmark for impact prediction. Any changes from the baseline inform the magnitude of the potential impact and its significance.
- 3.21 For the environmental elements considered within this ES, the baseline conditions have been established using a combination of desk-top studies (drawing on: published databases, maps, and reports); survey techniques; and monitoring. The specific methods employed to record the baseline conditions are detailed within the corresponding Chapters of this ES.

Assessment Criteria

- 3.22 Schedule 4 of the EIA Regulations 2017 requires an ES to include:

'A description of the likely significant effects on all 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.'

- 3.23 A number of criteria have been used to determine whether or not the potential environmental impacts from the proposed development are significant. These are outlined with reference to specific environmental issues in the relevant Technical Chapters of this ES, unless minor variations are explicitly stated within the 'Assessment Methodology' section within specific Technical Chapters. So far as appropriate, the impacts are assessed quantitatively using definitive standards and legislation. Where quantitative assessment is not possible, qualitative evaluation of significance based on professional judgement, with assumptions or uncertainties clearly highlighted, has been applied.
- 3.24 The significance of impacts has been assessed, taking into consideration a range of criteria:
- Performance against environmental quality standards;
 - Relationships with international, national and local planning policy;
 - Sensitivity of the receptor;
 - Reversibility and duration (short, medium, long-term) of the impact;
 - Nature of the impact (direct/indirect, positive/negative);
 - Extent of influence and magnitude of the impact; and
 - Inter-relationship between impacts.
- 3.25 Any additional impacts that were considered to be significant prior to and following mitigation have been identified within this ES. The significance of residual impacts following mitigation reflects judgements as to the importance or sensitivity of the identified receptor(s) and the nature and magnitude of the predicted changes. For example, a large adverse impact on a feature or site of low importance will be of lesser significance than the same impact on a feature or site of high importance.
- 3.26 Unless otherwise stated, the following terms have been used to define the significance of impacts, where they are predicted to occur:
- **Major Positive** or **Major Negative Impact** - where the development would cause a significant improvement or deterioration to the existing environment;
 - **Moderate Positive** or **Moderate Negative Impact** - where the development would cause a marginal improvement or deterioration to the existing environment;

- **Minor Positive or Minor Negative Impact** - where the development would cause a barely perceptible improvement or deterioration to the existing environment; and
- **Negligible** - no discernible improvement or deterioration to the existing environment.

- 3.27 The above terms are consistent with those used in the 2015 ES and associated Addenda.
- 3.28 A distinction between direct and indirect; short and long-term; permanent and temporary; primary and secondary; positive and negative; and cumulative impacts; has been made, where applicable.
- 3.29 The duration of effects resulting from the construction or operation of the proposed development is one of the factors to be considered in determining their significance. The classification of these is given in Table 3.3 below.
- 3.30 In order to distinguish between permanent and temporary effects, permanent effects are defined as those that result from irreversible change to the environmental baseline or persist for the foreseeable future. Impacts that are considered significant prior to and following mitigation have been identified in the ES.
- 3.31 In accordance with the 2015 ES and associated Addenda, unless otherwise stated in the technical chapters (6.0-16.0), 'major' and 'moderate' impacts are classed as 'significant' and 'minor' and 'negligible' impacts as well as 'no change' are classed as 'not significant'.

Table 3.3 Classification of Duration of Impacts

Significance	Definition
Temporary	The impact lasts for the period of construction or less
Short-term	Less than 5 years (but longer than the full period of construction)
Medium-term	5-10 years
Long-term	The impact remains for a substantial time, for the duration of the operation of the development

- 3.32 The ES also distinguishes the geographical extent of impacts; the definitions shown in the following table have been adopted.

Table 3.4 Classification of Different Geographical Extents

Significance	Definition
Local	The site and its immediate surroundings
Regional	The region (i.e. London)
National	United Kingdom

Significance	Definition
International	Europe and beyond

3.33 Where the above criteria have not been used, the methodology section of the Technical Chapter states the alternate criteria that have been applied and the rationale for their use.

Cumulative Impacts

3.34 Impacts arising from interactions extant, permitted and other proposed developments that are subject to undetermined planning applications close proximity to the site or that have planning permission and are under construction, are considered within individual Technical Chapters and summarised in Chapter 16.0: Cumulative Impacts.

3.35 A review of those applications where cumulative impacts have the potential to occur has been carried out and screened against the significance criteria identified above. The following schemes have been identified for consideration within the ES based on a review of Barnet Council and Enfield Council planning portals in August 2021:

- Former Abbots and Winters Haulage Site (15/04005/FUL);
- Sweets Way (B/04309/14 and 16/4513/RMA);
- Pavilion Study Centre (20/1304/FUL);
- 70-84 And Land R/o Oakleigh Road North (19/1950/FUL);
- Ladderswood Estate (P12-02202PLA);
- Gas Holder, Pinker Way (20/04193/FUL, pending consideration); and
- Barnet House (21/3726/FUL, pending consideration).

3.36 The above developments are either committed or pending consideration.

3.37 For a number of the technical assessments (e.g. transport) cumulative developments have been included as a part of the baseline in accordance with relevant assessment methodology.

Assumptions and Limitations

3.38 Certain assumptions have been made during the EIA, which are set out below. Assumptions specific to individual environmental aspects are discussed in the relevant Chapters of the ES. It is assumed that information provided by third parties, including publicly available information and databases, is correct at the time of receipt.

3.39 The EIA has been subject to the following limitations:

- Baseline conditions are accurate at the time of the physical surveys but due to the dynamic nature of the environment, conditions may change during the construction and operational phases;
- The assessment of any cumulative impacts has been based upon the information available at the time of writing (August 2021) and currently available assessment techniques; and
- The anticipated date of first occupation of the proposed development would be in 2031.

PROFESSIONAL TEAM

3.40 Table 3.5 sets out a summary of the team of 'competent experts' who have contributed to the preparation of the ES. The table also summarises their relevant qualifications and experience. The ES has been written and co-ordinated by Greengage Environmental Ltd with contributions from the following specialist consultants.

Table 3.5 ES Competent Experts' Relevant Qualifications and Experience

Name & Company Name	Technical Area	Qualifications	Relevant Experience
Mitch Cooke Greengage Environmental	EIA Coordination, Biodiversity, Waste & Socio-Economic	BSc MSc	Over 20 years' experience in the environment sector. Leads a multidisciplinary team and is expert in managing complex development projects. EIA schemes include Brentford Community Stadium, Clapham Park, and Stratford Central.
James Bumphrey Greengage Environmental	EIA Coordination & Biodiversity	BSc (Hons) MSc	Over 8 years' experience, managing EIA and ecology projects. Developments include Clapham Park, Pincents Lane and Goldsworth Road.
Simon Young Stomor	Transport	BA (Hons), Dip Urb, MCIHT	28 years' experience working on development and transport projects.
Paula Cullen Stomor	Transport	BA (Hons) MCIHT	10 years' experience working within the Transport Planning sector.
Erin Zhang RSK	Air Quality	BSc MSc	Erin is a Full Member of both the Institute of Air Quality Management and the Institution of Environmental Sciences. Erin has over 5 years' experience in environmental consultancy. The

			majority of her work is carrying out air quality assessments in support of planning applications for mixed-use, residential, commercial, industry and large environmental impact assessment (EIA) schemes.
Anna McMahon	Air Quality	BSc MSc	Anna is a Chartered Environmentalist and a full Member of both the Institute of Air Quality Management and the Institution of Environmental Sciences. Anna has over 10 years' experience in environmental consultancy. Anna has undertaken the role of air quality lead on numerous EIAs preparing and reviewing the ES chapter and associated detailed air quality assessments for a range of developments.
Victoria Oleksy AOC Archaeology Group	Archaeology and Cultural Heritage	BA (Hons) MA	Over 15 years experience Victoria specializes in EIAs, Archaeological Impact Assessment and Conservation Management Plans and has appeared as an expert witness for planning appeals and called-in planning applications.
Andy Kent RSK	Ground Conditions	BSc (Hons) MSc AIEMA	Over 15 years experience in the assessment of contaminated land and ground conditions managing a wide array of site investigation and ES chapters. Projects include elements of Crossrail (OOCPA and WITI), Upton Park redevelopment and The Hamptons. Worcester Park amongst various others.
Peter Stewart Peter Stewart Consultancy	Townscape and Visual Impact	MA, Dip Arch RIBA	Over 20 years' experience undertaking and managing townscape, visual and heritage impact assessments as part of an EIA, on hundreds of projects across the UK.
Dan Thomson Peter Stewart Consultancy	Townscape and Visual Impact	MA	Over 20 years' experience in the built environment sector, including seven years on the staff of CABE, latterly as a design review advisor handling CABE's response to major schemes submitted for review. Over 14 years' experience writing townscape, visual and built heritage assessments for a wide range of development proposals, principally for major developments requiring an EIA.

<p>Federico Gottardo RSK Acoustics</p>	<p>Noise and Vibration</p>	<p>BSc, MSc, MIOA</p>	<p>Over 9 years' experience working with major UK developers and architecture/design practices across the UK to assist with the noise and vibration aspects of the consenting process including large scale development (500+ units) to smaller schemes.</p>
<p>Jonathan Mart RSK Acoustics</p>	<p>Noise and Vibration</p>	<p>BSc (Hons), IOA Diploma in Acoustics and Noise Control, MIOA</p>	<p>Over 12 years' experience in the field of acoustics having acted as the programme manager, technical and stakeholder lead for noise and vibration assessments, specifications, monitoring and management plans to support the consenting, design, construction and operation of small to large project schemes.</p>

REFERENCES

- 1 Town and Country Planning (Environmental Impact Assessment) Regulations 2017
- 2 Ministry of Housing, Communities & Local Government (2019) Guidance Environmental Impact Assessment
- 3 The Institute of Environmental Management and Assessment (IEMA), (2004); Guidelines for Environmental Impact Assessment. IEMA.
- 4 ODPM, (2002); Note on Environmental Impact Assessment Directive for Local Planning Authorities. CLG.

4.0 CONSULTATION

- 4.1 The following Chapter sets out the consultation undertaken in support of the proposed development.
- 4.2 During the course of the development of the Masterplan, consultation has taken place with a range of organisations and individuals. Consultation was carried out for the following range of purposes:
- To obtain baseline information;
 - To obtain advice or comment on the scope of the EIA;
 - To obtain comment about the potential environmental effects of the proposed development;
 - To obtain comment on works potentially required to avoid, reduce or mitigate the potential environmental effects of the proposed development; and
 - To engage organisations and individuals most affected by the proposed development in the consideration of impacts and in the development of design and mitigation proposals.
- 4.3 The consultees approached fall into five groups:
- Statutory consultation bodies. These comprise public bodies with responsibilities relating to environmental protection and includes local councils and planning authorities;
 - Other public bodies or voluntary-sector organisations with responsibilities or interests relating to environmental protection or data collection;
 - Public bodies or voluntary-sector organisations whose environmental interests may be affected by the proposed development;
 - Commercial organisations or private individuals whose economic interests or quality of life may be adversely affected or benefitted by the proposed development; and
 - Members of the local community.
- 4.4 Where relevant, consultations in relation to specialist topics are referred to in the appropriate discipline-specific chapters of this ES. This Chapter presents an overall summary of the consultation process and its results.
- 4.5 As set out in the Statement of Community Involvement which has been submitted with the application, given the restrictions associated with the Covid 19 pandemic, public consultation was undertaken remotely.

Engagement with Political Stakeholders

- 4.6 Ward councillors, neighbouring ward councillors and Barnet Council leadership were notified of the development plans via email and were invited to participate in a discussion and presentation with the project team, as well as being invited to view the digital consultation. Meetings with the following stakeholders have taken place:
- Brunswick Park Ward councillors;
 - Councillor Dan Thomas, Leader of Barnet Council;
 - Councillor Shimon Ryde, (former) Chair of Barnet’s Strategic Planning Committee;
 - Theresa Villiers Member of Parliament for Chipping Barnet; and
 - Councillor Eva Greenspan, Chair of Barnet’s Strategic Planning Committee.
- 4.7 The applicant also held several meetings with officers at Barnet Council and the Greater London Authority to introduce the proposals and garner feedback. In addition to the political stakeholders above, the applicant also sought meetings with East Barnet ward councillors.

Engagement with Community Groups

- 4.8 The applicant invited the East Barnet Residents Association to a private briefing on the proposals. The group did not respond to this offer, nor did they reply to the invite to take part in the public consultation. The applicant has also been in touch with the Rector of East Barnet about potentially taking up space on the new development.

Digital Consultation

- 4.9 As it was not possible to hold a traditional public exhibition to showcase the plans to the community, the applicant moved this activity to online platforms and hosted a ‘virtual consultation’ from the main project website. The ‘virtual consultation’ ran for two weeks from Tuesday 27th April to Tuesday 11th May and had two core elements; a Virtual Exhibition and two Webinar presentations. To advertise the consultation, 4,028 invitations were distributed so residents were clear on how the consultation would run.
- 4.10 Across the two-week period 423 new users viewed the Virtual Exhibition with 20 feedback forms submitted and 14 emails were received.
- 4.11 The applicant held two webinars on Wednesday 28th May from 6pm till 7pm and Wednesday 8th May from 6pm till 7pm. During these events, attendees received a presentation on the proposals from the architects followed by a live question and answer session with the project team. Across both these events, 70 residents attended and asked 167 questions.

5.0 CONSTRUCTION AND PROGRAMME

INTRODUCTION

- 5.1 This Chapter addresses the proposed phasing and key activities for enabling works, demolition and construction across the proposed development. The Chapter is not written to assess the impact associated with the technical topics that make up this ES, and as such does not follow the same Chapter structure.
- 5.2 Planning for enabling works, demolition and construction is broad at this stage and may be subject to modification during the detailed planning of these works. It is anticipated that further information and detail will be submitted pursuant to planning conditions in accordance with standard practice.
- 5.3 The ES considers the potential impacts during construction as well during the operation of the scheme. This includes outline mitigation measures to minimise the risk of pollution incidents as well measures to protect members of the public. The assessment of potential construction phase impacts and associated mitigation is set out in the technical Chapters of this ES (6.0-16.0) and not repeated here.

PROGRAMME AND PHASING

- 5.4 The proposed programme for construction is anticipated as follows:
- Phase 0 – School;
 - Phase 1 – 466 residential units;
 - Phase 2 – 155 residential units;
 - Phase 3 – 485 residential units;
 - Phase 4 – 735 residential units; and
 - Phase 5 – 592 residential units.
 - Construction period estimated to be up 84 months (7 years) commencing in 2022.
- 5.5 A Proposed Development Zone Plan showing the area for each phase is provided at Appendix 2.1.
- 5.6 An existing site plan is provided at Appendix 1.2.

CONSTRUCTION ENVIRONMENTAL MANAGEMENT PLAN

- 5.7 A Construction Environmental Management Plan (CEMP) builds on the mitigation measures identified during the environmental assessment process and documented in

the ES. The aim of the CEMP is to minimise the noise, vibration, dust and water pollution as part of the construction.

- 5.8 A preliminary Construction Management Plan has been produced to support the application and is provided in Appendix 5.1. A detailed CEMP will be produced at the appropriate stage once detail of specific construction methodology is available. This will be secured by planning condition and incorporate all relevant construction phase mitigation measures as set out in this ES.

CONSIDERATE CONSTRUCTORS

- 5.9 The applicant is registered with the Considerate Contractors Scheme and observe their Code of Considerate Practice to promote and achieve best practice onsite. Sites and companies that register with the scheme sign up and are monitored against a Code of Considerate Practice, designed to encourage best practice beyond statutory requirements. All sites registered with the scheme are monitored by an experienced industry professional to assess their performance against the Code of Practice.

CONTRACTOR RESPONSIBILITIES

- 5.10 It would be part of the environmental duties of the Contractor to:
- ensure that a Traffic Management Plan is active;
 - refer to the CEMP and keep it updated as required;
 - ensure designed mitigation measures are carried out as specified;
 - ensure compliance with the Considerate Constructors Scheme Codes of Practice;
 - act as a first point of contact for compliance officers from statutory bodies;
 - ensure compliance with relevant pollution prevention guidelines;
 - ensure a Spillage Emergency Control Plan is in place;
 - deal with enquiries from members of the public; and
 - establish and carry out monitoring for such matters as noise, air quality, water quality and road conditions as appropriate.

TRAFFIC MANAGEMENT PLAN

- 5.11 A detailed Traffic Management Plan (secured by planning condition) will be produced by the Contractor at the appropriate stage. The following arrangements will be considered within this Plan:
- Providing separate entrances dedicated for pedestrians to safely segregate construction traffic at the project entrance.

- Providing “pedestrians only” areas within the site and safe pedestrian routes to and from work locations.
- Provide safe construction vehicle routes around the project.
- Providing “construction vehicles only” areas where only designated personnel can enter. (laydown and loading areas etc.).
- Providing trained security, logistics and traffic marshals.
- Location of cabins, welfare etc.
- Plan / drawing of access and egress to the project. (traffic and logistics plan to be displayed on site)
- Implement one-way systems to avoid reversing and turning construction vehicles
- Where one-way systems cannot be achieved suitable turning areas will be provided.
- Specify areas where the project will need to provide traffic control. (Will be required during the future phases to protect live public areas from construction traffic).
- Detail and enforce strict speed limits / height and width restrictions.
- Parking restrictions.
- Other local traffic characteristics: vehicular, cyclists and pedestrian flow.
- Mobilising / demobilising of plant.
- Deliveries to project / loading / storage areas.
- Signage.
- Temporary hoarding lighting.
- Impact of other contractors undertaking works (co-ordination of shared areas)

SITE WORKING HOURS

- 5.12 There will be no construction traffic, plant or noise impacting the surrounding area prior to the agreed start time.
- 5.13 All site deliveries and construction traffic movements will be carried out between the hours of:
- Monday to Friday - 8.00am to 6.00pm
 - Saturdays - 8.00am to 12.00pm
 - Sundays and Bank Holidays - NO working
- 5.14 The site shall be open from 07.30 with works proceeding at 08.00. No major works, entailing construction nuisance, noise or vibration shall commence before 08.00. Certain

activities will need to take place outside these core times to enable safe working, minimum disruption to road users or restrictions placed by three parties such as utility companies or the Highway Authority.

- 5.15 Start-up and close-down periods of up to an hour before and after core working hours may be used for activities such as arrival of workforce and staff on site; maintenance and checking of plant and machinery; general refuelling; site inspections, and safety checks prior to commencing work; site meetings; and general site clean-up and departure.
- 5.16 Deliveries will only be allowed on a 'just in time' basis and only accepted at the site between the hours of 10.00 – 14.00 to avoid peak traffic times and minimise the impact on the local residents and businesses.

CONSTRUCTION METHODOLOGY

Enabling Works

- 5.17 It is anticipated that some initial enabling works will be required prior to demolition and construction to divert existing utilities and drainage connections and to construct the new on site access junction and road from Brunswick Park Road.
- 5.18 This initial stage is anticipated to be undertaken as an early work during the design development of the proposed school to ensure a prompt start on site for the school buildings.

Demolition

- 5.19 Demolition would progress in a measured fashion with the demolition contractor recycling as much material from the site as possible. Soft strip would yield timber, pipework and electrical recycling and would also deal with any asbestos present in the buildings.
- 5.20 Concrete, brick and blockwork would be retained on site and crushed for re-use as fill within the site earthworks.
- 5.21 Prior to the commencement of Phase 1 the site would be hoarded with a 3m high solid panel hoarding to help retain dust and noise. Particular attention will be taken on boundaries with occupied facades.
- 5.22 Other phases would be similarly hoarded with higher hoardings in place at localised locations around the site where existing dwellings are in close proximity having due regard to rights to light.

-
- 5.23 The construction of the school building in the first phase of development will require the demolition of the existing security cabin at the Brunswick Park Road entrance, along with Building 5 and Building 6.
- 5.24 The security cabin is a small lightweight masonry building in the east of the site approximately 41m from the nearest occupied facade. The building comprises glazing and steel cladding and would be quickly demolished following soft strip using a 14 tonne slew and pressurised water to dampen down dust. Masonry elements will be stockpiled for crushing and re-use, and glazing and metals will be recycled.
- 5.25 Building 5 currently houses the St Andrew the Apostle School and is a mainly 2 storey concrete framed building in the south of the site. The building is around 60 m from the nearest façade on Brunswick Crescent. Following soft strip and removal of recyclable glazing and cladding elements, the concrete frame, floors and roof would be taken down using a 25-30 Tonne slew, starting with the highest section of the building, and with pressurised water for dust suppression.
- 5.26 Building 6 comprises a 2-storey flat roofed concrete framed building with curtain wall glazing and a clad frame. It is situated on the southern boundary of the site and is around 49m from the nearest façade on Brunswick Crescent. Following soft strip and removal of recyclable glazing and cladding elements, the concrete frame, floors and roof would also be taken down using a 25-30 Tonne slew, starting with the highest section of the building, and with pressurised water for dust suppression. Concrete elements would be crushed on site for re-use.
- 5.27 The existing Nursery and Ariana Banqueting Suite comprise a single building in the north of the site around 56m from the nearest dwelling façade on Brunswick Park Gardens. The building is of single storey masonry construction with glazing panels and low pitch steel clad roof. Following soft strip and removal of recyclable metal and glazed elements, the building would be taken down using a 14 tonne slew with pressurised water for dust suppression, with masonry elements recycled on site.
- 5.28 The remaining buildings for demolition to enable Phase 2 and onwards of the development comprise Buildings 3 and 4, are situated in the west of the site and comprise relatively modern concrete framed buildings with flat roofs and glazing and ranging from one to four storeys in height. The nearest property to any of these buildings is at the western boundary across the railway line with a façade around 70m from the building. After soft strip and removal of all recyclable glazing and metal elements, the buildings would be demolished typically using 25-30 Tonne slew, with pressurised water for dust suppression. The taller parts of the buildings would also employ the use of a 40 tonne slew, also with pressurised water for dust suppression.
- 5.29 The existing multi storey car park provides two decks of parking in addition to ground floor and is of concrete framed construction. It is situated in the south west of the site
-

and is approximately 64m from the nearest building façade. Following removal of waterproofing and soft strip, the concrete elements would be taken down using 14 tonne slews with hammer attachments and 25-30 tonne slews, with pressurised water for dust suppression, and be crushed on site for re-use.

- 5.30 Excavations would typically be undertaken using a 25 Tonne excavator with 9 tonne dumpers moving spoil to on site tips. Secant wall constructions would typically use 40 tonne continuous flight auger piling rigs.
- 5.31 The construction plant employed in this phase would typically comprise tower cranes; mobile cranes; concrete pumps; concrete vibrator compactors; and floor screed vibrators. The usual hand tools, cutters and grinders would be employed on site.

Physical Forms of Construction

- 5.32 The scheme includes a range of building typologies including small unit housing; apartment blocks; underground basements and a secondary school building.
- 5.33 Such buildings typically utilise a number of construction forms such as:
- Piled foundations;
 - Secant walls (secant pile walls are formed by constructing intersecting reinforced concrete piles);
 - In situ concrete frame construction;
 - Steel frame construction;
 - Timber frame construction;
 - Brickwork and blockwork;
 - Steel cladding;
 - Glazing elements;
 - Timber cladding; and
 - Flat and pitched roofing forms.
- 5.34 The proposed external landscape arrangements include a range of hard and soft landscaping which will provide a significant improvement on the existing landscape conditions at the site. This is expected to include timber decking; concrete block paving; tarmac surfacing; resin bound surfaces; a variety of alternate seed mixes in landscaped areas; tree planting and street furniture such as benches, play equipment and bins.

Earthworks

- 5.35 Basement excavations are likely to proceed after the construction of a secant piled wall around the basement perimeter. Bulk basement excavation would then proceed with material being retained on site for later use in fill areas.
- 5.36 Any identified contamination hot spots would either be remediated on site with the approval of the Environment Agency and Environmental Health Officer or would be taken off site to suitably licensed tips.

Structural

- 5.37 Building structural forms will be the most economically appropriate at the time of construction selected by the contractor but will also need to take into account the construction period available, especially for the school building.
- 5.38 It is anticipated that structural elements will be a mix of in site concrete, pre cast concrete framed, steel framed and timber frame where appropriate.

SITE WASTE MANAGEMENT

- 5.39 The Site Waste Management Plan (SWMP) regulations were revoked by the UK Government in December 2013 and are no longer a legal requirement in England for all construction projects starting onsite after the 1st of December 2013. However, despite this change in regulation SWMPs are still considered the standard practice onsite, as these plans are designed to encourage better waste management practices, improve environmental performance and reduce the cost of waste disposal. A Site Waste Management Plan would be included as part of the detailed CEMP (secured by planning condition).

6.0 ACCESS AND TRANSPORT

INTRODUCTION

- 6.1 This Chapter presents an assessment of the likely Transport and Access effects of the proposed development.
- 6.2 This Chapter provides a description of the methods used in the assessment. This is followed by a description of the relevant baseline conditions of the site and surrounding area, together with an assessment of the likely potential effects of the proposed development. Mitigation measures are identified where appropriate to avoid, reduce or offset any adverse effects identified and / or enhance likely beneficial effects. Taking account of the mitigation measures, the nature and significance of the likely residual effects are described.
- 6.3 This Chapter is supported by the following appendices, provided in Volume 2.0 of this ES:
- Appendix 6.1: Transport Assessment
 - Appendix 6.2: Travel Plan

LEGLISATION AND POLICY CONTEXT

- 6.4 This section outlines the legislative framework, the national, regional and local planning policy and supplementary policy guidance/best practice that has been considered in this assessment.

Legislation

- 6.5 There is no legislation that is relevant to this Chapter.

Policy

National Planning Policy Framework (NPPF), 2021

- 6.6 Section 9 of NPPF¹ 'Promoting Sustainable Transport' states:
- 'Transport issues should be considered from the earliest stages of plan-making and development proposals, so that:*
- a) the potential impacts of development on the transport networks can be addressed;*
 - b) opportunities from existing or proposed transport infrastructure, and changing transport technology and usage, are realised – for example in relation to the scale, location or density of development that can be accommodated;*

c) opportunities to promote walking, cycling and public transport use are identified and pursued;

d) the environmental impacts of traffic and transport infrastructure can be identified, assessed and taken into account – including appropriate opportunities for avoiding and mitigating any adverse effects, and for net environmental gains; and

e) patterns of movement, streets, parking and other transport considerations are integral to the design of schemes and contribute to making high quality places.'

6.7 In respect of considering development proposals, paragraph 108 states:

'In assessing sites...specific applications for development, it should be ensured that:

a) appropriate opportunities to promote sustainable transport modes can be – or have been – taken up, given the type of development and its location;

b) safe and suitable access to the site can be achieved for all users; and

c) any significant impacts from the development on the transport network (in terms of capacity and congestion), or on highway safety, can be cost effectively mitigated to an acceptable degree.'

6.8 Paragraph 110 states the following requirements for development applications:

'd) give priority first to pedestrian and cycle movements, both within the scheme and with neighbouring areas; and second – so far as possible – to facilitating access to high quality public transport, with layouts that maximise the catchment area for bus or other public transport services, and appropriate facilities that encourage public transport use;

e) address the needs of people with disabilities and reduced mobility in relation to all modes of transport;

f) create places that are safe, secure and attractive – which minimise the scope for conflicts between pedestrians, cyclists and vehicles, avoid unnecessary street clutter, and respond to local character and design standards;

g) allow for the efficient delivery of goods, and access by service and emergency vehicles; and

h) be designed to enable charging of plug-in and other ultra-low emission vehicles in safe, accessible and convenient locations.'

6.9 In terms of managing the off-site impacts of the traffic generated from the development, paragraph 109 states:

'Development should only be prevented or refused on transport grounds if there would be an unacceptable impact on highway safety, or the residual cumulative impacts on the road network would be severe.'

The London Plan, 2021

6.10 Policy GG2² Making the best use of land states that:

6.11 *'To create successful sustainable mixed-use places that make the best use of land, those involved in planning and development must:*

- *enable the development of brownfield land, particularly in Opportunity Areas, on surplus public sector land, and sites within and on the edge of town centres, as well as utilising small sites*
- *prioritise sites which are well-connected by existing or planned public transport*
- *proactively explore the potential to intensify the use of land to support additional homes and workspaces, promoting higher density development, particularly in locations that are well-connected to jobs, services, infrastructure and amenities by public transport, walking and cycling*
- *plan for good local walking, cycling and public transport connections to support a strategic target of 80 per cent of all journeys using sustainable travel, enabling car-free lifestyles that allow an efficient use of land, as well as using new and enhanced public transport links to unlock growth.'*

6.12 With reference to housing, The London Plan acknowledged that brownfield sites are crucial to deliver the new homes. Furthermore, it is stated that *'Boroughs should proactively use brownfield registers and permission in principle to increase planning certainty for those wishing to build new homes.'*

6.13 Policy T4 Assessing and mitigation transport impacts states the following:

- *'Where appropriate, mitigation, either through direct provision of public transport, walking and cycling facilities and highways improvements or through financial contributions, will be required to address adverse transport impacts that are identified.*
- *Where the ability to absorb increased travel demand through active travel modes has been exhausted, existing public transport capacity is insufficient to allow for the travel generated by proposed developments, and no firm plans and funding exist for an increase in capacity to cater for the increased demand, planning permission will be contingent on the provision of necessary public transport and active travel infrastructure.'*

- 6.14 Policy T6 Car Parking states that 'Car parking should be restricted in line with levels of existing and future public transport accessibility and connectivity.'

Barnet Draft Local Plan, 2020

- 6.15 Barnet Council is reviewing and updating the Borough's Local Plan. The Local Plan sets out a vision for how Barnet will change as a place over the next 15 years. The emerging Plan³ will, when it replaces the existing 2012 Local Plan, provide the main basis upon which future planning applications will be determined.

- 6.16 The following objectives are identified within the Local Plan:

- To deliver growth to meet housing aspirations and needs;
- To improve orbital connectivity and sustainable travel options including cycling and walking; and
- To ensure new development is high quality, sustainable, and capable of adaption to meet the needs of residents over their lifetime.

- 6.17 The Local Plan identified the need for 46,000 new homes to be delivered until 2036 to accommodate the planned growth in Barnet. Furthermore, the Local Plan seeks efficient use of previously developed land to address Barnet's housing needs:

'Policies BSS01 and GSS01 aims to make the best use of previously developed land which can be planned at higher densities...'

- 6.18 With regards to walking and cycling, the Local Plan states:

'Walking and cycling are transport modes that the Council is keen to promote due to the many benefits they provide ranging from reducing the use of private cars with consequent improvements for air quality to a more active and healthy population that increased walking and cycling leads to in terms of the health benefits to the individuals from derived from partaking in exercise.'

- 6.19 In relation to vehicle parking, for non-residential uses the Council supports the application of London Plan car parking standards. For residential uses the Council advocates an approach which is more reflective of local circumstances. The accessibility of individual locations will be taken into consideration, based on:

- The overall public transport accessibility level (PTAL);
- Orbital PTAL;
- Parking stress including the level of on-street parking control;
- Population density and parking ownership of surrounding areas;
- Location (i.e. is it in a town centre);

- Ease of access by cycling and walking; and
- Other relevant planning or highways considerations, such as to whether the proposal is a conversion of an existing use.

6.20 Local Plan aims to increase the rate of change in terms of car use, which includes support for active travel and public transport opportunities, as well as promoting innovative ways to enable long term modal shift.

ASSESSMENT METHODOLOGY

6.21 In support of the outline planning application, Transport Assessment (TA) and Travel Plan (TP) documents have also been prepared by Stomor and are contained in Appendices 6.1 and 6.2 of this ES. These documents detail the transport strategy and technical assessment upon which this Chapter has been based.

6.22 It should be noted that the DMRB states that '*The approach to assigning significance of effect relies on reasoned argument, the professional judgement of competent experts and using effective consultation to ensure the advice and views of relevant stakeholders are taken into account*'. This statement is also supported by the IEMA Guidelines and is particularly applicable for qualitative assessments not based on changes in traffic flows.

6.23 This assessment has taken into account the traffic generated by the proposed development as a whole. The assessment of the study area has considered a Base Year of 2021 to establish current, theoretical, network conditions. A forecast year of 2031 has been adopted as part of this assessment in line with what was agreed with TfL/LBB as part of the TA scoping discussions.

6.24 Owing to the submission programme it was not possible to prepare a full TA due to a delay in obtaining the required data from TfL in order to undertake junction capacity assessments. Therefore, a separate Addendum will be prepared in due course to address these assessments.

6.25 Notwithstanding this, the TA Addendum will have no impact on the conclusions of this Chapter given that it will contain technical assessments of the junctions within the local highway and has no relevance to the content of this Chapter.

Scope of the Assessment

Transport for London (TfL) Model

6.26 To evaluate the potential impacts of the proposed development on the surrounding highway network, a series of modelling scenario assessments have been undertaken using TfL's transport model.

6.27 The methodology for the local network assessment has been agreed with Barnet Council and TfL during pre-application discussions

- 6.28 The below scenarios were provided by the TfL model:
- 2021 Reference Case; *and*
 - 2031 Forecast Year (inclusive of local committed development schemes).
- 6.29 The information for the forecast year assessment is inclusive of local committed development. The TfL data provided did not disaggregate the committed development, and as such this assessment considers `with committed development` scenarios only. This does however provide a robust assessment.
- 6.30 The TfL 2021 data was not inclusive of all the junctions requested by TfL and Barnet Council, and as such, observed 2021 data captured during the traffic surveys undertaken to support the TA have been used to provide a full data set.

Study Area

- 6.31 As requested by TfL during the scoping discussions, traffic counts were undertaken in May 2021 within the agreed area, as shown in Figure 6.1 below and summarised in Table 6.1.

Table 6.1 Junctions Within Study Area

Junction No.	Junction	Junction Type
1	A109 Oakleigh Road North/Oakleigh Park/Myddelton Park	Signalised Crossroads
2	Church Hill Road/Russell Lane/Brunswick Park Road	3-arm Mini roundabout
2a	Brunswick Park Road/Osidge Lane	3-arm Mini roundabout
3	A109 Oakleigh Road North/Pollard Road/B5143 Russell Lane	4-arm Mini roundabout
4	Site Access/Brunswick Park Road/Goldrill Drive	Crossroads
5	A109 Oakleigh Road North/Site Access	Priority Junction
5a	A109 Oakleigh Road South/Brunswick Avenue	Priority Junction
6	A109 Oakleigh Road South/Coppies Grove	Priority Junction
7	Friern Barnet Road/A109 Oakleigh Road North/Waterfall Road/Bowes Road (Betstyle Circus)	5-arm roundabout
8	A109 Oakleigh Road/A1000 High Road/Totteridge Lane	Signalised Staggered Crossroads

Figure 6.1 –2021 MCC Survey Locations (base mapping extracted from Bing Maps)



- 6.32 The study area for this Chapter has been calculated in line with the air quality and noise study area to provide a cohesive approach across all disciplines.
- 6.33 Table 6.2 summarises the links within the scope of this assessment.

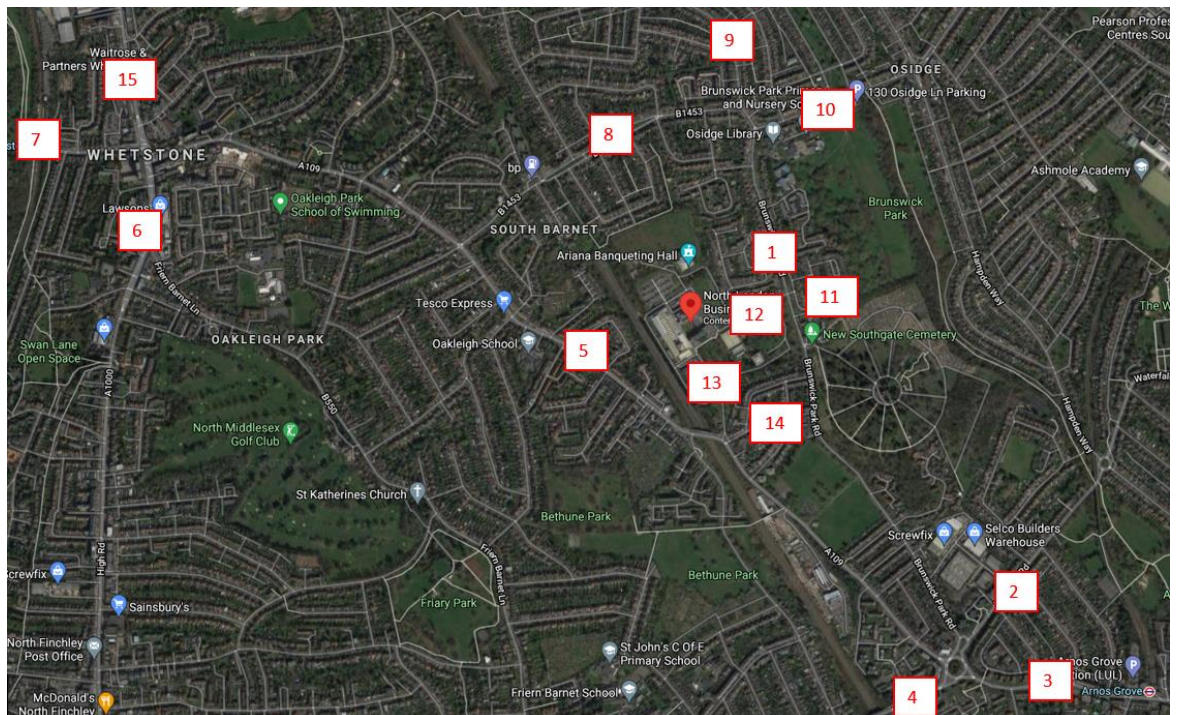
Table 6.2 Highway Links Within EIA Study Area

Link Number	Link Name
1	Brunswick Park Avenue
2	A1003 Waterfall Road
3	A1110 Bowes Road
4	A109 Friern Barnet Road
5	A109 Oakleigh Road
6	A1000 High Road (S)
7	A5109 Totteridge Lane

Link Number	Link Name
8	B1453 Russell Lane
9	Church Hill Road
10	B1453 Russell Lane
11	Goldrill Drive
12	Eastern Site Access
13	Southern Site Access
14	Brunswick Avenue
15	A1000 High Road (N)

6.34 The locations of these links are illustrated in Figure 6.2.

Figure 6.2 Link Location Plan (base mapping extracted from Google maps)



Construction Traffic

- 6.35 The scale of construction traffic trip generation, the proportion of HGVs, construction traffic routes and the arrival arrangements are set out in the Construction Management Plan (Appendix 5.1) prepared in support of the application. An initial assessment to estimate the number of vehicles has been completed and traffic flow diagrams have been used to assess the likely scale of impact.

Proposed Development Trip Generation

- 6.36 Operational data is based on a trip generation exercise, as detailed in Section 8 of the Transport Assessment (see Appendix 6.1). The methodology for this exercise was agreed with TfL and Barnet Council. Trip distribution information has been derived from construction traffic data has been provided by the pre-construction advisor for the project.
- 6.37 A trip rate search has been undertaken using the latest available TRICS database to ascertain trip rates associated with the residential element of the proposed development. Trip rates have been selected using the following criteria:
- 03 Residential– C: Flats Privately Owned
 - Town Centre & Edge of Town Centre sites
 - Greater London sites only
- 6.38 Vehicular activity associated with the residential element of the site has been forecast using vehicle trip rates agreed and used with LBB TfL and Barnet Council. A bespoke assessment methodology has been developed and agreed with TfL and Barnet Council in order to robustly assess potential trip generation by all modes across the daily period. Ward-level Census data Middle Super Output Area (MSOA) Barnet 010 has been used to derive the mode shares calculated to produce trip generation figures for rail, bus, bicycle, pedestrian, motorcycle, taxi and other modes.
- 6.39 The full methodology employed to inform the multi-modal trip generation is contained in Section 8 of the Transport Assessment (see Appendix 6.1).

Assessment Criteria

Significance Criteria

- 6.40 Where formal significance criteria are available (e.g., provided within industry guidance) these have been referenced below for the appropriate assessment areas and have been translated into the impact magnitude and receptor sensitivity tables.
- 6.41 It is noted that for a number of impacts, there are no readily available thresholds of significance. Where this is the case, judgement based on knowledge of the site,

interpretation of quantitative data, where available, and discussion with the highway authorities has been applied.

- 6.42 The significance of residual effects has been determined by taking into account the sensitivity of receptors, the magnitude of the potential impacts and the effectiveness of mitigation measures in reducing the magnitude of the potential impacts.

Impact Magnitude

Traffic

- 6.43 This assessment has been undertaken in accordance with the Institute of Environmental Management and Assessment (IEMA) (formerly the Institute of Environmental Assessment (IEA)) 'Guidelines for the Environmental Assessment of Road Traffic' (the IEMA Guidelines)⁴. These guidelines are intended to provide a consistent and comprehensive approach to the assessment of the environmental impacts of traffic associated with major new development projects.
- 6.44 The IEMA Guidelines refer to the Department for Transport's 'Manual of Environmental Appraisal'⁵, which suggests that changes in traffic flow of 30%, 60% and 90% would be likely to produce 'slight', 'moderate' and 'substantial' changes respectively. These have been translated into the impact magnitudes shown in Table 6.3. These impact magnitudes have been applied in the consideration of potential traffic impacts of person and servicing vehicular activity generated by the proposed development.

Table 6.3 Impact Magnitude on Baseline Transport

Impact Magnitude	Description
Major	The proposed development would cause a considerable impact (by extent, duration or magnitude) of more than local significance or in breach of recognised acceptability, legislation, policy or standards, (greater than 60% change)
Moderate	The proposed development would cause a limited impact (by extent, duration or magnitude) which may be considered significant (30% to 60% change)
Minor	The proposed development would cause a slight, very short or highly localised impact of no significant consequence (10% to 30% change)
Negligible	The proposed development would cause no discernible change to existing environmental conditions (< 30% change)

Accident Data

- 6.45 Personal Injury Collision (PIC) data covering the highway network within the vicinity of the site has been obtained from TfL. The data was obtained for the most recent period available; 5 years to the end of June 2019. For further details regarding the PIC data refer to London collision map - Transport for London (tfl.gov.uk).
- 6.46 Specific regard has been made to the occurrence of vulnerable road users in any PIC data. This has been compared against likely increases in traffic flow as a result of the proposed development and proposed alterations to the highway network to assess the potential impact magnitude of accidents.

Cyclists

- 6.47 As previously detailed, the IEMA Guidelines suggest that changes in traffic flow of 30%, 60% and 90% would be likely to produce 'slight', 'moderate' and 'substantial' changes respectively. These impact criteria, as shown in Table 6.3 can be used to assess the impact of increased traffic flows to cyclist safety and environment.

Pedestrians

- 6.48 The following pedestrian assessment impact magnitudes have been applied:
- **Pedestrian Movement & Capacity:** the net change in pedestrian trips on the network has been calculated as part of the multi-modal trip generation exercise undertaken. An assessment of the impact of the proposed development on pedestrian movement and capacity has been undertaken, as detailed within the Transport Assessment (Appendix 6.1).
 - **Pedestrian Severance:** severance can be defined as the perceived divisions that can occur within a community when it becomes separated by a traffic route. The threshold for assessing severance is based on changes in traffic flows as set out in the Design Manual for Roads and Bridges (DMRB) (Volume 11, Section 3, Part 8)⁶, which uses the same percentage threshold changes in traffic flow as those shown in Table 6.2 to measure the magnitude of impacts on severance. As such, the impact magnitude criteria in Table 6.3 have been applied.
 - **Pedestrian Delay:** increases in traffic flows can lead to greater delays to pedestrians seeking to crossroads. The IEMA Guidelines do not prescribe any quantitative significance criteria for the assessment of pedestrian delay. Instead, traffic flow and pedestrian data have been used to determine whether pedestrian delays on the local footpaths, if any, would be significant. Therefore, the impact magnitude criteria detailed in Table 6.3 have been applied.

- Pedestrian Amenity:** the IEMA Guidelines describe pedestrian amenity as the relative pleasantness of a journey. It is affected by traffic flow, traffic composition, footway width and separation from traffic. The IEMA Guidelines suggest that the threshold for judging the significance of changes in pedestrian amenity would be where the traffic flow is doubled. As such, the impact magnitude criteria set out in Table 6.3 have been applied.
- Pedestrian Fear & Intimidation:** pedestrian fear and intimidation is caused by a number of factors, including a combination of volume of traffic, its HGV composition, its proximity to people and the lack of protection caused by such factors as narrow footway widths. The IEMA Guidelines' suggested criteria for assessing fear and intimidation are presented in Table 6.4, with the equivalent magnitude criteria applied within this Chapter.

Table 6.4 – IEMA Thresholds for Fear and Intimidation

Degree of Hazard	Average Traffic Flow (Vehicle/Hour)	Total 18 Hour Goods Vehicle Flow	Average Speed (mph)	Impact Criteria Used
Extreme	1,800+	3,000+	20+	Major
Great	1,200 – 1,800	2,000 – 3,000	15 – 20	Moderate
Moderate	600 – 1,200	1,000 – 2,000	10 – 15	Minor
*	*	*	*	Negligible

* No IEMA criteria exist; a negligible impact is considered anything below the IEMA 'moderate' degree of hazard thresholds.

Public Transport Services

- 6.49 The net change in public transport trips (bus and National Rail) has been calculated as part of the trip generation exercise of part of the multi-modal trip assessment. The IEMA Guidelines contained in Table 6.3 can be utilised to assess the impact of changes in public transport trips, whereby changes of 30%, 60% and 90% would be likely to produce 'slight', 'moderate' and 'substantial' changes respectively. A percentage change below 30% represents a negligible impact.

Receptor/Sensitivity Value

- 6.50 Receptors are defined as any road users (incorporating pedestrians, equestrians, vehicle drivers / passengers and cyclists), public transport users and services, or sites / locations subject to high use. The sensitivity of a road user can be defined by their capacity to navigate the roads system and ultimately their vulnerability in doing so. For example, an elderly person or a young child would have more difficulty crossing a road than a fit

and healthy adult. Therefore, a sensitive area can be defined as an area where footfall activity is high or where there are a number of vulnerable road users, for example a school or where there is an existing accident hotspot.

Table 6.5 Sensitivity/Value of Transport Receptors

Receptor Sensitivity	Description
High	Receptors with high sensitivity to changes in traffic flows. These include schools, colleges, accident clusters, junctions that operate at or near capacity and roads without footways that are used by pedestrians
Medium	Receptors with medium sensitivity to changes in traffic flows. These include congested junctions, hospitals, shopping areas with roadside frontage, roads with narrow footways
Low	Receptors with low sensitivity to changes in traffic flows. These include public open space, junctions that operate below capacity, tourist attractions and areas with adequate footway provision

Significance of Effect

6.51 The significance of effects is presented in Table 6.6 below.

Table 6.6 Significance Matrix for Transport

Receptor Sensitivity/Value	Nature of Effect			
	Major	Moderate	Minor	Negligible
Very High	Substantial	Substantial	Moderate	Slight
High	Substantial	Moderate	Slight	Negligible
Medium	Moderate	Slight	Negligible	Negligible
Low	Slight	Negligible	Negligible	Negligible

6.52 The effects are either long or short-term, typically with the effects of construction traffic deemed short-term and those associated with the operational stages of the proposed development as long-term.

6.53 The effects of the proposed development have been characterised as either:

- Positive: changes produce benefits in terms of transportation and access (such as reduction of traffic, travel time or patronage, or provision of a new service, access or facility);
- Negligible: the bearing of the changes is too small to be measured meaningfully; or

- Negative: changes produce disbenefits in terms of transportation and access (such as increase of traffic, travel time, patronage or loss of service or facility).

Identified Sensitive Receptors

6.54 Using the thresholds identified in Table 6.6 above, the following receptors have been identified within the study area adopted as part of the assessment presented in this Chapter.

Table 6.7 Receptors Within the EIA Study Area

Link No.	Link Description	Receptor	Sensitivity
1	Brunswick Park Road	Cyclists on carriageway	Medium
		Brunswick Park Medical Practice	Medium
		New Southgate Cemetery	Low
2	A1003 Waterfall Road	Cyclists on carriageway	Medium
3	A1110 Bowes Road	Our Lady Lourdes Church	Low
		Cyclists on carriageway	Medium
		Shopping area with roadside frontage	Medium
4	A109 Friern Barnet Road	Cyclists on carriageway	Medium
		Shopping area with roadside frontage	Medium
5	A109 Oakleigh Road	New Southgate Recreation Ground	Low
		Cyclists on carriageway	Medium
		Oakleigh Road Medical Centre	Medium
		St Andrews Medical Practice	Medium
		Oakleigh Community Church	Low

Link No.	Link Description	Receptor	Sensitivity
6	A1000 High Road (S)	Cyclists on carriageway	Medium
		Shopping area with roadside frontage	Medium
7	A5109 Totteridge Lane	Cyclists on carriageway	Medium
		Shopping area with roadside frontage	Medium
8	B1453 Russell Lane	Cyclists on carriageway	Medium
		Shopping area with roadside frontage	Medium
9	Church Hill Road	Cyclists on carriageway	Medium
		Oak Hill Park	Medium
10	B1453 Osidge Lane	Cyclists on carriageway	Medium
11	Goldrill Drive	Cyclists on carriageway	Medium
12	Eastern Site Access	Cyclists on carriageway	Medium
13	Southern Site Access	Cyclists on carriageway	Medium
14	Brunswick Avenue	Cyclists on carriageway	Medium
15	A1000 High Road (N)	Cyclists on carriageway	Medium
		Shopping area with roadside frontage	Medium

ASSUMPTIONS AND LIMITATIONS

- 6.55 The development proposals are for up to 2,428 dwellings, 2,353sq.m of workspace, 3,835 sqm flexible non-residential floorspace, which could be used for community use, medical use, retail, offices, cafes etc. and a new 5FE school building.
- 6.56 In order to ensure a robust assessment, this assessment considers the impact of up to 2,500 dwellings and 6,188sq.m of B1 Office space to provide a worst-case assessment.

- 6.57 The information for the forecast year assessment is inclusive of local committed development. The TfL data provided did not disaggregate the committed development, and as such this assessment considers `with committed development` scenarios only. This does however provide a robust assessment.
- 6.58 The TfL 2021 data was not inclusive of all the junctions requested by TfL and Barnet Council, and as such, observed 2021 data captured during the traffic surveys undertaken to support the TA have been used to provide a full data set.

BASELINE CONDITIONS

Existing Conditions

Bus Facilities

- 6.59 The development site is well located in terms of access on foot and by bicycle to public transport. Drawing ST-3013-02 `Accessibility Plan` has been provided in Appendix 6.1, which shows the existing public transport facilities within the vicinity of the site.
- 6.60 There are two bus stops located adjacent to the site access: one on Brunswick Park Road and the other on the A109 Oakleigh Road North. Both of these stops are within 400m as measured from the centre of the site, and as illustrated in the Accessibility Plan contained in Appendix 6.1.
- 6.61 The bus stops along the A109 Oakleigh Road North are accessible via the footways available from the site and along both sides of the A109 Oakleigh Road North. Access to the northbound bus stop is facilitated via a zebra crossing located along the A109 Oakleigh Road North adjacent to the southern site access.
- 6.62 The bus stops along Brunswick Park Road are accessible via the footways available from the site and along both sides of Brunswick Park Road. Access to the southbound bus stop is facilitated via a zebra crossing located along Brunswick Park Road to the north of the site access.
- 6.63 In addition to the bus stops located adjacent to the existing site accesses, there are also bus stops located along the B1453 Russell Lane. Whilst there is no existing access within the vicinity of the B1453 Russell Lane, a pedestrian/cycle access will be delivered as part of the proposals, which will link the north of the site to Ashbourne Avenue, which connects to the B1453 Russell Lane. As a result, the development parcels located within the northern area of the site will be within a 400m walking distance of existing stops along the B1453 Russell Lane.
- 6.64 The following bus services are available from the stops located along the A109 Oakleigh Road North:

- Service 34 operates between Barnet Church and Walthamstow Central with one service in both directions every 8-10 minutes during the week, increasing to a 30 min frequency during the weekends. Service 34 also provides a link to Arnos Grove Underground Station, Walthamstow Central Station and neighbourhood centres at Whetstone, Barnet centre, Edmonton and Walthamstow;
- Service 251 operates between Edgware Bus Station and Arnos Grove Underground Station, with one service in each direction every 8-12 minutes during the week, reducing to every 20-30 minutes on Sundays. Service 251 also provides a link to Mill Hill Broadway Station.
- Service 382 is available from the stops located along Brunswick Park Road. Service 382 operates between Millbrook Park and Southgate and runs on a 15 min frequency, increasing to a 30-minute frequency on Sundays. Service 382 also provides a link to Mill Hill East Underground Station, Finchley Central Station, Arnos Grove Underground Station and Southgate Underground Station.
- Service 125 is available from the bus stops along the B1453 Russell Lane, operating between Colindale Station and Winchmore Hill, with one service in each direction every 10-12 minutes during the week and Saturday, with services every 15 minutes on Sundays.

6.65 Bus journey time during peak periods from the stops along the A109 Oakleigh Road North to:

- Arnos Grove Underground is 6 minutes;
- Walthamstow Central Station is 35 minutes;
- Mill Hill Broadway Station is 20 minutes; and
- Edgware Bus Station is 30 minutes.

6.66 Bus journey time during peak periods from the stops along Brunswick Park Road to:

- Arnos Grove Underground Station is 6 minutes;
- Southgate Underground Station is 10 minutes; and
- Finchley Central Station is 35 minutes.

6.67 This level of service is therefore considered acceptable for the area, with a good, combined frequency of service, a multitude of travel options and a short walk distance to stops.

National Rail Services

6.68 The nearest National Rail stations to the site are Oakleigh Park to the north and New Southgate to the south (a 23-minute walk or 8-minute cycle journey from the centre of

the site). These stations are on the Great Northern line between Moorgate and Welwyn Garden City.

- 6.69 Southbound services into London (Moorgate) are provided at 20-minute intervals during the week, which increase to a 30-minute interval during the weekends. The Northern, Circle, Metropolitan and Hammersmith & City underground lines all stop at the Moorgate hub.
- 6.70 Northbound services (to Welwyn Garden City) are provided at 20-minute intervals during the week, which increase to a 30-minute interval during the weekends.
- 6.71 The first weekday train departs New Southgate to Moorgate at 05:50, arriving at 06:16. The last train from Moorgate departs at 23:57. The journey between New Southgate and Oakleigh Park is approximately 3 minutes. This shows that the stations provide a service which caters to commuters working in the more central areas of London.
- 6.72 Passengers have the option to interchange to alternative surface rail services along the route from New Southgate. Key interchange stations include Finsbury Park, Highbury & Islington and Old Street.
- 6.73 Secure cycle storage is available at New Southgate and Oakleigh Park stations, making sustainable trips to the station attractive to residents of the area. Station information suggests there are currently 10 cycle storage spaces at New Southgate and 8 spaces at Oakleigh Park station

London Underground

- 6.74 The site is located between two London Underground lines; the Northern Line and Piccadilly Line, with the nearest station being Arnos Grove on the Piccadilly Line (24-minute walk or 8-minute cycle away). There are 10 cycle storage spaces at the station with additional stands in the local area.
- 6.75 The nearest station on the Northern Line is Totteridge & Whetstone (28-minute walk or 8-minute cycle journey via the Ashbourne Road link). There are 10 cycle storage spaces at the station. A table of key destinations is summarised below.

Table 6.8 London Underground Service Summary

Stations	Line	Termini and Major Interchanges
Totteridge & Whetstone	Northern	Euston, Leicester Square, Tottenham Court Road, Bank, Elephant & Castle, Morden
Arnos Grove	Piccadilly	Kings Cross, Russell Square, Covent Garden, Leicester Square, Piccadilly Circus, Green Park

- 6.76 Northern Line services from the Totteridge & Whetstone provide ample opportunity for interchange between lines or modes as well as serving a number of desirable destinations directly. Tottenham Court Road will also become a Crossrail station upon completion of the project, facilitating further options for travel east/west.
- 6.77 The Piccadilly line from Arnos Grove serves several central interchange stations including King's Cross and Green Park. Between them these stations provide options for onwards travel by National Rail, Victoria London Underground line and Jubilee London Underground line amongst others.

Existing Pedestrian and Cyclist Facilities

- 6.78 Zebra crossings are in place adjacent to both existing site accesses. Additional zebra crossings are also located along Oakleigh Road North and South; adjacent to Oakleigh Close; adjacent to Raleigh Drive, at the Russell Lane western mini roundabout; and to the south at Betstyle Circus. Other pedestrian facilities along Brunswick Park Road include a zebra crossing approximately 450m north of the existing site access and additional informal crossing points at regular intervals with dropped kerbs.
- 6.79 Footways continue on both sides of Oakleigh Road South and Oakleigh Road North between Friern Barnet and Whetstone. Street lighting is in place in conjunction with the footway provision. Footways in the vicinity of this existing access are 2m wide on average.
- 6.80 To the east of the site, footways are present on both sides of the carriageway with street lighting provided. At points the footway is set back from the carriageway with vegetation segregating the two uses
- 6.81 With regards to cycling, an off-highway cycle route to the east of the site provides a north-south connection towards East Barnet and New Southgate through Brunswick Park, between Osidge Lane and Wilmer Way. Beaconsfield Road is a further locally recognised cycle route from the site which allows cyclists to avoid Betstyle Circus.

Local Highway Network

- 6.82 The site has two existing access points, one to the south onto the A109 Oakleigh Road North and one to the east onto Brunswick Park Road.
- 6.83 There is also a redundant, unused access point to the northern boundary which would provide access to Ashbourne Avenue, were it not currently fenced off. Ashbourne Avenue leads onto the B5143 Russell Lane, which comprises a mix of residential properties and neighbourhood retail frontage.

-
- 6.84 Access to the existing employment is provided via both existing accesses into the site. The A109 Oakleigh Road North access takes the form of a priority junction at the southern extent of the redevelopment site. There is a zebra crossing immediately to the north west of this access and there is space for a vehicle to wait to turn into the site between the zig-zag line markings associated with this crossing, out of the line of traffic. There is also an existing auxiliary lane directly from Brunswick Avenue to the North London Business Park access road.
- 6.85 The access road in this location has a width of approximately 7.8m. A footway leads into the redevelopment site on the western side of the access road, gated at the site entrance. This footway has a width of 2m adjacent to Oakleigh Road North, increasing to 3m further into the site.
- 6.86 The existing access from Brunswick Park Road takes the form of a crossroads arrangement on the eastern edge of the redevelopment site. Goldrill Drive is located opposite the site access, and both form minor arms to Brunswick Park Road. An existing zebra crossing is located approximately 20m to the north of the junction.
- 6.87 The site access road at this location is approximately 8.5m in width. There are footways on either side of the carriageway approximately 2m in width and gated at the site entrance. Approximately 23m from Brunswick Park Road, the site access has a three-arm roundabout with priority given to vehicles travelling into the site from Brunswick Park Road over vehicles on the circulatory.
- 6.88 Further afield, the A109 Oakleigh Road South continues towards Friern Barnet, to the south of the redevelopment site. To the north of the site access the A109 Oakleigh Road North continues on towards Whetstone Village neighbourhood centre.
- 6.89 Brunswick Park Road provides a north-south link between the B1453, Osidge Lane and the A1003, Waterfall Road situated between Friern Barnet and Arnos Grove. Osidge Lane connects to Brunswick Park Road and provides an approximate 500m eastwards link to the neighbourhood centre at Hampden Square in Osidge.
- 6.90 Parking on Brunswick Park Road takes the form of on carriageway informal parking and kerb mounted parking bays. Additionally, a free off-highway parking area is provided approximately 55m south of the junction of Brunswick Park Road and Brunswick Avenue.
- 6.91 Ashbourne Avenue continues south-north from the northern site boundary to Russell Lane. A highway stub exists to the site boundary, and it is understood that this was previously used for pedestrian access to the development site but is now closed. A track runs between the site boundary and the rear of properties on Weirdale Avenue, providing access to garages and rear gardens.
- 6.92 This track is accessed via the Ashbourne Avenue southern stub and from Russell Lane to the north west. The Ashbourne Avenue connection between the site and Russell Lane

is approximately 230m in length and the road features footway and street lighting on both sides of the carriageway.

- 6.93 Russell Lane from east to west and provides a link between the mini roundabout at Oakleigh Road North/Pollard Road and the mini roundabout at Brunswick Park Road/Church Hill Road. The directional lanes on the central section of Russell Lane are divided by a green area, creating an urban dual carriageway.
- 6.94 Brunswick Avenue provides a link between Oakleigh Road South and Brunswick Park Road, approximately 10m to the south of the existing A109 Oakleigh Road North site access.
- 6.95 The highway network in the vicinity of the site is subject to a 30mph speed limit. There are no 'red routes' (TLRN) in the vicinity of the site.

Baseline Traffic Flows

- 6.96 Baseline traffic flows have been extracted from the traffic counts undertaken in May 2021, with peak hour traffic flows summarised in Table 6.9.

Table 6.9 2021 Baseline Flows (2-way)

Link No.	Link Description	AM Peak 0800 – 0900	PM Peak 1700 – 1800
		All Vehicles	All Vehicles
1	Brunswick Park Road	1143	892
2	A1003 Waterfall Road	2078	2022
3	A1110 Bowes Road	1327	1458
4	A109 Friern Barnet Road	2243	2316
5	A109 Oakleigh Road	1180	1329
6	A1000 High Road (S)	1645	1696
7	A5109 Totteridge Lane	1021	1071
8	B1453 Russell Lane	1151	1166
9	Church Hill Road	1109	1048
10	B1453 Osidge Lane	1378	1401
11	Goldrill Drive	55	69
12	Eastern Site Access	453	145
13	Southern Site Access	240	74
14	Brunswick Avenue	167	192
15	A1000 High Road (N)	1574	1673

Accident Data

PIC Summary – Junctions

6.97 An assessment of the highway safety conditions at the 8 junctions identified within the study area are summarised below:

- Junction 1 – A109 Oakleigh Road North/Oakleigh Park/Myddelton Park - 1 PIC classified as Slight in severity occurred at J1 in 2017 and involved 2 cars. Another Slight PIC was recorded in 2018 and involved a car and a motorcycle. No PICs that were classified as Serious or Fatal in severity were recorded during the most recent 5-year period;
- Junction 2 – Church Hill Road/Russell Lane/Brunswick Park Road - 1 Slight PIC was recorded at J2 in 2015 which involved 2 cars. No other PICs were recorded at J2 during the 5-year period;
- Junction 2a – Brunswick Park Road/Osidge Lane - 1 Slight PIC was recorded at J2a in 2019 which involved a car and a motorcycle. No other PICs were recorded at J2a during the 5-year period;
- Junction 3 – A109 Oakleigh Road North/Pollard Road/Russell Lane - 3 Slight PICs were recorded at J3 in 2015. All of these incidents involved vehicles and no vulnerable road users. 1 Slight PIC was recorded in 2016 involving a bus. 1 Serious PIC was recorded in 2018 and involved a pedestrian and a motorcyclist;
- Junction 4 – Site Access/Brunswick Park Road/Goldrill Drive - No PICs were recorded at J4 during the 5-year period;
- Junction 5 – A109 Oakleigh Road North/Site Access - No PICs were recorded at J5 during the 5-year period;
- Junction 5a – A109 Oakleigh Road South/Brunswick Avenue - No PICs were recorded at J5a during the 5-year period;
- Junction 6 – A109 Oakleigh Road South/Coppies Grove - 1 Slight PIC was recorded at J6 in 2015 which involved 2 cars. 1 Slight PIC was recorded at J6 in 2018 which involved 2 cars;
- Junction 7 – Friern Barnet Road/A109 Oakleigh Road North/Waterfall Road/Bowes Road (Betstyle Circus) - 3 Slight PICs were recorded at J7 in 2015, all of which involved cars. 1 Slight PIC occurred in 2016 involving 2 cars. 1 Slight PIC was recorded in 2019 (along the eastern circulatory) which involved a car and a motorcycle. 3 further Slight PICs were recorded in 2019 that involved cars. 1

Serious PIC was recorded in 2019 (along the Friern Barnet Road approach) which involved a car and a pedestrian; and

- Junction 8 – A109 Oakleigh Road/A1000 High Road/Totteridge Lane signalised crossroads – 1 serious collision occurred in 2015 along the A1000 High Road northern arm involving a car and a cyclist. 2 serious collisions were recorded in 2017 and 2018, both involving motorcyclists along the A109 Oakleigh Road North approach. Another serious incident was recorded in 2018 along the A109 Oakleigh Road North approach involving a vehicle only.

PIC Summary – Links

6.98 An assessment of the highway safety conditions along the key links within the study area has been undertaken. The following key links have been identified as they will provide access (both vehicular and pedestrian/cyclist) to the proposed development.

- PIC Link 1 – The A109 Oakleigh Road North and South (providing access to the site access to the south)
 - *4 Slight PICs in 2016, 1 involving a pedestrian (near Deodora Close). 1 Slight PIC involving a cyclist (near Oakleigh Crescent);*
 - *2 Slight PICs in 2017;*
 - *2 Slight PICs in 2018, 1 involving a cyclist (north of Waterfall Road) and 1 involving a motorcycle (near York Way). 1 Serious PIC recorded in 2018 involving a pedestrian.*
 - *2 Slight PICs in 2019, 1 involving a pedestrian (near Carlisle Place);*
- PIC Link 2 – Brunswick Park Road (providing access to the site via the east); no PICs recorded; and
- PIC Link 3 – Wierdale Avenue/Ashbourne Avenue/ B1453 Russell Lane (providing pedestrian/cycle only access to the north); no PICs recorded.

Summary

6.99 Table 6.10 below provides a summary of all PICs recorded at the junctions/links within the study area.

Table 6.10 Summary of PICs

Ref	Slight	Serious	Fatal	Total	Vulnerable road users involved	Comments
J1	2	0	0	2	Y	1 Slight PIC involved a motorcycle
J2	1	0	0	1	N	n/a
J2a	1	0	0	1	Y	1 Slight PIC involved a motorcycle
J3	4	1	0	5	Y	1 Serious PIC involved a pedestrian and a motorcycle
J4	0	0	0	0	N	n/a
J5	0	0	0	0	N	n/a
J5a	0	0	0	0	N	n/a
J6	2	0	0	0	N	n/a
J7	5	1	0	6	N	1 Slight PIC involved a motorcycle. One Serious PIC involved a pedestrian
J8	0	3	0	4	Y	2 Serious PICs involving motorcyclists and 1 Slight PIC involving a cyclist.
PIC Link 1	15	3	0	18	Y	1 Serious PIC involving a cyclist, 1 Serious PIC involving a cyclist. 1 Serious PIC involving a pedestrian. 1 Slight PIC involving a pedestrian.
PIC Link 2	0	0	0	0	-	-
PIC Link 3	0	0	0	0	-	-
Total				37		

6.100 No PICs were recorded at any of the existing or proposed site accesses. In the wider study area, given the timescale and volume of traffic likely to utilise the road network, the number and severity of collisions is not considered to be excessive or giving rise to specific concerns regarding access to the proposed development.

Pedestrian Fear and Intimidation

- 6.101 Pedestrian fear and intimidation is influenced by volume of traffic, its HGV composition, its proximity to people and the lack of protection caused by such factors as narrow footway widths.
- 6.102 Based on IEMA Guidelines contained in Table 6.4, the existing degree of hazard for the 3 links within the immediate site vicinity which are likely to have the most pedestrian movements) (Link 1 Brunswick Park Road, Link 5 A109 Oakleigh Road and Link 8 B1453 Russell Lane) is presented in Table 6.11.

Table 6.11 Baseline Pedestrian Fear and Intimidation

Link	Traffic Flow	HGV Flow	Speed
1 – Brunswick Park Road	Moderate	Negligible	Extreme
5 – A109 Oakleigh Road	Great	Negligible	Extreme
8 – B1453 Russell Lane	Moderate	Negligible	Extreme

- 6.103 Whilst it is noted that the traffic flows along the A109 Oakleigh Road are currently high, there are sufficiently wide footways available along both sides, and formal pedestrian crossings provided at key locations to accommodate pedestrian movements.

Summary of Baseline Conditions

- 6.104 The site is situated in a sustainable and accessible location within Barnet, and has strong connections by foot, cycle and public transport, providing access to a variety of local facilities and amenities.
- 6.105 The levels of public transport services are considered acceptable for the area, with a good, combined frequency of services offering a multitude of travel options and a short walk distance to bus stops.

POTENTIAL IMPACTS

Design Interventions

- 6.106 The following interventions have been incorporated into the scheme and have therefore informed the consideration of potential impacts.

Public Realm Proposals

- 6.107 The site layout will be characterised by the creation of a comprehensive network of inter-connected streets and spaces that allow efficient movement on foot and by bicycle, promoting a permeable network within the site with strong links to the surrounding employment, retail and residential areas.
- 6.108 The provision of direct and convenient routes for pedestrians and cyclists will encourage residents to use more sustainable travel options by reducing walk/cycle journey times.
- 6.109 The pedestrian/cycle access strategy is designed to make travel on foot or by bicycle the preferred mode of travel within the site and to immediately adjacent destinations.
- 6.110 To improve connectivity and promote walking and cycling the following strategy is to be implemented within and adjacent to the proposed development:
- Provision of crossing facilities on all arms of the new signalised Eastern Access providing a connection to the bus stops and the wider footway network along Brunswick Park Road;
 - Provision of a comprehensive on-site footway network based on key desire lines which prioritises pedestrians over vehicular traffic. This will include the delivery of links to off-site pedestrian and cycle connections;
 - From the early phases of the development onwards, combined footway/cycleways will be provided along with site access points solely for pedestrians and cyclists and speed control measures (such as speed tables and shared surfaces) to reduce traffic speed and promote safe access on foot/by bicycle; and
 - Provision of signage to direct pedestrians and cyclists to the key locations on- and off-site. This signage will be delivered on a phase-by phase basis dependent upon the facilities delivered within each respective phase.
- 6.111 The provision of a comprehensive footway/cycleway network and additional crossings/links off site will also mean travel to and through the site is also a viable option on foot/by bicycle.

Parking Provision

- 6.112 Planning policy promotes sustainable modes (walking, cycling and public transport), and the Mayor's Transport Strategy sets a target of 75% sustainable travel mode share for Outer London by 2040. In light of this, it is proposed to provide car parking within Phase 1 at a ratio of approximately 0.8 spaces per dwelling resulting in a total of 381 car parking spaces for the 454 total dwellings within Phase 1. Of these 381 car parking spaces, 37 spaces will be allocated for disabled parking provision.
- 6.113 There will also be 52 motorcycles provided as part of Phase 1.

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- 6.114 A total of 901 cycle parking spaces will be provided which equates to 1 space per bedroom which is in accordance with the guidance set out within the London Plan.
- 6.115 The cycle parking will be provided within locked, sheltered enclosures, with sliding gates provided to enable residents to access their bicycle easily. The parking will be provided at ground level within each individual building and the quantum within each store will correspond directly with the requirements relating to the specific blocks of flats that the store serves.
- 6.116 In accordance with the London Plan standards, 20% of the spaces will be for electric vehicles ('active' provision) with the remaining 80% of spaces having passive provision for electric vehicles in the future.

Servicing and Deliveries

- 6.117 The proposed development has been designed to ensure that all servicing activities are undertaken within designated areas in order to ensure that traffic flows on the surrounding highway network are unaffected by the operation of the site.
- 6.118 Any special deliveries to the site will need to be pre-arranged with site management by telephone or through an online booking system. Special deliveries are defined as unusually large items which would arrive on an infrequent basis. The delivery time and duration will be negotiated with the site management office to minimise the impact upon the routine daily servicing requirements of the development.
- 6.119 Out of peak time deliveries will be encouraged for such instances where possible. The management agents will regularly contact residents through newsletters and emails advising them of the necessary arrangements for large deliveries.
- 6.120 Any special deliveries to the site will need to be pre-arranged with site management by telephone or through an online booking system. Special deliveries are defined as unusually large items which would arrive on an infrequent basis. The delivery time and duration will be negotiated with the site management office to minimise the impact upon the routine daily servicing requirements of the development.
- 6.121 Out of peak time deliveries will be encouraged for such instances where possible. The management agents will regularly contact residents through newsletters and emails advising them of the necessary arrangements for large deliveries.

Consideration of Potential Impacts

During Construction

Traffic

6.122 Potential demolition and construction transportation and access related impacts that may arise are likely to comprise:

- Temporary disruption to road users and pedestrians from vehicles (particularly HGVs) entering and leaving the site, including issues such as temporary footway closures and diversion of pedestrian and cyclist movements;
- Temporary disruption to pedestrians due to the provision of hoardings around the site, resulting in a reduction of footway width; and
- Short-term increases in vehicle movements on the highway in the vicinity of the site.

6.123 When considering construction vehicle types, a balance needs to be maintained between the size of vehicles and the number of vehicle trips to be carried out. Generally, the larger the vehicle used, the fewer trips required to be made. Therefore, provided that strict health and safety and environmental arrangements are in place, it is preferable to use larger vehicles to limit the total number of vehicular movements.

6.124 A schedule of predicted frequencies per construction phase has been developed. A summary of anticipated average and peak weekly construction traffic movements is set out in Table 6.12.

6.125 The most intensive period for construction vehicle activity will be during demolition and site clearance works during Phases 1 and 3, with a weekly peak of 127 construction vehicles equating to around 25 movements per day.

Table 6.12 Table 6.12 – Construction Vehicle Forecast

Phase	Description	Weekly Construction Vehicles		
		Average Construction Traffic	Peak Construction Traffic	Peak Contractor Traffic
1	Demolition & Site clearance	100 per week (20 per day on turnaround)	175 per week (35 per day on turnaround)	30 (management and visitor vehicles only)
	Construction period	20 (1 day per week)	35-40 (1 day per week)	
2	Demolition & Site clearance	75 per week (15 per day on turnaround)	125 per week (25 per day on turnaround)	
	Construction period	20 (1 day per week)	30-35 (1 day per week)	

3	Demolition & Site clearance	100 per week (20 per day on turnaround)	175 per week (35 per day on turnaround)	
	Construction period	20 (1 day per week)	35-40 (1 day per week)	
4	Demolition & Site clearance	75 per week (15 per day on turnaround)	125 per week (25 per day on turnaround)	
	Construction period	20 (1 day per week)	35-40 (1 day per week)	
5	Demolition & Site clearance	50 per week (10 per day on turnaround)	75 per week (15 per day on turnaround)	
	Construction period	15-20 (1 day per week)	25-30 (1 day per week)	

6.126 Peak periods of construction vehicle activity are anticipated to have a **Minor adverse** effect on HGV flows and a **Negligible** effect on all traffic flows. It is important to note that this construction peak is a temporary impact. This, alongside mitigation measures detailed in this Chapter will help to minimise the effect.

Public Transport

6.127 A Sustainable Transport Strategy to be employed for construction personnel has been prepared by the applicant and as part of the CMP prepared as part of the application. All personnel will be expected to travel to and from the site by foot, bicycle or public transport.

6.128 The impact of construction personnel on local bus and National Rail services is anticipated to be **Negligible**.

Pedestrians and Cyclists

6.129 With regard to pedestrian movement, severance, delay, amenity, fear and intimidation, construction at the site may result in temporary disruption to pedestrians and cyclists from vehicles (particularly HGVs) entering and leaving the site, temporary footway closures and diversion of pedestrian and cyclist movements, resulting in a **Minor Adverse** impact. Mitigation measures will help to reduce the effect of construction on pedestrian and cyclist movement and safety.

During Operation

Traffic

6.130 As outlined in more detail in the Transport Assessment (and forthcoming Transport Assessment Addendum) the proposed development of up to 2,500 dwellings and 6,188sq.m of B1 Office space would be expected to generate in the region of 1,328 2-

way person movements during the AM peak and 1,178 2-way person movements in the PM peak hour.

6.131 Using the total person trips described above, a bespoke vehicular trip generation for the proposed development has been derived using the 'Method of Travel to Work' MSOA of St Barnet 010 from the NOMIS database. This methodology was agreed with LBB and TfL. The proposed development is anticipated to generate a total of 570 2-way vehicular movements in the AM Peak and 513 vehicular trips in the PM peak. Further details can be found in the forthcoming Transport Assessment Addendum.

6.132 As agreed with TfL and Barnet Council, a Forecast Year of 2031 has been adopted as part of the TA. The following summarises the assessments undertaken in this report in addition to Base Year 2021:

- 2031 Forecast Year plus committed development; and
- 2031 Forecast Year plus committed development plus the Proposed Development fully occupied.

6.133 The 2031 Forecast 2031 Year plus committed development traffic flows in the study area are shown in Table 6.13.

Table 6.13 – 2031 Forecast Year Plus Committed Development Without Development Flows (2-way)

2031 Without Development		AM Peak 0800 – 0900	PM Peak 1700 – 1800
Link No.	Link Description	All Vehicles	All Vehicles
1	Brunswick Park Road	1177	919
2*	A1003 Waterfall Road	2119	2062
3*	A1110 Bowes Road	1353	1487
4*	A109 Friern Barnet Road	2288	2363
5	A109 Oakleigh Road	1528	1575
6	A1000 High Road (S)	1688	1740
7	A5109 Totteridge Lane	1048	1099
8	B1453 Russell Lane	1640	1867
9*	Church Hill Road	1153	1079
10	B1453 Osidge Lane	1481	1623
11	Goldrill Drive	57	71
12	Eastern Site Access	467	149
13	Southern Site Access	250	78

2031 Without Development		AM Peak 0800 – 0900	PM Peak 1700 – 1800
Link No.	Link Description	All Vehicles	All Vehicles
14	Brunswick Avenue	223	242
15	A1000 High Road (N)	1615	1716

*Note Observed 2021 data growthed using the TfL 2021 – 2031 model data has been utilised for links associated with J7 and J9 given inconsistency with observed 2021 and TfL 2031 data

Table 6.14 2031 Forecast Year Plus Committed Development With Development Flows (2-way)

2031		Scenario	All Vehicles		% Increase from the Proposed Development	
Link No.	Link Description		AM Peak 0800 – 0900	PM Peak 1700 – 1800	AM Peak 0800 – 0900	PM Peak 1700 – 1800
1	Brunswick Park Road	Without Dev	1177	919	13.8%	16.2%
		With Dev	1339	1068		
2	A1003 Waterfall Road	Without Dev	2119	2062	1.3%	0.5%
		With Dev	2148	2072		
3	A1110 Bowes Road	Without Dev	1353	1487	3.2%	1.9%
		With Dev	1396	1515		
4	A109 Friern Barnet Road	Without Dev	2288	2363	9.2%	5.8%
		With Dev	2498	2500		
5	A109 Oakleigh Road	Without Dev	1528	1575	6.8%	6.0%
		With Dev	1632	1670		
6	A1000 High Street (S)	Without Dev	1688	1740	0.0%	0.0%

2031		Scenario	All Vehicles		% Increase from the Proposed Development	
Link No.	Link Description		AM Peak 0800 – 0900	PM Peak 1700 – 1800	AM Peak 0800 – 0900	PM Peak 1700 – 1800
		With Dev	1688	1740		
7	A5109 Totteridge Lane	Without Dev	1048	1099	5.7%	4.2%
		With Dev	1108	1145		
8	B1453 Russell Lane	Without Dev	1640	1867	2.6%	2.0%
		With Dev	1682	1905		
9	Church Hill Road	Without Dev	1153	1079	3.9%	4.0%
		With Dev	1199	1122		
10	B1453 Osidge Lane	Without Dev	1481	1623	5.0%	4.2%
		With Dev	1555	1692		
11	Goldrill Drive	Without Dev	57	71	0.0%	0.0%
		With Dev	57	71		
12	Eastern Site Access	Without Dev	467	149	63.6%	178.3%
		With Dev	763	416		
13	Southern Site Access	Without Dev	250	78	104.7%	301.1%
		With Dev	511	312		

2031		Scenario	All Vehicles		% Increase from the Proposed Development	
Link No.	Link Description		AM Peak 0800 – 0900	PM Peak 1700 – 1800	AM Peak 0800 – 0900	PM Peak 1700 – 1800
14	Brunswick Avenue	Without Dev	223	242	5.6%	5.1%
		With Dev	235	254		
15	A1000 High Road (N)	Without Dev	1615	1716	4.4%	3.6%
		With Dev	1686	1778		

6.134 IEMA guidelines state that 'highway links should be assessed when traffic flows have increased by more than 30% or other sensitive areas affected by traffic increases of at least 10%'.

6.135 As shown in Table 6.13, the only links which experience an increase of traffic beyond 30% as a result of the proposed development are the two site accesses. This is to be expected given the scale of development proposed and the existing levels of development on the site currently.

Public Transport

6.136 As part of the scoping discussions, TfL stated that they do not wish to divert any of the existing bus services through the development site. As part of the extant 2020 permission, a financial contribution of sum of £825,000 was secured as part of the S106 to provide an additional bus service on the 382 bus route.

6.137 Given that it will not be feasible to divert any existing TfL bus services through the site, it is proposed that the financial contribution sum is increased to reflect the uplift in the residential development of 1,150 units).

6.138 Furthermore, Comer Homes will provide an on-site shuttle bus service which will provide an 'on-demand' service to key destinations such as local commercial and health centres and also to key public transport interchange hubs.

6.139 The proposed development is considered to have a **Negligible** effect on the local public transport system.

Pedestrians and Cyclists

- 6.140 The site layout will be characterised by the creation of a comprehensive network of inter-connected streets and spaces that allow efficient movement on foot and by bicycle, promoting a permeable network within the site with strong links to the surrounding employment, retail and residential areas.
- 6.141 The provision of direct and convenient routes for pedestrians and cyclists will encourage residents to use more sustainable travel options by reducing walk/cycle journey times.
- 6.142 The pedestrian/cycle access strategy is designed to make travel on foot or by bicycle the preferred mode of travel within the site and to immediately adjacent destinations, and as such will result in a **Minor Positive** effect.

MITIGATION

During Construction

- 6.143 A Construction Management Plan (CMP) has been prepared as part of the planning application. The CMP sets out the proposed construction vehicle routing strategy (provided in Chapter 4.0 of the CMP), indicative details concerning the type of construction vehicles required to serve the site daily, and operating procedures to be employed to help mitigate the impact of proposed development on the local highway network. A detailed Construction Environmental Management Plan (CEMP) will be produced at the appropriate stage once specific construction details become available.
- 6.144 Clear routes and procedures are outlined that will be adhered to at all times as a means of limiting the effect of construction. It addresses the practical considerations of construction, including the proposed construction methodology and anticipated timescales, and more importantly considers the impact of construction on the local community giving consideration to issues such as traffic congestion, air quality impacts associated with dust and vehicle emissions, noise, hours of operation and site security.

Pedestrian Site Access and Public Protection

- 6.145 Pedestrian access will be controlled via a single point of entry at the Brunswick Park Road entrance leading to the welfare area (location to be confirmed). Access will be permitted via a facial recognition turnstile system for all operatives and visitors to sign in, enter and exit the site directly from the secure site compound. All pedestrian and vehicle routes will have appropriate signage and will be clearly designated in accordance with the HSE HSG144:2009⁷ guidance.

Pedestrians

6.146 Without mitigation, construction is considered to have a minor adverse effect on pedestrian and cyclist movement and safety. However, it should be noted that such adverse effects will occur on a short-term basis. The following mitigation by management measures (incorporated into CMP) result in a **Negligible** impact to pedestrians and cyclists:

- Construction Best Practices;
- Contractor registration to both FORS and CCS;
- Consultation and communication with local residents and businesses;
- Provision of contact details of site manager to local business, residents and on hoardings outside the site;
- Dust management and frequent cleaning of temporary and permanent carriageways;
- Banksmen to be located on-site at all times during working hours; and
- Marshalling of construction vehicles entering and exiting the site

Measures to Protect Workforce and Public

6.147 Protecting the workforce and the public is paramount therefore, permanent traffic marshals will be employed to manage and oversee all vehicle movements to and from site, including all plant and vehicle movements within the public areas. There will also be a suitable number of relief traffic marshal to cover all breaks sufficiently.

6.148 Vehicles will utilise the access route via Brunswick Park Road (or the A109 Oakleigh Road for pre-arranged abnormal loads), where they will access via the existing security gates and will be met by the gate security guard. Delivery drivers will be directed to the relevant site access gate, where they will be met by the traffic marshals who will log in the delivery, check documentation and brief drivers. The vehicles will enter site under the supervision of a trained traffic marshal who will bank them to the required offloading location. Strict speed limits will be adhered to at all times

Considerate Contractors Scheme

6.149 Comer Homes Group are registered with the Considerate Contractors Scheme and observe their Code of Considerate Practice to promote and achieve best practice onsite. The Scheme's Monitors visit the site regularly to assess the performance of registered sites against a checklist of questions to establish what level a site is performing to. The Comer Homes Group site manager will be tasked to achieve a score of 40/50 to maintain an 'excellent' rating.

During Operation

- 6.150 Measures contained within the Travel Plan and Transport Assessment produced for the site will help to minimise and mitigate against vehicle emissions and potential climate change impacts.

Travel Plan

- 6.151 A Travel Plan (TP) has been prepared for the proposed development. The aim of the TP is to support the essential travel needs of all site users including residents and visitors; and to encourage all site users to adopt healthy, sustainable travel choices in order to increase levels of walking, cycling and public transport, and subsequently reduce single occupancy vehicle trips to and from the site.

Sustainable Transport Strategy

- 6.152 The site is very well located in terms of sustainable transport, with local employment, retail, education and bus stops within easy walking and cycling distance of all parts of the site. New pedestrian/cycle links and crossings will be provided to promote sustainable access to the wider network, alongside upgrades to existing infrastructure.

Pedestrian/Cycle Connectivity

- 6.153 To improve connectivity and promote walking and cycling the following strategy is to be implemented within and adjacent to the proposed development;
- Provision of crossing facilities on all arms of the new signalised Eastern Access providing a connection to the bus stops and the wider footway network along Brunswick Park Road;
 - Provision of a comprehensive on-site footway network based on key desire lines which prioritises pedestrians over vehicular traffic. This will include the delivery of links to off-site pedestrian and cycle connections;
 - A new pedestrian/cycle access will be provided to the north of the site to link with the residential street, Ashbourne Avenue;
 - From the early phases of the development onwards, combined footway/cycleways will be provided along with site access points solely for pedestrians and cyclists and speed control measures (such as speed tables and shared surfaces) to reduce traffic speed and promote safe access on foot/by bicycle; and
 - Provision of signage to direct pedestrians and cyclists to the key locations on- and off-site. This signage will be delivered on a phase-by phase basis dependent upon the facilities delivered within each respective phase.

- 6.154 As discussed earlier in this Chapter, given that it will not be feasible to divert any existing TfL bus services through the site, it is proposed that the financial contribution sum is increased to reflect the uplift in the residential development of 1,150 units).
- 6.155 Furthermore, Comer Homes will provide an on-site shuttle bus service which will provide an `on-demand` service to key destinations such as local commercial and health centres and also to key public transport interchange hubs.

Home and Remote Working

- 6.156 Census 2011 data indicates a significant number of people will work at or from home in the proposed development. We would expect this figure to have grown by the time of the next Census, and any increase reflected in the proposed development where new dwellings have the potential to be served by high-speed broadband and improved mobile communications networks.
- 6.157 Increases in home working will reduce demand to travel to and from the site, especially at peak times.

Home Delivery and Shopping

- 6.158 The growth of online shopping and increase in capacity of home delivery services suggests that fewer trips will be made to retail and takeaway food establishments in future years.
- 6.159 The use of `multi-drop` delivery services could effectively replace multiple car journeys. Whilst it is likely that this will be mainly `off-peak` for the purposes of this assessment, there is potential for home delivery services to reduce some peak time traffic to and from the site.

Car Sharing and Car Clubs

- 6.160 Car Clubs are increasingly popular for people who wish to have occasional access to a car without owning one (i.e., for occasional work or leisure purposes). This may help some residents live without the need for owning a car for regular and, therefore, peak time use.
- 6.161 Initial discussions with the car club operator ZipCar suggest that the development at full build out could support 8 car club cars. 2 spaces will be provided within Phase 1, located along the site access road from Brunswick Park Road. If there is a high demand for Car Sharing vehicles, then the provision of additional spaces within the later Phases will be reviewed.

RESIDUAL IMPACTS

During Construction

Traffic

Given both the peak number of construction vehicles associated with the proposed development (175 as a worst case) and the management and mitigation measures that would be implemented during construction, the significance of the effects of construction to pedestrians, cyclists and the public transport network are considered to be **Negligible**.

During Operation

Traffic

- 6.162 A **Negligible** increase in traffic flows will be experienced on the local highway network as a result of the proposed development.
- 6.163 Servicing vehicle movements at the commercial elements of the proposed development can be strictly controlled in terms of vehicle size and arrival and departure times. This will be managed through a vehicle booking system. A similar system will be implemented for large residential deliveries
- 6.164 As such, the residual effect of the proposed development on traffic and the local highway network is considered to be **Negligible**.

Summary

Table 6.15 Summary of Mitigation/Enhancement and Residual Impacts

Description OF Impact/Receptor	Mitigation/Enhancement Measure	Residual Impact
During Construction		
Construction Traffic	Measures incorporated into Framework (CEMP) including but not limited to: <ul style="list-style-type: none"> - Use of strategic routes that are suitable for use by construction vehicles. - Vehicle booking system. 	Negligible
Public Transport	Construction Sustainable Transport Strategy	Negligible
Pedestrian/cyclists	Measures incorporated into Framework (CEMP) including but not limited to:	Negligible

Description OF Impact/Receptor	Mitigation/Enhancement Measure	Residual Impact
	<p>Construction Best Practices; Registered to the CCS, FORS and Construction Logistics and Cyclist Safety.</p> <p>Use of traffic marshals and banksmen.</p>	
During Operation		
Traffic	<p>Low levels of car parking to encourage sustainable travel (in accordance with the London Plan)</p> <p>Travel Plan; servicing and vehicle booking system.</p>	Negligible
Pedestrians/cyclists (including movement, severance, delay, amenity, fear and intimidation)	<p>Provision of crossing facilities on all arms of the new signalised Eastern Access providing a connection to the bus stops and the wider footway network along Brunswick Park Road.</p> <p>Provision of a comprehensive on-site footway network based on key desire lines which prioritises pedestrians over vehicular traffic. This will include the delivery of links to off-site pedestrian and cycle connections</p> <p>A new pedestrian/cycle access will be provided to the north of the site to link with the residential street, Ashbourne Avenue.</p>	Negligible to Minor Positive
Public Transport	<p>Proposed increased financial contribution (previously agreed as part of extant permission) to Bus Route 382 to reflect the uplift in the development quantum</p> <p>Provision off on—site shuttle bus for residents</p>	Negligible

CUMULATIVE IMPACTS

6.165 Traffic associated with the future operation of cumulative schemes is accounted for in the future year scenarios within the TfL modelling undertaken. As traffic associated with the identified cumulative schemes has been incorporated into the traffic modelling work detailed within this chapter, no additional cumulative assessment has been undertaken.

CONCLUSION

6.166 The site will be designed to promote access by sustainable modes of transport using the following strategy:

- Providing a mix of land uses on site to encourage people to live, work and use school and leisure facilities this promoting walking and cycling within the site;
- Locating a significant volume of housing within easy walking and cycling distance of local employment and retail facilities as well as on a bus route to key areas and rail connections;
- Providing additional employment and education services within walking and cycling distance of existing residential development and on an existing bus route;
- Providing pedestrian and cycle links to existing footway and cycleway infrastructure as well as pedestrian and cycle routes and crossings within the site to provide good connectivity to and permeability within the site;
- Providing fair and justifiable financial contribution towards off-site improvements to sustainable transport infrastructure;
- Providing a Travel Plan to help promote sustainable travel to, from and within the site, managed and monitored over time with evolving measures as circumstances change; and
- Enabling home working and access to online retail and home deliveries by providing access to broadband services for residents, businesses and pupils.

6.167 Adverse effects associated with the construction phase will be short-term and will include temporary disruption to road users and pedestrians from construction vehicles particularly HGVs vehicles entering and leaving the site). The production of a CEMP will help to mitigate such adverse effects.

6.168 The operational phase of the proposed development is considered to primarily have a **Negligible** effect on transport, particularly in terms of increases in traffic flow, pedestrian fear and intimidation, pedestrian severance and cyclists.

6.169 An improved public realm, including the new signalised site access and resultant enhanced pedestrian and cyclist environment will result in **Positive** effects on pedestrian movement, amenity, delay and fear and intimidation.

REFERENCES

- 1 Ministry of Housing, Communities & Local Government, (2021); National Planning Policy Framework.
- 2 GLA (2021); The London Plan.
- 3 Barnet Council (2020); Barnet Draft Local Plan (Regulation 18).
- 4 Institute of Environmental Management & Assessment (IEMA) (Former, Institute of Environmental Assessment), (1993); Environmental Assessment of Road Traffic.
- 5 HMSO (1983) Department of Transport: Manual for Environmental Appraisal. London.
- 6 HMSO (1994, Updated 1999); Design Manual for Roads and Bridges: Vol 11 Environmental Assessment. London.
- 7 HSE HSG144:2009. The Safe Use of Vehicles on Construction Sites

7.0 AIR QUALITY

INTRODUCTION

- 7.1 This Chapter presents the findings of an air quality assessment of existing baseline air quality conditions and the potential air quality impacts during both the construction and operational phase of the proposed development on local air quality.
- 7.2 This Chapter describes the assessment methodology; the policy framework; the baseline conditions at the site and surroundings; the likely significant environmental effects; the mitigation measures required to prevent, reduce or offset any significant negative effects; and the likely residual effects after these measures have been employed.
- 7.3 This Chapter should be read in combination with the Air Quality Assessment (AQA) provided at Appendix 7.1.

LEGISLATION AND POLICY CONTEXT

- 7.4 Where any development may have a direct or indirect effect upon air quality, there is a legislative and policy framework to ensure the proposals are considered with due regard for their impact to notable receptors. This section outlines the legislative framework, the national, regional and local planning policy and supplementary policy guidance/best practice that has been considered in this assessment.

Legislation

- 7.5 The applicable legislative framework is summarised as follows:
- The Air Quality Strategy (AQS) for England, Scotland, Wales and Northern Ireland, 2007;¹
 - Clean air Strategy 2019²
 - Directive 2008/50/EC of the European Parliament and of the Council of 21st May 2008 on Ambient Air Quality and Cleaner Air for Europe;³
 - Air Quality (England) Regulations 2000;⁴
 - Air Quality (England) Regulations, 2002;⁵
 - The Air Quality Standards Regulations, 2010;⁶
 - The Air Quality Standards (Amendment) Regulations, 2016⁷; and
 - The Environment Act, 1995⁸.
- 7.6 Further details of the legislative frameworks used within this Chapter are provided in the AQA in Appendix 7.1.

Policy

- 7.7 The land use planning process is a key means of improving air quality, particularly in the long term, through the strategic location and design of new developments. Any air quality concern that relates to land use and its development can, depending on the details of the proposed development, be a material consideration in the determination of planning applications.

National

National Planning Policy Framework (NPPF), 2021⁹

- 7.8 Section 15 of the NPPF deals with conserving and enhancing the natural environment, and states that the intention is that the planning system should prevent *'development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water or noise pollution or land instability'* and goes on to state that *'new development [should be] appropriate for its location'* and *'the effects (including cumulative effects) of pollution on health, the natural environment or general amenity, and the potential sensitivity of the area or proposed development to adverse effects from pollution, should be taken into account.'*

- 7.9 With specific regard to air quality, the NPPF at paragraph 186 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.'

Planning Practice Guidance (PPG)¹⁰

- 7.10 The PPG sets out how planning should take account of potential impacts of new development on air quality.
- 7.11 It provides guidance on whether air quality is relevant to a planning decision depending on the development and its location. The guidance States that:

'Concerns could arise if the development is likely to have an adverse effect on air quality in areas where it is already known to be poor, particularly if it could affect the implementation of air quality strategies and action plans and/or breach legal obligations'

(including those relating to the conservation of habitats and species). Air quality may also be a material consideration if the development would be particularly sensitive to poor air quality in its vicinity.

Where air quality is a relevant consideration the local planning authority may need to establish:

- the 'baseline' local air quality, including what would happen to air quality in the absence of the development;*
- whether the proposed development could significantly change air quality during the construction and operational phases (and the consequences of this for public health and biodiversity); and*
- whether occupiers or users of the development could experience poor living conditions or health due to poor air quality.'*

Regional

The London Plan, 2021¹¹

7.12 Policy SI 1 Improving air quality states:

'A Development Plans, through relevant strategic, site-specific and area-based policies, should seek opportunities to identify and deliver further improvements to air quality and should not reduce air quality benefits that result from the Mayor's or boroughs' activities to improve air quality.

B To tackle poor air quality, protect health and meet legal obligations the following criteria should be addressed:

1) Development proposals should not:

- a) lead to further deterioration of existing poor air quality*
- b) create any new areas that exceed air quality limits, or delay the date at which compliance will be achieved in areas that are currently in exceedance of legal limits*
- c) create unacceptable risk of high levels of exposure to poor air quality.*

2) In order to meet the requirements in Part 1, as a minimum:

- a) development proposals must be at least Air Quality Neutral*
- b) development proposals should use design solutions to prevent or minimise increased exposure to existing air pollution and make provision to address local problems of air quality in preference to post-design or retro-fitted mitigation measures*
- c) major development proposals must be submitted with an Air Quality Assessment. Air quality assessments should show how the development will meet the requirements of B1*

d) development proposals in Air Quality Focus Areas or that are likely to be used by large numbers of people particularly vulnerable to poor air quality, such as children or older people should demonstrate that design measures have been used to minimise exposure.

C Masterplans and development briefs for large-scale development proposals subject to an Environmental Impact Assessment should consider how local air quality can be improved across the area of the proposal as part of an air quality positive approach. To achieve this a statement should be submitted demonstrating:

- 1) how proposals have considered ways to maximise benefits to local air quality, and*
- 2) what measures or design features will be put in place to reduce exposure to pollution, and how they will achieve this.*

D In order to reduce the impact on air quality during the construction and demolition phase development proposals must demonstrate how they plan to comply with the Non-Road Mobile Machinery Low Emission Zone and reduce emissions from the demolition and construction of buildings following best practice guidance.

E Development proposals should ensure that where emissions need to be reduced to meet the requirements of Air Quality Neutral or to make the impact of development on local air quality acceptable, this is done on-site. Where it can be demonstrated that emissions cannot be further reduced by on-site measures, off-site measures to improve local air quality may be acceptable, provided that equivalent air quality benefits can be demonstrated within the area affected by the development.'

Local

Barnet's Local Plan (Core Strategy) 2012¹²

7.13 Policy CS13: Ensuring the efficient use of natural resources, states that:

'We will seek to minimise Barnet's contribution to climate change and ensure that through the efficient use of natural resources the borough develops in a way which respects environmental limits and improves quality of life.

...

We will improve air and noise quality by requiring Air Quality Assessments and Noise Impact Assessments from development in line with Barnet's SPD on Sustainable Design and Construction.

...'

Barnet's Local Plan (Development Management Policies) 2012¹³

7.14 Policy DM04: Environmental considerations for development, states that:

- *'Where there is a localised source of air pollution, buildings should be designed and sited to reduce exposure of air pollutants.*

- *Development proposals will ensure that development is not contributing to poor air quality and provide air quality assessments where appropriate.'*

Barnet Sustainable Design and Construction Supplementary Planning Document (SPD) 2016¹⁴

7.15 Sustainable Design and Construction outlines the following air quality principles:

'A. Location – Ensure that development type suits development site

B. Siting and design – Ensure that where there is a localised and proximate source of air pollution, buildings are designed and sited to reduce exposure to air pollutants.'

ASSESSMENT METHODOLOGY

Guidance

7.16 The following guidance have been used during the preparation of this Chapter, further details of which are set out in the AQA in Appendix 7.1:

- Institute of Air Quality Management (IAQM), Guidance on the Assessment of Dust from Demolition and Construction, 2016;¹⁵
- Environmental Protection UK (EPUK) and IAQM, Land-Use Planning and Development Control: Planning for Air Quality, 2017;¹⁶
- Department for Environment, food and Rural Affairs, Local Air Quality Management (LAQM) Technical Guidance (TG16), 2018;¹⁷
- Mayor of London, London Local Air Quality Management Technical Guidance, 2016;¹⁸
- Mayor of London, The Control of Dust and Emissions During Construction and Demolition Supplementary Planning Guidance, 2014;¹⁹
- Mayor of London, Sustainable Design and Construction Supplementary Planning Guidance, 2014;²⁰ and
- Air Quality Consultants, Air Quality Neutral Planning Support Update: GLA 80371.²¹

Assessment Methodology

Dust and Particulate Matter Generated by Construction Phase Activities

7.17 Construction works for the proposed development have the potential to lead to the release of fugitive dust and particulate matter. Three separate dust impacts were considered:

- Annoyance to dust soiling;
- The risk of health effects due to an increase in exposure to particulate matter (PM₁₀); and

- Harm to ecological receptors.
- 7.18 An assessment of the likely significant effects of construction phase dust and particulate matter at sensitive receptors has therefore been undertaken following the IAQM's construction dust guidance, the available information for this phase of the proposed development provided by the project team and professional judgement.
- 7.19 The assessment considers the risk of potential dust and particulate matter effects from the following four sources: demolition; earthworks; general construction activities; and trackout. It takes into account the nature and scale of the activities undertaken for each source and the sensitivity of the area to increases in dust and particulate matter levels to assign a level of risk. Risks are described in terms of there being a low, medium or high risk of dust effects. Once the level of risk has been ascertained, then site specific mitigation proportionate to the level of risk is identified, and the significance of residual effects determined. Further details on the IAQM methodology can be found in section 3 and Annex A of the AQA in Appendix 7.1.

Increase in Pollutant Concentrations as a Result of Exhaust Emissions arising from Construction Phase Traffic and Plant

- 7.20 Exhaust emissions from construction vehicles and plant may have an effect on local air quality at sensitive human or ecological receptors adjacent to the routes used by these vehicles to access the site and in the vicinity of the site itself. As detailed information on the number of vehicles and plant associated with each part of the construction phase was not available at the time of assessment, a qualitative assessment of their effect on local air quality has been undertaken using professional judgement and by considering the following, where available:
- The number and type of construction traffic and plant likely to be generated by this phase of the proposed development;
 - The number and proximity of sensitive receptors to the site and along the likely routes to be used by construction vehicles; and
 - The likely duration of the construction phase and the nature of the construction activities undertaken.

Increase in Pollutant Concentrations as a Result of Additional Traffic Emissions Arising from Operational Phase

- 7.21 Once operational, the proposed development will generate additional traffic on the surrounding road network; the emissions to air associated with this traffic have the potential to impact on nearby sensitive human or ecological receptors.
- 7.22 A detailed dispersion modelling assessment of the potential operational phase traffic effects has been undertaken, with full model setup details provided in the AQA in Appendix 7.1.

7.23 The EPUK-IAQM 2017 guidance provides an approach for determining the significance of air quality impacts associated with a development in relation to emissions from traffic. To assess the impacts of a development on the surrounding area, the guidance recommends that the degree of an impact is described by expressing the magnitude of incremental change as a proportion of the relevant assessment level and examining this change in the context of the new total concentration and its relationship with the assessment criterion. The approach is presented in Table 7.5 and also further described in section 3 and Annex B of the AQA in Appendix 7.1 including the descriptors for the impact significance.

7.24 The following scenarios have modelled and assessed in this ES chapter:

- S1: 2019 'Verification Baseline' scenario – for model verification purpose.
- S1a: 2021 'Current Baseline' scenario – for the current year
- S2: 2031 'Without Development' scenario – for the future year of opening of the completed development, without Development but with committed developments; and
- S3: 2031 'With Development' scenario – for the future year of opening of the completed development, with Development and with committed developments

7.25 2019 is used as the 'verification baseline' year in this assessment, for the purpose of model verification (i.e. S1) as the most recent year in which a full year of bias-adjusted and ratified local monitoring data is available. 2021 is considered as the 'current baseline' (i.e. S1a), representing current air quality baseline condition. 2031 has been considered as the proposed development opening year based on the year that Transport Assessment considered, however, it is understood that the proposed development is unlikely to be fully occupied by 2031. The air quality assessment assumes that the proposed development will be fully occupied by 2031 and will consider the overall impact of the total development traffic emissions on local air quality. As background concentrations and vehicle emissions are predicted to fall with time, this approach is considered to be conservative.

Increase in Pollutant Concentrations as a Result of Additional Boiler Emissions Arising from Operational Phase

7.26 The energy and sustainability consultants for the proposed development, MKP Consultants Ltd, have advised that a hybrid heat network, led by Air Source Heat Pump (ASHPs) and supplemented by gas fired boilers, will serve all new dwellings. ASHPs will be powered by electricity and will therefore have no combustion emissions at the site. It is considered that the main combustion emissions from the proposed development will likely be from the gas boilers.

7.27 At this stage, it is understood that 10 Hamworthy Modumax 254/762V low nitrogen

oxides (NO_x) gas boilers or similar, which has a heat input of 807kW and 38.8mg/kWh NO_x emission rates, are proposed for the proposed development along with the ASHPs. Given the low NO_x emission rates, it is considered unlikely that the proposed boilers will have a significant impact on local air quality. Therefore, boiler emissions have been scoped out of the ES and have not been considered further in this assessment.

Study Area

Construction Phase

- 7.28 Based on the IAQM construction dust guidance, the study area for sensitive receptors for demolition, earthworks and general construction activities is considered to be up to 350m from the site boundary. For trackout activities, the study area is considered up to 50m from the edge of the roads likely to be affected by trackout, as per the IAQM guidance. For human receptors, nearby dwellings have been considered in the assessment. No designated ecological receptors have been identified within 50m of the site boundary or the anticipated trackout route. Therefore, following the IAQM guidance, ecological receptors have been screened out of the assessment and are not considered further.

Operational Phase

Sensitive Receptors

- 7.29 Pollutant concentrations were predicted at a number of receptor locations at both existing locations and future properties within the site. Details of all specific receptors included in the modelling study are summarised in Table 7.1 and shown in Figure 7.1 as below. The existing receptors were selected to represent the sensitive receptors (e.g. residential dwellings) at locations near to the application site, and junctions and main roads in the vicinity, to ensure that 'worst-case' impacts were captured. The Design Manual for Roads and Bridges (DMRB)²² recommends a quantitative air quality assessment for European designated ecological sites when they are located within 200m of 'affected roads' (as defined in the DMRB). No designated ecological receptors have been identified within 200m of the roads within the study area and therefore, ecological receptors have been scoped out of the assessment and are not considered further.

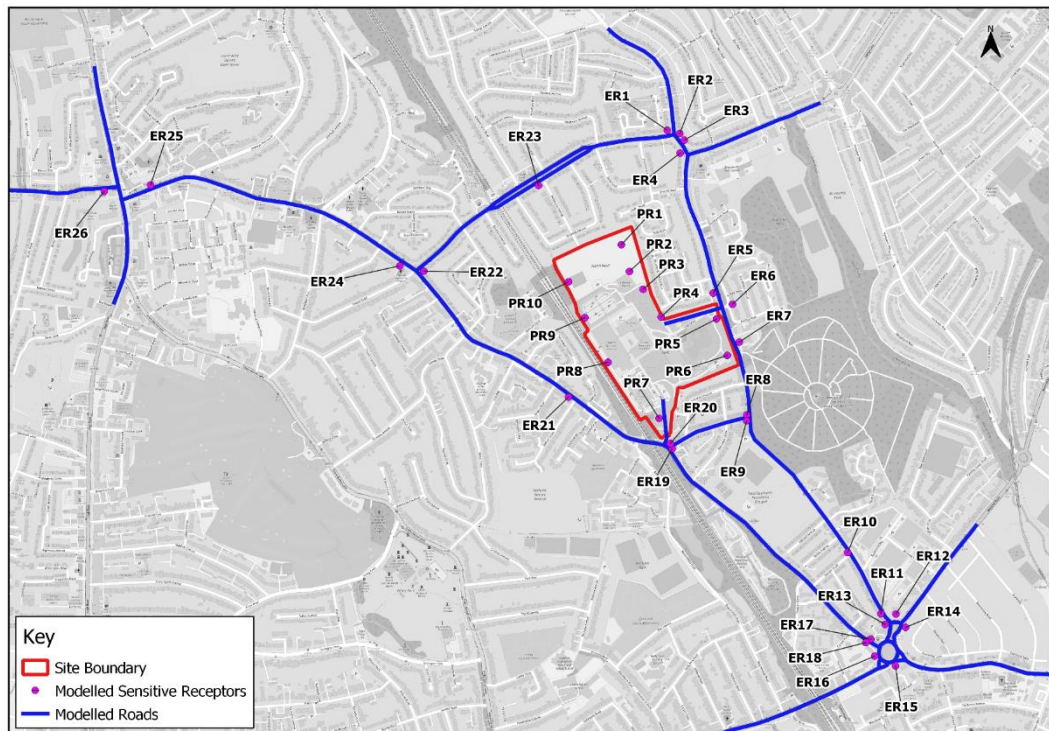
Table 7.1 Receptors Considered in the Dispersion Modelling Assessment

Receptor ID	Receptor Location	Grid Reference		
		X	Y	Z
Existing Sensitive Receptors				
ER1	262, Church Hill Road, Brunswick Park	528104	194125	1.5

Receptor ID	Receptor Location	Grid Reference		
		X	Y	Z
ER2	246, Brunswick Park Road, Brunswick Park	528142	194114	1.5
ER3	236, Brunswick Park Road, Brunswick Park	528156	194094	1.5
ER4	259, Brunswick Park Road, Brunswick Park	528144	194054	1.5
ER5	8 - 9, Howard Close, Brunswick Park	528245	193624	1.5
ER6	Goldrill Drive, Brunswick Park	528304	193590	1.5
ER7	151, Brunswick Park Road, North London Business Park	528325	193474	1.5
ER8	1, Brunswick Avenue, Brunswick Park	528348	193250	1.5
ER9	2a, Brunswick Avenue, Brunswick Park	528348	193232	1.5
ER10	21, Spencer Road, Brunswick Park	528658	192828	1.5
ER11	25, Brunswick Park Road	528760	192640	1.5
ER12	A1003, New Southgate	528806	192639	1.5
ER13	Boundary Court 1 - 8, Brunswick Park Road	528773	192607	1.5
ER14	A1003, New Southgate	528836	192598	1.5
ER15	Massey Close, New Southgate	528805	192480	1.5
ER16	Oakleigh Road South, New Southgate	528741	192510	1.5
ER17	8, Oakleigh Road South, New Southgate	528729	192562	1.5
ER18	Oakleigh Road South, New Southgate	528714	192551	1.5
ER19	Lisa Court 1 - 6, Brunswick Avenue, Brunswick Park	528119	193146	1.5
ER20	85, Brunswick Avenue, Brunswick Park	528114	193162	1.5
ER21	393, Oakleigh Road North, Brunswick Park	527801	193305	1.5

Receptor ID	Receptor Location	Grid Reference		
		X	Y	Z
ER22	201, Oakleigh Road North, Brunswick Park	527357	193692	1.5
ER23	62, Russell Lane, Brunswick Park	527709	193955	1.5
ER24	164, Oakleigh Road North, Whetstone	527283	193708	1.5
ER25	25, Oakleigh Road North, Whetstone	526518	193956	1.5
ER26*	U-Pol, 1-3, Totteridge Lane, Whetstone	526375	193937	4
Proposed Sensitive Receptors				
PR1	Sensitive Receptor at the Proposed Development	527963	193773	1.5
PR2	Sensitive Receptor at the Proposed Development	527988	193691	1.5
PR3	Sensitive Receptor at the Proposed Development	528030	193636	1.5
PR4	Sensitive Receptor at the Proposed Development	528085	193551	1.5
PR5	Sensitive Receptor at the Proposed Development	528255	193545	1.5
PR6	Sensitive Receptor at the Proposed Development	528288	193433	1.5
PR7	Sensitive Receptor at the Proposed Development	528079	193240	1.5
PR8	Sensitive Receptor at the Proposed Development	527922	193412	1.5
PR9	Sensitive Receptor at the Proposed Development	527851	193549	1.5
PR10	Sensitive Receptor at the Proposed Development	527801	193659	1.5
*First Floor Residential Receptor				

Figure 7.1 The Roads and Receptors Included in the Dispersion Modelling Assessment



© [OpenStreetMap contributors](#)

Assessment Significant Criteria

- 7.30 The significance level attributed to each effect has been assessed based on the magnitude of change due to the proposed development and the sensitivity of the affected receptor.

Dust and Particulate Matter Generated by Construction Phase Activities

- 7.31 The IAQM 'Guidance on the Assessment of Dust from Demolition and Construction' criteria and methodology have been adopted to determine the sensitivity of the receptor and the magnitude of effect. Detailed information of the methodology can be found in Annex A of Appendix 7.1. A summary is presented as below:
- 7.32 Table 7.2 below sets out the general principals, along with professional judgement that have been considered to determine the scale of sensitivity that has been applied to receptors identified and considered within the construction phase assessment.

Table 7.2 Scale of Receptor Sensitivity Used in the Construction Phase Assessment

Sensitivity of Area	Dust Soiling	Human Receptors	Ecological Receptors
High	<p>Users can reasonably expect an enjoyment of a high level of amenity. The appearance, aesthetics or value of their property would be diminished by soiling.</p> <p>The people or property would reasonably be expected to be present continuously, or at least regularly for extended periods, as part of the normal pattern of use of the land.</p> <p>Examples include dwellings, museums and other culturally important collections, medium and long term car parks and car showrooms.</p>	<p>Locations where members of the public are exposed over a time period relevant to the air quality objective for PM10 (in the case of the 24-hour objectives, a relevant location would be one where individuals may be exposed for eight hours or more in a day)</p> <p>Examples include residential properties, hospitals, schools and residential care homes should also be considered as having equal sensitivity to residential areas for the purposes of this assessment.</p>	<p>Locations with an international or national designation and the designated features may be affected by dust soiling.</p> <p>Locations where there is a community of a particularly dust sensitive species such as vascular species included in the Red Data List For Great Britain.</p> <p>Examples include a Special Area of Conservation (SAC) designated for acid heathlands or a local site designated for lichens adjacent to the demolition of a large site containing concrete (alkali) buildings.</p>
Medium	<p>Users would expect to enjoy a reasonable level of amenity, but would not reasonably expect to enjoy the same level of amenity as in their home.</p> <p>The appearance, aesthetics or value of their property could be diminished by soiling.</p> <p>The people or property wouldn't reasonably be expected to be present here continuously or regularly for extended periods as part of the normal pattern of use of the land.</p> <p>Examples include parks and places of work.</p>	<p>Locations where the people exposed are workers and exposure is over a time period relevant to the air quality objective for PM10 (in the case of the 24-hour objectives, a relevant location would be one where individuals may be exposed for eight hours or more in a day).</p> <p>Examples include office and shop workers, but will generally not include workers occupationally exposed to PM10, as protection is covered by Health and Safety at Work legislation.</p>	<p>Locations where there is a particularly important plant species, where its dust sensitivity is uncertain or unknown.</p> <p>Locations with a national designation where the features may be affected by dust deposition.</p> <p>Example is a Site of Special Scientific Interest (SSSI) with dust sensitive features.</p>
Low	<p>The enjoyment of amenity would not reasonably be expected.</p>	<p>Locations where human exposure is transient.</p>	<p>Locations with a local designation where the features may be affected by dust</p>

Sensitivity of Area	Dust Soiling	Human Receptors	Ecological Receptors
	<p>Property would not reasonably be expected to be diminished in appearance, aesthetics or value by soiling.</p> <p>There is transient exposure, where the people or property would reasonably be expected to be present only for limited periods of time as part of the normal pattern of use of the land.</p> <p>Examples include playing fields, farmland (unless commercially-sensitive horticultural), footpaths, short term car parks and roads.</p>	<p>Indicative examples include public footpaths, playing fields, parks and shopping streets.</p>	<p>deposition.</p> <p>Example is a local Nature Reserve with dust sensitive features.</p>

7.33 Table 7.3 below indicates the scale of impact magnitude that has been used in undertaking the construction phase assessment. The descriptors included in this section are based upon the IAQM 'Guidance on the Assessment of Dust from Demolition and Construction'.

Table 7.3 Scale of Magnitude for Dust Emission Impacts Used in the Construction Phase Assessment

Activity	Magnitude	Description
Demolition	Large	Total building volume >50,000m ³ , potentially dusty construction material, on-site crushing and screening, demolition activities >20m above ground level.
	Medium	Total building volume 20,000m ³ – 50,000m ³ , potentially dusty construction material, demolition activities 10m – 20m above ground level.
	Small	Total building volume <20,000m ³ , construction material with low potential for dust release, demolition activities <10m above ground, demolition during wetter months.
Earthworks	Large	Total site area >10,000m ² , potentially dusty soil type (e.g. clay), >10 heavy earth moving vehicles active at any one time, formation of bunds >8m in height, total material moved >100,000 tonnes.
	Medium	Total site area 2,500 – 10,000m ² , moderately dusty soil type (e.g. silt), 5 – 10 heavy earth moving vehicles active at any one time, formation of bunds

Activity	Magnitude	Description
		4 – 8m in height, total material moved 20,000 – 100,000 tonnes.
	Small	Total site area < 2,500m ² , soil type with large grain size (e.g. sand), <5 heavy earth moving vehicles active at any one time, formation of bunds <4m in height, total material moved <10,000 tonnes, earthworks during wetter months.
Construction	Large	Total building volume >100,000m ³ , piling, on site concrete batching.
	Medium	Total building volume 25,000 – 100,000m ³ , potentially dusty construction material (e.g. concrete), piling, on site concrete batching.
	Small	Total building volume <25,000m ³ , construction material with low potential for dust release (e.g. metal cladding or timber).
Trackout	Large	>50 HDV (>3.5t) trips in any one day, potentially dusty surface material (e.g. high clay content), unpaved road length >100m.
	Medium	10 – 50 HDV (>3.5t) trips in any one day, moderately dusty surface material (e.g. high clay content), unpaved road length 50 – 100m.
	Small	<10 HDV (>3.5t) trips in any one day, surface material with low potential for dust release, unpaved road length <50m.

7.34 The sensitivity of receptor and magnitude of impact have then been combined using the ES significance matrix as detailed in Table 7.4 below to determine the significance of effects. The dusts emission magnitude determined have been used to recommend site-specific mitigation measures.

Table 7.4 Scale of Magnitude for Dust Emission Impacts Used in the Construction Phase Assessment

Sensitivity of Area		Dust Emission Magnitude		
		Large	Medium	Small
Demolition	High	High Risk	Medium Risk	Medium Risk
	Medium	High Risk	Medium Risk	Low Risk
	Low	Medium Risk	Low Risk	Negligible
Earthworks	High	High Risk	Medium Risk	Low Risk

Sensitivity of Area		Dust Emission Magnitude		
		Large	Medium	Small
	Medium	Medium Risk	Medium Risk	Low Risk
	Low	Low Risk	Low Risk	Negligible
Construction	High	High Risk	Medium Risk	Low Risk
	Medium	Medium Risk	Medium Risk	Low Risk
	Low	Low Risk	Low Risk	Negligible
Trackout	High	High Risk	Medium Risk	Low Risk
	Medium	Medium Risk	Low Risk	Negligible
	Low	Low Risk	Low Risk	Negligible

Increase in Pollutant Concentrations as a Result of Exhaust Emissions arising from Construction Phase Traffic and Plant

7.35 The significance of effects of exhaust emissions arising from construction phase vehicles and on-site plant have been evaluated qualitatively using professional judgement and the principles of the EPUK / IAQM 'Land-Use Planning & Development Control: Planning for Air Quality' significance criteria described below for operational phase traffic effects.

Increase in Pollutant Concentrations as a Result of Additional Traffic Exhaust Emissions Arising from Operational Phase

7.36 The significance of emissions from the proposed development on human receptors has been determined using the criteria outline in the EPUK/IAQM 'Land-Use Planning & Development Control: Planning for Air Quality' guidance. The EPUK / IAQM guidance recommends that the degree of effect is described by expressing the magnitude of incremental change as a proportion of the relevant assessment level and examining this change in the context of the new total concentration and its relationship with the assessment criterion. Table 7.5 presents the suggested framework for describing the effects. For the purpose of this ES, the percentage change in concentration (relative to the assessment level) has been considered as the magnitude of change, and terminology has been adapted in keeping with the terminology used within the ES.

Table 7.5 Operational Phase Effect Descriptors for Individual Receptors

Long term average concentration at receptors in assessment year	% Change in Concentration Relative to Air Quality Assessment Level (AQAL) – Magnitude of Impact			
	1% Very Slight	2-5% Slight	6-10% Moderate	>10% Substantial
75% or less of AQAL	Negligible	Negligible	Minor	Moderate
76-94% AQAL	Negligible	Minor	Moderate	Moderate
95-102% of AQAL	Minor	Moderate	Moderate	Major
103-109% of AQAL	Moderate	Moderate	Major	Major
110% or more	Moderate	Major	Major	Major

Notes

AQAL = Air Quality Assessment Level, which for this assessment related to the UK Air Quality Strategy objectives.

% change based on rounded values. Where the % change in concentrations is 0, i.e. <0.5%, the change is described as 'Negligible' regardless of the concentration.

When defining the concentration as a percentage of the AQAL, the 'without scheme' concentration should be used where there is a decrease in pollutant concentration and the 'with scheme' concentration where there is an increase.

- 7.37 For the assessment of exposure at sensitive receptors within the proposed development, air quality is judged to be acceptable and to have an insignificant effect on future users where predicted concentrations are found to be below the relevant air quality objectives. Where concentrations exceed the objectives, appropriate mitigation should be considered.
- 7.38 The EPUK/IAQM guidance notes that the criteria in Table 7.5 should be used to describe impacts at individual receptors and should only be considered as a starting point to make a judgement on significance of effects, as other influences may need to be accounted for. The EPUK/IAQM guidance states that the assessment of overall significance should be based on professional judgement, taking into account several factors, including:
- the existing and future air quality in the absence of the proposed development;
 - 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
- 7.39 Where significance of effects is determined as moderate or above, they will be considered to be significant.

ASSUMPTIONS AND LIMITATIONS

7.40 The following uncertainties and assumptions were made in the air quality assessment (further details can be found in the AQA in Appendix 7.1):

- Given the lack of local background monitoring data, background PM_{2.5} (fine particulates with a diameter <2.5µm) concentrations have been taken from the Department for Environment, Food and Rural Affairs (Defra) LAQM background maps;
- Vehicle emission factors for NO_x, PM₁₀ and PM_{2.5} were obtained from the Defra Emissions Factors Toolkit (EFT) v10.1;
- There will be uncertainties introduced because the modelling has simplified real-world processes into a series of algorithms. For example, it has been assumed that wind conditions measured at Northolt meteorological station in 2019 were representative of wind conditions at the site, as this meteorological station is the nearest station where the required meteorological data for predicting air quality impacts of the proposed development are measured on routine basis. Furthermore, it has been assumed that the subsequent dispersion of emitted pollutants will conform to a Gaussian distribution over flat terrain in order to simplify the real-world dilution and dispersion conditions;
- An important step in the assessment is verifying the dispersion model against measured data. The model verification was based on the comparison of model results based on 2019 traffic data with 2019 monitored NO₂ and PM₁₀ concentrations. As no PM_{2.5} monitoring data were available near the site area, the adjustment factors used for the predicted roadside PM₁₀ concentrations have been applied to the predicted PM_{2.5} concentrations, as per guidance provided in the LAQM.TG(16);
- The national diurnal profile published by the Department for Transport for 2019, has been assumed to be applicable for the roads assessed;
- At the time of writing, detailed design of the boiler emission stack is not available. Boiler emissions have not been considered in this assessment, due to lack of information. However, given the low NO_x emission rate of the proposed boilers, it is considered unlikely that the boiler emissions will cause a significant impact; and
- There is an element of uncertainty in all measured and modelled data. All values presented in this report are best possible estimates.

BASELINE CONDITIONS

Existing Baseline

7.41 Existing or baseline air quality refers to the concentrations of relevant substances that

are already present in ambient air. These substances are emitted by various sources, including road traffic, industrial, domestic, agricultural and natural sources.

- 7.42 The site lies within the London Borough of Barnet (LBB) within the jurisdiction of Barnet Council. LBB currently has one Air Quality Management Area (AQMA) declared, covering the whole borough. Therefore, the proposed development is located within an AQMA. This AQMA was declared for annual mean NO₂ and 24 hour mean PM₁₀ in 2001. In 2010 the AQMA order was amended to include the one hour mean NO₂, due to exceedances in a bus station and some high streets.

Baseline Monitoring Data

- 7.43 A review of the LBB 2019 Air Quality Annual Status Report showed that there were no monitoring locations within the immediate vicinity of the site; the nearest monitoring location is diffusion tube PBN12, approximately 1.7km from the application site. This tube is located adjacent to a busy high street road (the A1000, High Road), whilst the site is located further away from comparable major roads. Therefore, this monitoring location is not considered to be representative of the site.
- 7.44 Following a review of the Air Quality ES Chapter from the 2015 ES for the HPP (Kairus Ltd, 2018), it is noted that LBB advised applying monitoring data from the automatic background monitoring location at Chalgrove Primary School (i.e. ABN2) as a background concentration for the site. ABN2 is located approximately 5.2km southwest of the site and is considered to be in a more similar setting to the site. Table 7.6 presents available monitoring results (NO₂ and PM₁₀) at ABN2; there were no exceedances of the relevant objectives between 2015 and 2019.

Table 7.6 Monitoring Results at ABN2 (Chalgrove School)

Pollutants	Site Description	Approximate Distance from Site (in km)	Monitoring Results				
			2015	2016	2017	2018	2019
Annual Mean NO ₂ Concentration (µg/m ³)	Urban Background	5.2	23	28	29	27	25
Number of Hours NO ₂ >200µg/m ³			0	0	1	0	0
Annual Mean PM ₁₀ Concentration (µg/m ³)			22	23	21	21	20

Pollutants	Site Description	Approximate Distance from Site (in km)	Monitoring Results				
			2015	2016	2017	2018	2019
Number of Days PM ₁₀ >50µg/m ³			6	4	6	1	4

LAQM Background Data

7.45 In addition to local monitoring data, estimated background air quality data are available from the United Kingdom Air Information Resource (UK-AIR) website operated by Defra. The UK-AIR website provides estimated annual average background concentrations of NO₂, PM₁₀ and PM_{2.5} on a 1km² grid basis. Table 7.7 shows Defra estimated annual average background NO₂, PM₁₀ and PM_{2.5} concentrations at the proposed development site for 2019, current year 2021 and a future year of 2030. Background concentrations are well below the annual average air quality objectives for human health for NO₂, PM₁₀ or PM_{2.5}. As background concentrations are predicted to fall with time, background concentrations in future years would not be expected to exceed their respective annual mean standards.

Table 7.7 Defra LAQM Estimated Annual Average NO₂, PM₁₀ and PM_{2.5} Concentrations at Development Site

Assessment Year	Estimated Annual Average Pollutant Concentrations (µg/m ³) Derived from the LAQM Support Website		
	NO ₂	PM ₁₀	PM _{2.5}
2019	20.96*	16.62	11.17
2021	17.62	16.03	10.77
2030	14.04	15.26	10.22
Air Quality Objective (AQO)	40	40	25

Notes: Presented concentrations for 1km² grid centred on 527500, 193500; approximate centre of development site is 527983, 193511; *Air Quality Consultants²³ reviewed Defra's 2018-based background mapped NO_x and NO₂ concentrations for 2019 against 2019 annual mean measured background concentrations at automatic monitoring sites. They identified that the 2019 Defra mapped data are under-predicting (except in inner-London), therefore, an adjustment factor of 1.0855 has been applied to background NO₂ concentrations for a conservative approach.

Modelled 2021 Current Baseline (i.e. S1a) at Existing Receptor Locations

7.46 Detailed dispersion modelling has been undertaken with the use of the ADMS-Roads

dispersion model software, following guidance in accordance with LAQM.TG(16). The modelled concentrations have been verified and results processed as detailed in Section 3 of the AQA in Appendix 7.1. Based on the traffic data available (provided by the project transport consultant), 2021 Current Baseline (i.e. S1a) has been assessed and the modelling results are presented in Table 7.8. The results of the assessment indicate that in the current baseline of 2021, annual mean NO₂, PM₁₀ and PM_{2.5} concentrations for all receptor locations are below the relevant objectives.

Table 7.8 Modelled 2021 NO₂, PM₁₀ and PM_{2.5} Concentrations at Existing Receptor Locations

Receptor ID	Annual Average NO ₂ (µg/m ³)	Annual Average PM ₁₀ (µg/m ³)	Annual Average PM _{2.5} (µg/m ³)
ER1	31.14	18.74	12.06
ER2	33.08	19.25	12.37
ER3	33.34	19.31	12.41
ER4	29.62	18.28	11.79
ER5	27.30	17.64	11.52
ER6	26.91	17.52	11.45
ER7	28.09	17.83	11.63
ER8	28.16	17.99	11.72
ER9	27.95	17.92	11.68
ER10	28.68	18.21	12.41
ER11	29.92	18.39	12.53
ER12	29.34	18.23	12.44
ER13	29.84	18.38	12.52
ER14	31.38	18.82	12.79
ER15	32.25	19.05	12.92
ER16	31.27	18.77	12.75
ER17	33.95	19.53	13.21
ER18	31.65	18.89	12.82
ER19	32.41	19.50	12.60
ER20	29.70	18.54	12.04

Receptor ID	Annual Average NO ₂ (µg/m ³)	Annual Average PM ₁₀ (µg/m ³)	Annual Average PM _{2.5} (mg/m ³)
ER21	29.62	18.57	12.08
ER22	33.35	19.31	12.54
ER23	29.85	18.63	12.12
ER24	28.76	18.04	11.79
ER25	35.03	19.80	12.66
ER26	30.99	18.68	11.98
AQO	40	40	25

POTENTIAL IMPACTS

During Construction

Dust and Particulate Matter Generated by Construction Phase Activities

- 7.47 Full details of the dust risks determined in the AQA before mitigation is considered are presented in section 5.1 of the AQA in Appendix 7.1 and have been summarised as below.
- 7.48 With reference to the IAQM criteria, the dust emission magnitudes for demolition, earthworks, construction and trackout activities are summarised in Table 7.9. Where information is not yet known, a conservative approach has been adopted and professional judgement has been used based on the scale of the proposed development and experience of working on similar schemes. Furthermore, where the criteria for each activity are from range of magnitudes the more conservative magnitude has been selected.
- 7.49 The dust emission magnitudes from Table 7.9 have been combined with the sensitivity of the area from Table 7.10, to determine the risk of impacts of construction activities before mitigation, as summarised in Table 7.11.
- 7.50 It should be noted that dust mitigation measures for demolition / construction activities are normally secured by planning conditions, or legal obligation within a section 106 agreement, and are included in a Dust Management Plan (DMP) or a Construction Environmental Management Plan (CEMP). Therefore, any adverse effects will be reduced through a DMP/CEMP, and thus the pre-mitigation impacts are not considered relevant. This Chapter only reports the residual effect (after mitigation) for construction phase, which are detailed in the 'residual impact' section.

Table 7.9 Summary of Dust Emission Magnitudes (Before Mitigation)

Activity	Dust Emission Magnitude	
Demolition	<ul style="list-style-type: none"> The total volume of buildings to be demolished is estimated to be > 50,000m³. On-site crushing and screening are proposed. The height of demolition activities above ground will be 10-20m. There will be minimal potential dusty demolition materials on site, mainly steel frame and cladding to be demolished. Demolition is anticipated to be undertaken during wetter months 	Large
Earthworks	<ul style="list-style-type: none"> The total area where earthworks expected to take place is >10,000m². The soil type is London Clay. Therefore, the soil at the site is expected to be potentially dusty. The number of heavy earthmoving vehicles active at any one time will likely be 5-10. Height of stockpiled materials will be <4m Given the size of the site, the total material to be moved is estimated to be >100,000 tonnes. Earthworks is anticipated to be undertaken during wetter months 	Large
Construction	<ul style="list-style-type: none"> Total volume to be built will be >100,000m³. No on-site concrete batching is proposed. No on-site concrete sandblasting is proposed There will be some potentially dusty construction material on site. 	Large
Trackout	<ul style="list-style-type: none"> There will be 10-50 HDV outward movements in any one day. Onsite, the surface could potentially be dusty, however it is understood that the existing site access road will be retained for a temporary accessway plus widening to provide construction routes. 	Medium

Table 7.10 Sensitivity of the Area

Potential Impact		Sensitivity of the surrounding area		
		Demolition	Earthworks and Construction	Trackout
	Receptor	High	High	High

Potential Impact		Sensitivity of the surrounding area		
		Demolition	Earthworks and Construction	Trackout
Dust Soiling	Sensitivity			
	Number of receptors and distance from the source	10-100 within 50m of the demolition activities	>100 within 20m of the site boundary	10-100 within 20m of the trackout boundary
	Overall sensitivity of the area	Medium	High	High
Human Health	Receptor Sensitivity	High	High	High
	Annual mean PM ₁₀ concentration	<24µg/m ³	<24µg/m ³	<24µg/m ³
	Number of receptors and distance from the source	10-100 within 50m of the demolition activities	>100 within 20m of the site boundary	10-100 within 20m of the trackout boundary
	Overall sensitivity of the area	Low	Medium	Low
Ecological	NA			

Table 7.11 Summary of the Dust Risk from Construction Activities Prior to Mitigation

Potential Impact	Dust Risk Impact			
	Demolition	Earthworks	Construction	Trackout
Dust soiling	High	High	High	Medium
Human health	Medium	Medium	Medium	Low

Increase in Pollutant Concentrations as a Result of Exhaust Emissions arising from Construction Phase Traffic and Plant

7.51 The operation of vehicles and equipment powered by internal combustion engines results in the emission of exhaust gases containing pollutants including NO_x, PM₁₀, PM_{2.5}, volatile organic compounds, and carbon monoxide. The quantities emitted depend on factors such as engine type, service history, pattern of usage and fuel composition.

- 7.52 Construction traffic will comprise haulage/construction vehicles and vehicles used for workers' trips to and from the application site. The greatest impact on air quality due to emission from construction phase vehicles will be in areas adjacent to the application site access and nearby road network. It is anticipated that construction traffic will access the application site via Brunswick Park Road, which has a number of residential properties located adjacent to it. At this stage, detailed information regarding construction phase traffic flow is not available, although the outline predicted numbers set out in Chapter 6.0 would appear to be below the threshold for requiring further assessment. It is understood that the construction works will be phased into 5 construction areas to minimise the anticipated volume of construction traffic delivering and collecting. Furthermore, a Construction Traffic Management Plan (secured by planning condition) will be prepared for the proposed development to ensure that construction traffic should have no detrimental effect on the highways or the local community. Therefore, it is considered unlikely construction plant and vehicles will cause a significant impact on local air quality.
- 7.53 The operation of site equipment and machinery will result in emissions to atmosphere of exhaust gases. The proposed development is located within LBB, it is anticipated that Non-Road Mobile Machinery (NRMM) used on site will meet Stage IIIB of EU Directive 97/68/EC, in accordance with the London Local Air Quality Management Technical Guidance 2016 (LLAQM.TG(16)). It is considered that, with suitable controls and site management, as per the LAQM

During Operation

Increase in Pollutant Concentrations as a Result of Additional Traffic Exhaust Emissions Arising from Operational Phase

- 7.54 Based on the traffic data available, S2 '2031 without Development' and S3 '2031 with Development', have been assessed to consider the potential effects of the proposed development. It should be noted that both opening year scenarios (i.e. S2 and S3) have included traffic data associated with local committed developments.
- 7.55 Full details of the results are presented in section 5 and Table 5.4, 5.5, 5.6, and 5.7 of the AQA in Appendix 7.1 and the findings are summarised below.
- 7.56 The AQS objectives for NO₂, PM₁₀ and PM_{2.5} are predicted to be met at all receptor locations considered in the assessment. In accordance with EPUK-IAQM guidance, the impacts of the proposed development on NO₂, PM₁₀ and PM_{2.5} concentrations, prior to mitigation, are predicted to be long term, local and of '**Negligible**' significance at all receptor locations. Overall, the effect of the proposed development on NO₂, PM₁₀ and PM_{2.5} concentrations, prior to mitigation, is considered to be **not significant**.
- 7.57 Predicted NO₂, PM₁₀ and PM_{2.5} concentrations at proposed receptors on the site itself show that future users of the proposed development are not predicted to be exposed to

air quality exceeding the UK AQS objectives.

AIR QUALITY NEUTRAL ASSESSMENT

- 7.58 An air quality neutral assessment has been undertaken in accordance with the Air Quality Neutral Planning Support Update guidance. Full details of the results are presented in section 6 of the AQA in Appendix 7.1 and the findings are summarised below.
- 7.59 The building and transport emissions associated with the proposed development are predicted to be below the building emissions benchmark and transport emissions benchmark. Therefore, the proposed development is predicted to be better than 'air quality neutral' in respect of building and transport emissions.
- 7.60 It is noted that the London Plan 2021 includes a requirement of the preparation of an Air Quality Positive (AQP) Statement for large-scale developments subject to an EIA. At the time of writing, the guidance on preparing an AQP was in draft format only and detailed mitigation for the proposed development has not yet been agreed, therefore it is anticipated that an AQP Statement will be required at a later stage and likely secured by planning condition.

MITIGATION

During Construction

- 7.61 In accordance with the IAQM guidance, a construction phase dust assessment has been undertaken to define the pre-mitigation risk of dust impacts of the activities during construction (as presented in the AQA in Appendix 7.1), and site-specific mitigation measures have been recommended based on the risk level determined. The following mitigation measures presented in Table 7.12 will be adopted and form part of the detailed Construction Environmental Management Plans (CEMP) which will be secured by planning condition. There are two categories of mitigation measure – 'highly recommended' and 'desirable', which are indicated according to the dust risk level identified in Table 7.11. Desirable measures are presented in italics.

Table 7.12 Construction Phase Mitigation Measures

Construction Phase Mitigation Measures
Communications
<ul style="list-style-type: none"> • Develop and implement a stakeholder communications plan that includes community engagement before work commences on site. • Display the name and contact details of people accountable for air quality and dust issues on the site boundary. This may be the environment manager/engineer or the site manager. • Display the head or regional office contact information
Dust Management

Construction Phase Mitigation Measures

Develop and implement a 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 as a minimum the highly recommended measures. The desirable measures should be included as appropriate for the site. The DMP may include monitoring of dust deposition, dust flux, real-time PM10 continuous monitoring and/or visual inspections.

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 off-site or the action taken to resolve the situation in the log book.
- Hold regular liaison meetings with other high risk construction sites within 500 m 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 if asked. This should include regular dust soiling checks of surfaces such as street furniture, cars and windowsills within 100m of site boundary, with cleaning to be provided if necessary.
- Carry out regular site inspections to monitor compliance with any dust management plan, record inspection results, and make an inspection log available to the local authority when asked.
- 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.
- Liaise with the local authority to determine the instrumented dust monitoring requirements. Dust deposition, dust flux, or real-time PM10 continuous monitoring locations with the Local Authority.

Preparing and Maintaining the Site

- Plan site layout so that machinery and dust causing activities are located away from receptors as far as 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 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.
- Cover, seed or fence stockpiles to prevent wind whipping.

Operating Vehicles/Machinery and Sustainable Travel

- Ensure all on-road vehicles comply with the requirements of the London Low Emission Zone and the London NRMM standards, where applicable
- 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 15mph on surfaced and 10mph on

Construction Phase Mitigation Measures
<p>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).</p> <ul style="list-style-type: none"> • Produce a Construction Logistics Plan to manage the sustainable delivery of goods and materials • Implement a Travel Plan that supports and encourages sustainable travel (public transport, cycling, walking and car-sharing). <p>Operations</p> <ul style="list-style-type: none"> • 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 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. • Ensure equipment is readily available on site to clean any dry spillages and clean up as soon as reasonably practicable after the event using wet clean methods. <p>Waste Management</p> <ul style="list-style-type: none"> • Avoid bonfires or burning of waste materials.
Measures Specific to Demolition
<ul style="list-style-type: none"> • Soft strip inside buildings before demolition (retaining walls and windows in the rest of the building where possible, to provide a screen against dust). • Ensure effective water suppression is used during demolition operations. Hand held sprays are more effective than hoses attached to equipment as the water can be directed to where it is needed. In addition high volume water suppression systems, manually controlled, can produce fine water droplets that effectively bring the dust particles to the ground. • Avoid explosive blasting, using appropriate manual or mechanical alternatives. • Bag and remove any biological debris or damp down such material before demolition.
Measures Specific to Earthworks
<ul style="list-style-type: none"> • Re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces as soon as practicable. • Cover, seed or fence stockpiles to prevent wind whipping. • Only remove the cover in small areas during work and not all at once
Measures Specific to Construction
<ul style="list-style-type: none"> • 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 material are delivered in enclosed tankers and stored in silos with suitable emission control systems to prevent escape of material and overfilling during delivery. • For smaller supplied of fine powder materials ensure bags are sealed after use and stored appropriately to prevent dust.

Construction Phase Mitigation Measures
Measures Specific to Trackout
<ul style="list-style-type: none"> • Use water-assisted dust sweeper(s) on the access and local roads, to remove, as necessary, any material tracked out of the site. • Avoid dry sweeping of large areas. • Ensure vehicles entering and leaving sites are covered to prevent the 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 any inspections of haul routes and subsequent action in site log book. • Install hard surfaced haul routes, which are regularly damped down with fixed or mobile sprinkler systems, or mobile water bowsers and regularly cleaned. • Implement wheel washing system. • 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. • Access gates to be located at least 10m from receptors where possible.

7.62 Prior to commencement of construction activities, it is anticipated that an agreement on the scope of dust management within the detailed CEMP for the construction phase will be reached with LBB to ensure that the potential for adverse environmental effects on local receptors is minimised.

During Operation

7.63 The assessment predicts that the operational phase of the proposed development will have a negligible impact on local air quality. Therefore, it is not considered that any specific mitigation measures will be required for operational phase. However, given that the site is located in an AQMA, transport related mitigation measures (such as provision of electric vehicle charge points) will be implemented to minimise the potential impact of the proposed development on local air quality. This includes a Travel Plan (Appendix 6.2) that has been prepared by the project transport consultant. The Travel Plan sets out measures to encourage sustainable means of transport, which will assist in increasing accessibility whilst reducing congestion and local air pollution.

RESIDUAL IMPACTS

During Construction

7.64 With the implementation of the proposed construction phase mitigation measures (detailed in Table 7.12), the residual impacts are considered to be temporary, local level and of **Negligible** significance.

During Operation

- 7.65 No significant impacts are anticipated once the proposed development is operational and therefore, operational phase impacts are considered to remain long term, local level and of **Negligible** significance.

Table 7.13 Summary of Impacts

Description of Impact/Receptor	Potential Impact	Mitigation Measures Proposed	Residual Impact
During Construction			
Construction phase impacts of the proposed development on local air may potentially arise due to the generation and re-suspension of dust and particulate matter during the construction phase.	N/A	As detailed in Table 7.12. These measures will be incorporated into a detailed CEMP (secured by planning condition)	Negligible
Increase in Pollutant Concentrations as a Result of Exhaust Emissions arising from Construction Phase Traffic and Plant	N/A	A Construction Traffic Management Plan (secured by planning condition) The proposed development is located within LBB, it is anticipated that Non-Road Mobile Machinery (NRMM) used on site will meet Stage IIIB of EU Directive 97/68/EC, in accordance with the London Local Air Quality Management Technical Guidance 2016 (LLAQM.TG(16)).	Negligible
During Operation			
Increase in Pollutant Concentrations as a Result of Additional Traffic Exhaust Emissions Arising from Operational Phase	Negligible	No specific mitigation measures will be required. Transport related mitigation measures (such as provision of electric vehicle charge points and a Travel Plan) will be included.	Negligible

CUMULATIVE IMPACTS

- 7.66 Eight sites have been included within the cumulative assessment, as detailed in Chapter 16.0.

During Construction

- 7.67 The IAQM construction phase methodology states that beyond 350m from a site boundary, the risk of impact from activities carried out on site during the construction phase can be considered to be negligible. The committed developments identified (as detailed above) are all >1km from the site, apart from Oakleigh Road South Depot site (ref: 15/04005/FUL), which is located approximately 370m away. It is uncertain when the construction phase works for this site would be commenced. It is noted that as part of the S106 agreement for the planning permission of Oakleigh Road South Depot site (ref: 15/04005/FUL) was prepared which included details of minimising dust and debris generated during the construction phase. Should the construction phase work for this site coincide with the proposed development construction phase, the two sites will liaise to ensure plans are co-ordinated and dust and particulate matter emissions are minimised, including consideration of off-site construction vehicles (as the two sites are within 500m, see IAQM recommended mitigation measures in Table 7.12). The procedure for liaison with surrounding development sites will be set out in the detailed CEMP (secured by planning condition).
- 7.68 Therefore, with appropriate mitigation measures in place, construction phase cumulative impact is considered to be **Negligible**.

During Operation

- 7.69 Cumulative schemes may cause an increase in traffic on the surrounding road network and therefore cause an increase in pollutant levels at sensitive receptors.
- 7.70 Traffic data used in the air quality assessment was provided by the appointed project transport consultant, who confirmed that 'the information for the forecast year assessments is inclusive of local committed development. The data Transport for London (TfL) provided did not disaggregate the committed development, and as such this assessment considers 'with committed development' scenarios only. This does however provide a robust assessment.'. Therefore, both opening year scenarios (i.e. S2 and S3) have included traffic data associated local committed developments.
- 7.71 Based on above, operational phase cumulative impact is considered to be **Negligible**.

SUMMARY AND CONCLUSION

- 7.72 An air quality assessment has been undertaken to consider the potential air quality impacts associated with the proposed development at Royal Brunswick Park.
- 7.73 An assessment of construction phase impacts has been undertaken following the IAQM guidance. The potential risk of construction phase impacts from dust soiling was predicted to be 'medium' to 'high' risk, and on human health was predicted to be 'low' to 'medium' risk. Mitigation measures have been recommended to reduce the risk of

dust and particulate matter being generated and re-suspended, and also to reduce emissions from vehicles and plant associated with construction related activities. With implementation of an appropriate selection of measures, such as those recommended in Annex E of the Air Quality Assessment report (Appendix 7.1), no significant impacts are anticipated during the construction phase.

- 7.74 The main potential air quality impact once the proposed development is complete and occupied is likely to be emissions from road traffic (i.e. changes in traffic flow volume and distribution) associated with the proposed development. The key air pollutants of concern were NO₂, PM₁₀ and PM_{2.5}. Concentrations of these key pollutants were predicted at the most relevant receptor locations using ADMS-Roads dispersion model for the base year 2019, and for the proposed opening year 2031 with and without the proposed development in place.
- 7.75 The impact of the proposed development on NO₂, PM₁₀ and PM_{2.5} concentrations at existing sensitive human receptors, prior to mitigation, was **Negligible** at all locations. Therefore, it is not considered that any specific mitigation measures will be required for operational phase. Nevertheless, transport related mitigation measures (such as provision of electric vehicle charge points and a Travel Plan) will be included to minimise the potential impact of the proposed development on local air quality.

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8.0 BIODIVERSITY

INTRODUCTION

- 8.1 This Chapter assesses the likely significant effects of the construction (including demolition) and operational phases of the proposed development in respect of ecology and nature conservation.
- 8.2 This Chapter describes the legislative and policy framework; the assessment methodology; the baseline conditions at the site and surroundings; the likely significant environmental effects; the mitigation measures required to prevent, reduce or offset any significant adverse effects; and the likely residual effects after these measures have been employed. It should be read in conjunction with the following reports and assessments:
- Appendix 8.1: 2021 Preliminary Ecological Appraisal Report;
 - Appendix 8.2: 2021 Phase 2 Survey Report;
 - Appendix 8.3: 2021 Biodiversity Impact Assessment Report; and
 - Appendix 8.4: 2021 Arboricultural Impact Assessment Report.

LEGISLATION AND POLICY CONTEXT

- 8.3 Where any development may have a direct or indirect effect upon ecology, there is a legislative and policy framework to ensure the proposals are considered with due regard for their impact to notable receptors. This section outlines the legislative framework, the national, regional and local planning policy and supplementary policy guidance/best practice that has been considered in this assessment.

Legislation

International

The Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019

- 8.4 The Conservation of Habitats & Species Regulations replace The Conservation (Natural Habitats, etc.) Regulations 1994 (as amended)¹, and transpose Council Directive 92/43/EEC on the Conservation of Natural Habitats and Wild Fauna and Flora ('EU Habitats Directive')², and Council Directive 79/409/EEC on the Conservation of Wild Birds ('Birds Directive')³ into UK law (in conjunction with the Wildlife and Countryside Act).
- 8.5 Regulation 43 and 47 respectively of the Conservation of Habitats & Species Regulations makes it an offence (subject to exceptions) to deliberately capture, kill, disturb, or trade in the animals listed in Schedule 2 (European protected species of animals), or pick,

collect, cut, uproot, destroy, or trade in the plants listed in Schedule 5 (European protected species of plant). Development that would contravene the protection afforded to European protected species requires a derogation (in the form of a licence) from the provisions of the Habitats Directive.

8.6 Regulation 63 (1) states:

'A competent authority, before deciding to undertake, or give any consent, permission or other authorisation for, a plan or project which –

(a) is likely to have a significant effect on a European site or a European offshore marine site (either alone or in combination with other plans or projects); and

(b) is not directly connected with or necessary to the management of that site;

must make an appropriate assessment of the implications for that site in view of that site's conservation objectives.'

8.7 These Regulations are of specific relevance to this assessment given the sites proximity to several statutorily designated sites.

National

8.8 The protection afforded to individual species/group of species e.g. bats and birds is detailed below under the specific species/group of species headings. This approach has been taken as species/groups of species can receive protection under more than one piece of legislation. Bats and birds are the only species considered below as these are the only species of relevance to site as informed by the survey work carried out by Greengage.

Wildlife and Countryside Act 1981 (as amended)

8.9 The Wildlife and Countryside Act 1981 (as amended) is the principal mechanism for the legislative protection of wildlife in Great Britain. This legislation is the means by which the Convention on the Conservation of European Wildlife and Natural Habitats (the 'Bern Convention') and the Birds Directive and EU Habitats Directive are implemented in Great Britain.

The Countryside and Rights of Way Act 2000

8.10 The Wildlife and Countryside Act has been updated by the CRoW Act. The CRoW Act amends the law relating to nature conservation and protection of wildlife. In relation to threatened species it strengthens the legal protection and broadens the offences of damaging, disturbing, or obstructing access to any structure or place a protected species uses for shelter or protection, and disturbing any protected species whilst it is occupying

a structure or place it uses for shelter or protection to include any such acts committed recklessly.

The Natural Environment and Rural Communities Act 2006

- 8.11 The Natural Environment and Rural Communities Act 2006 states that every public authority must, in exercising its functions, have regard, so far as is consistent with the proper exercise of those functions, to the purpose of conserving biodiversity. Biodiversity Action Plans provide a framework for prioritising conservation actions for biodiversity.
- 8.12 Section 41 of the Natural Environment and Rural Communities Act requires the Secretary of State to publish a list of species of flora and fauna and habitats considered to be of principal importance for the purpose of conserving biodiversity. The list, a result of the most comprehensive analysis ever undertaken in the UK, currently contains 1,149 species, including for example, hedgehog (*Erinaceus europaeus*), and 65 habitats that were listed as priorities for conservation action under the now defunct UK Biodiversity Action Plan⁴ (UK BAP). Despite the devolution of the UK BAP and succession of the UK Post-2010 Biodiversity Framework⁵ (and Biodiversity 2020 strategy⁶ in England), as a response to the Convention on Biological Diversity's (CBD's) Strategic Plan for Biodiversity 2011-2020⁷ and EU Biodiversity Strategy (EUBS)⁸, this list (now referred to as the list of Species and Habitats of Principal Importance in England) will be used to guide decision-makers such as public bodies, including local and regional authorities, in implementing their duty under section 40 of the Natural Environment and Rural Communities Act 2006 'to have regard' to the conservation of biodiversity in England, when carrying out their normal functions.

Legislation Relating to Badger

- 8.13 The Protection of Badgers Act (1992) provides badgers with legislative protection in the UK. It makes it an offence to kill, injure or take a badger from the wild. It is also an offence under the act to intentionally or recklessly destroy, damage, interfere with or obstruct entrance to a sett without a relevant license from a statutory authority.

Legislation Relating to Bats

- 8.14 All UK bats and their roosts are protected by law. Since the first legislation was introduced in 1981, which gave strong legal protection to all bat species and their roosts in England, Scotland and Wales, additional legislation and amendments have been implemented throughout the UK.
- 8.15 Six of the 18 British species of bat have Biodiversity Action Plans (BAPs) assigned to them, which highlights the importance of specific habitats to species, details of the threats they face and proposes measures to aid in the reduction of population declines.

- 8.16 Although habitats that are important for foraging and commuting bats are not legally protected, unlike their roosts, care should be taken when dealing with the modification or development of an area if aspects of it are deemed important to bats such as flight corridors and foraging areas.
- 8.17 The Wildlife & Countryside Act 1981 was the first legislation to provide protection for all bats and their roosts in England, Scotland and Wales (earlier legislation gave protection to horseshoe bats only.)
- 8.18 All eighteen British bat species are listed in Schedule 5 of the Wildlife and Countryside Act, 1981 and under Annexe IV of the Habitats Directive, 1992 as a European protected species. They are therefore fully protected under Section 9 of the 1981 Act and under Regulation 43 of The Conservation of Habitats and Species Regulations 2017, It is an offence to:
- Deliberately capture, injure or kill a bat;
 - Intentionally or recklessly disturb a bat in its roost or deliberately disturb a group of bats;
 - Damage or destroy a bat roosting place (even if bats are not occupying the roost at the time);
 - Possess or advertise/sell/exchange a bat (dead or alive) or any part of a bat; and
 - Intentionally or recklessly obstruct access to a bat roost.
- 8.19 This legislation applies to all bat life stages.
- 8.20 The implications of the above in relation to the proposals are that where it is necessary during construction to remove trees, buildings or structures in which bats could roost, it must first be determined whether the tree or structure does support a roost and if so that the work is compulsory. If the answer to both these questions is yes then an appropriate license must be obtained from Natural England.

Legislation Relating to Nesting Birds

- 8.21 Nesting birds, with certain exceptions, are protected from disturbance under the Wildlife and Countryside Act 1981 (as amended) and the CRoW Act. Any clearance of suitable habitat should therefore be undertaken outside of the nesting bird season, taken to run conservatively from March to August inclusive, unless an ecologist confirms the absence of active nests prior to clearance. Under this legislation it is an offence to:
- Kill, injure or take any wild bird;
 - Take, damage or destroy the nest of any wild bird while it is in use or being built; and
 - Take or destroy the egg of any wild bird.

- 8.22 The implications of the above in relation to the proposals are that where it is necessary during construction to remove trees and buildings which are suitable to support nesting birds, this should be done outside of the nesting bird season (March-August inclusive inclusive). If this is not possible an ecologist must be present to confirm absence of nesting birds prior to completion of works.

Legislation Relating to Reptiles

- 8.23 All species of reptile native to the UK are protected to some degree under national and/or international legislation, which provides mechanisms to protect the species, their habitats and sites occupied by the species.
- 8.24 Sand lizards and smooth snakes are European protected species and are afforded full protection under Section 9 of the Wildlife and Countryside Act 1981 and Regulation 43 of the Conservation of Habitats and Species Regulations 2017. However, these species are rare and highly localised. Their occurrence is not considered as relevant in this instance, as the ranges and specialist habitats of these species do not occur at this site.
- 8.25 The remaining widespread species of native reptiles (adder, grass snake, slow worm and viviparous lizard) are protected under part of Section 9(1) and all of Section 9(5) of the Wildlife and Countryside Act 1981. They are protected against intentional killing and injury and against sale, transporting for sale etc. The habitat of these species is not protected. However, in terms of development, disturbing or destroying reptile habitat during the course of development activities while reptiles are present is likely to lead to an offence under the Wildlife and Countryside Act 1981. It is therefore important to identify the presence of these species within a potential development site. If any of these species are confirmed, all reasonable measures must then be taken to ensure the species are removed to avoid the threat of injury or death associated with development activities.
- 8.26 Each species of native reptile has specific habitat requirements but general shared features include a structurally diverse habitat that provides for shelter, basking, foraging and hibernating.
- 8.27 All reptiles are BAP species and as such are also of material consideration in the planning process due to the NPPF.

Policy

National

National Planning Policy Framework, 2021

- 8.28 The National Planning Policy Framework (NPPF) 2021 sets out the Government's planning policies for England, including how plans and decisions are expected to apply a

presumption in favour of sustainable development. Chapter 15 of the NPPF focuses on conservation and enhancement of the natural environment, stating plans should 'identify and pursue opportunities for securing measurable net gains for biodiversity'.

- 8.29 It goes on to state: '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'. Alongside this, it acknowledges that planning should be refused where irreplaceable habitats such as ancient woodland are lost.

Regional

The London Plan, 2021

- 8.30 The London Plan is comprised of separate chapters relating to a number of areas, including London's Places, People, Economy and Transport. The following policies have been identified within the London Plan, which relate specifically to ecology and this development.
- Policy 2.18 Green Infrastructure - Policy 2.18 aims to protect, promote, expand and manage the extent and quality of, and access to, London's network of open and green spaces.
 - Policy 5.10 Urban Greening - This policy encourages the 'greening of London's buildings and spaces and specifically those in central London by including a target for increasing the area of green space (including green roofs etc) within the Central Activities Zone'.
 - Policy 5.11 Green Roofs and Development Site Environs - Policy 5.11 specifically supports the inclusion of planting within developments and encourages boroughs to support the inclusion of green roofs.
 - Policy 5.13 Sustainable Drainage - Policy 5.13 promotes the inclusion of sustainable urban drainage systems in developments and sets out a drainage hierarchy that developers should follow when designing their schemes.
 - Policy 7.19 Biodiversity and Access to Nature - 'The Mayor will work with all the relevant partners to ensure a proactive approach to the protection, enhancement, creation, promotion and management of biodiversity in support of the Mayors Biodiversity Strategy.'

Local

Barnet's Local Plan

- Core Strategy Policy CS5: Protecting and Enhancing Barnet's Character to Create High Quality Places – '*Highlights that development in Barnet should respect the local*

context and distinctive local character, creating places and buildings of high quality design. As part of this, development should enhance all areas that make Barnet such an interesting, diverse and attractive place to live. This policy applies to all development in the borough... High quality landscape design can help to create spaces that provide attractive settings for both new and existing buildings, contributing to the integration of a development into the established character of an area'

- Core Strategy Policy CS9: Ensuring the Efficient Use of Natural Resources – *'Highlights that reducing carbon dioxide (CO2) emissions, adapting to future climate change, ensuring resource use is kept within acceptable levels, promoting biodiversity and improving quality of life are all key objectives for Barnet.'*
- Core Strategy Policy CS5: Protecting and Enhancing Barnet's character to create high quality spaces - Policy aims to protect and enhance Barnet's heritage and highlights Barnet's rich historic environment.
- Core Strategy Policy CS7: Protecting and Enhancing Barnet's Open Spaces - Policy aims to protect and improve open spaces and protect and enhance biodiversity. Policy also aims to improve public access to these green. The Policy aims to increase connectivity through Green Infrastructure.

ASSESSMENT METHODOLOGY

Desk Study and Consultation

- 8.31 Consultation was undertaken with Greenspace information for Greater London (GiGL) on details of statutory and non-statutory designated sites of nature conservation importance for the site and the surrounding area. In addition, the Multi-Agency Geographic Information for the Countryside (MAGIC) website was used to derive information relating to the location of statutory designated sites and priority habitats.
- 8.32 The Desk Study primarily focussed on a 2km radius around the site. This radius was extended to 10km for designated sites.

Surveys

Historic Surveys

- 8.33 A suite of surveys were undertaken and reported (see Appendix 8.1) in December 2015 in support of an existing permission for the site. The surveys undertaken included:
- A Phase 1 habitat survey including a desk study using results from Greenspace Information for Greater London (GiGL);
 - Bat surveys;

- Reptile surveys; and
- Invertebrate surveys.

8.34 The key findings included:

- The site was dominated by building/hardstanding surrounded by amenity grassland and mature ornamental trees. To the north of the site included a large expanse of poor semi-improved grassland and a lake was present to the southeast.
- Badger (*Meles meles*):
 - No badger setts were identified within or adjacent to the site boundary, although possible snuffle holes and a 'badger squeeze' hole with badger hair were noted to the north of the site.
- Bats:
 - Bat emergence/re-entry surveys undertaken on several trees/groups of trees on site confirmed the likely absence of roosting bats from the site; and
 - The bat activity surveys recorded low levels of activity across the site and 5 species/species groups were recorded.
- Reptile survey:
 - Surveys noted a 'low' population of slow worm (*Anguis fragilis*) in accordance with the criteria set out in the Froglife guidance.
- Invertebrates:
 - Nine species of conservation interest previously recorded, largely associated with banks surrounding the car park.
- Invasive species:
 - Japanese knotweed (*Fallopia japonica*), an invasive species listed on Schedule 9 of the Wildlife and Countryside Act 1981, was identified within the northern extant of the site.

2021 Preliminary Ecological Appraisal (Appendix 8.1)

8.35 A PEA walkover survey was conducted on the April 2021 based on the techniques and methodologies described in the Joint Nature Conservation Committee (JNCC) Handbook for Phase 1 Habitat Survey⁹ and using standard nomenclature¹⁰. The habitats present were recorded on to a field map with written target notes providing supplementary information on, for example, species composition structure and management where relevant (see Appendix 8.1).

8.36 This was extended to include notes on fauna and habitats which could potentially support protected species, an approach commonly referred to as an Extended Phase 1 Habitat

Survey. The presence of, or potential for, protected species was noted on the field map and in the written target notes during the survey.

Bats

Scoping

- 8.37 During the PEA site visit the buildings and trees on site were assessed to determine their potential to support roosting bats. External inspections were carried out on all buildings.
- 8.38 The site visit was undertaken in daylight and the evaluation of bat potential comprised an assessment of natural features on site that aimed to identify characteristics suitable for roosting, foraging and commuting bats. In accordance with Bat Conservation Trust's (BCT) Good Practice Guidelines and methods given in English Nature's (now Natural England) Bat Mitigation Guidelines. Consideration was given to:
- The availability of access to roosts for bats;
 - The presence and suitability of crevices and other places as roosts; and
 - Signs of bat activity or presence.
- 8.39 Definite signs of bat activity were taken to be:
- The bats themselves;
 - Droppings;
 - Grease marks;
 - Scratch marks; and
 - Urine spatter.
- 8.40 Signs of possible bat presence were taken to be:
- Stains; and
 - Moth and butterfly wings.
- 8.41 Examples of features with potential as roost sites include mature trees with holes, crevices or splits (the most utilised trees being oak, ash, beech, willow and Scots pine), caves, bridges, tunnels and buildings with cracks or gaps serving as possible access points to voids or crevices.
- 8.42 Additionally, linear natural features such as tree lines, hedgerows and river corridors are often considered valuable for commuting and semi-natural habitats such as woodland, meadows and waterbodies can provide important foraging resources. Consideration was given to the presence of these features both immediately within and adjacent to the assessment area.

Emergence Surveys and Activity Surveys (Appendix 8.2)

- 8.43 Updated emergence and activity surveys have been undertaken on the site to confirm the current baseline with regards to roosting bats. These surveys have been conducted following the methodology below.
- 8.44 The emergence surveys have been undertaken on various dates between May and July 2021 in suitable conditions in accordance with Bat Conservation Trust (BCT) guidelines¹¹.
- 8.45 Emergence surveys commenced 15 minutes prior to sunset and continued for 90 minutes after sunset. Each building was allocated a set number of surveyors to ensure all features with potential to support roosting bats could be assessed.
- 8.46 All surveyors were equipped with an Echometer Touch bat detector to hear, visualize and record bat calls and identify bats to species level.

Reptiles (Appendix 8.2)

- 8.47 A presence/absence survey for reptiles commenced in April 2021 with the survey sufficient to detect all species of reptiles including those most likely to be present, particularly slow worm, common lizard and grass snake. This was carried out in accordance with Natural England and Froglife¹² Guidelines, with temperatures during the surveys ranging between 10°C -14°C.
- 8.48 Seven survey visits were carried out between April and May 2021, avoiding July and August, to determine the presence/absence of reptile species on site. Artificial refugia were allowed to 'bed in' for at least five days following distribution and prior to the commencement of monitoring visits.

Invertebrates (Appendix 8.2)

- 8.49 One survey visit for terrestrial invertebrates took place on the 10th June 2021. To identify the types of invertebrates present on site, transects of the site, focusing on key habitats of greatest potential value for invertebrates, were walked allowing direct observations of species.
- 8.50 Active sampling was also used, which included using sweep-netting, beating trees and bushes and suction sampling. All samples collected in the field were identified in a laboratory with samples identified to species level where possible.

Assessment of Conservation Value of the Receptors

- 8.51 This Chapters assesses the ecological impacts of the proposed development following the approach set out in the CIEEM Guidelines for Ecological Impact Assessment.

Key Terms

8.52 The ecological feature which is being affected by the impact is termed the receptor. Key ecological receptors are features that have been assessed as being of value within the context of the proposals and the EIA.

Criteria for Assessing Conservation Value of Ecology Receptors

8.53 The approach to ecological evaluation advocated by the CIEEM guidelines involves professional judgement, based on available guidance and information, together with advice from experts who know the locality of the project and / or the distribution and status of the species or features that are being considered. The analysis aims to assign value to an ecological feature with reference to a defined geographical scale, i.e.:

- International;
- National;
- Regional;
- Metropolitan/District;
- Local.

8.54 Sites which are subject to statutory and/or non-statutory designation may be readily assigned a value on this scale, for example:

- Special Areas of Conservation (SACs) and SPAs are internationally important sites;
- Sites of Special Scientific Interest (SSSI) are nationally important sites; and
- Sites of Importance for Nature Conservation (non-statutory) are of Metropolitan/Borough value in London.

8.55 Where an area has more than one designation, the highest of these has been used to assign significance. Features of a site that are not the reasons for its designation(s) are assessed and valued according to their intrinsic value.

8.56 In assigning value to species, reference to a species' geographical distribution, and its population status (e.g. widespread, common, rare) and trends (e.g. declining, stable) has been made. A species that is rare and declining may be assigned a higher level of importance than one that is rare but known to be stable. Species which have a significant proportion of their European population in the UK may also be highly valued.

Methods for Assessment of Nature and Significance of Ecological Impacts

Impact Identification

- 8.57 The sensitivity (and recoverability) of receptors to an impact has been identified, as far as current knowledge allows. Generally, this is, by necessity, a qualitative assessment based on published literature and best available scientific information.

Impact Characterisation

- 8.58 Impacts were characterised by reference to the following terms and definitions where appropriate:

- Positive (a change that improves the quality of the environment);
- Negative (a change which reduces the quality of the environment);
- Extent (the spatial or geographical area over which the impact/effect may occur);
- Magnitude (size, amount, intensity and volume);
- Duration (should be defined in relation to ecological characteristics (such as a species' lifecycle) as well as human timeframes);
- Timing (timing of an activity or change may result in an impact if it coincides with critical life-stages or seasons e.g. bird nesting season.);
- Frequency (the number of times an activity occurs will influence the resulting effect.); and
- Reversibility.

- 8.59 Consideration was given to the potential for impacts to interact with other impacts (either arising from the proposed development or a different (external) source), thus producing a cumulative effect (often of greater magnitude).

Significance

- 8.60 For the purpose of the assessment within this report impacts are considered significant if they either support or undermine biodiversity conservation objectives for 'important ecological features' or for biodiversity in general.

Residual Impacts

- 8.61 The available means to avoid, minimise or mitigate for negative impacts have been identified. Then, subject to their acceptability, these means have been incorporated in the design of the proposal, so that the final assessment of impact identified impacts that

would be left. The consequences for development control, policy guidance and legislative compliance were then identified from the predicted residual impacts.

Assessment of Potential Impacts

8.62 The following table sets out the primary terms used to describe impacts in each of the sections below covering impacts on ecology.

Table 8.1 Terms for Describing Impacts

Severity	Periodicity	Extent
Positive	Temporary	Local
Negative	Short-term	Metropolitan/County/District
	Medium-term	Regional
	Long-term	National – national population context
	Permanent - no recovery to previous state within lifespan of project	International – international context

8.63 Further to the terms set out in the table above, 'Negligible' has been utilised where no significant change to existing nature conservation value would arise from the proposed development.

Zone of Influence

8.64 Given the nature of the proposals the zone of influence is considered to comprise the application site and adjacent areas.

ASSUMPTIONS AND LIMITATIONS

8.65 It is important to understand the limitations associated with the use of static bat detection. Intrinsically static detectors may fail to record bats passing at a certain distance, horizontally or vertically from the microphone. The SM4s do however allow a certain amount of omni-directionality, with a beam pattern of nearly 360°. Detectors were set to a high trigger sensitivity for recording.

8.66 'Bat passes' were defined as any sound file with bat calls recorded by the detectors. The number of bat calls or bat passes does not directly relate to the number of bats in a location. It is important to be aware that results can be skewed by a single bat recorded

sustained foraging in the location of the detector. Nevertheless, sustained foraging would indicate the importance of the location as a resource.

BASELINE CONDITIONS

Designations

- 8.67 Consultations with the local biological record centres (GiGL) and the MAGIC dataset have confirmed that there are no statutory designations of national or international importance within the boundary of the site.
- 8.68 Three statutory sites of European conservation importance are found within 10km of the development. These were: Lee Valley SPA/Ramsar and Epping Forest SAC, which are considered to be of international conservation value, and Walthamstow Reservoirs SSSI, part of Lee Valley, which is considered to be of national conservation value.
- 8.69 Records from GiGL also identified 12 non-statutory Sites of Importance for Nature Conservation (SINCs) within 2km of the site boundary. Further details are provided in Appendix 8.1.

Habitats

- 8.70 The full details of the habitat and fauna surveys undertaken are provided in Appendices 8.1 and 8.2. All pertinent information for the assessment is provided below.

Poor Semi-Improved Grassland (including Amenity Grassland)

- 8.71 To the north of the site was an expanse of well-established rough grassland seemingly left unmanaged. The sward was tall and tussocky and dominated by grasses including common couch (*Elymus repens*), false oat grass (*Arrhenatherum elatius*), Yorkshire fog (*Holcus lanatus*), and creeping bent (*Agrostis stolonifera*).
- 8.72 Several areas of grassland supported a more diverse composition including species such as ladies' bedstraw (*Galium verum*), bird's-foot-trefoil (*Lotus corniculatus*), selfheal (*Prunella vulgaris*), common knapweed (*Centaurea nigra*), oxeye daisy (*Leucanthemum vulgare*) and red clover (*Trifolium pratense*). It is understood from previous ecological assessments of the site that these areas have likely been seeded to increase diversity.
- 8.73 Overall, given the areas surrounding the site predominately comprise residential suburban housing, this poor semi-improved grassland was considered to be of at least **Local** value.
- 8.74 Habitats present throughout the main development largely comprise heavily managed amenity grassland with a poor species composition. This grassland was considered to be of **Negligible** value.

Hedgerows

- 8.75 The car park to the north of the site was surrounded by small hedgerows composed of hawthorn (*Crataegus monogyna*). Although intact in their length, the small hedgerows are no more than 1m in height and therefore do not meet the criteria for the UK BAP priority habitat 'hedgerow'¹³. Given these hedgerows location within an active car park and their regular maintenance they were considered to be of **Negligible** value.
- 8.76 To the north of the car park area was a hedgerow mainly composed of garden privet (*Ligustrum ovalifolium*) with a number of mature trees including oak (*Quercus sp.*) and ash (*Fraxinus excelsior*). Whilst the hedgerow was intact in its full length and above 3m on average in height it does not meet the criteria for the UK BAP priority habitat 'Hedgerow'. However, given its value as a green linear feature it was considered to be of at least **Local** value.

Trees

- 8.77 An assemblage of native and ornamental tree species was present through the development, the majority of which were early to semi-mature in age and in good condition. A line of mature Leyland cypress *X Cupressocyparis leylandii* separated the development from the railway line along the western boundary. Tree groups had established where management was lacking, particularly within the eastern extent. Understorey ground flora was species-poor in floral diversity. The tree assemblages were considered to be of at least **Local** value.

Scrub

- 8.78 The area of poor semi-improved grassland to the north of the site was also colonised in places by some areas of scattered scrub mainly comprised of bramble (*Rubus fruticosus*).
- 8.79 Areas of dense bramble scrub were also present around the peripheries of the site and around the lake to the south. Urban scrub species such as bramble (*Rubus fruticosus*) and butterfly bush (*Buddleia davidii*) were dominating throughout the site with goat willow (*Salix caprea*) and dogwood (*Cornus sanguinea*) present around the margins of the waterbody in the southeastern section of the site.
- 8.80 Due to its limited extent, this habitat was considered to be of **Within Site Boundary** value only.

Standing water

- 8.81 A large waterbody was present in the southeastern area of the site. Its banks were steep sided and some sides have been reinforced with steel supports. Vegetation within the pond was limited to small areas of common reed (*Phragmites australis*). An island is

present within the waterbody with large mature trees. The waterbody does not meet any of the criteria for it to be considered a BAP Priority Habitat¹⁴ and is consequently **Within Site Boundary** value only.

Built Environment

- 8.82 The development was dominated by buildings and hardstanding; these provide limited value for local wildlife and were of **Negligible** value only.

Species and Species Groups

Invasive Species

- 8.83 Japanese knotweed (*Fallopia japonica*), an invasive species listed on Schedule 9 of the Wildlife and Countryside Act, was identified within the northern extant of the site. This species has a minor adverse effect on conservation value at a **Within Site Boundary** level.

Badgers

- 8.84 There are no records of badger within 2km of the site, however the rough grassland habitat on site is suitable for foraging badger with potential evidence of badger recorded on site during the badger scoping in the form of snuffle holes. Snuffle holes were also previously recorded, in addition to badger hair on a 'squeeze hole'. No setts were identified however, given the evidence recorded the site is considered to be of **Local** value for badgers.

Bats

- 8.85 Updated bat activity surveys were completed during summer 2021, and were considered sufficient to establish usage by the local bat population. Bat activity was consistently low throughout transect and static surveys. Six species of bat were recorded across during the surveys, the most frequently recorded species being common pipistrelle (*Pipistrellus pipistrellus*), with low numbers of soprano pipistrelle (*Pipistrellus pygmaeus*), Nathusius pipistrelle (*Pipistrellus nathusii*), *Nyctalus* species and serotine. The development is therefore considered to be of **Within Site Boundary** value only for foraging and commuting bats.
- 8.86 Trees with 'Moderate' potential to support roosting bats were subject to further emergence/re-entry surveys with roosting confirmed as likely absent (see Appendix 8.2). Given the presence of roosting features, trees within the development were assessed as currently providing **Within Site Boundary** value for roosting bats.

- 8.87 The buildings within the development consisted of modern construction materials and methods which created no roosting opportunities for bats. The buildings are of **Negligible** value to the local bat population for roosting.

Breeding Birds

- 8.88 The hedgerows, trees and scrub provide suitable nesting opportunities for a range of urban birds, whilst the amenity areas, waterbody and rough grassland have some value providing foraging opportunities. Notable species identified during the 2021 walkover included dunnoek (*Prunella modularis*, BoCC amber listed and NERC species) and starling (*Sturnus vulgaris*, BoCC red listed and NERC species). These species were also recorded during the 2015 surveys.
- 8.89 Large numbers of breeding Canada geese (*Branta canadensis*) are present on site and would appear to negatively affect the conservation value of the waterbody on site.
- 8.90 Specific breeding bird surveys were completed in 2008 by Greenprint Ecology, where 38 species identified within the development, 27 of which were either confirmed or thought to be likely to be breeding. Three red listed species and eight amber-listed species were recorded. Due to the position of the development within a highly urbanised area, the development was considered to be of **Local** value for birds.

Great Crested Newt (GCN)

- 8.91 There are records of great crested newt within 2km of the site, however the waterbody on site contained large fish and waterfowl (large number of Canada geese) and is highly isolated from other waterbodies present within 500m.
- 8.92 Three further ponds are present within 500m of the boundary, all of which were considered to be isolated from the development through the presence of significant barriers to dispersal and therefore provide no conservation value for GCNs.
- 8.93 The site was considered to be of **Negligible** value for great crested newt.

Reptiles

- 8.94 Habitats across the site were largely unsuitable for reptile species being heavily managed and lacking structure. However, the area of rough grassland to the north of the site and scrub habitats were suitable to support common and widespread reptile species. In addition, piles of logs, green waste and debris throughout the site provide suitable hibernacula for species such as common lizard and slow worm. The site's connectivity to other habitats was also provided via the railway line to the west of the site.
- 8.95 Surveys completed in Summer 2021 (Appendix) confirmed the presence of 'good' populations of common lizard and slow-worm in habitat at the northern end of the site.

Given the habitats present on site and the numbers of reptiles recorded the site is considered to be of at least **Local** importance for reptiles.

Invertebrates

- 8.96 A total of 152 taxa were recorded including 11 with conservation statuses during the 2021 update surveys. Seven of these were not recorded in 2018. The assemblage is of **Local** value, primarily associated with the open herb rich verges and banks.

Hedgehogs

- 8.97 The grassland and scrub habitat on and adjacent to the site is likely to be suitable for hedgehogs. Given the availability of surrounding habitat (e.g railway sidings and residential gardens) the value of the is likely to be **Local** at most.

POTENTIAL IMPACTS

During Construction

Statutory and Non-statutory Sites

- 8.98 The habitats present within the development were of little value to species associated with Lee Valley Ramsar/SPA and Walthamstow Reservoirs SSSI which are approximately 7.8km south west. Epping Forest SAC/SSSI is located 9.8km east. Due to the intervening distance involved direct effects from construction, including dust particle release, air and water pollution and hydrological would be **Negligible**.
- 8.99 Without mitigation, New Southgate Cemetery SINC (40m east) and Barfield Allotments Nature Park SINC (145m west) could potentially be affected by dust particle release during the clearance of habitats or demolition of buildings due to their proximity. It is considered that these effects would result in a **Short-term, Negative** (Significant) at a **Local** level. The remaining SINC's are unlikely to be affected given their proximity.

Habitats

- 8.100 The development will result in the direct loss of the rough grassland within the northern extent of the development, resulting in a **Long-term, Negative** (Not Significant) effect at a **Local** level.
- 8.101 Existing amenity grassland, for the most part, will be lost to construction, however due to the limited conservation value of this habitat; it is considered that the effects would be **Negligible**.
- 8.102 The construction of the residential dwellings in the northern extent of the development would result in the loss of the existing hedgerows. Due to the non-native composition of these hedgerows, their limited extent and general low value, it is considered that this

permanent loss would have a **Long-term, Negative** (Not Significant) effect at a **Local** level.

- 8.103 A large proportion of the trees would be lost to proposals to facilitate construction. Due to its highly urbanised context, it is considered that prior to mitigation, this would result in a **Long-term, Negative** (Not Significant) effect at a **Local** level.
- 8.104 It is likely that all scrub would be lost during development clearance. Due to the species its supports and the habitat structure it provides, it is considered that its permanent loss would be negligible would result in a **Long-term, Negative** (Not Significant) effect at a **Local** level.
- 8.105 The waterbody would be reconstructed, whereby the concrete lining will be removed and the lake remodelled with the retention of mature trees within the island and banks, also a walkway over the lake will be constructed. The works will potentially result in the water being drained, whereby fish populations will be affected. There is also potential that water pollution incidents are possible during construction operations. Chemical and siltation incidences have the potential to damage aquatic life through smothering, suffocating and poisoning. It is considered probable that hydrological effects through improper construction management would result in a **Long-term, Negative** (Not Significant) effect at a **Within Site Boundary** level.
- 8.106 All buildings would be lost to the development and since these have limited ecological value, their loss is considered to have a **Negligible** effect.
- 8.107 Clearance of the development would involve the removal of Japanese knotweed *Fallopia japonica*. Japanese knotweed is listed on schedule 9 of the Wildlife and Countryside Act 1981 (as amended) and it is illegal to allow this species to spread into the wild. This species can cause damage to foundations, walls and drainage works and can be easily spread from fragments as small as 10mm in size. Should its removal not be completed with care, there is a possibility that regrowth could take place, potentially outcompeting native ground flora resulting in biodiversity loss, but also damaging surfaces and structures. The inadequate removal of this species would result in a **Long-term, Negative** (Not Significant) effect at a **Within Site Boundary** level.

Species and Species Groups

Badger

- 8.108 Due to the limited extent of suitable foraging habitat on site and the development's urbanised context, it is considered that the loss of the unmanaged grassland and scrub habitats would have a **Long-term, Negative** (Not Significant) effect at a **Within Site Boundary** level.

- 8.109 Construction activities also have the potential to trap badgers within holes, trenches, ditches and foundations which would result in injury or possible death. This would have a **Short-term, Negative** (Not Significant) effect at a **Within Site Boundary** level.

Bats

- 8.110 No roosting bats were recorded on site and **Negligible** effects are therefore anticipated.
- 8.111 Development proposals will lead to the loss of bat foraging and commuting resources on site. There will also be a potential increase in lighting during the construction period, although this would likely be more necessary during the winter months. Given the limited value of the site for bats, in the absence of mitigation, there is potential for a **Short-term, Negative** (Significant) effects at a **Within Site Boundary** scale on foraging and commuting bats.
- 8.112 All the existing buildings will be lost to development. This would have a **Negligible** effect on roosting bats, based on current data.

Birds

- 8.113 Construction operations would result in habitat loss, with the removal of foraging, breeding, roosting and loafing opportunities. While the effects are likely to be temporary, disturbance of birds during the breeding season could lead to nest abandonment and failure of breeding attempts.
- 8.114 Whilst effects of the construction operations upon breeding success of birds are unlikely to significantly alter the conservation status of the bird populations within the development, they have potential to lead to an infringement of legislation. Therefore it is considered that there would be a **Short-term, Negative** (Not Significant) effect at a **Within Site Boundary** level.
- 8.115 Construction would cause temporary disturbance and displacement of bird species, through the entire loss of habitats, it is considered to have a **Long-term, Negative** (Significant) effect at a **Local** level.

Reptiles

- 8.116 A 'good' population of slow worm and common lizard have been confirmed within the northern extent of the development. The development would result in the entire loss of the suitable reptile habitats, which would result in injury or death of individuals. All UK reptiles are partially protected under the Wildlife and Countryside Act 1981 (as amended), their harm or otherwise would constitute an offence which is considered to have a **Long-term, Negative** (Significant) effect at a **Local** level.

Invertebrates

- 8.117 The construction phase would result in a large proportion of the vegetation being removed, resulting in the direct loss of foraging and cover habitats for invertebrates. Due to the assemblage recorded it is considered that construction operations would have a **Long-term, Negative** (Significant) effect at a **Local** level.

Hedgehog

- 8.118 Owing to the availability of similar adjacent habitat off site, it is considered that the loss of the unmanaged grassland and scrub habitats would have a **Long-term, Negative** (Not Significant) effect at a **Within Site Boundary** level.

During Operation

Statutory and Non-statutory Sites

- 8.119 Given the separation distances, it is considered that the effect arising through increased recreational pressure and air pollution upon Lee Valley Ramsar/SPA, Walthamstow Reservoirs SSSI and Epping Forest SAC/SSSI would be **Negligible**.
- 8.120 Recreational pressure from residents of the development is likely to increase upon New Southgate Cemetery SINC due to its proximity. However, the nature of the designated site means that footfall and cyclic traffic is likely to remain on formalised paths and therefore effects to sensitive receptors (mature trees/breeding birds) would be minimal and remain **Negligible**.
- 8.121 There is no public access into Barfields Allotments Nature Park SINC, therefore there is no anticipated increased recreational pressure arising from the development and the effect would be **Negligible**.
- 8.122 Impacts to the remaining SINCS from increased recreational pressure are considered to be **Negligible** due to their proximity to the development and the provision of other recreational facilities close by.

Habitats

- 8.123 The retained trees within the development could be subjected to damage from play or damage where branches overhang into residential dwellings/gardens, particularly around the peripheries. This would cause specimens health to suffer, where there would be a **Long-term, Negative** (Not Significant) effect at a **Within Site Boundary** level.
- 8.124 The waterbody within the development was created as attenuation for the business park and is proposed to receive excess runoff from the existing development. The drainage strategy associated with the change in land use to residential and schooling mimics the

existing runoff rates, and therefore effects arising through changes in hydrology and pollution are considered to be **Negligible**.

- 8.125 If Japanese knotweed has not been eradicated then this has the potential to spread around the development, from either management practices or during recreational activities that pass through such areas. This would have a **Long-term, Negative** (Not Significant) effect at a **Within Site Boundary** level.

Species and Species Groups

Badger

- 8.126 Due to the existing urbanised nature of the site, the proposals are unlikely to have significant effects upon the local badger population, as the development itself does not provide the only foraging resource. The operational effects upon badgers are considered to be **Negligible**.

Bats

- 8.127 The site lies within a highly urbanised area and existing lighting schemes are present along all roads and around buildings. A disturbance effect upon bats is possible from the new external light of buildings, car park, school playing fields and footpaths. However given the low level of activity currently recorded over the development, it is considered probable that effects from lighting on the completion will be **Negligible**.

Breeding Birds

- 8.128 Due to the existing nature of the development and the highly urbanised context, bird species present are likely to be habituated to disturbance; therefore the effects on breeding birds are considered to be **Negligible**.

Reptiles

- 8.129 The direct loss of suitable habitat through the construction phase, prior to mitigation measures, is likely to either harm/kill residing reptiles and/or displace these into habitats off-development to the west and around the peripheries of the old playing field. It is considered that effects upon reptiles during the operation stage of the development would be **Long-term, Negative** (Significant) at a **Local** level.

Invertebrates

- 8.130 Without appropriate planting and other habitat features, targeted notable invertebrate species currently present on site it is considered that operations would have a **Long-term, Negative** (Significant) effect at a **Local** level.

Hedgehog

- 8.131 As the development itself does not provide the only foraging resource effects are considered to be limited. The operational effects upon hedgehogs are considered to be **Negligible**.

MITIGATION AND ENHANCEMENT

- 8.132 This section includes mitigation for any significant construction and operational effects in addition to providing guidance to ensure compliance with European or UK legislation. To ensure significant effects are adequately mitigated (or compensated) for, general habitat creation is set out to ensure that the existing retained biodiversity is protected and enhanced, as stated within the national and regional policies.
- 8.133 Habitat creation also aims to ensure that there are significant Green Infrastructure (GI) components within the development to allow unhindered movement of local wildlife through the development in future.
- 8.134 Mitigation has been designed through incorporation of GI, which would retain, protect and enhance some of the valued habitat resources including a large resource of trees. Where valued habitats are to be lost, mitigation would compensate through habitat creation. Newly created habitats are to be incorporated across the development, particularly concentrated within public spaces centrally located; New Brunswick Park North and South, and Brunswick Lakeside Park. In addition, a substantial resource of trees and shrubs would be planted around all buildings and access roads. These are intended to enhance the existing features and provide increased resources for local wildlife. Habitats to be incorporated include species-rich hedgerows, species-rich meadow grasslands and native tree and scrub planting.
- 8.135 The existing lake would be re-profiled to provide attenuation for the development and provide more opportunities for native aquatic and marginal planting, creation of new bankside profile would provide habitats such as wet grassland (swales) and scattered scrub habitats.
- 8.136 The above detailed features would increase and provide continued connectivity across the development and provide net biodiversity increases (see Appendix 8.3) through provision and enhancement of a wider range of habitats and increased resources to local wildlife.

During Construction

- 8.137 Habitats present ranged from Within Site Boundary to Local level nature conservation interest, largely owing to the majority of the development being a built environment with manicured amenity areas. Habitats of conservation value comprised the rough grassland, trees, standing water and a stretch of hedgerow. Mitigation for any effects

associated with land-take would include the creation of new habitats during the construction, with enhancements of existing habitats. The development has been designed to ensure protected species populations are maintained at a favourable conservation status.

8.138 To facilitate the development, the existing built environments (building and hardstanding) would be lost, together with all the hedgerows, large numbers of trees, scrub and the species-poor grassland. A number of trees, including those with bat roosting potential would be retained through proposals and safeguarded. Proposals aim to enhance biodiversity through ensuring corridors for movement are maintained, substantial new native species are incorporated, the waterbody would be enhanced and species-rich meadows provided within the centrally located parks. The development would largely mimic the existing built environment, however mitigation measures have the opportunity to create a net increase in biodiversity, through the creation of GI.

8.139 The mitigation measures below address those adverse effects that are possible during the construction stages of development. Within this section there is specific reference given to ecological practices to ensure biodiversity is protected, enhanced and strengthened. Where mitigation measures require more technical information from a range of other disciplines such as drainage and lighting, such additional details will be provided within a detailed Construction Environmental Management Plan (CEMP) which would be secured by planning condition.

Non-statutory Sites

8.140 The clearance of existing habitats would not disturb high levels of dust, however where work is undertaken in the summer, construction vehicles passing through the development could release dust, potentially effecting New Southgate Cemetery SINC (40m east) and Barfield Allotments Nature Park SINC (145m west). During warm periods water will be spread over the working area to suppress dust levels.

Retained Habitats

8.141 All retained habitats will be suitably protected from disturbance through encroachment of construction activities by appropriate fencing. The root protection zone around retained trees will be fenced off prior to commencement of works to ensure that roots are not damaged (see Appendix 8.4 for further details).

8.142 The possibility of fuel and other spillages during construction will be minimised through effective and rigorous development management including a contingency plan should an accident occur. Any environmental hazardous material used would be kept in dedicated stores and storage tanks would have appropriate bunding. In order to mitigate for the potential indirect effects of pollution caused by construction activities (including dust,

chemicals, silt etc) appropriate measures will be implemented in line with best practice guidelines.

- 8.143 The waterbody would be reconstructed through proposals, therefore will be completely drained to remove the concrete lining. Whilst de-watering, the fish would be removed and taken away, under Environment Agency approval to appropriate fisheries or similar. Such works would be undertaken during the winter to avoid stress to fish and any loss of bird breeding refuge sites.
- 8.144 During construction, all holes, trenches and ditches within the development will be covered at night or where not practicable a means of escape will be installed to allow badgers or other mammals to exit. This will avoid unnecessary injury and reduce the potential for fatality.
- 8.145 A treatment programme for Japanese knotweed will be put in place prior to the commencement of any construction works, in which the species will be removed via chemical or mechanical operations. The method used will depend upon speed of eradication required. The area should be fenced off approximately 7m away from the visible edge of the stand and signed to avoid any further spread.

Created Habitats

- 8.146 Where possible native species will be used throughout the development, however this may be restricted due to management and the overall aesthetics required within the development. Example species include:
- Pedunculate oak *Quercus robur*
 - Field maple *Acer campestre*
 - Wild cherry *Prunus avium*
 - Hawthorn *Crataegus mongyna*
 - Hazel *Corylus avellana*
 - Holly *Ilex aquifolium*
- 8.147 Non-native will be selected on their benefit to biodiversity, those that provide fruiting bodies or an increase in nectar sources.
- 8.148 Newly planted hedgerows will be planted within the development, these will consist of species which provide fruit flowers, seeds and nectar, which will benefit a variety of wildlife. Due to the landscaping features of the New Brunswick Park north and south and the Lakeside Park, hedgerows are unlikely to be suitable; therefore hedgerows would be planted around the peripheries and around residential areas. Typical hedgerow content would comprise of those in the list below:
- Hawthorn 55%

- Blackthorn *Prunus spinosa* 15%
- Field maple 5%
- Crab apple *Malus sylvestris* 5%
- Spindle *Euonymus europaeus* 5%
- Holly 5%
- Guelder rose *Viburnum opulus* 5%
- Field rose *Rosa arvensis* 5%

- 8.149 The development also provides opportunity for additional nectar sources from cultivated varieties and exotic plants, provided these have non-complex flowers and provide pollen and/or nectar, ensuring they provide interest for bees, butterflies and other pollinating insects. The planting strategy, both with private and public areas, would therefore combine a range of native and ornamental species with an accepted value for biodiversity. A range of shrubs, low growing woody species, grasses and perennials would provide a range of forms, sizes and finer scale variation to enhance the future structural and three dimensional complexity of the development.
- 8.150 To further enhance opportunity for invertebrates, the development would use different types of mulch, such as gravel, bark, compost and leaf mould would be used in planting beds to encourage different microhabitats for faunal basking, foraging and shelter. Deadwood piles would be created in less formal areas, such as within the species-rich meadows within the parks, around the waterbody and within the reptile receptor area. These would be formed from the existing trees to be lost and located beneath dense vegetation.
- 8.151 Newly planted hedgerows will be managed and monitored and specimens or poor health or those have died would be replaced. New hedgerows would be periodically laid to create a strong structural framework and future management will entail rotational management at three year intervals, increasing flower, fruit and nut production and structure.
- 8.152 Small areas of species-rich meadow grassland would be created within the parks, more informal areas around the waterbody and within the reptile receptor site. Once seeded these areas of grassland would be managed in a sympathetic manner consisting of one cut per year during late summer. Management of these habitats would ensure their longevity and enhance opportunities for local wildlife, particularly invertebrates. Planting will be designed to provide foraging and commuting habitat for birds, bats, reptiles and other local wildlife, ensuring connectivity along site boundaries, particularly alongside the railway line.

8.153 Areas of meadow grassland within New Brunswick Parks would be seeded with a species-rich meadow grassland mix; with a mix with species more tolerant of wet conditions surrounding the waterbody. Example species include:

- Yarrow *Achillea millefolium*
- Betony *Betonica officinalis*
- Common knapweed *Filipendula ulmaria*
- Lady's bedstraw *Galium verum*
- Greater bird's-foot-trefoil *Lotus pedunculatus*
- Ragged robin *Silene flos-cuculi*
- Devil's-bit scabious *Succisa pratensis*
- Tufted vetch *Vicia cracca*
- Selfheal *Prunella vulgaris*

8.154 Tussock forming grassland would also be incorporated on the western edge of the development, to provide a receptor area for the existing slow worm and common lizard population. This will form a habitat mosaic with existing adjacent scrub and trees that could be used by a range of species and include the following where suitable:

- Cock's-foot *Dactylis glomerata*
- Tufted hair-grass *Deschampsia cespitosa*
- Yorkshire fog *Holcus lanatus*
- Red fescue *Festuca rubra*
- Wild carrot *Daucus carota*
- Hedge bedstraw *Galium album*
- Oxeye daisy *Leucanthemum vulgare*
- Common vetch *Vicia sativa*
- Ribwort plantain *Plantago lanceolata*
- Bladder campion *Silene vulgaris*

8.155 Areas which would be more formally used for amenity would be seeded with a mix more tolerant of trampling and public pressure, however would include species of benefit to invertebrates such as white clover *Trifolium repens* and creeping buttercup *Ranunculus repens*.

8.156 The waterbody would be reconstructed through proposals and sympathetically designed and planted to maximise biodiversity value. This would involve the creation of shallow drawn down zones, scalloped edges and deep central areas and planted with locally

native marginal and aquatic vegetation. A denser and taller area of vegetation would be planted around the informal areas surrounding the waterbody and would include some of the species named in the above meadow grassland list as well as the following where suitable:

- Yellow flag iris *Iris pseudocarus*
- Purple loosestrife *Lythrum salicaria*
- Marsh marigold *Caltha palustris*
- Soft rush *Juncus effusus*
- Meadowsweet *Filipendula ulmaria*
- Gypsywort *Lycopus europaea*
- Water plantain *Alisma palntago-aquatica*
- Water speedwell *Veronica anagallis-aquatica*
- Reed sweet grass *Glyceria maxima*
- Branched bur reed *Sparganium erectum*

8.157 Further scrub and trees would be planted sparingly around the waterbody, and managed to ensure these do not engulf and overshadow large areas.

8.158 The main function of this waterbody is attenuation; however this would be designed to incorporate more ecologically beneficial features as well as providing an attractive amenity space.

8.159 Biodiverse living roofs including wildflower grass and substrate-based systems which are seeded and plug planted, incorporating at least 30 wildflower species of known value to wildlife, will be provided on suitable flat roof areas. The roofs will be further enhanced through the inclusion of features such as log piles, rope coils, sandy piles and ephemeral water features for invertebrates. These living roofs will compensate for the loss of the existing invertebrate habitat on site.

Bats

8.160 In order to mitigate for the potential effects of disturbance through noise and artificial lighting upon ecological receptors, specifically bats and birds, the location of the development offices, construction compounds and storage would be sensibly chosen in areas away from habitats utilised by these species or groups. All construction activities would be undertaken during daylight hours to avoid the need for high intensity artificial lighting therefore reducing the potential disturbance on bat species. Where nocturnal work is required, artificial lighting would be positioned away from natural existing habitats, whereby light will be directional focused and shrouded to ensure light does not spill of habitats.

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- 8.161 There would be some losses of mature trees across the development and none of these currently have bat roosting potential. Trees would be reassessed prior to removal to ensure no new features have formed and that the trees do not contain roosting bats.

Breeding Birds

- 8.162 To avoid unnecessary disturbance to birds utilising habitats within the development, all construction activities (removal of hedgerows, buildings, scrub and trees) would occur outside of the bird-breeding season (March to September inclusive). Where this is not possible all vegetation would be checked by a qualified ecologist before any removal takes place.

Reptiles

- 8.163 A good population of slow worm and common lizard were recorded within the northern extent of the development. The clearance of this area during construction would necessitate mitigation measures to ensure no offence is committed under the Wildlife and Countryside Act 1981 (as amended). Mitigation measures would comprise creation of a receptor site, followed by a trapping exercise which excludes reptiles from the working area. The working areas would be fenced off with reptile exclusion fencing and a trapping exercise commence, this can take place between (March to September/October), when weather conditions are optimal. Reptiles that are caught would be transferred directly to the receptor site. A destructive search of any suitable hibernation features would be undertaken and the area made unsuitable for reptile occupation.
- 8.164 The receptor site, located on the western boundary, would be managed to achieve conservation benefits for the existing reptile population. This would be specifically designed to improve both the botanical and structural diversity of vegetation in order to benefit reptiles. These measures would include low intensity management to establish grassland and scrub mosaic, and the provision of a series of additional hibernation features. The detailed design of the habitats would be achieved through the implementation of a Management Plan (secured by planning condition), which would ensure the successful establishment and maintenance of all retained and newly created habitats, ensuring the favourable conservation status of reptiles is maintained.
- 8.165 The receptor site would be created in advance of any construction works; this would therefore ensure that the habitat has developed adequately to ensure that they can support the translocated reptile population. The area proposed for the reptile reserve would require a degree tree and shrub removal and grassland establishment. Once the habitat has developed the future management would be secured into perpetuity, with specific management measures outlined within the Management Plan.

Hedgehog

- 8.166 Clearance of any grassland and shrub vegetation outside of the areas where reptiles were recorded will be undertaken with consideration of the potential presence of hedgehogs. Any hedgehogs found will be moved to an appropriate area outside of the construction zone.

During Operation

- 8.167 There is potential for increased recreational pressure upon the nearby SINCs, particularly New Southgate Cemetery. The restricted access into Barfield Allotments would ensure effects from increased recreational pressure remain negligible. In addition to open space proposed, in the form of Brunswick Lakeside Park and the New Brunswick Park North and South, a new cycle route is proposed to link the development to existing routes to the east, and this would comprise a formalised path, which aims to enhance recreational opportunities.
- 8.168 Localised loss of or damage to habitats through recreational use and vandalism would be reduced mostly through design. As much as possible, formalised access to GI and sensible positioning of footpaths away from sensitive habitat, together with centrally located amenity provisions would reduce the potential for incidents of localised loss of or damage to habitats through recreational use. Appropriate positioning of litter bins would also serve to mitigate and reduce the effects if loss, damage or degradation of habitat through recreational use (or misuse).

Habitat Creation and Enhancement

- 8.169 Newly planted hedgerow, tree, grassland and wildflower species would be monitored, if specimens are in poor health or die, then these would be replaced with similar species. New hedgerows would also be periodically laid to create a strong structural framework around the development, where such practises cannot be undertaken, then a rotational management at 3 year intervals; this would increase flower, fruit and nut production and structure. Where new hedgerows have been planted temporary post and wire fencing will be erected to avoid the public interference.
- 8.170 An Ecology Management Plan (EMP) would ensure that hedgerows and grassland habitats are appropriately managed to ensure maximum biodiversity, whereby cutting intervals are not isolated to one or two cuts a year but are periodically rotationally managed. The Management Plan will be secured by planning condition and will also ensure that specimens planted are replaced on a like for like basis if they deteriorate in health or die. The Management Plan will also ensure that scrub growth is limited and that invasive weeds are treated as soon as possible.

8.171 Installation of dog bins, appropriate management and education of residents would ensure that nutrient enrichment of the soil is avoided which might otherwise affect floral assemblages within created habitats, which would also include the more formal park areas.

Bats

8.172 The levels of bat activity across the development were found to be consistently low. A number of trees would be retained and, where possible, those with bat roosting potential. Following establishment of new native tree and shrub planting across the entire development, this would provide similar conditions to those currently existing. The access route would not change from its current location, which would prevent changes in current navigational routes. The planting scheme would ensure that locally native trees, hedgerows and shrubs would provide a diverse age range across the development in the long term. The extensive planting throughout would compensate for the loss of mature trees providing robust foraging and commuting corridors.

8.173 The substantial works to the waterbody, as described above, as well as creation of species-rich grassland and planting of a range of native trees and shrubs would provide enhanced conditions for invertebrates, and in residual impacts turn further foraging opportunities for bats. Textural complexity of such habitats would have positive impacts upon the local bat population.

8.174 To further enhance roosting opportunities bat boxes would be erected on retained trees around the site and incorporated into new buildings. These would be located in darker areas, particularly close to off-site corridors such as alongside the railway line. The external lighting scheme would be carefully designed to ensure that there is no upward emitted light, no glare and negligible light spill onto ecologically valuable receptors such as trees, hedgerows and shrubs. The specific areas of GI created for ecological reasons (meadow grassland, reptile receptor site, habitats throughout the parks and the waterbody) will not be lit to ensure green corridors are maintained. Lighting which is required would be low level, directional, shrouded or Light Emitting Diode (LED) lighting to avoid unnecessary illumination of sensitive habitats.

8.175 To avoid any impacts associated with light spill on potential bat flight lines or foraging habitat, the following measures will be implemented:

- The direct lighting of existing trees and the waterbody and proposed habitats would be avoided,
- Lighting would be directional and light spillage avoided,
- Lighting columns would in general be as short as possible, although in some locations taller columns would allow reduced horizontal spill and

- Lighting levels would be as low as guidelines permit and only used where required for public safety reasons.

Reptiles

- 8.176 Following translocation of the reptile population into the receptor area on the north western boundary, the incorporation of low intensity management would be employed, ensuring a mosaic of tussock grassland, scrub and scattered mature trees is maintained. The detailed design of the habitats would follow a specific Management Plan which will ensure the successful establishment and maintenance of all retained and newly created habitats. As part of the Management Plan, the population of reptiles would be monitored. This exercise would be undertaken for three years following completion of the translocation.

Birds

- 8.177 The development currently supports a number of bird species and the provision of new native trees, hedgerows and scrub would provide compensatory nesting, foraging and refuge habitat, for those habitats lost. In addition, enhancements to the waterbody and inclusion of species-rich meadow planting would provide a more diverse range of opportunities for birds and has the potential to attract new species. Habitat enhancements as well as the inclusion of a mixture of nest box types erected on existing trees, within shrubs and on buildings will provide an overall increase in breeding, foraging and overwintering opportunities for bird species, in particular house sparrow, starling and song thrush.
- 8.178 As mentioned above the habitats will be maintained to ensure fruiting trees and shrubs are optimised.

RESIDUAL EFFECTS

During Construction

Designated Sites

- 8.179 Due to the intervening distances involved, effects from construction activities upon Lee Valley SPA / Ramsar, Epping Forest SAC and Walthamstow Reservoirs SSSI would be **Negligible**.
- 8.180 Following implementation of mitigation measures, potential effects upon the local sites, specifically New Southgate Cemetery SINC and Barfield Allotments Nature Park SINC from pollution (air, noise, dust and lighting) would be **Negligible**.

Habitats

- 8.181 The enhancement and creation of species-rich grassland habitats across the development would compensate for the species-poor grassland loss, and will create habitats that were previously absent or poorly represented. This would be a **Long-term Positive** (Non-Significant) effect at a **Within Site Boundary** level.
- 8.182 The loss of trees to facilitate access and construction of new buildings would be compensated for through substantial re-planting of both native and non-native trees and shrubs across the development, resulting in **Long-term Positive** (Non-Significant) effects at a **Local** level.
- 8.183 The enhancement of the waterbody through proposals would improve water quality, increasing biodiversity value as species which are currently poorly represented or absent would have opportunity to colonise. This enhancement would have a **Long-term Positive** (Non-Significant) effects at a **Local** level.
- 8.184 The removal of the invasive Japanese knotweed would ensure that native species are not outcompeted, ensuring biodiversity is maintained. Its successful removal would have a **Negligible** effect.
- 8.185 A Biodiversity Impact Assessment (Appendix 3.3) has been undertaken based on the details available for this hybrid planning application. The baseline ecological value of the site is 21.24 habitat biodiversity units and 0.43 hedgerow units. Under the current development proposals, and additional enhancement measures and habitat creation, the development stands to result in a net gain of 1.10 habitat biodiversity units and 0.33 hedgerow units from pre-development levels. This is equivalent to a total net gain of 4.06 % for area-based units and a net gain of 77.70% for hedgerow units.

Badgers

- 8.186 Construction activities would follow best practice guidance ensuring badgers are not affected by works and effects are reduced to **Negligible**.

Bats

- 8.187 Through implementation of construction activity mitigation measures, such as daylight working hours and management of lighting, temporary effects through disturbance of bats will remain **Negligible**. The tree resource surrounding the development would be largely retained and the removal of trees and other vegetation would be compensated through substantial re-planting. Incorporation of new habitats such as the species-rich meadow and tussock grassland as well as enhancements to the waterbody would provide new and enhanced foraging opportunities, with **Long-term Positive** (Significant) effects at a **Local** level.

- 8.188 All trees providing bat roosting potential would be retained and the lighting scheme sympathetically designed, with further roosting opportunities included in the form of bat boxes. Such mitigation would have a **Long-term Positive** (Significant) effects at a **Within Site Boundary** level.

Birds

- 8.189 Construction operation would have the potential to disturb and displace birds, however following mitigation measures, these effects would be reduced to **Negligible**.
- 8.190 Mitigation measures will ensure the losses of vegetation are compensated for through re-planting and introduction of new habitats, increasing nesting, foraging and resting/roosting habitats. Overall there is anticipated to be a **Long-term Positive** (Non-Significant) effect at a **Local** level.

Reptiles

- 8.191 The creation of the specific receptor site in the north west, with a mosaic of structures and hibernacula, will ensure the favourable conservation status of reptiles is maintained into the future, especially as linkages to existing populations within Barfield Allotment Nature Park are maintained and enhanced. The mitigation measures within the development are considered to provide a **Negligible** overall residual effect.

Invertebrates

- 8.192 Creation of a mosaic of habitats across the development, including at roof level, would provide enhanced resources for invertebrates, which will include habitats that fulfil invertebrates life stages with aquatic and deadwood habitats, but also the enrichment of foraging resources with a variety of native and non-nature vegetation that will provide foraging for longer periods of the year. It is envisaged that the development would have a **Negligible** overall residual effect.

Hedgehog

- 8.193 Assuming the sensitive clearance of relevant habitat then a **Negligible** overall residual effect is anticipated. The landscaping proposals will compensate for the suitable existing habitat that will be lost.

During Operation

- 8.194 Operational landscaping and associated residual effects are discussed above.
- 8.195 The GI has been designed to concentrate public pressure centrally, away from sensitive habitats such as the reptile receptor site in the north west. Through inclusion of litter and dog waste bins, as well as designated walkways and open spaces, recreational

pressure on habitats within the development and surroundings to will be reduced to **Negligible**.

- 8.196 The lighting strategy would ensure lighting levels are adequately managed to ensure natural habitats can be utilised by bats and dark corridors remain, particularly alongside the railway line. The operational phase would therefore have **Negligible** effects upon bat activity.

Table 8.2 Summary of Mitigation/Enhancement and Residual Impacts

Receptor	Mitigation/Enhancement	Residual Impact
During Construction		
Designated Sites Statutory	N/A	Negligible
Designated Site Non - Statutory	Best Practice Dust Control Measures.	Negligible
Habitats	Construction Environmental Management Plan (secured by planning condition). Compensatory landscaping including species rich grassland, tree planting, biodiverse roofs, hedge planting and bird/bat boxes. Details to be provided in EMP (secured by planning condition).	Negligible to Long-term Positive
Badger	All holes and trenches to be provided with means of escape for mammals.	Negligible
Bats	Sensitive construction lighting.	Negligible to Long-term Positive
Birds	Seasonal timing of works.	Negligible to Long-term Positive
Reptiles	Reptile mitigation strategy implementation.	Negligible
Invertebrates	Compensatory habitat creation.	Negligible
Hedgehogs	Sensitive clearance of vegetation. Compensatory habitat creation as discussed above.	Negligible
During Operation		
Designated Sites - Statutory	N/A	Negligible
Designated Sites - Non Statutory	On site landscaping provision.	Negligible
Habitats	Compensatory habitat creation as discussed above. Ongoing management to be detailed in EMP	Negligible

Badger	N/A	See above
Bats	Compensatory habitat creation as discussed above. Ongoing management to be detailed in EMP.	Negligible
Birds	Compensatory habitat creation as discussed above.	See above
Reptiles	Reptile mitigation strategy implementation and ongoing monitoring.	Negligible
Invertebrates	Compensatory habitat creation as discussed above.	See above
Hedgehogs	Compensatory habitat creation as discussed above.	See above

CUMULATIVE IMPACTS

- 8.197 All cumulative developments are considered to be beyond the zone of influence for cumulative effects during the construction stage. During the operational phase, whilst the schemes may lead to a minor increase in recreational pressure on the adjacent New Southgate Cemetery SINC, as is discussed above, the nature of this site and associated existing management/maintenance means that effects are anticipated to be **Negligible**.

CONCLUSIONS

- 8.198 Existing habitats of conservation value comprised rough grassland, trees, standing water and a stretch of hedgerow.
- 8.199 To facilitate the development, the existing built environments (building and hardstanding) would be lost, together with all the hedgerows, large numbers of trees, scrub and the species-poor grassland.
- 8.200 Mitigation for any effects associated with land-take would include the creation of new habitats during the construction, with enhancements of existing habitats. The development has been designed to ensure protected species populations are maintained at a favourable conservation status.
- 8.201 Following the implementation of the mitigation outlined within this chapter residual effects are anticipated to range between **Negligible** and **Long-term Positive**.

REFERENCES

- 1 HM Government, (1994); The Conservation (Natural Habitats, &c.) Regulations. HMSO
- 2 CEC (Council of the European Communities), (1992); Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora
- 3 The European Parliament And Of The Council, (30 November 2009); Directive 2009/147/EC On The Conservation Of Wild Birds (Codified Version)
- 4 UK Biodiversity Action Plan (2007). UKBAP Priority Species and Habitats. <http://www.ukbap.org.uk/newprioritylist.aspx>
- 5 JNCC and Defra (on behalf of the Four Countries' Biodiversity Group) (2012). UK Post-2010 Biodiversity Framework. July 2012. Available from: <http://jncc.defra.gov.uk/page-6189>
- 6 Defra (2011). Biodiversity 2020: A strategy for England's wildlife and ecosystem services
- 7 Convention on Biological Diversity (CBD) (2010). Decision X/2 Strategic Plan for Biodiversity 2011-2020, including Aichi Biodiversity Targets. Available at <https://www.cbd.int/decision/cop/?id=12268>
- 8 European Commission (2012). Our life insurance, our natural capital: an EU biodiversity strategy to 2020 European Parliament resolution of 20 April 2012 on our life insurance, our natural capital: an EU biodiversity strategy to 2020 (2011/2307(INI))
- 9 Joint Nature Conservation Committee (JNCC) (2010) Handbook for Phase 1 Habitat Survey
- 10 Stace, C. (2010) New Flora of the British Isles
- 11 Collins, J. (2016) Bat Surveys for Professional Ecologists: Good Practice Guidelines. Bat Conservation Trust 3 edn
- 12 Froglife (1999) Reptile survey: an introduction to planning, conducting and interpreting surveys for snake and lizard conservation. Froglife Advice Sheet 10. Froglife, Halesworth
- 13 JNCC (2016) UK Biodiversity Action Plan Priority Habitat Descriptions – Hedgerows
- 14 JNCC (2016) UK Biodiversity Action Plan Priority Habitat Descriptions – Ponds

9.0 ARCHAEOLOGY AND CULTURAL HERITAGE

INTRODUCTION

- 9.1 This Chapter addresses the issues associated with the likely significant archaeological and cultural heritage effects of the proposed development.
- 9.2 This assessment identifies the archaeological and cultural heritage value of the proposed development and assesses the likely significant direct effects on archaeology and heritage assets resulting from the construction of the proposed development as well as indirect effects upon the setting of key heritage assets within the proposed development and the wider landscape during the operational phase. This assessment also identifies measures that will be taken to mitigate or offset any predicted significant adverse effects.
- 9.3 This Chapter should be read alongside the following Appendices:
- Appendix 9.1 - Gazetteer
 - Appendix 9.2 - Royal Brunswick Park, Barnet, London, Archaeological Desk-Based Assessment
 - Appendix 9.3 - North London Business Park, Oakleigh Road South, London Borough of Barnet, Archaeological Desk Based Assessment: Addendum, 2021
 - Appendix 9.4 - Chapter Figures

LEGISLATION AND POLICY CONTEXT

- 9.4 A summary of the legislation and policy is provided in the following section.
- 9.5 The scope of this assessment meets the requirements of current planning regulations set out in the Ancient Monuments and Archaeological Areas Act, 1979¹; Planning (Listed Buildings and Conservation Areas) Act, 1990²; Planning Policy Guidance³; National Planning Policy Framework⁴; and local planning policy.

Policy

National Planning Policy Framework (NPPF), 2021

- 9.6 Chapter 16 of the document is concerned with '*Conserving and enhancing the historic environment*'. It identifies heritage assets as '*an irreplaceable resource*' and notes that they '*should be conserved in a manner appropriate to their significance, so that they can be enjoyed for their contribution to the quality of life of existing and future generations*⁴.
- 9.7 The NPPF notes that where designated assets are concerned great weight should be given to the asset's conservation. The more important the asset the greater the weight

should be. Any harm to or loss of significance should require *'clear and convincing justification. Substantial harm to or loss of:*

- *Grade II listed building or grade II parks or gardens should be exceptional;*
- *assets of the highest significance, notably scheduled monuments, protected wreck sites, registered battlefields, grade I and II* listed buildings, grade I and II* registered parks and gardens, and world heritage sites, should be wholly exceptional'.*

9.8 With regard to proposals that are predicted to lead to substantial harm or the total loss of significance to a designated asset, Paragraph 201 states that *'local planning authorities should refuse consent, unless it can be demonstrated that the substantial harm or total loss is necessary to achieve substantial public benefits that outweigh that harm or loss'*. Where *'a development proposal will lead to less than substantial harm to the significance of a designated asset'* Paragraph 202 states that *'this harm should be weighed against the public benefits of the proposal including, where appropriate, securing its optimum viable use'*.

9.9 Impacts upon non-designated heritage assets are also a pertinent planning consideration; Paragraph 203 states that *'In weighing applications that directly or indirectly affect non-designated heritage assets, a balanced judgement will be required having regard to the scale of any harm or loss and the significance of the heritage asset'*.

9.10 Where a heritage asset is to be lost, either in part or in whole, as a result of the development, the local planning authority should require developers to *'record and advance understanding of the significance of any heritage assets to be lost (wholly or in part) in a manner proportionate to their importance and the impact, and to make this evidence (and any archive generated) publicly accessible'*.

London Plan, 2021

9.11 Chapter 7 is entitled Heritage and Culture and the following policy is relevant to this assessment:

'Policy HC1 Heritage conservation and growth

A Boroughs should, in consultation with Historic England, local communities and other statutory and relevant organisations, develop evidence that demonstrates a clear understanding of London's historic environment. This evidence should be used for identifying, understanding, conserving, and enhancing the historic environment and heritage assets, and improving access to, and interpretation of, the heritage assets, landscapes and archaeology within their area.

B Development Plans and strategies should demonstrate a clear understanding of the historic environment and the heritage values of sites or

areas and their relationship with their surroundings. This knowledge should be used to inform the effective integration of London's heritage in regenerative change by:

- 1) setting out a clear vision that recognises and embeds the role of heritage in place-making*
- 2) utilising the heritage significance of a site or area in the planning and design process*
- 3) integrating the conservation and enhancement of heritage assets and their settings with innovative and creative contextual architectural responses that contribute to their significance and sense of place*
- 4) delivering positive benefits that conserve and enhance the historic environment, as well as contributing to the economic viability, accessibility and environmental quality of a place, and to social wellbeing.*

C Development proposals affecting heritage assets, and their settings, should conserve their significance, by being sympathetic to the assets' significance and appreciation within their surroundings. The cumulative impacts of incremental change from development on heritage assets and their settings should also be actively managed. Development proposals should avoid harm and identify enhancement opportunities by integrating heritage considerations early on in the design process.

D Development proposals should identify assets of archaeological significance and use this information to avoid harm or minimise it through design and appropriate mitigation. Where applicable, development should make provision for the protection of significant archaeological assets and landscapes. The protection of undesignated heritage assets of archaeological interest equivalent to a scheduled monument should be given equivalent weight to designated heritage assets.

E Where heritage assets have been identified as being At Risk, boroughs should identify specific opportunities for them to contribute to regeneration and place-making, and they should set out strategies for their repair and reuse.'

Barnet Local Plan

9.12 Policy CS5: Protecting and enhancing Barnet's character to create high quality places under sub-heading Heritage and character states that:

'We will work with partners to proactively protect and enhance Barnet's heritage including conservation areas, listed buildings, locally listed buildings, registered parks and gardens; scheduled monuments, areas of archaeological significance and London's only battlefield site.

We will require proposals within or affecting the setting of heritage assets to provide a site assessment which demonstrates how the proposal will respect and enhance the asset. Policy CS13 addresses the adaptation of heritage assets to reduce carbon emissions and ensure efficient use of natural resources.

We will ensure through our programme of Conservation Area Character Appraisals that these areas are protected and enhanced.

We will encourage community involvement in the review of the Local List of important local buildings.

The Barnet Characterisation Study forms the baseline for the identification of places with a consistent and coherent architectural character. Within the typologies identified in the Characterisation Study we will through our Development Management Policies DPD and Residential Design Guidance SPD develop a framework to protect and enhance those high quality suburbs in Barnet not protected by Conservation Area designations.'

9.13 Policy DM06: Barnet's heritage and conservation within the Development Management Policies is relevant to this assessment:

'a. All heritage assets will be protected in line with their significance. All development will have regard to the local historic context.

b. Development proposals must preserve or enhance the character and appearance of 16 Conservation Areas in Barnet.

c. Proposals involving or affecting Barnet's heritage assets set out in Table 7.2 should demonstrate the following:

- the significance of the heritage asset*
- the impact of the proposal on the significance of the heritage asset*
- the impact of the proposal on the setting of the heritage asset*
- how the significance and/or setting of a heritage asset can be better revealed*
- the opportunities to mitigate or adapt to climate change*
- how the benefits outweigh any harm caused to the heritage asset.*

d. There will be a presumption in favour of retaining all 1,600 Locally Listed Buildings in Barnet and any buildings which makes a positive contribution to the character or appearance of the 16 Conservation Areas.

e. Archaeological remains will be protected in particular in the 19 identified Local Areas of Special Archaeological Significance and elsewhere in Barnet. Any development that may affect archaeological remains will need to demonstrate the likely impact upon the remains and the proposed mitigation to reduce that impact.'

ASSESSMENT METHODOLOGY

Guidance

Planning Practice Guidance (PPG) (2014; Updated 2018)

- 9.14 The Ministry of Housing Communities and Local Government (MHCLG) published Planning Practice Guidance in April 2014 to expand upon the NPPF and the section on the historic environment was last updated in July 2019. Section 18a of the guidance is concerned with 'Conserving and Enhancing the Historic Environment'. The Guidance notes that *'conservation is an active process of maintenance and managing change. It requires a flexible and thoughtful approach to get the best out of assets as diverse as listed buildings in every day use and as yet undiscovered, undesigned buried remains of archaeological interest'*.
- 9.15 PPG requires assessments to consider the potential for harm of a proposed development on heritage assets in order to understand the impact on the significance of the heritage asset. Where designated heritage assets will be impacted upon, the PPG requires the assessment to clearly state whether that harm will be substantial or less than substantial.

Setting

- 9.16 The NPPF defines the setting of a heritage asset as:
- 'The surroundings in which a heritage asset is experienced. Its extent is not fixed and may change as the asset and its surroundings evolve. Elements of a setting may make a positive or negative contribution to the significance of an asset, may affect the ability to appreciate that significance or may be neutral'*
- 9.17 In December 2017, Historic England (HE) published a guidance document on setting as part of their Good Practice Advice Notes intended to explain how to apply the policies contained in the NPPF. This document states:
- 'Setting is not itself a heritage asset, nor a heritage designation, although land comprising a setting may itself be designated. Its importance lies in what it contributes to the significance of the heritage asset or to the ability to appreciate that significance.'*
- 9.18 The guidance requires:
- 'A thorough assessment of the impact on setting needs to take into account, and be proportionate to, the significance of the heritage asset under consideration and the degree to which proposed changes enhance or detract from that significance and the ability to appreciate it.'*
- 9.19 The HE Guidance sets out the ways in which setting may contribute to the value of a heritage asset. It advocates a five step approach which includes:

- *'Step 1: Identify which heritage assets and their settings are affected;*
- *Step 2: Assess the degree to which these settings make a contribution to the significance of the heritage asset(s) or allow significance to be appreciated;*
- *Step 3: Assess the effects of the proposed development, whether beneficial or harmful, on that significance or on the ability to appreciate it;*
- *Step 4: Explore ways to maximise enhancement and avoid or minimise harm;*
- *Step 5: Make and document the decision and monitor outcome'.*

9.20 The guidance provides a checklist of potential attributes of setting which may contribute to or make appreciable the value of the asset in question. HE acknowledges that the checklist is non-exhaustive and that not all attributes will apply in all cases.

9.21 This assessment has regard to the HE checklist but, in the interests of being proportionate to the effects that would occur, only discusses attributes of setting where these are found to contribute to the value of the asset. Similarly, in many cases effects upon setting are 'less than substantial' and are not significant. As such, it is not always necessary or appropriate to propose mitigation or enhancement measures. Where relevant, mitigation and enhancement measures are identified as part of this assessment.

Scope of the Assessment

9.22 The main objective of this assessment is to identify the cultural heritage value of the site proposed for development. The evidence presented and the conclusions offered will provide a comprehensive basis for further discussion and decisions regarding archaeological constraints on the future development of the site and for the formulation of a mitigation strategy, should this be required.

Study Area

9.23 The 2015 Royal Brunswick Park DBA (included as Appendix 9.2) used a 1km study area and the same parameters are used for this assessment.

9.24 The study area includes all known heritage assets and archaeological events within 1km of the site in order to identify the heritage baseline. The aim of this is to identify the potential for direct impacts upon known heritage assets and to help predict whether any similar hitherto unknown archaeological remains are likely to survive within the site. Designated heritage assets within 1km have also been identified to allow for an assessment of impacts upon their settings.

9.25 All heritage assets are detailed in Appendix 9.1 and are shown on Figures 9.2 and 9.3 (Appendix 9.4).

9.26 The following data sources were consulted during preparation of this assessment:

- Greater London Archaeology Advisory Service (GLAAS) Historic Environment Record (HER) for HER data (report reference 16445) obtained in July 2021.
- National Heritage List for England for designated Heritage Asset data.
- Online historic mapping sources including old Ordnance Survey maps (1st & 2nd Edition, small- and large-scale) from the National Library of Scotland (NLS) and pre-OS maps from the British Library online, the Genealogist for tithe mapping and apportionments and other sources. All reproduced maps have been purchased from ProMap.
- AB Heritage Archaeological Consultancy- Royal Brunswick Park, Barnet, London- Archaeological Desk Based Assessment (included as Appendix 9.2).
- Information, archival material and mapping from a previous DBA undertaken for the site (Site 51).
- AOC Archaeology Group North London Business Park, Oakleigh Road South, London Borough of Barnet- Archaeological Desk Based Assessment Addendum For archival research pertaining to the extent of New Southgate Cemetery (included as Appendix 9.3).

Assessment Criteria

- 9.27 This sub-section sets out the methodology for assessing effects upon heritage assets both direct physical and setting effects. It takes account of the NPPF⁴, PPG³ and Historic England's Good Practice Advice Note 3: The Setting of Heritage Assets⁵.

Assessing Cultural Significance & Importance

- 9.28 The definition of cultural significance is readily accepted by heritage professionals both in the UK and internationally and was first fully outlined in the Burra Charter, Article One of which identifies that 'cultural significance' or 'cultural heritage value' means aesthetic, historic, scientific, social or spiritual value for past, present or future generations. This definition has since been adopted by heritage organisations around the world, including HE. The NPPF defines significance (for heritage policy) as:

*'The value of a heritage asset to this and future generations because of its heritage interest. That interest may be archaeological, architectural, artistic or historic. Significance derives not only from a heritage asset's physical presence, but also from its setting.'*⁴

- 9.29 All heritage assets have some significance; however, some assets are judged to be more important than others. The level of that importance is, from a cultural resource management perspective, determined by establishing the asset's capacity to inform present or future generations about the past. In the case of many heritage assets their

importance has already been established through the designation (i.e. scheduling, listing and register) processes applied by HE.

- 9.30 The rating of importance of heritage assets is first and foremost made in reference to their designation and to the NPPF. For non-designated assets, importance will be assigned based on professional judgement and guided by the criteria presented in Table 9.1 below; which itself relates to the criteria for designations as drawn from the Department of Media, Culture and Sports (DMCS) publication, Principles for Selection of Listed Buildings and the Scheduled Monuments Policy Statements published by the same body, which outline the criteria for designating heritage assets, and the HE guidance written to expand upon the guidance by DMCS.

Table 9.1 : Criteria for Establishing Importance of Heritage Assets

Importance	Criteria
Very High	International World Heritage Sites; Other designated or non-designated assets with demonstrable Outstanding Universal Value.
High	National Scheduled Monuments (Actual and Potential); Grade I and II* Listed Buildings; Grade I and II* Registered Parks and Gardens; Registered Battlefields; Outstanding examples of some period, style or type; Non-Designated assets considered to meet the criteria for the designation as per the types and grades of designation noted above (as stated in NPPF and PPG).
Medium	Regional, County and Borough Grade II Listed Buildings; Grade II Registered Parks and Gardens; Conservation Areas; Major or representative examples of some period, style or type; or Non-designated assets considered to meet the criteria for the designations as set out above
Low	Local Locally Listed Assets; Examples of any period, style or type which contribute to our understanding of the historic environment at the local level;

Importance	Criteria
	Non-designated heritage assets identified by local historic environment records protected by NPPF;
Negligible	Relatively numerous types of remains; Findspots or artefacts that have no definite archaeological remains known in their context; Non-designated heritage assets of lesser heritage significance.

- 9.31 While determining the relative cultural significance of a heritage asset is essential for establishing its importance, it is widely recognised that the importance of an asset is not the same as its sensitivity to changes to its setting. Thus, in determining effects upon the setting of assets by the proposed development, both importance and sensitivity to changes to setting need to be considered.
- 9.32 The Xi'an Declaration set out the first internationally accepted definition of setting with regard to heritage assets and features, indicating that setting is important where it forms part of or contributes to the significance of a heritage asset. The NPPF defines the setting of a heritage asset as *'the surroundings in which a heritage asset is experienced'* and states the setting of a heritage asset is *not 'fixed and may change as the asset and its surroundings evolve'*. The NPPF also notes that elements of setting may make a positive, neutral or negative contribution to the significance of an asset.
- 9.33 Setting is a key issue in the case of some, but by no means all assets. An asset of Very High or High importance does not necessarily have high sensitivity to changes to its setting (e.g. does not necessarily have a high relative sensitivity). An asset's relative sensitivity to alterations to its setting refers to its capacity to retain its ability to contribute to our understanding and appreciation of the past in the face of changes to its setting. The ability of an asset's setting to contribute to an understanding, appreciation and experience of it and its significance also has a bearing on the sensitivity of that asset to changes to its setting. Assets with high sensitivity may be vulnerable to changes that affect their settings, and even slight changes may reduce their significance or the ability of setting to contribute to the understanding, appreciation, and experience of the asset. Less sensitive assets will be able to accommodate greater changes to their settings without a reduction in their significance and, in spite of such changes, the relationship between the asset and its setting will still be legible.
- 9.34 In establishing the relative sensitivity of an asset to changes to its setting, the setting must first be identified. This assessment outlines a range of factors, through qualitative written narrative, which will be considered when establishing the setting of an asset and therefore determining its sensitivity. The factors will be assessed from known records and in the field. In defining these criteria, emphasis has been placed on establishing the

current setting of each asset, how this contributes to the significance of the asset and how the proposed development would affect it.

- 9.35 The criteria for establishing an asset’s relative sensitivity are outlined in Table 9.2. This table has been developed based on the professional judgement and experience in assessing setting effects of the consultant that completed this assessment. It has been developed with reference to the policy and guidance noted above including NPPF, PPG, the Xi’an Declaration and HE’s guidance on the setting of heritage assets.

Table 9.2 Criteria for Establishing Relative Sensitivity of a Heritage Asset to Changes to its Setting

Importance	Criteria
Very High	An asset, the setting of which, is critical to an understanding, appreciation and experience of it should be thought of as having Very High Sensitivity to changes to its setting. This is particularly relevant for assets whose settings, or elements thereof, make an essential direct contribution to their cultural significance.
High	An asset, the setting, of which, makes a major contribution to an understanding, appreciation and experience of it should be thought of as having High Sensitivity to changes to its setting. This is particularly relevant for assets whose settings, or elements thereof, contribute directly to their cultural significance.
Medium	An asset, the setting of which, makes a moderate contribution to an understanding, appreciation and experience of it should be thought of as having Medium Sensitivity to changes to its setting. This could be an asset for which setting makes a contribution to significance but whereby its value is derived mainly from its other characteristics.
Low	An asset, the setting of which, makes some contribution to an understanding, appreciation and experience of it should generally be thought of as having Low Sensitivity to changes to its setting. This may be an asset whose value is predominantly derived from its other characteristics.
Negligible	An asset whose setting makes minimal contribution to an understanding, appreciation and experience of it should generally be thought of as having Negligible Sensitivity to changes to its setting.

Criteria for Assessing Magnitude of Impact

- 9.36 Potential impacts, that is the physical change to known heritage assets, and unknown buried archaeological remains, or changes to their settings, in the case of the proposed development largely relate to the possibility of disturbing, removing or destroying in situ remains and artefacts during the construction phase or the placement of new features within their setting during the operational phase.

- 9.37 The magnitude of the impacts upon heritage assets caused by the proposed development is rated using the classifications and criteria outlined in Table 9.3.

Table 9.3 Criteria for Classifying Magnitude of change

Magnitude of Change	Criteria
High	Substantial loss of information content resulting from total or large-scale removal of deposits from an asset; Major alteration of an asset's baseline setting, which materially compromises the ability to understand, appreciate and experience the contribution that setting makes to the significance of the asset and erodes the key characteristics of the setting.
Medium	Loss of information content resulting from material alteration of the baseline conditions by removal of part of an asset; Alteration of an asset's baseline setting that effects the ability to understand, appreciate and experience the contribution that setting makes to the significance of the asset to a degree but whereby the cultural significance of the monument in its current setting remains legible. The key characteristics of the setting are not eroded.
Low	Detectable impacts leading to minor loss of information content. Alterations to the asset's baseline setting, which do not affect the ability to understand, appreciate or experience the contribution that setting makes to the asset's overall significance.
Negligible	Loss of a small percentage of the area of an asset's peripheral deposits; A reversible alteration to the fabric of the asset; A marginal alteration to the asset's baseline setting.
None	No effect predicted.

Criteria for Assessing Significance

- 9.38 The predicted level of effect on each heritage asset is then determined by considering the asset's importance or relative sensitivity in conjunction with the predicted magnitude of the impact. The method of deriving the level of effect is provided in Table 9.4.

Table 9.4 Level of Effect based on Inter-Relationship between the Importance and/or Relative Sensitivity of a Heritage Asset and/or its setting and the Magnitude of Impact

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

The levels of effect recorded in grey highlighted cells are 'significant'

9.39 The level of effect is judged to be the interaction of the asset's importance and / or relative sensitivity (Tables 9.1 and 9.2) and the magnitude of the impact (Table 9.3). In order to provide a level of consistency, the assessment of importance and relative sensitivity, the prediction of magnitude of impact and the assessment of level of effect is guided by pre-defined criteria. However, a qualitative descriptive narrative is also provided for each asset to summarise and explain each of the professional value judgements that have been made in establishing sensitivity and magnitude of impact for each individual asset.

9.40 Using professional judgement and with reference to the Guidelines for Environmental Impact Assessment⁶ (and in accordance with the general methodology for this ES), the assessment considers moderate and greater effects to be significant (shaded grey in Table 9.4), while minor and lesser effects are considered not significant.

Harm

9.41 The PPG notes that 'substantial' harm is a 'high test' and that as such it is unlikely to result in many cases. As noted earlier in this Section what matters in establishing whether harm is 'substantial' or not, relates to whether a change would seriously adversely affect those attributes or elements of a designated asset that contribute to, or give it, its significance.

9.42 In terms of effects upon the setting of designated heritage assets, it is considered that only those effects identified as 'significant' in this assessment have the potential to be of 'substantial' harm. Where no significant effect is found, the harm is considered to be 'less than substantial'. This is because, as set out earlier in this methodology, effects only reach the significance threshold if their relative sensitivity to changes in setting is at the higher end of scale, or if the magnitude of change is at the higher end of the scale.

- 9.43 For many designated assets, setting may not contribute to their significance or contribution to significance may be limited. For these assets, even High magnitude changes to setting are unlikely to have negative effects on the overall significance of the designated asset. As stated above lower ratings of magnitude of change tend to relate to notable or perceptible changes to setting but where these changes do not necessarily obscure or damage elements of setting or relationships which directly contribute to the significance of assets. As such, effects that are not significant will result in 'less than substantial' harm. Where there are no effects or effects are deemed to be Neutral there will be no harm.
- 9.44 Where significant effects are found, a detailed assessment of the level of harm will be made. Whilst non-significant effects will cause 'less than substantial' harm, the reverse is not always true. That is, the assessment of an effect as being 'significant' does not necessarily mean that the harm to the asset is 'substantial'. The assessment of level of harm, where required, will be a qualitative one, and will largely depend upon whether the effects predicted would result in a major impediment to the ability to understand or appreciate the heritage asset in question by reducing or removing its information content and therefore reducing its cultural significance.

Cumulative Effects

- 9.45 The assessment of cumulative effects will be undertaken in a similar manner to that of the potential effects but will take into consideration other developments as agreed with the planning authority, including those which are operational, under construction, consented or proposed. Cumulative effects relating to cultural heritage are for the most part limited to effects upon the settings of heritage assets.
- 9.46 The cumulative assessment will utilise the criteria for assessing setting effects as set out above. In line with HE setting guidance, consideration will be given to whether the additional change, which would result from the Development will further harm the significance of the asset.

ASSUMPTIONS AND LIMITATIONS

- 9.47 This assessment is based upon data obtained from publicly accessible archives as described in the Data Sources in paragraph 10.28. Heritage assets within 1km of the site were identified (Figure 9.2 & 9.3, Appendix 9.4). Data from the Greater London Historic Environment Record (GLHER) was obtained in July 2021 (GLHER Report 16445). The information presented in the gazetteer (included as Appendix 9.1) regarding known heritage assets is current to this date.
- 9.48 This assessment deals with known and potential archaeological deposits and also considers the contribution and consequence of the existence of buildings of various types within the site over time. Designated assets within 1km of the site have been included

as they contribute to an understanding of the baseline of the historic environment and for an assessment of the impact of the proposed development on their settings.

BASELINE CONDITIONS

- 9.49 Each heritage asset referred to in the text is listed in the Gazetteer (included as Appendix 9.1). All heritage assets within the Gazetteer have been assigned a 'Site No' unique to this assessment, and the Gazetteer includes information regarding the type, period, grid reference, HER number, protective designation and other descriptive information as derived from the consulted sources.
- 9.50 Each heritage asset referred to in the text is plotted on Figures 9.2-9.3 (Appendix 9.4) using the assigned Site Nos. The site is shown outlined in red.
- 9.51 No designated assets have been identified within the site.
- 9.52 There is one Grade II* Listed Building, the Parish Church of St Mary the Virgin (Site 4), c. 785m north of the site and a further 12 Grade II Listed Buildings (Sites 1-3 & 5-13). The closest of the Grade II Listed Buildings is the Memorial to German First World War Internees (Site 13) located c. 110m east of the site within New Southgate Cemetery.
- 9.53 There are three Archaeological Priority Areas (APA) within the 1km study area; the medieval and post-medieval extent of a settlement at Church Farm (Site 14) to the north; the medieval to modern extent of the settlement of Friar Barnet (Site 15) to the south-west; and the northern extent of the medieval manor of Halliwick to the south of the site.
- 9.54 The following baseline is an updated version of the baseline reported by AB Heritage in 2015 (Site 51) within the 2015 HPP ES and associated Addenda²⁹.

Geology and Topography

- 9.55 The British Geological Survey (BGS) records the bedrock on the site as London Clay Formation, a sedimentary bedrock formed approximately 48 million years ago in the Palaeogene period in a local environment previously dominated by deep seas.
- 9.56 Mapping of the extent of superficial geological deposits by the BGS is not always accurate due to the discontinuity in distribution of these deposits and difficulties in accessing below ground data.
- 9.57 A patch of Dollis Hill Gravel Member, a superficial deposit composed of sands and gravels formed up to 2 million years ago in the quaternary period in a local environment previously dominated by rivers is recorded as extending into the southern extent of the site. Dollis Hill Gravel is a Pleistocene River terrace deposit⁷, which pre-dates the diversion of the Thames in North London and is thought to be equivalent to the Winter Hill Gravel of the Middle Thames⁸. No paleoarchaeological or archaeological remains have been identified within the Dollis Hill Gravel although pockets of in situ sediments are

noted by Juby (2011) to be worth further investigation. Further areas of Dollis Hill Gravel Member are recorded to the west and north and River Terrace Deposits are recorded to the east of the site, along Pymme's Brook.

- 9.58 No boreholes are recorded by the BGS within the site. The closest boreholes to the site recorded by the BGS are c.345m south-east of the site, TQ29SE183 & 4 along Oakleigh Road South. These boreholes recorded made ground and topsoil underlain by increasing compaction of laminated and fissured clays.
- 9.59 The site is recorded at 75m Above Ordnance Datum (AOD) within the northern portion of the site, north of East Drive and the southern portion of the site is recorded at 64m AOD. It is likely, based on comparison between these levels and those outside of the site that the site has been artificially levelled in the past.

Prehistoric (8000BC- AD43) and Romano-British (AD43-410)

- 9.60 No prehistoric or Romano-British remains have been identified within the study area. As such there is judged to be a Low potential for remains of these dates to survive within the site.

Early Historic (AD410-1066)

- 9.61 The church at Friern Barnet (Site 29) to the south-west of the site within the APA (Site 15) is thought to have Early Historic or Saxon origins. The Grade II Parish Church of St James (Site 9) is first documented in 1187. Whilst no evidence of an earlier church was identified during excavations at the Church of St James (Site 9) in the 1970's (presumably Site 55), it remains possible that there was an earlier church on or near to the site of the existing church. Early Historic settlement at Friern Barnet is thought to have been precluded due to the presence of dense woodland and heavy clay soils. However, this would not have precluded the construction of individual ecclesiastical establishments or dwellings especially in clearings.
- 9.62 The Grade II* Listed Church of St Mary (Site 4) to the north of the site dates to the medieval period, although it has been suggested that earlier burials have been identified in the churchyard⁹ and it is possible that the Church or indeed the associated burial ground has an earlier antecedent.
- 9.63 No further Early Historic remains have been identified within the study area and as such there is judged to be a Low potential for remains of this period to survive on the site.

Medieval (AD1066-1600)

- 9.64 The borough of Barnet derives its name from the Anglo-Saxon word 'bærnet', which suggests the clearing of woodland by burning. It was first recorded as 'Barneto' in 1070¹⁰. The Domesday Book (1086)¹¹ does not document any settlement within the vicinity of the site.

- 9.65 The Grade II* Listed Parish Church of St Mary (Site 4), c. 785m north of the site dates from 1080 and originated as a small church built for a community of monks. The Church has been altered in the subsequent centuries. The churchyard (Site 26) of St Marys' has origins in the 13th century. The settlement centred on the APA of Church Farm (Site 14), which includes St Marys Church (Site 4) likely originated in the medieval period, first as a community of monks centred on the church and later expanded with a manor house being established in the mid-13th century¹². Oak Hill Woods (Site 27), c.630m to the north of the site date from the 11th century and lie partially within the APA (Site 14). The woods were in the ownership of the church, prior to the dissolution (1536-41) and then retained and sold as parkland.
- 9.66 The parish Church of St James (Site 9) is a Grade II Listed Building and was constructed in the 12th century. Only one doorway survives from this period, the rest of the building was altered and changed in subsequent centuries and was largely rebuilt in the 1850's. This re-design was recorded during a watching brief (Site 49) on works undertaken in 2012. The churchyard of St James (Site 31) is also thought to date from the medieval period, although the majority of visible gravestones date from the post-medieval period. The Church of St James is a central point in the APA of Friern Barnet (Site 15), located to the west of the site. Whilst the APA is thought to have not been settled prior to the 19th century due to dense woodland and heavy clay soils, the land once belonged to the Abbot of St Albans and was given to the Bishop of London following the conquest (1066). The placename, *Friern*, seems to indicate an association to the Knights of St John and a small medieval friary is thought to have existed around Site 28. The later Friern Barn manor house (Site 30) is reported by the GLHER to have been formerly held by the Knights of the Order of St John also known as the Hospitallers'. The lands at Friern Barnet (Site 15) were given to Sir Walter Raleigh by Queen Elizabeth I in the 16th century and subsequently sold. A medieval pound (Site 44) and well (Site 43) is also recorded within the APA. As such a small settlement is likely to have been located in the APA from the medieval period onwards.
- 9.67 The northern extent of the APA centred on the medieval Halliwick Mano (Site 16) extends within the 1km study area to the south of the site. The manor was first documented between 1278 and 1285 and was later mentioned as a manor house (Site 35) in the early 17th century.
- 9.68 The GLHER records a former county bank (Site 19), dated to the medieval period c. 820m east of the site. Medieval remains have not been reported from invasive archaeological works (Events- Sites 49, 52, 53 & 54) within the study area.
- 9.69 Following extensive landscaping in the past 100 years, there is judged to be a Low potential for medieval remains to have survived within the site boundary.

Post-medieval (AD1600-1900)

- 9.70 Pre-Ordnance Survey maps tend to be schematic and lack detail, although they give some idea of the nature of settlement. Blaeu's 1646 map¹³ (Not Illustrated) annotates Friern Barnet (Site 15) to the west of the site, however the land use around the site is not recorded.
- 9.71 A map by Warburton, Bland and Symthe dated 1724¹⁴ (Figure 9.4, Appendix 9.4) depicts the site in the vicinity of a parish boundary, with East Barnet annotated to the north, Friern Barnet and 'Whetstone' annotated to the west. No details about the land use on the site are depicted on this map.
- 9.72 Rocque's 1757 map of Middlesex¹⁵ (Figure 9.5, Appendix 9.4) annotates a small settlement at Friern Barnet (Site 15). The site appears to be located to the east in the vicinity of woodland and open land, most likely agricultural land. Bowen's 1770 map¹⁶ (Not Illustrated) shows no further details about the site.
- 9.73 Hyett's map dated 1805¹⁷ (Figure 9.6, Appendix 9.4) depicts the site within what appears to be agricultural fields to the south of "Russels Farm" and "Gittants Farm" and enclosed by roads to the east, aligned north-west, south-east, to the west, aligned roughly north-south and to the north, roughly aligned east-west.
- 9.74 The 1817 Barnet Inclosure Map shows the site laid out over a number of fields to the west of Pymmes Brook¹⁰. The site boundary is almost unrecognisable from its appearance today, owing to the large-scale development that followed, including construction of the railway, tunnel, and industrial development. The East Barnet Cum Chipping Barnet Tithe map of 1840¹⁸, shows the site within ten land parcels recorded mainly as meadows and one arable field.
- 9.75 The Great Northern Railway which demarcated the western site boundary¹⁹ was constructed in 1850 for the purpose of the delivery of the dead to a cemetery. The Great Northern Cemetery Company purchased 155 acres both west and east of what is now Brunswick Park Road to create the Cemetery, initially known as the Great Northern Cemetery and now known as the New Southgate Cemetery and Crematorium (Site 20). This included the entire area of the site and larger areas to the north-east and east²⁰. In 1859, the Great Northern Railway constructed the Station, Chapel (Site 57) and Cottages known as 'The Retreat' in the western section of the Cemetery (Site 20) and of the site. The first burial within the eastern section of the Cemetery has been identified as dating to the 11th July 1861²⁰ followed by the first burials within the western section of the Cemetery on the 23rd November 1861. The western part of the Cemetery in use at the time has been identified as a four acre area abutting the eastern boundary of the site.
- 9.76 The Ordnance Survey map published in 1872 (Figure 9.7, Appendix 9.4) depicts the site within an area annotated as the Great Northern Cemetery. This map surveyed in the 1860's reflects the area initially purchased for the Cemetery (Site 20). In 1876, the first of several Acts was passed to dispose of unconsecrated surplus land in the western section, comprising the entire development site and reducing the total size of cemetery

land to the east of the site²⁰ only. (Figure 9.11, Appendix 9.4) shows the extent of the consecrated land following the sale of unconsecrated Cemetery (Site 20) land. Two buildings are depicted in the south-western corner of the site on the OS map published in 1872 annotated as "Cemetery Station" and "Chapels (Dissenters)" (Site 57). Two further small buildings are depicted immediately south of the southern site boundary. In the northern area of the site, "Wells" (Site 58) are annotated and further to the north irregular features (Site 59) are depicted within the site and the east of the site. These likely denote the location of gravel pits or other such extractive works. The OS map published in 1872 depicts the landscaping within the site, probably laid out in preparation for a cemetery, with tree lined pathways. The main route into the Cemetery appears to have been a tree lined avenue aligned roughly east-west from Cemetery Station (Site 57). The north-western corner of the site is depicted within two fields, south-east of Gallants Farm.

- 9.77 The OS map published in 1897²¹ (Figure 9.8, Appendix 9.4) and surveyed in the early 1890's annotates the Chapel (Site 57) as 'disused'. The Chapel as marked on the map still consists of two buildings which include, a Chapel, a Station and Cottages. The Station (Site 57) is not annotated, although a surviving routeway within the site is shown aligned east-west between the Station (Site 57) and the Cemetery (Site 20), parallel to the south boundary of the site. The Station (Site 57) was not demolished until 1917²², and as such may have still been in partial use at this time. An area of landscaping is also depicted within the southern corner of the site which indicates that the Station (Site 57) may have still been in use. Another north-south aligned routeway, within the eastern site boundary is also depicted on the OS map of 1897. The majority of the site is depicted as unused land in the later 19th century. A pond (Site 60) is depicted in the centre of the site. The Cemetery (Site 20) is depicted to the east and residential development is depicted to the south of the site.
- 9.78 The probable medieval settlement centred on the APA of Church Farm (Site 14), includes several post-medieval sites, such as the Grade II Listed Clark Family Monument (Site 5), the Grade II Listed tombstones in St Mary's Churchyard (Site 8) and two Grade II Listed cottages (Site 10) Church Farm School.
- 9.79 The Grade II Listed Church of All Saints (Site 2) located approximately 760m to the north-west of the site, was built in 1883 and can be seen on the OS map of 1897 (Figure 9.8, Appendix 9.4). Slightly to the south, the Grade II Listed St James' Primary School (Site 12), is depicted to the south-east of a cottage (Site 32) labelled as 'Almshouse' which was originally built in c. 1612 to provide for 12 poor people.
- 9.80 The Grade II Listed Lodge of Friern Hospital (Site 3) is located to the north-west of the mid-19th century Middlesex County Lunatic Asylum, now a private residential complex, the Princess Park Manor (Site 36) located 970m to the south of the site. Evidence for the construction of the asylum in 1851 was uncovered during an evaluation in 1997,

which found evidence of large-scale mineral extraction, linear features possibly relating to the foundations of post-medieval buildings and a possible hearth (Site 37).

- 9.81 Two burial sites are recorded in the GLHER. An inhumation (Site 45) site was recorded 845m to the south-west of the site, although the only information recorded relates to pits cut into natural gravel and measuring 0.7 to 0.8m deep. A cemetery (Site 46) opened in 1880, is recorded 980m to the east of the site.
- 9.82 The GLHER records a further ten non-designated assets within 1km of the site. These include two houses (Sites 17 and 18), a Manor House (Site 33), two landfill sites (Sites 21 and 22), two schools (Sites 23 and 25), a well (Site 24), a gas meter house (Site 38) and a farm (Site 42). The structural remains of the school at Church Hill Road (Site 25) were uncovered during an archaeological evaluation (Site 53) in 1995.
- 9.83 The area of the 'The Retreat' (Site 57) was later the location of the John Tyler and Standard Telephones and Cables (STC) company Building 3 (Site 67), which would subsequently be demolished and built over again. With the exception of a small area of four acres abutting the eastern part of the site boundary, it is clear that the western section of the cemetery which includes the site was never consecrated²³. There is judged to be a Low potential for Cemetery buildings and *in situ* graves to have survived within the site boundary, although this cannot be completely ruled out. There is also a potential for isolated bones from earlier disturbed graves to have been redeposited within the site, although this is unlikely.

Modern (1900-Present)

- 9.84 The 1914 OS²⁴ map (Not Illustrated) of the site, shows no great changes, although the footpath across the field has been altered with a further two branches extending northwards and eastwards from the southern entrance. A rectangular building (Site 61) is depicted abutting the north-western corner of the 'Great Northern London Cemetery' which falls within the site boundary. The surrounding area remains largely undeveloped with urban development expending from Oakleigh Park in the north-west, Friern Barnet to the south and East Barnet in the north-east.
- 9.85 The approximate location of the 20th century buildings are depicted on Figure 9.12, Appendix 9.4. Part of the development site had been purchased in 1916 by J Tylor and Son for the production of lorry engines for WWI²³. The site was then purchased in 1922 by the International Western Electric which was later renamed as Standard Telephones and Cables (STC) Company²³. The company developed the land, constructing 11 separate industrial structures along with sports facilities. The coal chute (Site 81) may have been constructed at this time, with the original Boiler room located within Building 3 (Site 67) to the south. Coal was vital for the running of the industrial site. With the expansion of the site, a Boiler House, Building 10 (Site 72), was constructed in 1933²³ which is another potential and likely date for the construction of the coal chute (Site 81).

The coal chute (Site 81) has been described as an underground conveyer belt, running from the station siding to Building 10 (Site 72 - the Boiler House) and later to the coal stores in Building 8 (Site 71) and then turning to a southern alignment to link into Building 7 (Site 70).

- 9.86 No change is visible until the OS map of 1938²⁵ (Figure 9.9, Appendix 9.4), which shows most of the southern part of the site developed. Three large rectangular buildings along with a series of smaller buildings are depicted within the southern half and annotated as 'New Southgate Work (Telephones & cables)'. These are Buildings 3, 4 and 6 (Site 67, 68 and 69) constructed in 1933. Two 'Sports Grounds' are annotated within the northern and eastern portions of the site. In total approximately 23 buildings are depicted. The southernmost of the larger rectangular buildings (Building 3) is located on the site of the disused Chapel and Station (Site 57). Site 61 visible on the OS map of 1914²⁴ is no longer depicted. Urban development has progressed towards the site from the surrounding cities, although at this point, they are still relatively spread out.
- 9.87 The following year in 1939, Building 20, a self-contained ARP post and Fire HQ, was constructed. The following year Building 8 (the Radio Building – Site 71) was constructed along the easternmost boundary of the site, with a basement²³. A further feature has been identified linking Buildings 8 and 6 (Sites 69 and 71), which could relate to either a coal chute (Site 81) or another underground connection between buildings. In addition to coal stores, Building 8 (Site 71) also included an underground rifle range, although their exact footprint is not known²³. Building 6 was destroyed and Building 8 was damaged from a flying bomb during the Second World War. Rubble from both buildings was used to build up North Field²³. One of the bombs also fell near the playing fields in the northern area of the site, which may have also contained air raid shelters¹⁰. It must however be noted that the OS map of 1951 (Not Illustrated) does not depict the easternmost building, labelled as Building 8 on the '*Earlier STC Limited Plan of the New Southgate Works (1950s-1960s)*'²⁶, while Building 6 is still depicted.
- 9.88 At least 12 main air raid shelters and up to 28 air raid shelters throughout the site, have been identified. The largest of these shelters were specifically constructed tunnel shelters (numbers 1-12), laid out in a grid pattern in the North Field of STC, to the rear of Building 4 (Site 68). These were tunnelled into the slope with 12 entrances and cross-connecting internal tunnels. Further shelters were built across the site to house the full number of wartime staff²³. These are likely to have been provided within existing buildings, with the inclusion of reinforced basement, although their exact nature is uncertain. The location of the known air raid shelters are depicted on Figure 9.13 (Appendix 9.4).
- 9.89 No change is visible until the OS map of 1962²⁷ (Not Depicted). By this point, the 'Works' includes again a fourth large rectangular building along the eastern boundary of the site (Building 8 - Site 71) and several of the existing buildings appear to have been expanded, with further development in the southernmost corner. Building 8 (Site 71) may have been partially built over the footprint of several air raid shelters as depicted

on Figure 9.13 (Appendix 9.4). The surrounding area is by this point more densely populated.

- 9.90 No further changes are visible until the OS map of 1989²⁸ (Figure 9.10, Appendix 9.4), which depict two significant changes. Building 3 (Site 67) to the south has been demolished and a weir has been constructed in the open space of the sports ground to the east. The tunnel air raid shelter 1-12 were demolished in 1984 as they were deemed structurally unsound²³. The topography suggest the possibility for the air raid shelters to have remained in situ although with a degree of backfilling and landscaping²³. Northern Telecom manufactured telecommunications equipment between 1989 and 2000, when they left, following which the site became the North London Business Park¹⁰.
- 9.91 In the later part of the 20th century, the site continued to be developed with several buildings demolished and subsequently replaced. A multi storey car park was built over the footprint of the Building 3 (Site 67), reducing further the possibility for the remains of the Station and Chapel to have survived²³.
- 9.92 There are five Grade II Listed Buildings within the study area; these include a Water Tower (Site 1), Christchurch (Site 6), a statue in Friary Park (Site 7) erected in c.1910, a set of cottages (Site 11) and a memorial (Site 13) erected following the First World War.
- 9.93 The GLHER records four non-designated assets within the study area; the commemorative garden (Site 41) associated with the Grade II Listed All Saints Church (Site 2), the formal garden at Friern Barnet Lane (Site 34) opened in 1910 and an anti-tank block (Site 39) and pillbox (Site 40) recorded between 1995 and 2001 as part of a Defence for Britain project.
- 9.94 Construction of the STC factory buildings which took place in the 1930s, likely resulted in substantial disturbance to below ground deposits as indicated by evidence for landscaping, the construction of basements and infrastructure such as the coal chute (Site 81) and services. By the middle of the 20th century, only small, localised areas would have remained undisturbed by development. There is judged to be a Medium potential for STC infrastructure such as the coal chute (Site 81) to survive in localised areas of the site. There is judged to be a Medium to High potential for air raid shelters to have survived within the site, with three confirmed entrances still present.

Previous Archaeological Work

- 9.95 The GLHER records one desk-based assessment (Site 51) within the site, which relates to the assessment carried out by AB Heritage in 2015¹⁰ (included here as Appendix 9.2) within the 2015 Royal Brunswick Park Environmental Statement²⁹.
- 9.96 The majority of previous archaeological work recorded by the GLHER are desk-based assessments (Sites 47, 48, 50 and 56).

Walkover Survey

- 9.97 A walkover survey of the site and surrounding area was conducted on the 16th August 2021 in dry and overcast conditions. The purpose of the visit was to assess the potential for heritage constraints within the site together with the anticipated impacts of the proposed development on the settings of surrounding heritage assets.
- 9.98 The central part of the site is dominated by large modern office buildings and a school, with a multi-storey car park serving these buildings located in the southwest part of the site. The site surrounding these buildings has been extensively landscaped, with undulating artificial mounds planted with trees surrounding roads and pathways. A large artificial lake is located in the southeast part of the site.
- 9.99 The northern part of the site has been substantially raised above the surrounding area, with multiple levels of car parking terraced into the slope to the north of the office buildings (Plate 1). The former playing fields at the northern edge of the site are now overgrown with long grass (Plate 2).



Plate 9.1 West facing view towards the north carpark

Plate 9.2 West-facing view of former playing fields in the northern part of the site



- 9.100 Part of the northeast boundary of the site is formed by a high brick wall (Site 63), constructed between 1879 and 1897 (Plate 3). The wall appears to represent the former boundary of part of the Great Northern Cemetery that was formerly located on the western side of Brunswick Road. The wall currently forms the rear boundary of gardens located on the south and west side of the modern houses on Howard Close and Brunswick Park Gardens. No further above-ground remains relating to the cemetery, including the former station and chapel, were observed within the site.
- 9.101 Although late 20th century development and landscaping has removed most traces of the former STC New Southgate Works, a few vestigial elements remain, these include: the former recreational rifle range building (Site 64), which is now largely overgrown (Plate 4); and a small brick building of uncertain purpose (Site 65) close to the Oakleigh Road entrance to the Site (Plate 5).
- 9.102 Surviving Second World War air raid shelters associated with the STC Works were observed within undergrowth in the southern part of the site (Site 62). The shelters were visible as mounds of earth and rubble, with above-ground entrances capped with concrete lintels. Three entrances were observed, possibly relating to two separate shelters, although no access was available to the interior of the shelters during the visit.

Plate 9.3 North-facing view towards 19th century wall (Site 63) adjacent to the northeast site boundary



Plate 9.4 Southwest facing view of the former STC Works recreational rifle range (Site 64)



Plate 9.5 West-facing view of former STC building (Site 65) close to the southern corner of the site



Plate 9.6 Northwest-facing view of entrance to former STC air raid shelters (Site 62)



**Plate 9.7 Southeast-facing view of entrance to former STC air raid shelters
(Site 62)**



**Plate 9.8 Northwest-facing view of entrance to former STC
air raid shelters (Site 62)**



POTENTIAL IMPACTS

During Construction

9.103 Construction effects on cultural heritage receptors are largely limited to direct impacts on heritage assets within the site. The potential effect on these known buried archaeological remains relate to the possibility of disturbing, removing or destroying in situ remains and artefacts during ground-breaking works (including excavation, construction and other works associated with the proposed development) within the site. The proposed programme of demolition and construction works are described in Chapter 5.0: Construction and Programme of this ES. The location of these heritage assets is shown on Figure 9.3.

9.104 Table 9.5 sets out the level of effect based on the inter-relationship between the importance of a heritage asset and the magnitude of impact.

Table 9.5 Level of Direct Construction Effects

Name	Importance	Magnitude of Impact	Level of Effect
Cemetery (Site 20)	Local (Low)	Low	Negligible
STC buildings (Sites 65-74 and 77-80) and coal chutes (Site 81)	Local (Low)	Medium	Minor Negative
Air raid shelters (Site 62, 75 and 76)	Local (Low)	High	Moderate Negative

9.105 The Great Northern Cemetery (Site 20) was opened in 1861 on 155 acres of land purchased by the Great Northern Cemetery Company. In 1859, the Station, Chapel and Cottages (Site 57) known as 'The Retreat' were built in the western section of the Cemetery and the site. It is understood that no burials were undertaken within the site boundary. By 1876, unconsecrated surplus land in the western section of the Cemetery was sold. This included the area covered by the site, which remained unused until developed in the early 20th century. The only structures within the site pre-dating the construction of the STC factory buildings, are those associated with 'The Retreat' to the south-west and a single building abutting the Great Northern London Cemetery to the north (Site 61). The area of 'The Retreat' was later built over by the John Tyler and STC Building 3 (Site 67), which was subsequently demolished and built over. It is thus considered unlikely that remains relating to pre-20th century development survive in the site. The proposed development is judged to result in an impact of Low magnitude leading to a minor loss of information content, based on the limited likelihood of surviving

remains. Given the asset's Local (Low) importance this would result in a **Negligible** level of effect which is not considered significant.

9.106 Industrial development of the site began in 1916, following the purchase of the site by J Tylor and Son for the production of lorry engines for WWI. Development of the site intensified from 1922 when the land was purchased by the International Western Electric, later renamed the Standard Telephones and Cables (STC) which manufactured telephone and radio equipment. The site was extensively developed during this decade with the construction of buildings, basements, landscaping and services. Spoil resulting from this development, was used to level up the south-east corner of the site and in the creation of sport facilities and landscaped gardens to the north. A general timeline for the industrial use of the site is provided in an Addendum prepared by AOC Archaeology, 2021²³ (included as Appendix 9.3), and can be summarised here as follows:

- 1933- Construction of Buildings 3, 4 and 6 (Sites 67, 68 and 69)
- 1939 - Construction of air raid shelter and Building 20, 52 and 53 (Sites 80, 73 and 74) in 1939;
- 1940 – Construction of Building 8 (Site 71) was with a basement;
- 1944 – Destruction of Buildings 6 and 8 (Sites 69 and 71);
- 1968 - Cessation of use of coal chute (Site 81);
- 1980s - Demolition of Building 8 (Site 71) and removal of North Field air raid tunnels;
- 1986 - Demolition of Building 3 (Site 67)
- 1990s - Construction over footprint of Buildings 4, 6-10 (Sites 68- 71) and coal conveyer chute.

9.107 It must also be noted that there appears to be a slight discrepancy between the numbering of Buildings 6 and 8 and the OS map of 1951 (Not Illustrated). Based on this map, it is the easternmost building which has been destroyed by the bomb, which is Building 8 based on the *'Earlier STC Limited Plan of the New Southgate Works (1950s-1960s)'*³⁰, while the central Building 6 is still depicted. Building 8 then reappears on the OS map of 1962 (Not Illustrated). Numbering of the three central buildings is sequential and it is therefore likely that the numbering of Building 6 and 8 is correct. Information the STC New Southgate Open Day, states the *'the morning of 23rd August 1944, brought a happening of a tragic nature when a V1 Flying Bomb crashed between Buildings Six and Eight, demolishing the first and seriously damaging the second'*³¹. Despite this discrepancy, it appears that the basement of Building 8 survived the bomb crash and was later backfilled and as such, some structural elements may have survived, albeit potentially in poor condition²³. It has not been established if the coal chute (Site 81), when disused was demolished, filled in or left *in situ*. The current building has a footprint which covers much of the length of the coal chute (Site 81) and therefore any remains

are likely to be localised to those areas beyond the building footprint. In general, although there is a potential for STC buildings including the coal chute (Site 81) to have survived within the site, any such survival would be patchy and localised. The proposed development would constitute a Medium level of impact on any such remains relating to the coal chute or Building 8. Given the assets' Local importance, this would result in a **Minor Negative** level of effect in each case which is not considered significant.

- 9.108 The AB Archaeology desk-based assessment¹⁰ (included as Appendix 9.2), AOC archaeology Addendum²³ (included as Appendix 9.3) and site visits have identified several potential locations for air raid shelters across the site. These are shown as Sites 62 and 76 air raid shelter entrances on Figure 9.13 (Appendix 9.4). Air raid shelters in the North Field and smaller shelters across the site were built during the Second World War to house the wartime staff. Air Raid Shelters 1-12 in the North Field were used as storage until they were deemed structurally unsound in 1984 and demolished, although another date of 1994 for their demolition has been suggested²³. However, because of the topography of the northern part of the site, there is a potential for remains to have survived *in situ* below backfilling and landscaping within the area of the site that is currently used as a carpark. The presence of air raid shelters in the southern part of the site, to the east of Building 3 (Site 67) has been identified through records and the walkover survey. Three above ground entrances (Site 62), possibly relating to two separate shelters, were observed during the walkover survey. Air raid shelters have been previously identified in the triangular area to the east of Building 8 (Site 71), however there was no indication of their presence noted during the walkover survey. Air raid shelters are thus known to extend below the site and surviving remains could be damaged by the proposed development. This would constitute a High magnitude of impact. Given the asset's Local importance, this would result in a **Moderate Negative** level of effect which is considered significant.
- 9.109 Changes within the site boundary visible on historic maps within the last 150 years show widespread impact. These include multi-storey buildings, underground coal chutes, basements, hard landscaping and services. Bombing during the Second World War damaged several buildings which were subsequently demolished. Other buildings were demolished in the 1980s and 1990s to be replaced by the building layout as it stands today. As a result, it is likely that the STC complex of buildings will have had a substantial effect on any buried archaeological remains within the site.
- 9.110 The possible presence of UXO (Unexploded Ordnance) has been raised during the AOC DBA Addendum²³ (included as Appendix 9.3) and consideration should be given to having UXO monitoring during site works. The site has been impacted by two large bombs, between Buildings 6 and 8 (Sites 69 and 71) and in the North Field. There are archival reference as discussed in the Addendum to small High Explosives and/or incendiary bombs that fell within the site. The site was also the location of an active Home Guard

bomb disposal team and oral history suggests the possibility of a mock bomb ‘Satan’ having been buried on site at the end of the war.

9.111 This assessment considered there to be a Low potential for hitherto unknown buried archaeological remains to survive within the site. Following the construction of the buildings, which progressively expanded to cover a large footprint of the site, any earlier remains are likely to have been truncated, disturbed, removed or destroyed.

During Operation

9.112 Direct impact upon any known and previously unknown archaeological remains which may be present on the site would cease with the completion of the proposed development works and consequently no direct effects are predicted during operation.

9.113 Operational effects include impacts upon the settings of designated assets such as Listed Buildings. Site visit have indicated that the site has very little intervisibility with surrounding designated heritage assets. Whilst it should be noted that the setting of heritage assets is not limited to views from them, the urban nature of the surrounding area means that the proposed development is unlikely to materially alter the settings of assets with no intervisibility.

9.114 All indirect setting impacts assessed below are long-term impacts and would be the same for the life of the Development. All likely significant, or not significant, environment effects are also negative. Table 9.6 (below) summarises the predicted operational impact upon heritage assets within a 1km study area that could be impacted by the proposed development. Assets with no intervisibility with the site are considered to experience no effect as a result of the proposed development are not included in the table as per the reasoning outlined discussed above.

Table 9.6 Summary of the Predicted Operational Effects upon the Settings of Selected Heritage Assets by the Proposed Development

Site No.	Site Name	Designation	Relative Sensitivity	Magnitude of setting impact	Level of Effect
20	New Southgate Cemetery	Non-Designated	Low	Medium	Minor Negative
13	Memorial to German First World War Internees, New Southgate Cemetery	Grade II Listed Building	Medium	Low	Minor Negative

- 9.115 The following settings assessment is limited to a consideration of the following heritage assets: the non-designated New Southgate Cemetery (Site 20); and the Grade II Listed Memorial to German First World War Internees (Site 13), located within the cemetery.

New Southgate Cemetery (Site 20)

- 9.116 The gothic stone gate piers, railings, and adjacent lodge on the opposite side of Brunswick Park Road to the site form the main entrance to the cemetery (Site 20). Although not designated, the structures clearly contribute to the historic significance of the cemetery. The entrance to the cemetery is visible from the edge of the site (Plate 9), although it is partly screened from the wider site by trees set back from the road (Plate 10). Although the site would have once formed a key part of the cemetery's wider setting, with a trackway leading from the railway station and mortuary chapel to the northern entrance, this has subsequently been eroded by the development of the STC works and the later North London Business Park within the site. Consequently, whilst the cemetery is highly sensitive to changes within the present extent of its grounds but it is considered to have a Low sensitivity to changes within its wider setting. Visibility of the proposed development from the cemetery entrance would change views out from the site but would not prevent the ability to understand and appreciate the core relationship between the asset and the cemetery to which it primarily relates. This would constitute a Medium level of impact. Given the asset's Low sensitivity to changes in setting, this would result in a **Minor Negative** level of effect which is not considered significant.

Plate 9.9 East-facing view towards New Southgate Cemetery (Site 20) from the southeast corner of the Site



Plate 9.10 West facing view towards the Site from the northern gateway to New Southgate Cemetery (Site 20) on Brunswick Park Road



Memorial to German First World War Internees (Site 13)

9.117 The Grade II Listed Memorial to German First World War Internees (Site 13) located 100m to the east of the site, primarily derives its significance from its historic interest as a memorial to a little-remembered aspect of the First World War. The memorial does not stand in its original location on the other side of the path. Although its re-located setting within the cemetery is important in understanding the relationship between the monument and the 51 German civilians buried at New Southgate Cemetery during the First World War, it is considered to have a Low sensitivity to changes within its wider setting beyond the present extent of the cemetery. No burials are recorded within the site boundary which pre-dates the events that led to the memorial and therefore important view to Site 13 relate to the current New Southgate Cemetery and Crematorium to the south-east. Views of the proposed development from the memorial would be beyond the immediate setting which contributes to the understanding and appreciation of this asset and would be seen in the context of other distant modern development. Any views of the proposed development would thus constitute a Low level of impact which would result in a **Minor Negative** level of effect which is not considered significant.

Plate 9.11 West-facing view towards the Site from the Grade II Listed Memorial to German First World War Internees (Site 13)



MITIGATION

During Operation

- 9.118 National planning policies and planning guidance contained within the NPPF⁴ and its accompanying PPG³ as well as local planning policies contained within the London Plan and local policies within the Barnet's Local Plan³², require a mitigation response that is designed to take cognisance of the possible impacts upon heritage assets by the proposed development and avoid, minimise or offset any such impacts as appropriate.
- 9.119 Potential direct effects on known or unknown buried archaeological remains, in the case of the proposed development, relate to the possibility of disturbing, removing or destroying in situ remains and artefacts during ground-breaking works (including demolition, excavation, construction, and other works associated with the proposed development). Whilst the extent of the survival of some of the assets identified above is uncertain, it can be assumed that if substructure works for the proposed development are expected, these would remove any surviving archaeological remains that may be present.
- 9.120 This assessment has identified a **Moderate Negative** and significant direct effect upon the air raid shelters (Sites 62, 75 and 76) identified within the site and depicted on Figure 9.13 (Appendix 9.4) as these assets would be removed during construction works. It is recommended that the surviving structures should be further investigated and recorded by a Historic Building Specialist prior to commencement of the proposed development. Further archaeological work in the form of a watching brief should seek to establish the presence of any further surviving remains of air raid shelters which were opposite the old STC Building 3 (Site 67) and basement of Building 8 (Site 71). The requirement for these archaeological works could be secured through an appropriately worded planning condition. The walkover survey did not identify the presence of a possible air raid shelter in the triangular area of grass to the east of Building 8 as described in previous reports. It is possible that this asset has been removed or ground conditions have changed since the date of the last survey but it remains possible that buried remains of an air raid shelter survive in this area of the site. It is considered unlikely that any elements of the other air raid shelters which are known to have been present within the site survive.
- 9.121 This assessment has identified a **Minor Negative** and not significant direct effect on the STC Buildings and coal chute (Site 81) identified within the site. Archaeological work in the form of a watching brief should seek to identify, assess and record the extent of any surviving and identifiable buried remains of the coal chute (Site 81).
- 9.122 This assessment has identified a **Negligible** and not significant direct effect upon the Great Northern Cemetery (Site 20), now known as the New Southgate Cemetery and Crematorium. Archaeological work in the form of a watching brief is recommended in

the area of 'The Retreat' in order to identify any potential structural remains and if present to assess and record the extent of any buried remains relating to 'The Retreat'. The requirement for these archaeological works could be secured through an appropriately worded planning condition.

- 9.123 The exact scope and extent of any archaeological works required would be agreed in advance by the Greater London Archaeological Advisory Service (GLAAS). If significant archaeological remains were encountered, then further archaeological fieldwork, post-excavation analysis and reporting, including publication may also be required. Any such requirement would be determined by GLAAS.

During Operation

- 9.124 There would be no impact on buried archaeological remains following the completion of the proposed development and consequently no mitigations measures would be required for direct impacts on heritage assets within the site upon completion of the proposed development.
- 9.125 This assessment has judged that there would be no Long Term significant impacts on the setting of the Grade II Listed Memorial to German First World War Internees (Site 13). The magnitude of impact would be Low and the level of effect would be **Minor Negative**.

RESIDUAL IMPACTS

During Construction

- 9.126 Direct construction impacts are predicted upon known heritage assets within the site, however the mitigation set out above is designed to ensure that impacts upon the known or indeed impacts upon hitherto unknown buried remains are offset through preservation by record. Following the implementation of the outlined mitigation, residual effects upon the heritage assets would be of Minor Negative level and not significant.

During Operation

- 9.127 All operational effects upon the settings of designated assets will be as per the conclusions presented under Operational effects for the life of the proposed development.

Table 9.7 Summary

Description of Impact/Receptor	Potential Impact	Mitigation Measure	Residual Impact
During Construction			
The Great Northern Cemetery (Site 20)	Negligible to Low – direct impact/loss of information	Watching Brief of 'The Retreat' (Site 57)	Minor Negative
Standard Telephones and Cables (STC) Buildings (Sites 65-74 and 77-80) Coal Chute (Site 81)	Minor – direct impact/loss of information	Watching Brief of the Coal Chute (Site 81)	Minor Negative
Air Raid Shelters (Site 81)	Moderate – direct impact/loss of information	Historic Building Recording of upstanding structures Watching Brief of identified potential Air Raid Shelters location	Minor Negative
During Operation			
New Southgate Cemetery (Site 20)	Intervisibility – Medium magnitude impact	None Required	Negligible
Memorial to German First World War Internees (Site 13)	Intervisibility – Low magnitude impact	None Required	Minor Negative

CUMULATIVE IMPACTS

- 9.128 Cumulative impacts relating to cultural heritage are for the most part limited to indirect effects upon the settings of heritage assets. While there can, in some rare cases, be cumulative direct effects, none are anticipated to result from the construction or operation of the proposed development.
- 9.129 The possibility of cumulative effects, the potential for additional cumulative change, resulting from the effects of the proposed development in combination with other schemes, has also been considered. The proposed development has been found to have a non-significant effect upon two heritage assets, the Grade II Listed Memorial to First World War Internees (Site 13) and the non-designated New Southgate Cemetery (Site 20). The setting of both these assets relates to New Southgate Cemetery and its immediate urban surroundings, and it is this which contributes to an understanding and appreciation of the significance of these assets. Whilst Minor Negative effects are expected from the proposed development on its own, the cumulative developments considered here would be located largely to the northeast and south, beyond other built

environment features. Given the distance of these cumulative developments to the assets and the fact that they would not, in either an additive or synergistic manner, materially alter the surrounding urban character of the cemetery or the memorial there in, no significant cumulative effect have been identified.

CONCLUSIONS

- 9.130 This assessment has considered the likely significant effects upon heritage assets which could result from the proposed development. The conclusions of the assessment have been informed by the AB Heritage Archaeological Consultancy DBA (Appendix 9.2), the AOC Archaeology Addendum (Appendix 9.3) and a walkover and site visit to designated assets within the 1km study area which could have their setting affected.
- 9.131 This assessment has concluded that there would be a likely significant Moderate impact upon the known and potential remains of the air raid shelters to the east of STC Building 3 (Site 62), including upstanding entrances (Site 76) and potentially within the footprint of Building 8 (Site 71). Non-significant impact would be experienced by the STC coal chute (Site 81) and the potential structural remains of 'The Retreat' (Site 57) within the footprint of Building 3.
- 9.132 This assessment has also identified the possible presence of UXO (Unexploded Ordnance) and consideration should be given to having UXO monitoring during site works. This was based on evidence that the site has been impacted by two large bombs and potentially small High Explosives and/or incendiary bombs. The site was also the location of an active Home Guard bomb disposal team.
- 9.133 In order to mitigate the above effect and to identify any hitherto unknown buried archaeological remains, it is proposed to undertake a watching brief on targeted areas within the site to allow for recording of any archaeological features associated with the use of the site prior to and during the occupation by STC thus ensuring its preservation by record. The requirement for these archaeological works could be secured through an appropriately worded planning condition. A historic building recording survey of surviving air raid shelters is also recommended. This mitigation work would offset these impacts by ensuring that the loss of the assets is offset through preservation by record. Following the implementation of the outlined mitigation, residual effects upon the heritage assets would be of **Minor Negative** level and not significant.
- 9.134 Likely significant effects upon the setting of designated assets within the established study area have been considered. A non-significant setting effect is expected upon one designated asset.
- 9.135 No likely significant cumulative impacts are anticipated.
- 9.136 Following implementation of mitigation measures likely significant direct impacts will be offset and residual effects upon the heritage assets would be of **Minor Negative** level

and not significant. All operational impacts upon the settings of designated assets will be as per the conclusions presented under Operational Impact for the life of the proposed development.

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10.0 DRAINAGE AND WATER ENVIRONMENT

INTRODUCTION

- 10.1 This Chapter assesses the likely significant effects of the construction (including demolition) and operational phases of the proposed development in respect of drainage and water environment conservation.
- 10.2 This Chapter describes the legislative and policy framework; the assessment methodology; the baseline conditions at the site and surroundings; the likely significant environmental effects; the mitigation measures required to prevent, reduce or offset any significant adverse effects; and the likely residual effects after these measures have been employed. It should be read in conjunction with the following reports and assessments:
- Flood Risk Assessment Report (2021), Appendix 10.1;
 - Flood Risk Assessment & Hydrology Report (December 2015), Appendix 10.2;
 - Groundsure Enviroinsight report (November 2015), Appendix 10.3;
 - WSP Phase 1 Geo-Environmental Assessment (December 2007), Appendix 11.1

LEGISLATION AND POLICY CONTEXT

- 10.3 Where any development may have a direct or indirect effect upon drainage and water environment, there is a legislative and policy framework to ensure the proposals are considered with due regard for their impact to notable receptors. This section outlines the legislative framework, the national, regional and local planning policy and supplementary policy guidance/best practice that has been considered in this assessment.

Legislation

- 10.4 A summary of key relevant UK water legislation is provided below:
- Environmental Protection Act (1990)¹ sets out a range of provisions for environmental protection, including integrated pollution control for dangerous substances;
 - Water Resources Act (1991)² consolidated previous water legislation with regard to both the quality and quantity of water resources;
 - Environment Act (1995)³ established a new body (the Environment Agency (EA)) with responsibility for environmental protection and enforcement of legislation. This Act introduced measures to enhance protection of the environment including further powers for the prevention of water pollution;

- Water Industry Act (1999)⁴ consolidated previous legislation relating to water supply and the provision of sewerage services;
- Anti-Pollution Works Regulations (1999)⁵ provides powers to the EA to stop any activity (e.g. construction) that is giving or is likely to give rise to environmental pollution or to adequately enforce pollution control measures;
- Control of Pollution (Oil Storage) (England) Regulations (2001)⁶ imposes general requirements for preventing pollution of controlled waters from oil storage, particularly fixed tanks or mobile bowzers. Makes contravention a criminal offence;
- Water Act (2003)⁷ extends the provisions of the Water Resources Act (1991) and the Environment Act (1995) with regard to abstractions and discharges, water conservation and pollution control;
- The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017⁸ establish a framework for the protection of inland surface waters, estuaries, coastal waters and groundwater. The framework for delivering the Directive is through River Basin Management Planning; and
- Flood and Water Management Act (2010)⁹ makes provisions about the management of risks in connection with flooding and coastal erosion.

Policy

National

National Planning Policy Framework, 2021

- 10.5 Section 14 'Meeting the challenge of climate change, flooding and coastal change', Paragraph 153 and 154 of this section states the following

'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...

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 suitable adaptation measures, including through the planning of green infrastructure...'

- 10.6 Section 15 'Conserving and enhancing the natural environment', Paragraph 170 of this section states the following;

'174. Planning policies and decisions should contribute to and enhance the natural and local environment 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;... '

Regional

London Plan, 2021

- 10.7 The following policies are considered to be of relevance to this chapter:
- Policy GG6 Increasing Efficiency and Resilience – 'To help London become a more efficient and resilient city, those involved in planning and development must... ensure buildings and infrastructure are designed to adapt to a changing climate, making efficient use of water, reducing impacts from natural hazards like flooding and heatwaves, while mitigating against and avoiding contributing to the urban heat island effect.'
 - Policy SI12 Flood Risk Management – 'Current and expected flood risk from all sources across London should be managed in a sustainable and cost effective way in collaboration with the Environment Agency, the Lead Local Flood Authorities, developers and infrastructure providers...';
 - Policy S113 Sustainable Drainage – 'Development proposals should aim to achieve greenfield run-off rates and ensure that surface water run-off is managed as close to its source as possible in line with the drainage hierarchy. There should also be a preference for green over grey features...'; and
 - Policy S117 Protecting and Enhancing London's Waterways – 'Development Plans should support river restoration and biodiversity improvements. Development proposals that facilitates river restoration, including opportunities to open culverts, naturalise river channels, protect and improve the foreshore, the floodplain, riparian and adjacent terrestrial habitats, water quality as well as the heritage value, should be supported. Development proposals to impound and narrow waterways should be refused'.

Local

London Boroughs of Barnet, Brent, Ealing, Harrow, Hillingdon and Hounslow Strategic Flood Risk Assessment (SFRA), 2018¹⁰

- 10.8 The combined area covered by the SFRA features several cross-boundary Environment Agency-designated Main Rivers, including the Dollis Brook, Duke of Northumberland's River, River Brent, River Crane, River Colne, River Lee, River Pinn, River Thames and

Yeading Brook. These rivers cross boroughs that make up six of the seven local authorities that form the West London Alliance (WLA). Due to these established associations, groupings, and shared borough boundaries, a joint SFRA is beneficial for all Boroughs.

- 10.9 The overarching aim of this SFRA is to provide the evidence base for ensuring development is steered away from areas identified most at risk from all sources of flood risk, reducing the risk of flooding to residents and buildings.

London Borough of Barnet Local Flood Risk Management Strategy, 2017

- 10.10 The Local Strategy outlines ten local objectives. These local objectives have been developed to be consistent in line with the national objectives, which have been previously outlined in the National Flood and Coastal Erosion Risk Management Strategy (2011) and have been developed in collaboration with the relevant Risk Management Authorities.

- 10.11 This Local Strategy sets out to achieve the following:

- Produce a summary of local flood risk within the London Borough of Barnet;
- Identify the roles and responsibilities of Risk Management Authorities;
- Demonstrate The London Borough of Barnet Council’s position as a Lead Local Flood Authority;
- Outline the national and local objectives and measures for managing flood risk within Barnet; and
- Identify the possible funding sources and the feasible implementation approaches

ASSESSMENT METHODOLOGY

Scope of the Assessment

- 10.12 The scope of this assessment includes the following:

- identification of policies;
- review of available baseline information;
- summary of key supporting documents (i.e. Flood Risk Assessment); and,
- identification of impacts during construction and operational phases.

Baseline Data Collection

- 10.13 The sources of information reviewed as part of the assessment include:

- Flood Risk Assessment Report (2021), Appendix 10.1;

- Flood Risk Assessment & Hydrology Report (December 2015), Appendix 10.2;
- Groundsure Enviroinsight report (November 2015), Appendix 10.3;
- WSP Phase 1 Geo-Environmental Assessment (December 2007), Appendix 13.1;
- Topographic Survey produced by BW Surveys (2007); and,
- Environment Agency (EA) data (www.environment-agency.gov.uk);

Study Area

10.14 This study serves to identify any hydrological, geological, hydrogeological or other relevant features within 500m of the application site.

Assessment Criteria

10.15 The criteria for determining the magnitude of any identified impacts has been outlined in Table 10.1.

Table 10.1 Magnitude of Change

Magnitude	Criteria
Major	Significant deterioration/improvement in conditions or circumstances
Moderate	Readily Apparent change in conditions or circumstances
Minor	Perceptible change in conditions or circumstances
Negligible	Insignificant change in conditions or circumstances

10.16 The sensitivity of receptors has been determined by consideration to existing designations and quantifiable data or through professional judgement. The scale used to determine the significance of effects is included as Table 10.2.

Table 10.2 Matrix for determining the significance of effects

		Sensitivity of Receptor			
		High	Medium	Low	Negligible
Magnitude of Change	Major	Major	Moderate to Major	Minor to Moderate	Negligible
	Moderate	Moderate to Major	Moderate	Minor	Negligible
	Minor	Minor to Moderate	Minor	Negligible to Minor	Negligible
	Negligible	Negligible	Negligible	Negligible	Negligible

ASSUMPTIONS AND LIMITATIONS

- 10.17 The assessment of construction phase effects is based on the construction methodology as described in Chapter 5.0 of this ES.

BASELINE CONDITIONS

Geology and Hydrogeology

- 10.18 The Groundsure Enviroinsight Report indicates that the site is underlain by London Clay Formation, with superficial deposits of Dollis Hill Gravel.
- 10.19 The EA website indicates that the site is not located within a designated Source Protection Zone (SPZ), however the Groundsure Enviroinsight Report indicates a Secondary (A) aquifer within superficial deposits beneath the site, as well as two further Secondary (A) aquifers within a 500m radius of the site. The bedrock is classified as 'unproductive', with no groundwater abstractions reported within a 500m radius of site.
- 10.20 The Groundsure Enviroinsight Report also indicates two sites with 'high leaching potential', located 345m and 363m from the site.
- 10.21 Existing surface water features within 500m of the site have been summarised within Table 10.3.

Table 10.3 Summary of Surface Water Features

Feature	Distance (m)	Direction
Existing Attenuation Pond	On site	N/A
Culvert	259	S
Tertiary	367	SW
Pymme's Brook (Primary River)	393	E

Surface Water and Flood Risk

Existing Site

- 10.22 The existing surface water drainage regime for the site represents a typical brownfield site, with a number of private and adopted drainage networks.
- 10.23 Potential sources of surface and groundwater contamination associated with the existing usage of the site include the following:

- oil residues and sediments from vehicles using internal / access roads and car parking areas within the Site; and
- wastewater (sewage effluent, water from sinks, showers and other uses) from occupation of the commercial premises.

Surface Water Drainage

10.24 Topographical survey information for the site identifies several existing gullies and inspection chambers located across the site. It is presumed that this infrastructure discharges to the public sewer network in the vicinity of the site.

Foul Drainage

10.25 Sewer records identify a 225mm public foul water sewer running from north to south along Brunswick Park Road, to the east of the site. The public foul sewer then appears to head east along Benfleet Way, although the sewer records identify the sewers on Benfleet Way as being subject to an adoption agreement.

Future Baseline

10.26 It is anticipated that the baseline water quality, flood risk and drainage conditions described above would remain largely unchanged if the proposed development site did not proceed. However, considering the potential effects of climate change, it is likely that uncontrolled surface runoff from the site would still increase in the future.

POTENTIAL IMPACTS

- 10.27 A number of sensitive receptors have been identified within the vicinity of the site. Based on the available baseline data the sensitivity of these receptors has been outlined below:
- Surface water – Considered to be ‘medium’ sensitivity receptors due to the proximity of these features to the proposed development;
 - Groundwater – Due to the underlying London Clay, which is relatively impermeable, this receptor is considered to be of a ‘low’ sensitivity;
 - Residential properties – considered to be a ‘high’ sensitivity receptor given the large number of dwellings that are located downstream;
 - Potable water supplies – Whilst in a ‘seriously water stressed’ area, Affinity Water have a Water Resources Management Plan in place and therefore this is considered ‘medium’ sensitivity; and
 - Sewerage infrastructure – considered ‘low’ sensitivity given that any enabling improvement works would be implemented as part of the development.

During Construction

Potential Contamination of Surface and Groundwater

- 10.28 There is the potential for contamination of surface water runoff from construction activities, which could subsequently enter the underlying groundwater and other surrounding surface water features.
- 10.29 Activities which could give rise to the potential for run-off at the site to be contaminated with heavy metals, hydrocarbons, suspended solids and construction materials include the following:
- the operation of construction vehicles;
 - general construction and demolition activities and the storage of associated fuels and chemicals; and
 - the siting and operation of site construction compound and the construction of proposed site roads.
- 10.30 If untreated surface water runoff is discharged from the site, this could impact on the chemical and biological quality of the downstream watercourses. The movement of plant and machinery has the potential to damage soil stability, e.g. creating 'water logged' conditions during wet weather and dust during dry periods. This, as well as the stockpiling of spoil and other construction materials, has the potential to increase sedimentation on-site and in downstream watercourses. Such movements can be expected across the site, but can be controlled by the provision of designated haulage routes and tracks for use by construction vehicles, and appropriate phasing of the development.
- 10.31 The storage of the construction materials and hazardous substances (e.g. diesel) has the potential to impact on surface and groundwater quality if appropriate control / mitigation measures are not adopted.
- 10.32 The proposed development will require works to be undertaken, such as demolition, top soil stripping and stockpiling; trench excavations (including for the installation of gas supply, water supply, surface water and foul water sewerage infrastructure), and installation of building foundations. These activities have the potential to increase the quantity of suspended solids (dusts and particulates) in surface water run-off on the site.
- 10.33 The sensitivity of surface water is 'medium' and the magnitude of change, prior to mitigation, is 'moderate'. Therefore, as a result of construction there is likely to be a direct effect on groundwater of **Moderate Negative** significance prior to the implementation of mitigation.

10.34 The sensitivity of groundwater is 'low' and the magnitude of change, prior to mitigation, is 'moderate'. Therefore, as a result of construction there is likely to be a direct effect on groundwater of **Minor Negative** significance prior to the implementation of mitigation. Potential impacts on deep aquifers are addressed in Chapter 11.0 of this ES.

Effect of Increased Surface Water Run-off

10.35 Construction activities such as top soil stripping, the clearance of vegetation and vehicles movements are likely to result in soil compaction and ultimately less water being attenuated on site by vegetation and within the unsaturated soil matrix.

10.36 However, given the predominantly brownfield nature the site, and the presence of the existing on site attenuation pond, there is not likely to be a significant increase in run off during the construction phases.

10.37 The EA's indicative flood plain maps indicate that the site is located within 'Flood Zone 1 – Low Risk' from fluvial flooding. As such, construction activities are unlikely to be affected by flooding on site.

10.38 The sensitivity of the downstream receptors is considered to be 'high' and the magnitude of change, prior to mitigation is 'moderate'. There would therefore be a temporary, short-term effect on surface water run-off of **Moderate to Major Negative** significance prior to the implementation of mitigation.

During Operation

Potential Contamination of Surface and Groundwater

10.39 Contamination of surface water run-off and groundwater may lead to a deterioration of water quality in water receptors beneath and in the vicinity of the proposed development.

10.40 Potential sources of surface and groundwater contamination during operation of the proposed development are anticipated to be minimal, representing little change from the existing situation, and thus limited to the following:

- oil residues and sediments from vehicles using internal / access roads and car parking areas within the site; and
- wastewater (sewage effluent, water from sinks, showers and other domestic uses) from occupation of the residential and commercial premises.

10.41 It is considered that the nature of the proposed development represents a relatively low risk in terms of the potential for water pollution, given that storage and movement of hazardous materials and / or substances is not likely to be a frequent occurrence.

10.42 The sensitivity of the receiving surface water is considered to be 'medium' and the magnitude of change, prior to mitigation, is 'negligible'. Therefore, there is likely to be

a direct, permanent, long-term effect on surface water of **Negligible** significance prior to the implementation of mitigation.

10.43 The sensitivity of the receiving groundwater is considered to be 'low' and the magnitude of change, prior to mitigation, is 'negligible'. Therefore, there is likely to be a direct, permanent, long-term effect on groundwater of **Negligible** significance prior to the implementation of mitigation.

10.44 Potential impacts on deep aquifers are addressed in Chapter 11.0 of this ES.

Increased Surface Water Runoff

10.45 The change of land use to accommodate the development and the associated likely increase in impermeable areas may result in an increase in the volume and rate of surface water runoff.

10.46 The sensitivity of the downstream receptors is 'high' and the magnitude of change is considered to be 'moderate' prior to mitigation. Therefore, there is likely to be a direct, permanent, long-term effect on downstream receptors of **Moderate to Major Negative** significance prior to the implementation of mitigation.

Increased Surface Water Runoff

10.47 The change of land use to accommodate the development and the associated likely increase in impermeable areas may result in an increase in the volume and rate of surface water runoff.

10.48 The sensitivity of the downstream receptors is 'high' and the magnitude of change is considered to be 'moderate' prior to mitigation. Therefore, there is likely to be a direct, permanent, long-term effect on downstream receptors of **Moderate to Major Negative** significance prior to the implementation of mitigation.

Reduced Groundwater Recharge

10.49 The proposed development will most likely result in an increase in hardstanding across the site however given that the site is underlain by relatively impermeable London Clay the impact on groundwater recharge rate in the area is likely to be limited.

10.50 The sensitivity of groundwater is 'low' and the magnitude of change, prior to mitigation, is 'minor'. Therefore, there is likely to be a direct, temporary, short-term effect on groundwater of **Negligible to Minor Negative** significance prior to the implementation of mitigation.

Increased Water Usage Demand

- 10.51 The proposed development site is likely to result in an increase in potable water demand. In addition, landscaped areas of the proposed development will potentially require watering during certain times of the year.
- 10.52 The sensitivity of the water supply is 'medium', and the magnitude of change is 'moderate'. Therefore, there is likely to be a direct, permanent, long-term effect on the potable water supply of **Moderate Negative** significance prior to the implementation of mitigation.

Increased foul drainage

- 10.53 The foul sewage output from the site is likely to increase from that of current levels. However, any reinforcement works that are required to the existing network to accommodate the proposed development would be funded by the developer.
- 10.54 The sensitivity of the sewerage infrastructure is 'low', and the magnitude of change is 'moderate'. Therefore, there is likely to be a direct, permanent, long-term effect on the sewerage infrastructure of **Minor Negative** significance prior to the implementation of mitigation.

MITIGATION

During Construction

Potential Contamination of Surface and Groundwater

- 10.55 A detailed Construction Environmental Management Plan (CEMP) for the proposed development would contain measures to manage and control all ground works, including management of wastewater and the storage of fuel and chemicals. The CEMP would detail the procedures and methods that are to be followed by the construction workforce in order to minimise the potential effects of construction on the site on groundwater and surface water features. The detailed CEMP would be secured by planning condition.
- 10.56 All construction activities would be undertaken in accordance with relevant pollution prevention legislation and guidance (see paragraph 10.4 above).
- 10.57 Fuel, oil and chemicals would be stored in secondary containment and located a minimum of 10m from a watercourse or 50m from a well or borehole. The secondary containment system must provide storage of at least 110% of the tank's maximum capacity and ensure that any valves, filters, sight gauges, vent pipes or other ancillary equipment are also situated within the secondary containment system and arranged so that any discharges are contained.
- 10.58 Construction vehicles would be regularly maintained to reduce the risk of hydrocarbon contamination and will only be active when required. Other activities associated with the use of construction vehicles (such as wash down facilities) would be appropriately

managed to contain contaminants and regulate the release of water back into the natural environment. In addition, designated haul routes around the site would be implemented to minimise disturbance of soil and the subsequent effects of sedimentation on ground and surface waters within the vicinity of the application site.

- 10.59 To ensure the protection of water quality and to protect receiving waters from sediment load and contaminants, surface runoff from construction activities would be managed by the appropriate use of temporary bunding and detention basins. Detention basins are beneficial by allowing for isolation and on-site treatment of sediment laden or chemically contaminated surface runoff before it is released to the natural aquatic environment / sewerage network.
- 10.60 The careful management of pollutant sources, (e.g. storage of fuel from construction vehicles), the construction of the temporary surface water drainage network and adherence to best practice guidelines as part of the CEMP would enable the potential impact of contamination on surface and groundwater to be effectively managed, reduced and / or eliminated.
- 10.61 To mitigate potential impacts associated with the dewatering of excavations consideration will be given CIRIA C750: Groundwater Control – Design and Practice.
- 10.62 The water pumped or abstracted during a groundwater control operation (i.e. dewatering of excavations) is legally classified as 'trade effluent' and as such a discharge consent would be required if the water is to be discharged to a receiving watercourse. Discharge consents set maximum limits for suspended solids within discharged water and as such control measures may need to be in place to ensure that these limits are not exceeded.
- 10.63 It is anticipated that any groundwater encountered during excavation works will be pumped to a temporary surface water drainage network. The drainage network would act as a series of detention basins allowing sediment to settle out prior to discharge.
- 10.64 Further detailed measures would be outlined within the CEMP that would be developed and agreed with Barnet Council, the Environment Agency and other regulators/consultees, as required, prior to the commencement of the construction activities. Contractors working on the site would be then be required to comply with the CEMP.
- 10.65 The sensitivity of surface water is 'medium' and the magnitude of change, following mitigation, is 'negligible'. Therefore, there will be a **Negligible** effect on surface water following the implementation of mitigation measures.
- 10.66 The sensitivity of groundwater is 'low' and the magnitude of change, following mitigation, is 'negligible'. Therefore, there will be a **Negligible** effect on groundwater following the implementation of mitigation measures.

Increased Surface Water Run-off

- 10.67 The existing drainage network and attenuation pond will provide on-site attenuation for surface water flows during construction activities, thereby reducing on site and downstream flood risk during the construction phase.
- 10.68 Surface run-off should be disposed of appropriately, either tankered off-site or discharged following agreement with the appropriate authority.
- 10.69 The sensitivity of downstream residential receptors is considered to be 'high' and the magnitude of change, following mitigation, is 'negligible'. Therefore, there is likely to be a **Negligible** effect on downstream residential receptors following the implementation of mitigation measures.

During Operation

Potential Contamination of Surface and Groundwater

- 10.70 Any surface water discharges from private and communal car parking areas and high risk areas (i.e. major highway junctions) would incorporate appropriate pollution control measures (i.e. trapped gullies, manholes with catch pits etc.) to minimise the risk of polluted surface water runoff entering the receiving network. The proposed development will utilise SuDS in the form of detention basins and permeable paving. The use of these features will help to reduce the potential impact of point source pollution incidents and can help improve the quality of surface water discharges by allowing the removal of suspended matter prior to discharge.
- 10.71 A SuDS Management Plan will be provided at detailed design stage which will identify the following:
- The function of SuDS;
 - How and why it works on the site;
 - Impacts on amenity and wildlife, indicating how they can be enhanced; and
 - Health and safety issues.
- 10.72 The incorporation of the aforementioned mitigation measures would serve to attenuate and improve the quality of surface water runoff from the site, minimising the risk of contaminants such as hydrocarbons and silts entering surrounding surface water courses and underlying groundwater.
- 10.73 The sensitivity of surface water is considered to be 'high' and the magnitude of change, following mitigation, is 'negligible'. Therefore, there is likely to be a **Negligible** effect on surface water following the implementation of mitigation measures.
- 10.74 The sensitivity of groundwater beneath the site is considered to be 'low' and the magnitude of change, following mitigation, is 'negligible'. Therefore, there is likely to be

a **Negligible** effect on groundwater following the implementation of mitigation measures.

Increased Surface Water Runoff

- 10.75 Runoff generated by the proposed development will be intercepted and routed to through the development away from buildings. The drainage strategy will route all storm water flows through the development, prior to discharging to on site attenuation features.
- 10.76 In accordance with regional and local policy, the attenuation features would offer sufficient storage to enable the restriction of flows to the predevelopment greenfield rates throughout the 100 year design life (+40% climate change) of the development.
- 10.77 This strategy will inherently offer significant betterment, and therefore reduce the risk of flooding to the downstream catchment.
- 10.78 Given that the existing on-site attenuation feature is unlikely to have been designed to these current design standards, it is likely that the proposed system will again offer significant betterment with respect to runoff volumes.
- 10.79 The sensitivity of the downstream receptors is considered to be 'high' and the magnitude of change, following mitigation, is considered to be 'moderate'. Therefore, there is likely to be a **Moderate** to **Major Positive** effect from surface water runoff following the implementation of mitigation measures.

Reduced Groundwater Recharge

- 10.80 Given that the site is underlain by relatively impermeable London Clay, it is considered unlikely that groundwater recharge will be significantly affected by the proposed development.
- 10.81 The sensitivity of the groundwater resource is considered to be 'low' and the magnitude of change following mitigation is 'negligible'. Therefore, there is likely to be a direct, permanent, long term **Negligible** effect on the groundwater resource following the implementation of mitigation measures.

Increased Water Usage Demand

- 10.82 Affinity Water has prepared a Water Resources Management Plan which identifies how they intend to maintain the balance between supply and demand for water over the next 25 years. In calculating the water demand estimates the Water Resources Management Plan takes into consideration the potential growth in housing in the supply area over the 25 year period.
- 10.83 The proposed development would seek to minimise potable water consumption throughout the development. In accordance with the London Plan, the proposed

development would aim for the water consumption target of 105 litres or less per head per day.

10.84 Opportunities to implement water conservation measures across the development to conserve water resources will be given at the detailed design stage and may include measures such as water metering, dual flush toilets and the provision of rainwater recycling.

10.85 The sensitivity of the water supply is considered to be 'medium' and the magnitude of change, following mitigation, is considered to be 'minor'. Therefore, there is likely to be a **Minor Negative** effect on the potable water supply following the implementation of mitigation measures.

Increased Foul Drainage

10.86 Any proposed sewerage to serve the development will be designed and constructed in accordance with current regulations. Given that the phasing of the proposed development is likely to require existing drainage networks to stay operational, any diversion to these networks would be timed appropriately to minimise the impact.

10.87 The sensitivity of the foul drainage sewerage network to increases in foul drainage from the site is 'low' and the magnitude of change, following mitigation, is 'negligible'. Therefore, there is likely to be a **Negligible** effect on the foul drainage and sewerage network.

RESIDUAL IMPACTS

10.88 Residual impacts are stated in the section above and summarised below.

Table 10.4 Summary of Residual Impacts and Mitigation/Enhancement

Receptor	Mitigation/Enhancement	Residual Impact
During Construction		
Surface Water and Ground Water Contamination	Measures set out in CEMP secured by planning condition.	Negligible
Runoff (Downstream Residential Receptors)	Existing drainage network.	Negligible
During Operation		
Surface Water and Ground Water Contamination	Proposed SUDS strategy and Management Plan.	Negligible
Surface Water Runoff	Proposed SUDS strategy and Management Plan.	Moderate to Major Positive

Reduced Groundwater Recharge	N/A	Negligible
Increased Water Usage Demand	Water conservation measures included in development at detailed design stage.	Minor Negative
Increased Foul Drainage Demand	N/A	Negligible

CUMULATIVE IMPACTS

During Construction

- 10.89 Water resources and flood risk associated with construction impacts are typically site-specific. Consequently, it is likely that there would be no cumulative interaction between the proposed development and the cumulative developments in this regard. A **Negligible** cumulative impact is anticipated.

During Operation

- 10.90 All committed major developments in the area surrounding the proposed development will have to satisfy the requirements for the control of surface runoff within the PPG, i.e. discharge at the current greenfield runoff rate or the provision of a betterment in runoff rates post-development. Therefore, the cumulative effect of other local developments should result in a net positive effect through reducing overall flood risk in the area.
- 10.91 The cumulative effects of new development on water supply and foul drainage infrastructure are managed at the regional level by the appropriate water companies in consultation with statutory bodies such as the Local Planning Authorities and the Environment Agency. The cumulative effect of increases in mains water and foul drainage demand have to be offset by sustainable design and water efficiency measures and infrastructure contributions for sewage treatment works, where necessary. These measures should collectively ensure that the cumulative effects on regional water resources and treatment performance are controlled to an acceptable level during both the demolition and construction and the operation of the proposed development.

CONCLUSION

- 10.92 In terms of the construction phase, it is assumed that suitable mitigation measures would be in place to mitigate any adverse impacts in terms of potential pollution to ground and surface waters, ensuring compliance with relevant planning policies and legislation. All residual impacts are considered to be **Negligible**.

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- 10.93 During the operational phase there is the potential for a residual impact to arise in relation to increases in potable water demand (**Minor Negative**) from the site.
- 10.94 In relation to surface water run-off and flood risk and in order to comply with policy, the development would attenuate flows for the brownfield development back to the greenfield rates. The proposed development is therefore expected to have a **Moderate** to **Major Positive** impact on surface water runoff, reducing flood risk within the downstream catchment.

REFERENCES

- 1 Environmental Protection Act 1990 (c. 43). London: Her Majesty's Stationery Office.
- 2 Water Resources Act 1991 (c. 57). London: Her Majesty's Stationery Office.
- 3 Environment Act 1995 (c. 25). London: Her Majesty's Stationery Office
- 4 Water Industry Act 1999 (c. 9). London: Her Majesty's Stationery Office
- 5 Anti-Pollution Works Regulations S.I. 1999 No. 1006. London: Her Majesty's Stationery Office
- 6 Control of Pollution (Oil Storage) (England) Regulations S.I. 2001 No. 2954. London: Her Majesty's Stationery Office.
- 7 Water Act 2003 (c. 37). London: Her Majesty's Stationery Office.
- 8 Water Environment (Water Framework Directive) (England and Wales) Regulations 2017
- 9 Flood and Water Management Act 2010 (c. 29). London: Her Majesty's Stationery Office
- 10 London Boroughs of Barnet, Brent, Ealing, Harrow, Hillingdon and Hounslow Strategic Flood Risk Assessment (SFRA), 2018

11.0 GROUND CONDITIONS

INTRODUCTION

- 11.1 This Chapter of the ES presents a baseline overview of the geology, hydrogeology and potential land contamination issues in relation to the proposed development site and provide an assessment of the potential effects of the proposed development. Where significant effects have been identified, the chapter proposes mitigation control measures and assess the significance of any residual effects following the implementation of these.
- 11.2 This Chapter should be read alongside the following Appendices:
- Phase 1 Geoenvironmental Assessment Report, WSP Environmental Ltd (December 2007) (Appendix 11.1); and
 - Phase 2 Geoenvironmental and Geotechnical Site Investigation Report, RSK Environment Ltd (April 2021) (Appendix 11.2).

LEGISLATION AND POLICY CONTEXT

National

National Planning Policy Framework

- 11.3 The National Planning Policy Framework (NPPF) – revised July 2021 sets out the Government’s planning policies and how these are expected to be applied. The NPPF considers three dimensions to sustainable development: economic, social and environmental. In terms of land contamination, the environmental role aims to contribute to protecting and enhancing our environment, (paragraph 170) by:
- *“Protecting and enhancing valued landscapes, geological conservation interests and soils”;*
 - *“Preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water or noise pollution or land instability”;* and
 - *“Remediating and mitigating despoiled, degraded, derelict, contamination and unsuitable land where appropriate”.*
- 11.4 The NPPF sets out key core principals to land contamination including:

- Contribute to conserving and enhancing the natural environment and reducing pollution. Allocations of land for development should prefer land of lesser environmental value, where consistent with policies in the NPPF; and
- Encourage the effective use of land by reusing land that has been previously developed (brownfield land), provided that it is not of high environmental value).

Water Framework Directive

- 11.5 The 1980 Groundwater Directive 80/68/EEC and the 2006 Groundwater Daughter Directive 2006/118/EC of the WFD are the main European legislation in place to protect groundwater. The policies set out provisions for protecting and enhancing the quality of surface waters and groundwaters by assessing all ground and surface waters against a number of criteria including environmental quality standards for river basin specific pollutants. These standards specify maximum permissible concentrations for specific pollutants in controlled waters.

Regional Policy

London Plan

- 11.6 The adopted London Plan (2021) sets out policy (Policy 5.21) on contaminated land and hazardous sites. The policy states that developments should include appropriate measures to ensure that development on previously contaminated land does not activate or spread contamination.
- 11.7 The consultation draft of the New London Plan was published in December 2017. No new policy is indicated that differs materially from the adopted London Plan. However, Policy SI7 (Reducing waste and supporting the circular economy) states that referable applications should aim to be net zero-waste. In this regard the policy expects a Circular Economy Statement, which should show how all materials arising from demolition and remediation works will be re-used and/or recycled.

Local Policy

London Borough of Barnet Contaminated Land Strategy (2012)

- 11.8 Barnet's Local Plan was first adopted in April 2000, with the most recent document revised in 2012. The Local Plan sets out the council's proposals for the future development of the borough, including a strategy with regards to the inspection of potentially contamination land and deciding what remediation (if any) is required. The

Local Plan included reference to the local Contaminated Land Strategy which sets out the councils expectations for the assessment of sites.

ASSESSMENT METHODOLOGY

Guidance

- 11.9 Apart from the NPPF, the key regulatory regime for managing contaminated land is Part 2A of the Environmental Protection Act (DEFRA, 1990). The framework for the assessment of the contamination status of the site is in line with the technical approach presented in the EA document CLR 11 ("Model Procedures for the Management of Land Contamination" vii. CLR 11 provides the technical framework for applying a risk management process when dealing with land affected by contamination, the above approach fulfilling the requirements of a non-intrusive Preliminary Risk Assessment; and the relevant British Standard, BS 10175:2011 Investigation of potentially contaminated sites - code of practice (+A2:2017).

Scope of the Assessment

- 11.10 The scope of works for the assessment contains the following elements:
- Assessment of the potential for contamination soil and/or groundwater (sources);
 - Assessment of potential migration pathways within the saturated and unsaturated zones beneath the site (pathways);
 - Assessment of potential effect of contaminated land on groundwater, end users, and other sensitive receptors (receptors); and
 - Qualitative assessment of significance and magnitude of land contamination.
- 11.11 The assessment of ground conditions has involved the review and collation of information pertaining to the current condition of the soils and groundwater at the site and the potential risks they could pose to the environment and future site users. This information has been used to characterise baseline conditions for the site and to assess the need for mitigation to protect future users and the environment from any significant contaminant source identified. The information has been reviewed in the context of the proposed development to create a conceptual site model and assess the magnitude and significance of potential impacts.
- 11.12 The includes a review of the Environment Agency (EA) and British Geological Survey (BGS) websites. Data is collated through a review of the following sources of information and the data reviewed forms the basis of the assessment of likely significant effects of

the proposed development on the environment in respect of land contamination and ground conditions.

- Phase 1 Geoenvironmental Assessment Report, WSP Environmental Ltd (December 2007) (Appendix 11.1);
- Phase 2 Geoenvironmental and Geotechnical Site Investigation Report, RSK Environment Ltd (April 2021) (Appendix 11.2);
- British Geological Survey (BGS) Viewer (publicly available on-line); and
- Environment Agency dataset records (publicly available on-line).

11.13 The results of the Phase 2 environmental and geotechnical assessment in the April 2021 RSK Geo-environmental and Geotechnical Site Investigation Report (Technical Appendix 11.2), only relate to a portion (Phase 1 development area) of the larger site boundary. This Phase 1 area covers a footprint of approximately 4.5 hectares and is currently occupied by the Comer Business and Innovation Centre, St Andrew the Apostle Greek Orthodox School and associated external car parking facilities and soft landscaping areas.

11.14 The Phase 2 environmental and geotechnical report provides results of the intrusive investigation comprising the formation of several investigatory boreholes up to a maximum depth of 40m below ground level (bgl), in addition to mechanically excavated trial pits up to 3m bgl. The borehole information is also associated with in-situ testing and soil sample collection, ground gas and groundwater monitoring and a programme of environmental and geotechnical laboratory analysis.

11.15 The report includes a refined conceptual site model, generic quantitative risk assessment (GQRA) to assess complete pollutant linkages and identification of mitigation measures for complete pollutant linkages. Recommendations with respect to foundations and infrastructure design are provided based on interpretation of the ground conditions and geotechnical data. The findings of the RSK report including descriptions of the site setting, developmental history and baseline conditions are summarised in subsequent sections of this Chapter.

Assessment of Significance

11.16 A judgement has been made on the importance and/or sensitivity of the receptors involved, as indicated in Table 11.1.

Table 11.1 Method for Determining Sensitivity/Importance of the Environment

Receptor sensitivity	Description
High	Areas of critical topography, including steep slopes Inner groundwater source protection zones (SPZ 1) Areas of high groundwater vulnerability Principal aquifers Areas of known/confirmed contaminated land/groundwater Rivers with a Grade A water classification Areas of flood risk (Flood Zones 2 and 3) End users of the site Neighbouring properties and residents Areas with a risk of unexploded ordnance (UXO)
Medium	Outer groundwater source protection zones and total catchment areas (SPZ 2 and SPZ 3) Secondary aquifers Areas with intermediate groundwater vulnerability Rivers with a Grade B water classification.
Low	Industrial site topography Rivers with a Grade C or D water classification Unproductive strata Areas with low groundwater vulnerability.

11.17 Table 11.2 gives generic criteria for determining levels of magnitude of change on the physical environment.

Table 11.2 Magnitude of Effect

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

11.18 The assessment of effects can be described as follows:

- **Major:** Considerable effect (by extent, duration or magnitude) of more than local significance or in breach of recognised acceptability, legislation or policy or standards;
- **Moderate:** Some effect (by extent, duration or magnitude) which may be considered of moderate significance;
- **Minor:** Slight, very short of highly localised effect of low or no significance; or
- **Negligible:** Imperceptible or no significant effect to an environment, resource or receptor.

11.19 The categories used when classifying the overall significance of potential impacts by considering the sensitivity of receptor and the magnitude of effect, are shown in Table 11.3.

Table 11.3 Effect Significance Matrix

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

11.20 The nature of an effect can be classified as negative, negligible (or no effect), or positive:

- **Negative:** Classifications of significance indicate disadvantageous or negative effects to an environmental resource or receptor, which may be of **Minor, Moderate, or Major** significance;
- **Negligible:** Classifications of significance indicate imperceptible effects to an environmental resource or receptor; or
- **Positive:** Classifications of significance indicate advantageous or positive effects to an environmental resource or receptor, which may be of **Minor, Moderate or Major** significance.

11.21 Timescales associated with effects are categorised as follows:

- **Short to Medium Term:** Timescales where the effect is temporary and last for the period of the construction works or less; or
- **Long Term:** Timescales where the effect remains for a substantial time, perhaps permanently, after construction even though the activity that created it may be ceased some time ago.

11.22 The assessment has considered the potential for cumulative effects including:

- Type 1 effects: Combined effect of individual impacts from the proposed development; and
- Type 2 effects: Impacts from the proposed development with those from planned or reasonably foreseeable other developments.

ASSUMPTIONS AND LIMITATIONS

11.23 The opinions and recommendations expressed in this assessment are largely based upon a desk study/Geo-environmental Assessment undertaken by WSP Environmental Ltd in

December 2007 (Appendix 11.1). Whilst a more recent Geoenvironmental and Geotechnical Site investigation Report (Appendix 11.2) has been prepared by RSK in April 2021 this only relates to the Phase 1 development areas and not the wider site footprint. Outside of the Phase 1 development area, where the preliminary risk assessment has deemed investigation works to be necessary, intrusive works will be undertaken to address any future planning conditions in advance of the development works commencing.

- 11.24 Given the age of the 2007 Geoenvironmental Assessment undertaken by WSP Environmental Ltd, it has been assumed that these are no significant changes to the site baseline conditions associated with changes to the site configuration of land use in the intervening period.
- 11.25 This report is based upon information obtained from third party sources together with observations from the site walkover survey and findings from the Geoenvironmental and Geotechnical Site Investigation undertaken by RSK. During the investigation works, due to the operational status of the site at the time of the site investigation, the scope, extent and geographical access for the intrusive works undertaken were constrained by the existing structures and activities present on site.

BASELINE CONDITIONS

Site Setting

- 11.26 The baseline has been defined by the site walkover survey completed by RSK and a review of environmentally relevant data provided within the preceding WSP Environmental Ltd report (December 2007).
- 11.27 The site boundary, as detailed within the WSP Environmental Ltd report (December 2007), covers an area of approximately 16.5 hectares and is occupied by a business centre, St Andrew the Apostle Greek Orthodox School, and large areas of associated external car parking facilities. The business centre is occupied by commercial buildings including the Comer Business and Innovation Centre. The majority of the site comprises external space occupied by car parking, mounded soft landscaping areas with a large pond located within the eastern part of site. The building units on site are accessible by paved roads throughout the business park.
- 11.28 Intrusive investigation works have only been conducted within a portion of the larger site boundary, as indicated by Figure 2 of the April 2021 RSK Geo-environmental and Geotechnical Site Assessment Report (Appendix 11.2). This boundary covers an area of approximately 4.5 hectares located within the eastern part of the larger site boundary. This area comprises predominately external soft landscaping and external car parking

areas, a large pond feature and the St Andrew the Apostle Greek Orthodox School. Commercial buildings of the Comer Business and Innovation Centre are located directly west of the RSK intrusive investigation site boundary.

Site History

- 11.29 On the earliest available historical map records (1863) the site was shown to comprise land associated with the adjacent cemetery. A ground feature in the form of a cutting was noted towards the west of site from 1879. Gravel pits were noted within the northern part of the larger site boundary between 1879 and 1896.
- 11.30 From 1938 onwards, the site was noted to comprise a sports ground, with an accompanying miniature rifle range, pavilion and tank within the northern part of site. At this time, the southern part of site was noted to be occupied by New Southgate Works (Telephones and Cables), with a number of large warehouse style structures across the site. Two pond features separated by a weir were noted within the eastern part of site from 1981. Alternations to the warehouse buildings were noted between 1990 and 2000, with the existing site configuration noted from map records dated 2007 onwards.

Geology

- 11.31 Published geological records for the area indicates the geology beneath the Site to comprise bedrock deposits of the London Clay Formation, underlain by deposits of the Lambeth Group. Superficial geology deposits are not noted to be present on site. An area of made ground is also noted by the British Geological Survey within the eastern part of site, likely to be associated with the former East Barnet Sewage Works. Additionally, an infilled gravel pit is present in the north of the site, and several buried structures [air raid shelters (some infilled, some empty)] are present beneath the centre and (north) west of the site.
- 11.32 Investigation works undertaken by RSK revealed that the smaller Phase 1 site area is underlain by a variable thickness of Made Ground or Topsoil, over bedrock deposits of the London Clay Formation, with the Lambeth Group encountered at depth, as summarised in Table 11.4.

Table 11.4 General Succession of Strata Encountered

Stratum	Exploratory Holes Encountered	Depth to Top of Stratum (m bgl)	Proven Thickness (m)
Topsoil	TP1, TGP2, TP5 – TP7, TP11, TP13, TP14, BH5, BH6	Ground Level	0.15m – 0.40m
Made Ground	TP1 – TP12, TP14 – TP18, BH1 – BH8	Ground Level – 0.40m	0.45m – 2.50m
London Clay Formation	TP1, TP2, TP4 – TP9, TP13, TP14, BH1 – BH8	0.20m – 2.50m	<39.24m
Lambeth Group	BH1, BH3 – BH6	26.30m – 32.00m	<10.86m

- 11.33 Made Ground soils encountered on site generally comprise cohesive soils containing a significant granular proportion of anthropogenic material including brick, concrete, metal, timber and asphalt fragments.
- 11.34 The London Clay Formation was encountered in all of the deeper cable percussive borehole locations and generally comprises a brown becoming grey stiff consistency clay. Beneath the London Clay Formation, the Lambeth Group was reported as a stiff consistency sandy clay with occasional bands of siltstone.

Hydrogeology

- 11.35 The London Clay Formation underlying the site is identified as 'unproductive' strata. The London Clay Formation acts as an aquiclude, thereby restricting the downwards migration of shallow groundwater (and mobile contaminants, if present) to deeper groundwater resources.
- 11.36 It is considered that groundwater on site is likely to be present as perched groundwater bodies at the interface between Made Ground soils and the London Clay Formation. Across the Phase 1 development area investigation works encountered sporadic and discontinuous water strikes, with a number of monitoring wells noted to be free of groundwater across the monitoring programme undertaken.
- 11.37 The site is not designated as falling within a designated groundwater source protection zone (SPZ).

Surface Water

- 11.38 A surface water feature in the form of a lake is located within the eastern part of site. Pymme's Brook, nearest off-site surface water feature, is located 400m towards the east.
- 11.39 No surface water abstractions are located within 1km of the site.

Unexploded Ordnance

- 11.40 Within the preceding report prepared by WSP a potential source of unexploded ordnance (UXO) was noted to be present on site, associated with bombing during World War II. As a result, an unexploded ordnance desk study was completed by Zetica in April 2008. Given the density of World War II bombing and indications of damage in the area, the overall risk of potential UXO being present at the site was considered to be low.

Potential Sources of Land Contamination

- 11.41 Based on the historical mapping and a site walkover survey completed at the site, potential on-site sources of land contamination are predicted to principally relate to the site's historical land uses. Existing site activities are not considered to pose a significant land contamination risk. In addition, potential off-site sources of ground contamination are also anticipated within the immediate vicinity of the Site, these include storage tanks and electricity substations, sewage and photo works and two landfill sites located within 250m of site.
- 11.42 Where site investigation works have been completed across the smaller Phase 1 development area, no site-wide contamination issues have been identified and the site appears suitable for the residential development subject to the use of targeted and localised remedial measures. Based on the ground gas monitoring works completed the site has been classified as Characteristic Situation 2 owing to marginally elevated (>5%) concentrations of carbon dioxide at a number of locations.
- 11.43 The site is not located within an 'Affected Area' as defined by the Documents of the National Radiological Protection Board. Therefore, the risk of significant ingress of radon into structures on-site is low.
- 11.44 Since the production of the preceding WSP report, a preceding ES chapter from the HPP 2015 ES has alluded to anecdotal information concerning the contents of air raid shelters previously identified on site. The air raid shelters in the northeast corner of the site were reportedly filled with barrels full of oil during WWII. It is understood that the oil was a by-product of manufacturing on the site which was normally flared off but could not be in war time. As a result, the oil was stored in barrels in the air raid shelters. Anecdotal information also suggests that a number of scrap luminous (radium) dials may be buried on site, associated with the site's former land use, and that these may have an associated radioactivity risk.

Sensitive Receptors and Linking Pathways

- 11.45 Sensitive receptors identified in relation to the site setting and outlined baseline include:
- Future site occupants;

- Adjacent site users;
- Surface water bodies/groundwater in deep aquifer;
- Vegetation;
- Water supply pipes; and
- Buildings and infrastructure.

11.46 The plausible migration pathways identified in relation to the site setting and outlined baseline are summarised below:

- Direct contact and ingestion (soil, dust and vegetable ingestion, dermal contact and dust inhalation);
- Surface run-off;
- Vertical migration of mobile contaminants;
- Ground gas inhalation;
- Root uptake; and
- Chemical attack of infrastructure and buildings.

POTENTIAL IMPACTS

During Construction

11.47 Works that could potentially affect identified sensitive receptors during the construction phase of the proposed development include:

- Fuel storage and refuelling activities;
- Creation of temporary access roads and construction compounds;
- Excavations and earthworks to create level development platforms and basement cut;
- Excavation of potentially contaminated soils;
- Overland surface water run-off across impermeable surfaces;
- Installation of piled foundations resulting in the potential for contaminated soils to be driven into the underlying aquifer/s or for the creation of preferential migration pathways (if contamination is present);
- The importation of potentially contaminated materials from off-site for use in pile-mat construction or within gardens/landscaped areas; and

- Creation of pathways for the vertical migration of mobile contaminants towards sensitive aquifers at depth.
- 11.48 Effects relating to construction personnel have not been included for construction as pathways will relate to acute exposure and as such are outside the scope of chronic risk assessment methodologies. It is assumed that these will be mitigated via the preparation of detailed risk assessments for construction activities and implementation of appropriate control measures, including the use of personal protective equipment.
- 11.49 With respect to neighbouring properties and residents, the following effects could arise as a result of construction activities:
- The release of contaminated dust/vapours and/or asbestos fibres during the excavation and relocation of soils and movement of construction vehicles.
- 11.50 The sensitivity of neighbouring properties and residents is considered to be of High importance and, based upon professional judgement, the magnitude of effects associated with the release of airborne contaminants is considered to be Moderate in line with the criteria contained in Table 11.2. The overall significance of the above effects is therefore **Major/Moderate Negative**.
- 11.51 With respect to surface water bodies, the following effects could arise as a result of construction activities:
- Surface water run-off laden with silt and or containing potentially mobile contaminants;
 - Localised fuel leakages/spill from areas of fuel storage or during refuelling activities.
- 11.52 The sensitivity of surface water bodies in the site environs are considered to be of Low importance and, based upon professional judgement, the magnitude of effects associated with the surface water run-off and the potential for localised leaks/spills is considered to be Moderate in line with the criteria contained in Table 11.2. The overall significance of the above effects is therefore **Minor Negative** (as is also set out in Chapter 10 of this ES).
- 11.53 With respect to groundwater in the deep aquifer, the following effects could arise as a result of construction activities:
- Creation of pathways for the vertical migration of mobile contaminants towards sensitive aquifers at depth predominantly during piling operations.
- 11.54 The sensitivity of deep aquifer in the site environs is considered to be of Medium importance and, based upon professional judgement, the magnitude of effects associated with vertical migration of mobile contaminants is considered to be Moderate

in line with the criteria contained in Table 11.2. The overall significance of the above effects is therefore **Moderate Negative**.

Operational Phase

11.55 Following completion of the construction work, the site will be finished at surface level with hardstanding, with any planted areas finished as areas of soft landscaping and trees. Therefore, there is a potential for:

- Future site occupants or adjacent occupants to come into contact with soil materials in the soft landscaped areas and tree pits;
- Future vegetation may come into contact with potentially contaminated ground;
- Deeper foundation solutions (e.g. piles) could present a potential for long term migration pathway from the made ground to the deeper Secondary A aquifer beneath the site;
- Permeation of potable water supply pipes by mobile contaminants; and
- A potential risk associated with the potential for an aggressive attack on below ground concrete in contact with made ground and/or natural strata.

11.56 Effects relating to future maintenance workers have not been included for the operational phase as pathways will relate to acute exposure and as such are outside the scope of chronic risk assessment methodologies. It is assumed that these will be mitigated via the preparation of detailed risk assessments for construction activities and implementation of appropriate control measures, including the use of personal protective equipment.

11.57 With respect to future site occupants/adjacent occupants, the following effects could arise during the operational phase:

- Health effects on site occupants/adjacent occupants coming into contact (dermal contact, ingestion or inhalation of dust) with potentially contaminated soils/vapours; and;
- The ingestion of potential contaminants from home-grown produce, resulting from plant uptake;

11.58 The sensitivity of future site occupants/adjacent occupants is considered to be of High importance and, based upon professional judgement, the magnitude of effects associated with direct contact and ingestion pathways is considered to be Moderate in line with the criteria contained in Table 11.2. The overall significance of the above effects is therefore **Major/Moderate Negative**.

11.59 The following effects are potentially associated with the operation of the proposed development, with respect to vegetation:

- Health effects on vegetation coming into contact with contaminated ground.

11.60 The sensitivity of vegetation is considered to be of Low importance and, based upon professional judgement, the magnitude of effects associated with direct contact is considered to be Moderate in line with the criteria contained in Table 11.2. The overall significance of the above effects is therefore **Negligible/Minor Negative**.

11.61 With respect to groundwater in the deep aquifer, the following effects could arise during the operational phase:

- Creation of pathways for the vertical migration of mobile contaminants towards sensitive aquifers at depth.

11.62 The sensitivity of deep aquifer in the site environs is considered to be of Medium importance and, based upon professional judgement, the magnitude of effects associated with the vertical migration of contamination is considered to be Moderate in line with the criteria contained in Table 11.2. The overall significance of the above effects is therefore **Moderate Negative**.

11.63 The following effects are potentially associated with the operation of the proposed development, with respect to construction materials including water supply pipes:

- The permeation of contaminants into potable water supply pipes; and
- The potential degradation of construction materials via aggressive attack on below ground concrete in contact with made ground and/or natural strata.

11.64 The sensitivity of construction materials is considered to be of High importance and, based upon professional judgement, the magnitude of effects associated with permeation of water supply pipes and chemical attack on buried concrete is considered to be Moderate in line with the criteria contained in Table 11.2. The overall significance of the above effects is therefore **Major/Moderate Negative**.

MITIGATION

11.65 Potential suitable mitigation options are discussed below which will be confirmed following further intrusive investigation works across the wider site footprint in consultation with Barnet Council's Environmental Health Officer. These works will include an assessment of the composition and contamination status (including leachability) of any fill materials and made ground together with an assessment of potential ground gas generation and emissions beneath the site, particularly in the north and north-west of the site where filled ground is understood to be present.

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- 11.66 Upon completion of these works, an Options Appraisal and detailed Remediation Method Statement (RMS) will be compiled specifying the mitigation measures required to break any identified pollutant linkages. Prior to construction works commencing on site the RMS will be submitted to the Barnet Council's Environmental Health Officer and, if necessary, the Environment Agency for approval.
- 11.67 Where there is potential risk of creating a preferential pathway for the vertical migration of mobile contamination, a piling risk assessment will be undertaken to identify the preferred method of piling to mitigate risks in line with published Environment Agency guidance.
- 11.68 As a part of the remedial works a clean cover horizon, and potentially deeper inclusions for tree pits, will be required to encapsulate 'acceptable' residual contamination which does not pose a risk to controlled waters and break pollutant linkages with respect to human health and flora and fauna. The depth and nature of the clean cover horizon will be outlined within the RMS.
- 11.69 Fuels, lubricants, and chemicals required during construction operations will be stored in secure bunded areas, with refuelling restricted to these areas. Spill kits will be available on site in case of emergency.
- 11.70 A detailed Construction Environmental Management Plan (CEMP) will be prepared, setting out the methods which contractors will be required to adopt as a minimum. This CEMP will be secured by planning condition.
- 11.71 The CEMP will include quality control procedures to be employed by contractors for the import and export of materials to and from site. Methods for controlling surface water run-off and dust and measures to remove contaminated materials off site to licensed treatment or disposal sites, will also be detailed.
- 11.72 It is possible that UXOs could be disturbed/ encountered during the construction phase. Tool-box talks to all construction workers, informing them of the risk of UXOs on site and hence raising awareness.
- 11.73 Should the presence of previously unidentified contaminated material be suspected during excavation, work will cease until the material has been characterised and appropriate measures to treat or dispose of contaminated materials have been identified.
- 11.74 Measures will be undertaken to reduce the amount of water entering excavations so as to minimise dewatering activities. Should de-watering be required, the Environment Agency will be consulted and appropriate abstraction and discharge licences will be obtained as necessary. Prior to discharge, water will be treated to ensure it meets appropriate water quality standards.
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RESIDUAL IMPACTS

11.75 A summary of the potential impacts, associated mitigation and residual impacts are summarised below in Table 11.5.

Table 11.5 Summary of impacts, mitigation measures and residual impacts

Description of Impact/Receptor	Potential Impact	Mitigation Measure	Residual Impact
During Construction			
Risk to neighboring properties and residents	Major/Moderate Negative.	Good practice during construction as detailed during the preparation of a CEMP	Negligible
Risk to surface water bodies	Minor Negative.	Appropriate fuel storage and refueling in designated areas. Good practice during construction as detailed during the preparation of a CEMP	Negligible
Risk to deep aquifer	Moderate Negative	Preparation of a piling risk assessment to set out most appropriate piling methodologies and procedures	Negligible
During Operation			
Risk to future site occupants/adjacent occupants	Major/Moderate Negative.	Preparation of a detailed remediation method statement setting our appropriate mitigation measures following further intrusive investigation works across the wider site footprint in consultation with Barnet EHO. Inclusions of appropriate gas protection measures in proposed properties following completion of works to quantify the ground gas regime.	Negligible
Risks to future vegetation	Negligible/Minor Negative.	Preparation of a detailed remediation method statement setting our appropriate mitigation measures (likely to comprise of an appropriate clean cover horizon) following further intrusive investigation works across the wider site footprint in consultation with Barnet EHO.	Negligible

Risk to deep aquifer	Moderate Negative.	Preparation of a piling risk assessment to set out most appropriate piling methodologies and procedures	Negligible
Risk to construction materials	Major/Moderate Negative.	Design of appropriate construction materials (potentially barrier pipes for water supply pipes and appropriate concrete class to resist chemical attack) for use during construction.	Negligible

- 11.76 In summary, with full implementation of the outlined mitigation measures, there will be **Negligible** residual effects during the construction or operational phases of the proposed development.
- 11.77 Furthermore, where site investigation works were to encounter any contamination on site, the associated remedial works would result in potential positive effects associated with the treatment or removal of any identified source of contamination.

CUMULATIVE IMPACTS

- 11.78 No relevant cumulative impacts have been identified in relation to the proposed development works.

CONCLUSIONS

- 11.79 The existing baseline conditions have been identified from a site wide Phase 1 Geoenvironmental Assessment (desk study) prepared by WSP Environmental Ltd in 2007 (Appendix 11.1) and a more recent Phase 2 Geoenvironmental and Geotechnical Site Investigation Report (Appendix 11.2) which is only specific to the smaller Phase 1 development area prepared by RSK in 2021. Following the production of these reports, an assessment of the significance of effects has been conducted in line with the outlined methodologies.
- 11.80 The site is underlain by the London Clay Formation which is in turn underlain by the Lambeth Group which was encountered at depths in the order of 26.30m to 32.00m during preceding site investigation works. Published geological records do not show superficial deposits to be present across the site footprint.
- 11.81 Widespread made ground deposits are anticipated to be present across the site footprint given the site setting and history of development. Across the Phase 1 development area made ground deposits were proven to a maximum depth of 2.50m typically comprising

of cohesive soils containing a significant granular proportion of anthropogenic material including brick, concrete, metal, timber and asphalt fragments.

- 11.82 The London Clay Formation is designated as 'unproductive strata' in terms of its aquifer designation thereby acting to limit the downwards migration of any mobile contaminants, if present. The site is not located within a designated source protection zone.
- 11.83 Potential sources of contamination have been identified on site from desk study research and locally across the Phase 1 development area through the completion of site investigation works.
- 11.84 The intrusive works to the Phase 1 development area did not encountered site-wide contamination issues have been identified and the site appears suitable for the residential development subject to the use of targeted and localised remedial measures. Based on the ground gas monitoring works completed the site has been classified as Characteristic Situation 2 owing to marginally elevated (>5%) concentrations of carbon dioxide at a number of locations.
- 11.85 Across the remainder of the site, based on the historical mapping and a site walkover survey completed at the site, potential on-site sources of land contamination are predicted to principally relate to the site's historical land uses. Existing site activities are not considered to pose a significant land contamination risk. In addition, potential off-site sources of ground contamination are also anticipated within the immediate vicinity of the Site, these include storage tanks and electricity substations, sewage and photo works and two landfill sites located within 250m of site.
- 11.86 Potential effects have been identified during the site's construction and operational phases relating to a number of potentially sensitive receptors. These include neighbouring properties and residents, end users of the site, flora and fauna and building infrastructure including potable water supply pipes.
- 11.87 In order to mitigate the identified potential effects, a number of measures have been outlined, including intrusive investigation works to confirm potential sources of contamination, and preparation of a Remediation Method Statement if the intrusive works show there to be a need for the remediation of ground contamination. In addition, a detailed CEMP will be prepared to outline working methods and quality control procedures.
- 11.88 When the outlined measures are correctly implemented, there will be **Negligible** residual effects during the construction and operational phases of the proposed development. In addition, no cumulative effects have been identified.

11.89 Furthermore, where site investigation works were to encounter any contamination on site, the associated remedial works would result in potential positive effects associated with the treatment or removal of any identified source of contamination.

12.0 TOWNSCAPE AND VISUAL IMPACT

INTRODUCTION

- 12.1 This Chapter of the ES contains a summary of the assessment of the effect of the proposed development in townscape and visual terms. The full Townscape and Visual Impact Assessment ('TVIA'), which includes Accurate Visual Representations (AVRs) showing the proposed development in selected views, is contained in Appendix 12.1 of the ES.

LEGISLATION AND POLICY CONTEXT

- 12.2 Where any development may have a direct or indirect effect upon the townscape and visual environment, there is a legislative and policy framework to ensure the proposals are considered with due regard for their impact to notable receptors. This section outlines the legislative framework, the national, regional and local planning policy and supplementary policy guidance/best practice that has been considered in this assessment.

National

National Planning Policy Framework (2021)

- 12.3 The NPPF¹ sets out planning policies for England and how these are expected to be applied.
- 12.4 Section 12 of the NPPF, 'Achieving well-designed places' deals with design and contains the policies most relevant to the townscape and visual impact of the proposed development.

Planning Practice Guidance, (2014 - ongoing)

- 12.5 The PPG² includes a section called 'Design: process and tools' which '*provides advice on the key points to take into account on design*'. This was issued on 1 October 2019; it replaces a previous section called 'Design'.
- 12.6 The PPG deals with the processes of the planning system with respect to design, and notes that guidance on good design is set out in the National Design Guide.

The National Design Guide (2019)

- 12.7 The National Design Guide³ (September 2019) ('NDG') states (paragraph 3) that it '*forms part of the Government's collection of planning practice guidance*'.
- 12.8 At paragraph 21 the NDG states that well-designed places are achieved by making the right choices at all levels, and at paragraph 35 the NDG sets out characteristics which

contribute to the character of places, nurture and sustain a sense of community, and address issues affecting climate.

Historic England Advice Note 4 – Tall Buildings (2015)

- 12.9 This document⁴ sets out guidance on dealing with tall buildings in the planning process. A second edition consultation draft⁵ was issued in 2020.

Regional

The London Plan (2021)

- 12.10 The London Plan⁶ is *'the overall strategic plan for London.'* The policies most relevant to townscape and visual impact are found in Chapter 3, 'Design,' and Chapter 7, 'Heritage and Culture.'

London View Management Framework Supplementary Planning Guidance (March 2012)

- 12.11 The 'London View Management Framework Supplementary Planning Guidance'⁷ ('LVMF') is designed to provide further clarity and guidance on the London Plan's policies for the management of strategic views. None of the LVMF views are considered relevant to the proposed development.

London's Natural Signatures: The London Landscape Framework, (prepared for Natural England, January 2011)

- 12.12 This guidance document⁸ divides London into 22 Natural Landscape Areas and identifies the key natural characteristics, or 'Natural Signatures', of those areas.

Local

London Borough of Barnet – Core Strategy (2012)

- 12.13 The Core Strategy⁹ was adopted in September 2012. Policy CS5: 'Protecting and Enhancing Barnet's Character to Create High Quality Places' is the principal policy concerning design. Policy CS3 identifies the site and Oakleigh Road South as a regeneration/ development area.

London Borough of Barnet Local Plan (Development Management Policies) (2012)

- 12.14 The Local Plan (Development Management Policies)¹⁰ contains a number of policies relevant to design of new development, including Policy DM01: 'Protecting Barnet's character and amenity', Policy DM05 'Tall Buildings', and policy DM06 'Barnet's Heritage and Conservation'.

Characterisation Study of London Borough of Barnet Final Report, May 2010

- 12.15 The characterisation study¹¹ was prepared as part of the evidence base for the Core Strategy. It provides a detailed understanding of the Borough's urban character and identifies character typologies as well as geographic character areas.

Residential Design Guidance SPD, April 2013

- 12.16 The Residential Design Guidance SPD¹² aims to help ensure that design appropriate to LB Barnet's suburban context is achieved. It lists a variety of requirements ranging from appropriate patterns of development to specific design guidelines for houses.

London Borough of Barnet - Planning Brief, North London Business Park Planning Brief (2016)

- 12.17 This Planning Brief¹³ for the site has the aim of providing a '*vision for the transformation of the site*'. This brief acknowledges that the kind of redevelopment that was envisaged in a previous 2006 planning brief - i.e. mixed use, protecting existing operational employment uses - had not revitalised the site, and that the site '*...is large enough to have its own character.*'

ASSESSMENT METHODOLOGY

Guidance

- 12.18 This section provides a brief overview of the method that has been used to carry out the TVIA presented in full in Appendix 12.1. The method is based on the principles set out in the third (2013) edition of 'Guidelines for Landscape and Visual Impact Assessment' (GLVIA)¹⁴, produced by the Landscape Institute with the Institute of Environmental Management and Assessment.

Scope of the Assessment and Study Area

Townscape

- 12.19 An assessment has been made of the site and surrounding townscape areas in their existing state. This is based on study of the historic development of the area with reference to relevant publications, and study of the present-day condition of the area based on site visits, study of maps and aerial photographs, and relevant publications.
- 12.20 This analysis has informed the division of the study area into townscape characters areas ('TCAs') i.e. geographical areas which have readily identifiable characteristics in common. The impact of the proposed development on these townscape areas has been assessed, informed by the views analysis.

Views

- 12.21 The study area for the visual assessment is centred on the site and limited to locations from which the site can be seen, or from which new buildings on the site have the potential to result in a significant visual impact at the height proposed. Viewpoints are identified on the basis of the following method.
- 12.22 Four principal types of viewing location are identified:
- Views that have been identified as significant, by London Borough of Barnet or others, e.g. in relevant planning policy and guidance documents (including the London Plan LVMF) and Conservation Area appraisals;
 - Other locations or views of particular sensitivity, including those viewpoints in which the proposed development may significantly affect the settings of World Heritage Sites, Listed Buildings and Conservation Areas;
 - Representative townscape locations from which the proposed development will be visible; and
 - Locations where there is extensive open space between the viewer and the proposed development so that it will be prominent rather than obscured by foreground buildings.
- 12.23 The set of viewpoints is chosen so that it covers:
- The range of points of the compass from which the proposed development will be visible;
 - A range of distances from the site; and
 - Different types of townscape area.
- 12.24 Possible locations in these categories within the study area were identified based on an examination of maps and aerial photographs; maps of Conservation Areas; and maps and lists of Listed Buildings. The study area and the possible locations were then visited

to establish candidate viewpoints. The viewpoint locations replicate those provided for the 2015 ES which were determined after consultation Barnet Council at the time. New photography was taken from each of the viewpoints, in March 2021.

- 12.25 There is relatively low visibility of the site within its surroundings. The viewpoints in the assessment have been specifically chosen to illustrate those points from which the proposed development is likely to be most visible; as such, they are not necessarily typical of the general experience of views from the surrounding area towards the site.

Built Heritage

- 12.26 A study was undertaken to identify any designated heritage assets within 1km of the centre of the site, using information derived from the National Heritage List for England website and the Local Planning Authority website, with the intention that any such assets would inform the identification and assessment of townscape character areas and views where relevant. Designated heritage assets comprise World Heritage Sites, Conservation Areas, Listed Buildings, and Registered Parks and Gardens of Special Historic Interest.
- 12.27 One designated heritage asset was identified within the initial 1km radius. Heritage assets just beyond the 1km radius were then considered and, informed by site visits and map study, it was considered that these would not be relevant to development on the site at the scale envisaged and they were not, therefore, added to the scope of the assessment.
- 12.28 A study was also carried out to identify any buildings on London Borough of Barnet's Schedule of Buildings of Local Architectural or Historic Interest in the streets immediately around the site, and four were identified.

Assessment Criteria

Methodology for Assessment

- 12.29 Assessment of the effect of any proposed development on a receptor (an area of townscape or view) is made on the basis of professional judgement which takes into account relevant planning policies and guidance. It is based on the following method.
- 12.30 The sensitivity of the receptor as existing is assessed as high, medium or low, depending on the importance, value and quality of the receptor, and nature and expectation of the viewer. The importance of the viewpoint is determined by any recognition that the viewpoint may have and by its amenity value. In terms of views, recognition includes viewpoints identified by the local authority in planning documents, and viewpoints visited by large numbers of people. In terms of townscape receptors, recognition includes heritage designation e.g. of a Conservation Area. Locations such as parks and riverside walkways which are used for leisure purposes are considered to be more sensitive in visual terms than everyday streetscapes with no heritage designation.

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- 12.31 The assessment takes into account the setting of any Grade I Listed Buildings, the setting of any Grade II* or Grade II Listed Buildings or conservation areas, if relevant, and the amenity value of the viewing location and area in which it is located. The assessment of the sensitivity of the receptor under consideration is moderated to take into account a judgement about its quality in the round.
- 12.32 The magnitude of the change resulting from the proposed development is assessed as major, moderate, minor or negligible according to the change to the receptor.
- 12.33 These two measures are combined to provide a measure of the significance - major, moderate, minor or negligible - of the effect on the receptor which will result from the proposed development, the most significant effects being effects of major magnitude on receptors of high sensitivity.
- 12.34 Effects are assessed as beneficial, adverse, or neutral. The assessment as beneficial or adverse is a 'net equation', since with regard to the receptor that is being assessed, there may be both positive and negative effects as a result of the proposed development.
- 12.35 For each of the identified views provided in Appendix 12.1, there are images of the view 'as existing' and 'as proposed'. 'As proposed' images are provided as 'Accurate Visual Representations' ('AVRs'). AVRs are produced by accurately combining images of the proposed development (typically created from a three-dimensional computer model) with a photograph of its context as existing. The method by which AVRs are produced is described in Appendix 12.1.
- 12.36 AVRs of the outline component of the proposed development are provided as 'shaded volumes', diagrammatic representations showing the massing of the proposed development at maximum parameters. With respect to the detailed part of the proposed development, in some images the detailed buildings are represented by a shaded volume showing their massing, with some articulation of form, and in some views they are shown as rendered (photorealistic) images, which also show the detailed form of the buildings and the proposed use of materials within them. A red dotted outline shows the location of the proposed development where it is obscured from sight.
- 12.37 For each of the identified views, a description of the view as existing is given, identifying its visual quality, sensitivity to change and reason for that sensitivity. A description of the view as proposed is then given with an assessment, based on the method set out above, of the significance of the effect that the proposed development will have on the view.
- 12.38 A number of proposals for proposed or consented developments in the wider area around the site have been identified for 'cumulative' assessment. An assessment of the effect of the proposed development in the context of these schemes has been provided in Appendix 12.1.
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ASSUMPTIONS AND LIMITATIONS

12.39 Most of the baseline photography was carried out in March 2021 when the trees were without leaves, and the assessment is therefore of the maximum visibility of the proposed development. Some of the views illustrated would appear different in summer, and this is likely to result in the visibility of the proposed development being reduced to some extent in some cases.

BASELINE CONDITIONS

12.40 The site is large and relatively self-contained in character, with its only meaningful street frontage addressing Brunswick Park Road, to the east. It has been consistently developed in a different manner to the areas surrounding it to the north, south, east and west, which were largely developed for suburban housing, particularly in the inter-war years; the buildings on the site today are mostly large in footprint and accommodate office or educational uses, set within landscaped and open grassed areas including many trees, which provides the site with a leafy character. The variation in land levels across the site, particularly a rise in level towards the north and west, is a notable aspect of its character.

12.41 There is generally little awareness of the buildings on the site in the area immediately around it, despite their relatively large scale. There are opportunities for longer range views towards the site, particularly from the east, due to the topography of the wider area around the site. Where visible, the similarity in scale of the existing buildings on the site, and the generally horizontal emphasis of their elevations, is such they have a somewhat homogeneous and monotonous appearance.

12.42 The wider area around the site is overwhelmingly suburban and residential in character. Two storey housing is the predominant form of development, most of it from the inter-war period, but there are examples of other building forms, including apartment blocks dating from the post-war and more recent decades. Street trees and relatively generous areas of landscape are common and contribute to the leafy, suburban character.

12.43 Six townscape character areas were identified and these are as follows -

- The site;
- TCA A - inter-war housing;
- TCA B - residential area east of the site;
- TCA C - residential area south of the site;
- TCA D - parks and green spaces; and
- TCA E - Oakleigh Road South.

12.44 A total of 19 viewpoints were identified for illustration within the TVIA, replicating those locations agreed with Barnet Council for the 2015 ES. These views are as follows -

- King George Playing Fields, Hadley Green;
- Osidge Lane north;
- Osidge Lane south;
- Brunswick Park;
- New Southgate Recreation Ground;
- Bethune Park;
- New Southgate Cemetery, looking towards entrance gateway;
- Brunswick Park Road south;
- Brunswick Park Road, looking along line of site entrance;
- Brunswick Park Road north;
- Howard Close;
- Pine Road;
- Weirdale Avenue;
- Ashbourne Avenue;
- Barfield Avenue;
- Fernwood Crescent;
- Balfour Grove;
- Oakleigh Road north, looking along Oakleigh Crescent; and
- Oakleigh Road south.

POTENTIAL IMPACTS

During Construction

- 12.45 There are no special visual impacts that are generated as a result of the construction process outside of those that are inherent in constructing buildings of the type proposed.
- 12.46 The most significant medium and long range visual impact associated with the construction process would be the presence of tower cranes. Their presence is inevitable in connection with construction of the type and scale envisaged.
- 12.47 The top of a tower crane is likely to be higher than the top of the building, so it would be more visible than the finished building. This temporary state of affairs is common as a consequence of building activity in London and there is no practical way of avoiding it. In terms of mitigation, during construction the perimeter of the site would be surrounded by hoarding in the conventional manner.

- 12.48 While any assessment of the visual effect of construction activities in aesthetic terms would tend to find the effect adverse rather than beneficial, few people think of construction activities in this way, considering their effects rather as a fact of life which while not fleeting, is clearly understood to be temporary.

During Operation

Architectural, Urban Design and Public Realm assessment

- 12.49 The proposed development would redevelop the site in a comprehensive manner, in line with an ordered and logical masterplan. It would introduce a legible network of routes and spaces, including a new access point from the north which would enhance permeability, and it would enhance the sense of arrival at the other key entrance points to the site. The site would be significantly better integrated with the local area around it as a result.
- 12.50 The scale of the buildings across the site would respond appropriately to the site's surroundings, by placing lower scale buildings at the northern, eastern and southern edges of the site, where they would be adjacent to existing low scale neighbouring housing, and stepping up the height of buildings towards the centre of the site, and its western edge set against the railway lines.
- 12.51 The architecture of the buildings within Phase 1, which are subject to a detailed planning application, would be relatively simple, and would have a calm, ordered appearance. The predominant use of brick would relate well to many of the existing buildings in the area around the site.

Visual Effects - Summary

- 12.52 There would be limited visibility of the proposed development in short to medium range views from the streets of inter-war housing to the north, such as along Ashbourne Avenue and Weirdale Avenue. There would be greater visibility from the streets of largely post-war housing immediately east of the site, such as Howard Close, in which gaps between existing buildings allow direct views towards the site. However, the viewpoints in the assessment have been chosen in order to illustrate those points from which the proposed development is likely to be most visible; they are not typical of the general experience of views towards the site from this area, and the visibility of the proposed development would generally be much less than shown within the illustrated views from these streets. In those views where it would be seen to a considerable extent, the proposed development would appear as a coherent, high quality scheme, and its scale would appear comfortable in relation to existing buildings. Retained and new trees would maintain and in some cases enhance the leafy quality of the site in such views.
- 12.53 The proposed development would be visible in some medium to long range views from the east and west, as a result of the raised level of the land in these areas. It would

clearly appear as part of a background layer of townscape, and would provide visual interest through the variation in the heights of proposed buildings across the site.

Townscape Effects - Summary

- 12.54 The quality of the site would be substantially improved by the proposed development. In respect of the TCAs around the site, the proposed development would be visible in some views from the residential area immediately east of the site, TCA B, in which it would appear as a high quality development. The proposed development would improve the definition and appearance of Brunswick Park Road through the presence of the main school building, and there would be enhanced permeability and new areas of public realm within the site, both of which would be of benefit to this TCA.
- 12.55 The proposed development would similarly be of benefit to TCA A (inter-war housing) and would appear as a coherent and high quality development in the background of medium to long range views from this TCA.
- 12.56 There would be limited or no visibility of the proposed development from the parks and open spaces in the wider area around the site (TCA D), with the principal exception of more open areas of New Southgate Cemetery. The form and architecture of the proposed development is such that it would appear as a calm backdrop in these views, and retained and new trees and areas of open space would help to maintain the site's overall leafy and suburban character in such views.
- 12.57 The proposed development would have a relatively minor effect in relation to the other TCAs around the site.

MITIGATION

During Construction

- 12.58 During construction the perimeter of the site would be surrounded by hoarding in the conventional manner.

During Operation

- 12.59 The iterative design process for a complex project on a site such as the subject of this assessment is inherently one whereby visual impact is taken into account at each stage. Any unacceptable visual impacts are mitigated by the design team as an integral part of the design development iterations. The comments of the local authority's planning officers, based on detailed knowledge of the site and surroundings and of planning policies affecting them, are part of the input into this process.
- 12.60 By virtue of the careful attention that has been given to the design of the new buildings and the public realm through this thorough process, therefore, the proposed

development in the form in which it is submitted for planning permission does not give rise to any adverse visual impacts which require mitigation.

RESIDUAL IMPACTS

During Construction

12.61 As no mitigation is required, the residual effects are the same as the potential effects.

During Operation

12.62 As no mitigation is required, the residual effects are the same as the potential effects.

Table 12.1 Summary

Description of Impact/Receptor	Potential Impact	Mitigation Measure	Residual Impact
During Construction			
Stage 1- Phase 1			
Views 7, 9, 10 and 11	Moderate significance, adverse effect	Hoarding	Moderate significance, adverse effect
All other views	No more than minor to moderate significance, adverse or neutral effect	Hoarding	No more than minor to moderate significance, adverse or neutral effect
The Site	Moderate significance, adverse effect	Hoarding	Moderate significance, adverse effect
All other TCAs	No more than 'minor to moderate' significance, adverse effect	Hoarding	No more than 'minor to moderate' significance, adverse effect
Stage 2 – other phases with Phase 1 completed			
Views 16, 19	Moderate significance, adverse effect	Hoarding	Moderate significance, adverse effect
All other views	No more than 'minor to moderate' significance, adverse or neutral effect	Hoarding	No more than minor significance, adverse or neutral effect
The Site	Moderate significance, adverse effect	Hoarding	Moderate significance, adverse effect
All other TCAs	No more than 'minor to moderate'	Hoarding	No more than 'minor to moderate'

	significance, adverse effect		significance, adverse effect
During Operation			
View 1 – King George’s Playing Fields, Hadley Green	No effect	None required	No effect
View 2 – Osidge Lane North	Minor to moderate significance, beneficial effect.	None required	Minor to moderate significance, beneficial effect.
View 3 – Osidge Lane South	Minor to moderate significance, neutral effect.	None required	Minor to moderate significance, neutral effect.
View 4 – Brunswick Park	Negligible significance, neutral effect.	None required	Negligible significance, neutral effect.
View 5 – New Southgate Recreation Ground	Minor significance, neutral effect.	None required	Minor significance, neutral effect.
View 6 – Bethune Park	Minor significance, neutral effect	None required	Minor significance, neutral effect
View 7 – New Southgate Cemetery, looking towards entrance gateway	Moderate significance, beneficial effect	None required	Moderate significance, beneficial effect
View 8 – Brunswick Park Road south	Minor to moderate significance, beneficial effect	None required	Minor to moderate significance, beneficial effect
View 9 – Brunswick Park Road, looking along site entrance	Moderate significance, beneficial effect	None required	Moderate significance, beneficial effect
View 10 – Brunswick Park Road north	Moderate significance, beneficial effect	None required	Moderate significance, beneficial effect
View 11 – Howard Close	Moderate significance, beneficial effect	None required	Moderate significance, beneficial effect
View 12 – Pine Road	Minor to moderate significance, beneficial effect	None required	Minor to moderate significance, beneficial effect
View 13 – Weirdale Avenue	Minor significance, neutral effect	None required	Minor significance, neutral effect
View 14 – Ashbourne Avenue	Minor significance, neutral effect	None required	Minor significance, neutral effect
View 15 – Barfield Avenue	Minor significance, neutral effect	None required	Minor significance, neutral effect

View 16 – Fernwood Crescent	Moderate significance, beneficial effect	None required	Moderate significance, beneficial effect
View 17 – Balfour Grove	Minor significance, neutral effect	None required	Minor significance, neutral effect
View 18 – Oakleigh Road north, looking along Oakleigh Crescent	Minor to moderate significance, beneficial effect	None required	Minor to moderate significance, beneficial effect
View 19 – Oakleigh Road south	Moderate significance, beneficial effect	None required	Moderate significance, beneficial effect
The site	Moderate to major significance, beneficial effect	None required	Moderate to major significance, beneficial effect
TCA A – inter-war housing	Moderate significance, beneficial effect	None required	Moderate significance, beneficial effect
TCA B – residential area east of the Site	Moderate significance, beneficial effect	None required	Moderate significance, beneficial effect
TCA C – residential area south of the Site	Minor to moderate significance, neutral effect	None required	Minor to moderate significance, neutral effect
TCA D – parks and green spaces	Minor to moderate significance, neutral effect	None required	Minor to moderate significance, neutral effect
TCA E – Oakleigh Road South	Minor significance, neutral effect	None required	Minor significance, neutral effect

CUMULATIVE IMPACTS

- 12.63 A number of cumulative schemes have been identified for cumulative assessment. These are all located 500m or more from the centre of the site, and in most cases they are considerably more than 1km away. At the distances involved, and taking into account the scale of development proposed in the cumulative schemes, it is assessed that there would be no significant cumulative effect with the proposed development in any case.
- 12.64 The effect of the proposed development in the context of cumulative schemes would, therefore, be the same as that of the proposed development considered on its own in respect of views and townscape character areas.

Table 12.2 Summary

Scheme Name	During Construction	During Operation
Sweets Way, N20; Oakleigh Road – South Depot site; Pavilion Study Centre; 70-84 and Land R/o Oakleigh Road North; Gas Holder, N11; Ladderswood Estate, N11; Barnet House, N20	No significant effects with the proposed development	No significant effects with the proposed development
	During Construction	During Operation
Cumulative Impact Assessment	The effects of the proposed development would be the same in the cumulative scenario as those for the proposed development considered on its own.	The effects of the proposed development would be the same in the cumulative scenario as those for the proposed development considered on its own.

CONCLUSIONS

- 12.65 The overall effect of the proposed development would be to open up what is currently a relatively self-contained site and integrate it better with its surroundings. The character of the proposed development would undoubtedly be different to that of surrounding areas, including in the density and scale of the development on it; this, however, is appropriate for a site which has always been developed differently. The proposed development would be neighbourly in its approach to the distribution of massing across the site, and the enhanced permeability and new public realm it would offer would be of benefit to the local and wider area in which the site is located. The proposed development would enhance the views in which it is seen most clearly and would have a beneficial or neutral effect in relation to the TCAs around it.

REFERENCES

- ¹ Ministry of Housing, Communities and Local Government (2021); National Planning Policy Framework, (www.gov.uk/mhclg)
- ² Ministry of Housing, Communities and Local Government (2014): Planning Practice Guidance (www.gov.uk/mhclg)
- ³ Ministry of Housing, Communities and Local Government (2019): National Design Guide (www.gov.uk/mhclg)
- ⁴ Historic England (2015): Historic England Advice Note 4 – Tall Buildings, Historic England.
- ⁵ Historic England (2020): Historic England Advice Note 4 – Tall Buildings- Second edition consultation. Historic England.
- ⁶ Mayor of London (2021); The London Plan – Spatial Development Strategy for Greater London, Greater London Authority.
- ⁷ Mayor of London (2012); London View Management Framework Supplementary Planning Guidance, Greater London Authority.
- ⁸ Natural England (2011): London’s Natural Signatures: The London Landscape Framework, Natural England.
- ⁹ London Borough of Barnet (2012): Core Strategy. London Borough of Barnet
- ¹⁰ London Borough of Barnet (2012): Local Plan (Development Management Policies). London Borough of Barnet.
- ¹¹ London Borough of Barnet (2010): Characterisation Study of London Borough of Barnet Final Report. London Borough of Barnet.
- ¹² London Borough of Barnet (2013): Residential Design Guidance SPD. London Borough of Barnet.
- ¹³ London Borough of Barnet (2016): Planning Brief, North London Business Park. London Borough of Barnet.
- ¹⁴ Landscape Institute and Institute of Environmental Management and Assessment: IEMA (2013); Guidelines for Landscape and Visual Impact Assessment Third Edition (GLVIA), London and New York: Routledge.

13.0 NOISE AND VIBRATION

INTRODUCTION

- 13.1 This Chapter assesses the likely significant effects of the construction and operational phases of the proposed development in respect of noise and vibration.
- 13.2 This Chapter describes the legislative and policy framework; the assessment methodology; the baseline conditions at the site and surroundings; the likely significant environmental effects; the mitigation measures required to prevent, reduce or offset any significant adverse effects; and the likely residual effects after these measures have been employed.

LEGISLATION AND POLICY CONTEXT

- 13.3 This section outlines the legislative framework, the national, regional and local planning policy and supplementary policy guidance/best practice that has been considered in this assessment.

National

National Planning Policy Framework, 2021

- 13.4 The National Planning Policy Framework (NPPF) (published March 2012 & updated in February 2019 and July 2021)¹ is the means by which noise is considered within the planning regime. The NPPF does not contain assessment design targets, instead providing a series of policies, giving local authorities the flexibility in meeting the needs of local communities. The NPPF states:

"Planning policies and decisions should contribute to and enhance the natural and local environment by [...] 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."

"Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:

a) mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life;

b) identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason.”

“Planning policies and decisions should ensure that new development can be integrated effectively with existing businesses and community facilities (such as places of worship, pubs, music venues and sports clubs). Existing businesses and facilities should not have unreasonable restrictions placed on them as a result of development permitted after they were established. Where the operation of an existing business or community facility could have a significant adverse effect on new development (including changes of use) in its vicinity, the applicant (or ‘agent of change’) should be required to provide suitable mitigation before the development has been completed.”

- 13.5 The suitability of internal noise levels within a development for its intended uses can be determined with reference to BS 8233:2014 ‘Guidance on sound insulation and noise reduction for buildings’.

Noise Policy Statement for England, 2010

- 13.6 The Noise Policy Statement for England (NPSE) is published by the Department for Environment, Food and Rural Affairs (Defra)² and sets out the approach to noise within the Government’s sustainable development strategy.

- 13.7 The significance of impacts from noise within the NPSE are defined as follows:

‘There are two established concepts from toxicology that are currently being applied to noise impacts, for example, by the World Health Organisation. They are:

NOEL – No Observed Effect Level

- This is 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 the noise.

LOAEL – Lowest Observed Adverse Effect Level

- This is the level above which adverse effects on health and quality of life can be detected.’

- 13.8 Extending these concepts for the purpose of this NPSE leads to the concept of a significant observed adverse effect level.

‘SOAEL – Significant Observed Adverse Effect Level

- This is the level above which significant adverse effects on health and quality of life occur.’

13.9 The three aims of the NPSE are stated as:

'Avoid significant adverse impacts on health and quality of life from environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.

Mitigate and minimise adverse impacts on health and quality of life from environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.

Where possible, contribute to the improvement of health and quality of life through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.'

Professional Practice Guidance on Planning and Noise (ProPG), 2017

13.10 The Professional Practice Guidance on Planning and Noise³ is written to provide practitioners with guidance on a recommended approach to the management of noise within the planning system in England. The CIEH, IOA and the ANC have worked together to produce the guidance which encourages better acoustic design for new residential development and aims to protect people from the harmful effects of noise. This Professional Practice Guidance is based on the best knowledge available at the time of publication. It does not constitute an official government code of practice and neither replaces nor provides an authoritative interpretation of the law or government policy on which users should take their own advice as appropriate.

13.11 In relation with achieving internal noise values with open windows ProPG states that:

"Where it is not possible to meet internal target levels with windows open, internal noise levels can be assessed with windows closed, however any façade openings used to provide whole dwelling ventilation (e.g. trickle ventilators) should be assessed in the "open" position and, in this scenario, the internal L_{Aeq} target levels should not normally be exceeded".

Acoustic Design

13.12 ProPG encourages the use of acoustic design as a means to inform the site masterplans and is key to avoiding or reducing to a minimum any adverse effects on any sensitive internal or external spaces. In considering acoustic design, consideration should be given by the developer to the management of noise through a hierarchy of potential mitigation measures which may include:

- Maximising the separation distance between source and receiver;
- Incorporate noise barriers (where applicable) to screen the development site (or individual plots) from significant sources of noise;

- Use existing features to reduce noise propagation across the site;
- Orientate the buildings in a manner which reduces the noise levels within habitable rooms (particularly bedrooms);
- Building envelope design to mitigate the noise to acceptable levels, whilst providing adequate ventilation.

Regional

The London Plan, 2021⁴

Policy D14 Noise

13.13 In order to reduce, manage and mitigate noise to improve health and quality of life, residential and other non-aviation development proposals should manage noise by:

- '1) avoiding significant adverse noise impacts on health and quality of life*
- 2) reflecting the Agent of Change principle as set out in Policy D13 Agent of Change*
- 3) mitigating and minimising the existing and potential adverse impacts of noise on, from, within, as a result of, or in the vicinity of new development without placing unreasonable restrictions on existing noise-generating uses*
- 4) improving and enhancing the acoustic environment and promoting appropriate soundscapes (including Quiet Areas and spaces of relative tranquillity*
- 5) separating new noise-sensitive development from major noise sources (such as road, rail, air transport and some types of industrial use) through the use of distance, screening, layout, orientation, uses and materials – in preference to sole reliance on sound insulation*
- 6) where it is not possible to achieve separation of noise-sensitive development and noise sources without undue impact on other sustainable development objectives, then any potential adverse effects should be controlled and mitigated through applying good acoustic design principles*
- 7) promoting new technologies and improved practices to reduce noise at source, and on the transmission path from source to receiver.'*

13.14 Boroughs, and others with relevant responsibilities, should identify and nominate new Quiet Areas and protect existing Quiet Areas in line with the procedure in Defra's Noise Action Plan for Agglomerations.

Local

London Borough of Barnet's 'Core Strategy'⁵ and 'Development Management Policies'⁶, 2012

13.15 Air and noise pollution:

'18.11.1) Levels of noise and air pollution have a major bearing on the health and wellbeing of all Barnet residents. The majority of Barnet's housing growth will take place in areas that already suffer from air and noise pollution. The design of the built environment has an important role in managing the degree to which people are exposed to pollution. Within Barnet emissions from traffic have the most severe and pervasive impact on air quality.

18.11.3) Persistent and intermittent noises such as those made by industrial activities, transport, construction and congregations of people can undermine quality of life. We will take into account noise considerations when assessing development proposals. Regard will be made to the Mayor's Ambient Noise Strategy as a reference source for understanding noise and identifying best practice. We will require Noise Impact Assessments for developments likely to generate or be exposed to significant noise. Further guidance on noise quality and when assessments will be required is provided in our SPD on Sustainable Design and Construction.'

London Borough of Barnet's Supplementary Planning Document: Sustainable Design and Construction, 2016⁷

13.16 Noise Quality:

'2.14.1) Noise can have a significant effect on the quality of life enjoyed by those who live work and visit the borough. Noise can also impact the natural environment. Vibration is also an issue, often related to noise.

2.14.2) The main sources of noise (and vibration) in Barnet include road and rail traffic, commercial and industrial land use, refrigeration and air handling plant [building services plant], sound systems, construction activities and people. Management of noise is an issue which significantly increases in importance for higher densities of population and economic activity. Noise can be persistent such as traffic, air conditioning or refrigeration units or intermittent such as drilling or early morning delivery vehicles.

2.14.3) Receptors which are particularly sensitive to noise include residential, health care facilities and schools. Noise also affects people enjoying outdoor amenity space and public open space. Noise exposure can have effects including significant sleep disturbance and annoyance. Recent evidence shows that noise can impair cognitive learning in school children. It is also agreed by many experts that environmental noise can lead to chronic health effects. For example, associations have been found between

long term exposure to some types of transport noise, particularly from aircraft and road traffic, and an increase in the risk of cardiovascular effects (heart disease and hypertension). This guidance aims to address the effect that noise can have on quality of life and deliver the best acoustic outcome for a site.

2.14.4) In order to affect the design process it is important to assess and address noise impacts arising or existing for a new development at the earliest stage. If there is insignificant noise and vibration, then mitigation requirements maybe unlikely and further assessment maybe unnecessary. However, if there are significant noise or vibration levels, then the noise affects would need to be assessed carefully using suitably qualified consultants providing a Noise Impact Assessment which identifies optimum mitigation measures to reduce the noise impacts to an acceptable level.

2.14.5) To help consider noise at a site at an early stage an initial noise risk assessment should assess the Noise Risk Category of the site to help provide an indication of the likely suitability of the site for new residential development from a noise perspective. Figure 1: Initial Site Risk Assessment sets out the indicative noise levels for the Noise Risk Categories and a description of the potential effect of noise were no further noise mitigation to take place as well as additional pre-planning application guidance.'

Table 13.1 Initial Site Risk Assessment

Noise Risk Category	Potential Effect if unmitigated	Pre-Planning Application Guidance
0 – Negligible $L_{Aeq,16hr} < 50dB$ $L_{Aeq,8hr} < 40dB$	May be noticeable but no adverse effect on health and quality of life	In this category the development is likely to be acceptable from a noise perspective, nevertheless a good acoustic design process is encouraged to improve the existing environment and/or safeguard against possible future deterioration and to protect any designated tranquil areas. A noise assessment may be requested to demonstrate no adverse impact from noise. Application need not formally be delayed on noise grounds.
1- Low $L_{Aeq,16hr}$ 50 - 63dB $L_{Aeq,8hr}$ 40 - 55dB	Adverse effect on health and quality of life	In this category the development may be refused unless a good acoustic design process is followed and is demonstrated via a Level 1 Acoustic Design Statement, which confirms how the adverse impacts of noise on the new development will be mitigated and minimised, and that a significant adverse noise impact will not arise in the finished development. Planning conditions and other measures to control noise may be required.
2 – Medium $L_{Aeq,16hr}$ 63-69dB $L_{Aeq,8hr}$ 55-60dB $L_{AFmax} > 80dB$	Significant adverse effect on health and quality of life	In this category the development is likely to be refused unless a good acoustic design process is followed and is demonstrated via a Level 2 Acoustic Design Statement which confirms how the adverse impacts of noise on the new development will be mitigated and minimised,

Noise Risk Category	Potential Effect if <u>unmitigated</u>	Pre-Planning Application Guidance
		and clearly demonstrates that a significant adverse noise impact will not arise in the finished development. Planning conditions and other measures to control noise will normally be required.
3 – High $L_{Aeq,16hr} > 69dB$ $L_{Aeq,8hr} > 60dB$ $L_{AFmax} > 80dB$	Unacceptable adverse effect on health and quality of life	In this category the development is very likely to be refused on noise grounds, even if a good design process is followed and is demonstrated via a Level 2 Acoustic Design Statement. Applicants are advised to seek expert advice on possible mitigation measures. Advice on the circumstances when the refusal of new housing on noise grounds should normally be anticipated is included in the ProPG.

Source: Figure 1, page 31, Barnet Council Supplementary Planning Document, 2016

'2.14.6) Barnet will consider daytime and night time averages, background noise levels and maximum intermittent noise levels during the night in order to establish appropriate mitigation in accordance with guidance. Barnet would expect a good acoustic design with mitigation measures that ensure a good level of amenity both externally and internally'

13.17 A number of further design principles are provided on page 31 of the supplementary planning document.

ASSESSMENT METHODOLOGY

Guidance

13.18 The following standards and guidance documents are relevant to the assessment methodology adopted within this Chapter.

British Standard (BS) 5228-1: 2009 +A1:2014 'Code of practice for noise and vibration control on construction and open sites. Noise'

13.19 Construction phase impacts have the potential for a short-term impact on noise sensitive receptors in the vicinity of the proposed development. These impacts are assessed by calculating the site noise level ($L_{Aeq,T}$) as a result of such activities using the methods described by BS 5228-1. To do this, noise emissions from various anticipated construction activities are calculated and compared against a pre-determined criteria based on the pre-construction ambient noise.

13.20 The method for assessing the significance of noise from demolition and construction activities are provided within Annex E of BS 5228. One such method of applying significance to noise effects is repeated in Table 13.2.

Table 13.2 Criteria for assessing potential significant effects

Assessment Category and Threshold Value Period, L_{Aeq}	Threshold Value in Decibels, dB		
	Category A ¹	Category B ²	Category C ³
Night-time (23.00–07.00)	45	50	55
Evenings and weekends ⁴	55	60	65
Daytime (07.00–19.00) and Saturdays (07.00–13.00)	65	70	75
¹ Category A: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are less than these values. ² Category B: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are the same as category A values. ³ Category C: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are higher than category A values. ⁴ 19.00–23.00 weekdays, 13.00–23.00 Saturdays and 07.00–23.00 Sundays.			

- 13.21 A significant effect has been deemed to occur if the site noise level (construction only), exceeds the threshold level for the Category appropriate to the ambient noise level for a month or more. If the baseline ambient noise level exceeds the Category C values then a significant effect is deemed to occur if the total noise level (construction + ambient noise) for the period increases by more than 3 dB.
- 13.22 Works for a shorter duration that might result in a significant effect are considered by using the trigger levels for sound insulation and time criteria from Annex E.4 of BS 5228-1.
- 13.23 Exceedance of identified levels as shown in the table below and trigger a responsibility on the developer to provide noise insulation. The standard suggests that noise insulation should be provided if the trigger levels (or a noise level 5 dB above the existing noise level, whichever is higher) are predicted to be exceeded for a period of ten or more days of working in any fifteen consecutive days, or for a total of days exceeding 40 in any six month period.

Table 13.3 Criteria for assessing eligibility for noise insulation

Time	Relevant Time Period	Averaging Time, T	Noise Trigger Level, dB $L_{Aeq, T(1)}$
Monday to Friday	07.00 – 08.00	1 h	70
	08.00 – 18.00	10 h	75
	18.00 – 19.00	1 h	70
	19.00 – 22.00	3 h	65
	22.00 – 07.00	1 h	55

Time	Relevant Time Period	Averaging Time, T	Noise Trigger Level, dB L _{Aeq, T(1)}
Saturday	07.00 – 08.00	1 h	70
	08.00 – 13.00	5 h	75
	13.00 – 14.00	1 h	70
	14.00 – 22.00	3 h	65
	22.00 – 07.00	1 h	55
Sunday and Public Holidays	07.00 – 21.00	1 h	65
	21.00 – 07.00	1 h	55
Note 1 - Equivalent continuous A-weighted noise level predicted or measured at a point 1m in front of the most exposed windows or doors leading directly to a habitable room (living room or bedroom) in an eligible dwelling.			

13.24 BS 5228-1 continues to state within the example criteria, that temporary re-housing, or a reasonable cost thereof, would be offered by the developer where noise levels are 10 dB above any of the trigger levels (or a noise level 10 dB above the existing noise level, whichever is higher).

BS 5228-2: 2009 +A1:2014 'Code of practice for noise and vibration control on construction and open sites. Vibration'

13.25 BS 5228-2:2009+A1:2014 'Code of practice for noise and vibration control on construction and open sites. Vibration' (BS5228)⁸ provides guidance on vibration levels that can be used to assess the likely impacts of construction activities on buildings and on humans. Annex B of the standard gives guidance on the significance of vibration effects in terms of human response to vibration and structural response.

Table 13.4 Guidance on Effects of Vibration Levels Perceptible on Humans

Vibration Level (PPV)	Effect
0.14 mms ⁻¹	Vibration might be just perceptible in the most sensitive situations for most vibration frequencies associated with construction. At lower frequencies, people are less sensitive to vibration
0.3 mms ⁻¹	Vibration might be just perceptible in residential environments
1.0 mms ⁻¹	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
10 mms ⁻¹	Vibration is likely to be intolerable for any more than a very brief exposure to this level

Table 13.5 Transient Vibration Guide Values for Cosmetic Damage

Line	Type of Building	Peak component particle velocity in frequency range of predominant pulse	
		4 Hz to 15 Hz	15 Hz and above
1	Reinforced or framed structures / Industrial and heavy commercial buildings	50 mms ⁻¹ at 4 Hz and above	
2	Unreinforced or light framed structures	15 mms ⁻¹ at 4 Hz increasing to 20 mms ⁻¹ at 15 Hz	20 mms ⁻¹ at 15 Hz increasing to 50 mms ⁻¹ at 40 Hz and above
	Residential or light commercial buildings		
Note 1 – values referred to are at the base of the building; Note 2 – for line 2, at frequencies below 4 Hz, a maximum displacement of 0.6 mm (zero to peak) is not to be exceeded.			

13.26 BS 5228 states that the guide values in Table 13.5 predominantly relates to transient vibration which does not give rise to resonant responses in structures, and to low-rise buildings. Where the dynamic loading caused by continuous vibration is such as to give rise to dynamic magnification due to resonance, especially at the lower frequencies where lower guide values apply, then the guide values in Table 13.5 might need to be reduced by up to 50%.

BS 8233: 2014 'Guidance on sound insulation and noise reduction for buildings'

13.27 BS 8233⁹ establishes internal ambient noise levels for dwellings based upon occupancy patterns and derived from World Health Organisation (WHO) guidelines for community noise. These are summarised below:

Table 13.6 Design Targets for Indoor Ambient Noise Levels

Activity	Location	07:00 to 23:00	23:00 to 07:00
Resting	Living Room	35 dB L _{Aeq, 16hr}	--
Dining	Dining room/area	40 dB L _{Aeq, 16hr}	--
Sleeping (daytime resting)	Bedroom	35 dB L _{Aeq, 16hr}	30 dB L _{Aeq, 8hr}

13.28 BS 8233 also provides design targets for external noise and Section 7.7.3.2 states:

"For traditional external areas that are used for amenity space, such as gardens and patios, it is desirable that the external noise level does not exceed 50 dB L_{Aeq,T}, with an upper guideline value of 55 dB L_{Aeq,T} which would be acceptable in noisier environments. However, it is also recognized that these guideline values are not achievable in all

circumstances where development might be desirable. In higher noise areas, such as city centres or urban areas adjoining the strategic transport network, a compromise between elevated noise levels and other factors, such as the convenience of living in these locations or making efficient use of land resources to ensure development needs can be met, might be warranted. In such a situation, development should be designed to achieve the lowest practicable levels in these external amenity spaces, but should not be prohibited.”

World Health Organisation Guidelines, 1999

13.29 The WHO Guidelines for Community Noise was published in 1999¹⁰ as a response to a need for action together with a generic need for improvements in legislation at a national level. Although not legislation, this document provides general guidance and guidelines which have been set for different health effects, using the lowest noise level that produces an adverse health effect in specific human environments.

Table 13.7 Guidelines for Community Noise Levels

Specific Environment	Critical Health Effect(s)	L _{Aeq, T} (dB)	Time base, T (hours)	L _{AFmax} (dB)
Outdoor Living Area	Serious annoyance, daytime and evening	55	16	--
	Moderate annoyance, daytime and evening	50		
Dwellings, indoors	Speech intelligibility and moderate annoyance, daytime and evening	35	16	--
Inside bedrooms	Sleep disturbance, night-time	30	8	45 ^(a)
Outside bedrooms	Sleep disturbance, window open (outdoor values)	45	8	60

^(a) Should not exceed 45 dB L_{AFmax} more than 10-15 times a night

BS 4142: 2014 + A1: 2019 'Methods for rating and assessing industrial and commercial sound'

13.30 BS 4142: 2019¹¹ describes the methods for rating and assessing noise from industrial or commercial sources, including manufacturing processes, fixed installations and plant equipment, loading of goods and sound from mobile plant. The standard is applicable for the purpose of assessing sound at proposed new dwellings, through the determination of a rating level of an industrial or commercial noise source.

13.31 Where certain acoustic features are present at the assessment location, a character correction should be applied to the specific sound level to give the rating level to be used in the assessment.

- A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.
- A difference of around +5dB is likely to be an indication of adverse impact depending on the context.
- Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact depending on the context.

13.32 BS 8233 provides good internal design threshold for new developments, including residential. This standard is derived from the WHO Guidelines for Community Noise (see above). For the use of BS 4142 in assessing new residential development applications ProPG (Paragraph 2.43) states that:

'Professional judgement will have to be exercised in addressing these sorts of issues. One possible approach may be to apply BS 4142:2014 character corrections to the noise level guideline values in order to derive suitable effect thresholds and/ or mitigation design targets and to use the same reference time periods recommended in the standard'.

'Where the initial estimate of the impact needs to be modified due to the context, all pertinent factors should be taken into account, including:

- The absolute level;
- The character and level of the residual sound;
- The sensitivity of the receptor and whether dwellings will already (or likely) to incorporate design measures that secure good internal and/or outdoor acoustic conditions, such as: i) façade insulation treatments, ii) ventilation and/or cooling, and iii) acoustic screening.'

13.33 BS 4142 states that:

'A correction of up to +9 dB can be applied for sound that is highly impulsive, considering both the rapidity of the change in sound level and the overall change in sound level. Subjectively, this can be converted to a penalty of 3 dB for impulsivity which is just perceptible at the noise receptor; 6 dB where it is clearly perceptible, and 9 dB where it is highly perceptible.'

Building Bulletin 93 'Acoustic design of schools: performance standards', 2015

13.34 Acoustic criteria for new and refurbished school buildings are defined by Building Bulletin 93: 'Acoustic Design of Schools', 2015 (BB93)¹². BB93 outlines the acoustic performance

standards, including the minimum internal ambient noise levels to be achieved in the different spaces within the school and noise levels within external teaching spaces.

- 13.35 Suitable indoor ambient noise levels are required for clear communication of speech between teacher and students and also to ensure activities requiring concentration can be carried out undisturbed. The indoor ambient noise level is a function of external noise sources and noise from building services.
- 13.36 The BB93 upper limit levels for various room types likely to be present at the proposed development are presented in Table 13.8. For naturally ventilated rooms, the limits are to be applied when ventilators or windows are open as required to provide adequate ventilation. If mechanically assisted ventilation is used, the internal noise limits apply to the cumulative effect of both internal mechanical services noise and external noise ingress.
- 13.37 The noise targets are for each type of space when unoccupied and exclude noise contributions from teaching activities and associated equipment.

Table 13.8 BB93 Target Indoor Ambient Noise Levels

Room	BB93 Indoor Ambient Noise Level (IANL) Upper Limit
Art and design	≤ 40 dB $L_{Aeq,30min}$
Calm room	≤ 35 dB $L_{Aeq,30min}$
Dining room	≤ 45 dB $L_{Aeq,30min}$
Food technology	≤ 40 dB $L_{Aeq,30min}$
General classroom	≤ 35 dB $L_{Aeq,30min}$
Interview room	≤ 40 dB $L_{Aeq,30min}$
Multi-use hall	≤ 35 dB $L_{Aeq,30min}$
Office	≤ 40 dB $L_{Aeq,30min}$
Science laboratory	≤ 40 dB $L_{Aeq,30min}$
Staff room	≤ 40 dB $L_{Aeq,30min}$
WC / Changing	≤ 50 dB $L_{Aeq,30min}$
Teaching space intended specifically for students with special hearing and communication needs (SEN)	≤ 30 dB $L_{Aeq,30min}$
Notes:	
<ol style="list-style-type: none"> Where target IANL is 40 dB $L_{Aeq,30min}$ or lower, a +5 dB relaxation can be applied where a natural or hybrid ventilation strategy is implemented. This applies only to noise from external sources (not noise from building services). During the hottest 200hrs of the year, noise from external sources is permitted up to 55 dB(A) provided a natural/hybrid system is installed. Noise from mechanical 	

Room	BB93 Indoor Ambient Noise Level (IANL) Upper Limit
<p>systems may be relaxed by +5 dB above the IANL target. This relaxation only applies where ventilation is under local control of the teacher so noise can be reduced to normal levels when needed.</p> <p>3. The noise level from locally controlled intermittent boost mechanical ventilation may exceed the IANL by up to +5 dB for dilution of fumes during practical activities. If natural ventilation is utilised for this purpose, noise levels up to 55 dB(A) may be permitted.</p> <p>4. To protect students from regular discrete noise events (e.g. aircraft), IANLs should not exceed 60 dB $L_{A01,30min}$. This is achieved by default for spaces with IANLs up to 40 dB $L_{Aeq,30min}$.</p>	

Design Manual for Roads and Bridges, LA111 Noise and Vibration, 2020

- 13.38 The assessment is based on the procedure set out in the Design Manual for Roads and Bridges (DMRB)¹³. The assessment covers both the magnitude and significance of any change as a result of any new or amended highway scheme however is relevant for noise assessment of other project types. DMRB refers specifically to noise impacts and as such will be discussed in these terms for the purposes of this assessment.
- 13.39 A significant change is defined as an increase in the 18-hour traffic flow which is equal or greater than 25%, or a decrease which is equal or greater than 20%. Changes of this magnitude are equivalent to a change in noise level of at least 1 dB.
- 13.40 The magnitude of noise impact is therefore assessed by comparing the increase and decrease in noise levels between both short term and long-term scenarios. DMRB defines this impact both in the short term (immediate impact) and long term (future impact).

Table 13.9 Guidelines for Community Noise Levels

Magnitude of Change	Noise Change, dB $L_{A10, 18hr}$	
	Short Term	Long Term
Major	Greater than or equal to 5.0	Greater than or equal to 10.0
Moderate	3.0 to 4.9	5.0 to 9.9
Minor	1.0 to 2.9	3.0 to 4.9
Negligible	less than 1.0	less than 3.0

British Standard 6472-1:2008 'Guide to evaluation of human exposure to vibration in buildings'

- 13.41 BS 6472¹⁴ acknowledges that specific magnitudes and types of vibration can cause unfavourable reactions to occupants within buildings. It provides general guidance on human exposure to building vibration in the frequency range 1 Hz to 80 Hz.

- 13.42 The table below shows the assessment criteria for determining human response to building vibration for both daytime and night-time periods. In accordance with BS 6472, for there to be a low adverse probability of comment, the VDV must be between 0.2 to 0.4 $\text{m/s}^{1.75}$ during the day and between 0.1 to 0.4 $\text{m/s}^{1.75}$ during the night.

Table 13.10 Vibration Dose Value Ranges of Adverse Comment

Place and Time	Low probability of adverse comment, $\text{ms}^{-1.75}$	Adverse comment possible, $\text{ms}^{-1.75}$	Adverse comment probable, $\text{ms}^{-1.75}$
Residential buildings / 16hr day	0.2 to 0.4	0.4 to 0.8	0.8 to 1.6
Residential buildings / 8hr night	0.1 to 0.2	0.2 to 0.4	0.4 to 0.8

Acoustics Ventilation and Overheating - Residential Design Guide: 2020

- 13.43 Whilst the noise criteria outlined within BS 8223: 2014 provides guidance for 'normal' conditions, it is widely considered that a relaxation in acoustic criteria is permissible during peak summer months where occupants may be willing to compromise on noise ingress for purpose of thermal comfort. Suitable internal noise levels during overheating periods (i.e. when open windows or other measures are required to be implemented for the control of overheating) are provided in Acoustics Ventilation and Overheating: Residential Design Guide (AVO)¹⁵.
- 13.44 A summary of the recommended levels for the most noise-sensitive spaces (bedrooms) are provided below in Table 13.11 for average ambient noise levels throughout a given time period (L_{Aeq}) and maximum noise levels (L_{max}) during the night.

Table 13.11 Ventilation and Overheating Design Targets (Internal)

Period	Normal condition (As per BS 8223)	Overheating condition
Daytime (07:00 to 23:00)	35 dB $L_{Aeq,16hr}$	40 – 50 dB $L_{Aeq,16hr}$
Night-time (23:00 to 07:00)	30 dB $L_{Aeq,8hr}$ 45 dB L_{Amax}	35 – 42 dB $L_{Aeq,8hr}$ 65 dB L_{Amax}^*

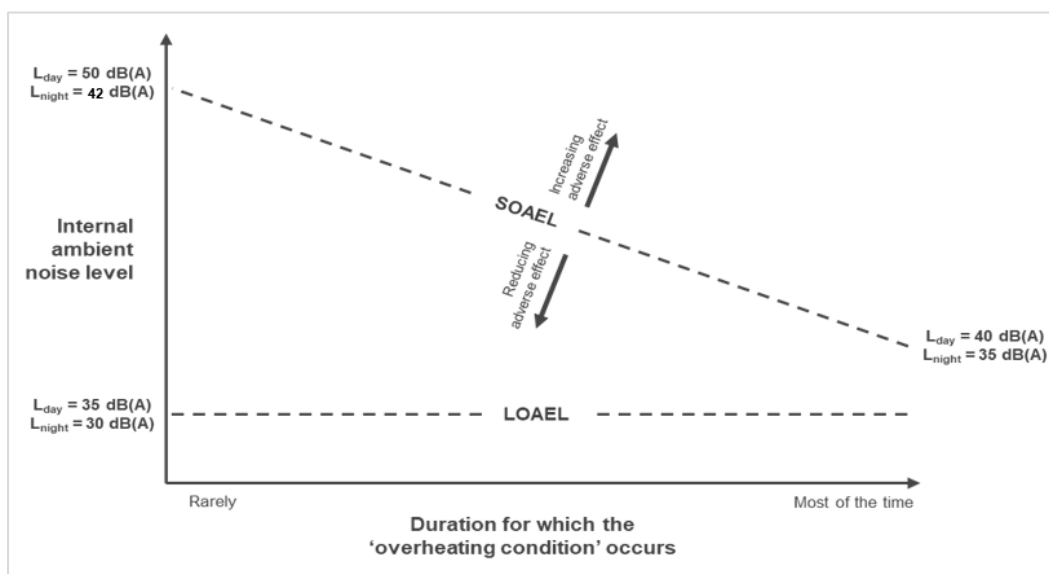
* Note L_{AFmax} refers to the level not normally exceeded, and not the 10th highest L_{AFmax} highest level used within WHO guidelines

- 13.45 The lower ambient noise level thresholds in the overheating condition (40 dB(A) and 35 dB(A) for day and night respectively) correspond to the recommendation within BS 8233:2014 for internal noise levels that would be considered "reasonable" under normal conditions.
- 13.46 The appropriate target level within the range is determined by considering the duration for which windows or ventilation openings are required to be utilised to control

overheating. While there are no defined values as to what is considered "rarely" or "most of the time", guidance is provided through assessment of overheating risk assessments or thermal modelling output.

- 13.47 It should be noted that the noise levels stated are considered to apply for transportation noise sources and industrial noise is not considered by the AVO guide. It is therefore necessary to include the previously identified corrections to measured noise levels for acoustic characteristics of industrial sound that residents may find more annoying or disturbing (e.g. where noise sources have prominent tonal qualities, are intermittent or are impulsive).

Figure 13.1 Relationship between internal ambient noise level and duration of overheating situation



Sport England 'Artificial Grass Pitch (AGP) Acoustics', 2015

- 13.48 This guidance¹⁶ provides details of the acoustic implications associated with AGP facilities and follows on from an acoustic research programme involving detailed analysis of relevant noise guidance documents and site testing in a range of locations. It proposes appropriate noise criteria and assessment methods and outlines practical measures that can be applied to reduce noise in particularly sensitive areas.

Scope of the Assessment

Consultation

- 13.49 Discussions with the Environmental Health Officer at Barnet Council were sought to agree the scope and methodology of the assessment. The baseline survey methodology and methodology of assessment was discussed via telephone conversation and subsequent emails on 20 April 2021, reproduced in Appendix 13.5.

- 13.50 The Environmental Health Officer advised that the design targets within BS 8233: 2014 and WHO would apply for the design of internal noise levels. In addition, the noise emitted from plant and machinery (associated with the development site) shall be at least 5 dB(A) below the background level, as measured from any point 1 metre outside the window of any room of a neighbouring residential property. If the noise emitted has a distinguishable, discrete continuous note (whine, hiss, screech, hum) and/or distinct impulse (bangs, clicks, clatters, thumps), then it shall be at least 10 dB(A) below the background level, as measured from any point 1 metre outside the window of any room of a neighbouring residential property.
- 13.51 In addition, it was advised that overheating should also be considered within the assessment, with suitable mitigation measures incorporated through design.

Construction Phase

- 13.52 At this stage, detailed construction methodologies and plant lists are not available. The assessment has therefore been informed by an indicative construction programme and plant lists formulated by RSK (the consultant that produced the chapter) which provides a conservative and robust approach in the absence of final construction details. This is based on previous experience on similar projects however, the assessment would likely be subject to change upon receipt of the final construction methodologies/plant lists.
- 13.53 Similarly, construction vibration has been assessed providing an estimation of vibration levels at different separation distances. During construction, the likely activity to cause vibration is piling during the foundation stage. Special consideration will be given to the piling method selection in order to incorporate the risks, mitigation and control measures into a detailed Construction Environmental Management Plan (CEMP). Rotary bored piling offers a better noise and vibration performance in relation to driven or pressed-in techniques. When setting targets for maximum vibration levels, reference would need to be made to the criteria contained within BS 5228.

Operational Phase

- 13.54 Fixed plant noise from the proposed development (including school premises) has been assessed in line with BS 4142:2014+A1: 2019 and guidance targets provided by the local authority. At this stage, the amount, positioning and type of potential fixed plant is unknown therefore, criteria at nearest receptor locations has been proposed, in line with the requirements of the aforementioned standard and local authority.
- 13.55 Noise from MUGA (Multi-use Games Area) and outdoor playing fields associated with the proposed school will be assessed in accordance to recommended external noise levels for residential use set out in BS 8233:2014 and WHO (1999).
- 13.56 At the time of writing, Transport for London (TfL) were not in a position to disaggregate the traffic flows associated with the committed developments in the area from the

opening and future scenarios to enable a road traffic noise assessment, as requested by the project's traffic consultants. The assessment as therefore been informed by the available data incorporated in the previously submitted ES Noise and Vibration Addendum prepared in May 2018 in support of the HPP by The EQUUS Partnership noise consultants and reproduced in Appendix 13.4.

- 13.57 The document included predicted traffic flows for the opening year (2025) on Brunswick Park Road only, deemed the potentially most affected road section following consultation with Barnet Council 2018.

Site Suitability

- 13.58 The suitability of the proposed development for residential accommodation has been assessed in line with the relevant internal design targets in BS 8233 and WHO for daytime and night time (including maximum noise levels).
- 13.59 Recommendations on the ventilation strategy have been made based on predicted external ambient noise levels and in line with the guidance set out in the Acoustics, Ventilation and Overheating Residential Design Guide (AVO Guide).
- 13.60 The proposed school building within detailed Phase 0 has been assessed in accordance with the guidance provided in BB93.

Study Area

- 13.61 This study serves to identify any effects from noise and vibration at those immediate receptors at closest distance to the application boundary and also the effect of road traffic noise along the local road network. The project transport consultants (Stomor) have advised that the effect of operational road traffic would extend to Brunswick Park Road.

Assessment Criteria

- 13.62 This Chapter has used a topic specific assessment framework for assessing the significance of effect. The following text and tables define the receptor sensitivity and magnitude of effects that are used to determine the significance of effect outlined in this chapter.

Value of Receptor Sensitivity

- 13.63 The example for sensitivity within the IEMA Noise Assessment Guidelines (ref. Chapter 7, Table 7-7) has been followed to provide the criteria for sensitivity as follows.

Table 13.12 Receptor Sensitivity Criteria

Sensitivity	Criteria
High	Receptors where occupants or activities are particularly susceptible to noise. Examples include: residences, quiet outdoor areas used for recreation, conference facilities, auditoria/studios, schools in daytime, hospitals/residential care homes and religious institutions e.g. churches or mosques.
Medium	Receptors moderately sensitive to noise, where it may cause some distraction or disturbance. Examples include: offices, restaurants and sports grounds where spectator noise is not a normal part of the event and where quiet conditions are necessary (e.g. golf or tennis).
Low	Receptors where distraction or disturbance from noise is minimal. Examples include residences and other buildings not occupied during working hours, factories and working environments with existing high noise levels and sports grounds where spectator noise is a normal part of the event.

13.64 The area surrounding the proposed development is predominantly residential. As residences are classed as being of the highest sensitivity, these would be the governing receptors in terms of impact. Therefore, for the purposes of the assessment of noise, all residential receptors are considered as being of 'high' sensitivity.

Magnitude of Effect

13.65 The 'magnitude of effect' is used to describe a numerate impact in effect terms and is used differently for each of the various aspects of change to the noise environment. Table 13.13 presents a summary of the effect criteria:

Table 13.13 Magnitude of Effect Criteria

Effect	Criteria				
	Construction Noise	Construction Vibration	Road Traffic (Short term)	Road Traffic (Long term)	Fixed Plant
Major	Exceedance of Noise Insulation Trigger requirements	PPV level ≥ 10.0 mms^{-1}	Change in $L_{A10, 18 \text{ hour}}$ of 5.0 dB or more	Change in $L_{A10, 18 \text{ hour}}$ of 10.0 dB or more	10.0 dB or more above existing background noise ($L_{A90, T}$)
Moderate	Exceedance of Noise Thresholds for more than 1 month	PPV level ≥ 1.0 and < 10.0 mms^{-1}	Change in $L_{A10, 18 \text{ hour}}$ of 3.0 - 4.9 dB	Change in $L_{A10, 18 \text{ hour}}$ of 5.0 - 9.9 dB	5.0 - 9.9 dB above existing background noise ($L_{A90, T}$)
Minor	Exceedance of Noise Thresholds for	PPV level ≥ 0.3 and < 1.0 mms^{-1}	Change in $L_{A10, 18 \text{ hour}}$ of 1.0 - 2.9 dB	Change in $L_{A10, 18 \text{ hour}}$ of 3.0 - 4.9 dB	0.1 - 4.9 dB above existing

Effect	Criteria				
	Construction Noise	Construction Vibration	Road Traffic (Short term)	Road Traffic (Long term)	Fixed Plant
	less than 1 month				background noise (L _{A90, T})
Negligible	No exceedance of Noise Thresholds	PPV level < 0.3 mms ⁻¹	Change in L _{A10, 18 hour} of 0.1 - 0.9 dB	Change in L _{A10, 18 hour} of 0.1 - 2.9 dB	Below existing background noise (L _{A90, T})
* Based on specific local authority requirements					

Significance of Effect

- 13.66 The nearest receptors to the proposed development are residential properties and therefore in line with the appropriate guidance, the sensitivity of these receptors for the purposes of this assessment is classed as 'high'.
- 13.67 As this assessment considers one level of sensitivity, the normal approach to significance cross referencing sensitivity and magnitude of impact has been substituted with a dual approach. Impacts are considered significant if the magnitude of effect is either moderate or major as per Table 13.14 below. Mitigation has been applied where a significant effect has been assessed.

Table 13.14 Matrix of Significance

		Sensitivity of Receptor to Change/Effect		
		High	Medium	Low
Magnitude of Change/Effect	Major	Major Significance	Major - Moderate Significance	Moderate – Minor Significance
	Moderate	Major - Moderate Significance	Moderate – Minor Significance	Minor Significance
	Minor	Moderate – Minor Significance	Minor Significance	Not significant
	Negligible	Not significant	Not significant	Not significant

- 13.68 The LOAEL (lowest observed adverse effect level) and SOAEL (significant observed adverse effect level) for each aspect of the assessment have been based on relevant guidance documents and example criteria from recent and similar projects. Based on the magnitude of effect and in line with NPSE, a LOAEL would occur where there is an exceedance of the minor effect level and SOAEL where there is an exceedance of the major effect level for receptors that are of high sensitivity.

ASSUMPTIONS AND LIMITATIONS

- 13.69 At this stage, detailed construction methodologies and plant lists are not available. The assessment has therefore been informed by an indicative construction programme and plant lists formulated by RSK (the consultant that produced this chapter) and assuming a conservative scenario. This is based on previous experience on similar projects and it is considered a robust approach of plant selection; however, the assessment would likely be subject to change upon receipt of the final methodologies. Once the exact construction plant, phasing and timings have been determined, a further assessment would be considered in line with a Construction Environmental Management Plan (CEMP).
- 13.70 At this stage, specific details of the locations and noise levels of any fixed plant is unknown, therefore a conclusive assessment of noise from any proposed building services plant cannot be undertaken. Proposed noise limits at those nearest receptors have been included which provide a set of criteria that the fixed plant will be designed to in order to meet the requirements of Barnet Council.

BASELINE CONDITIONS

- 13.71 A baseline noise and vibration survey was undertaken between 13 and 17 May 2021 to establish the existing levels across the site, with the resulting data set used to inform the assessment. Monitoring comprised of unattended measurements.
- 13.72 Six long term noise monitoring stations were installed at various positions within and along the boundary of the proposed development in order to measure the noise environment across the site.

Monitoring Locations

- 13.73 The measurement locations and identified noise sources observed during attendance are provided below (graphically presented in Figure 13.2 below):

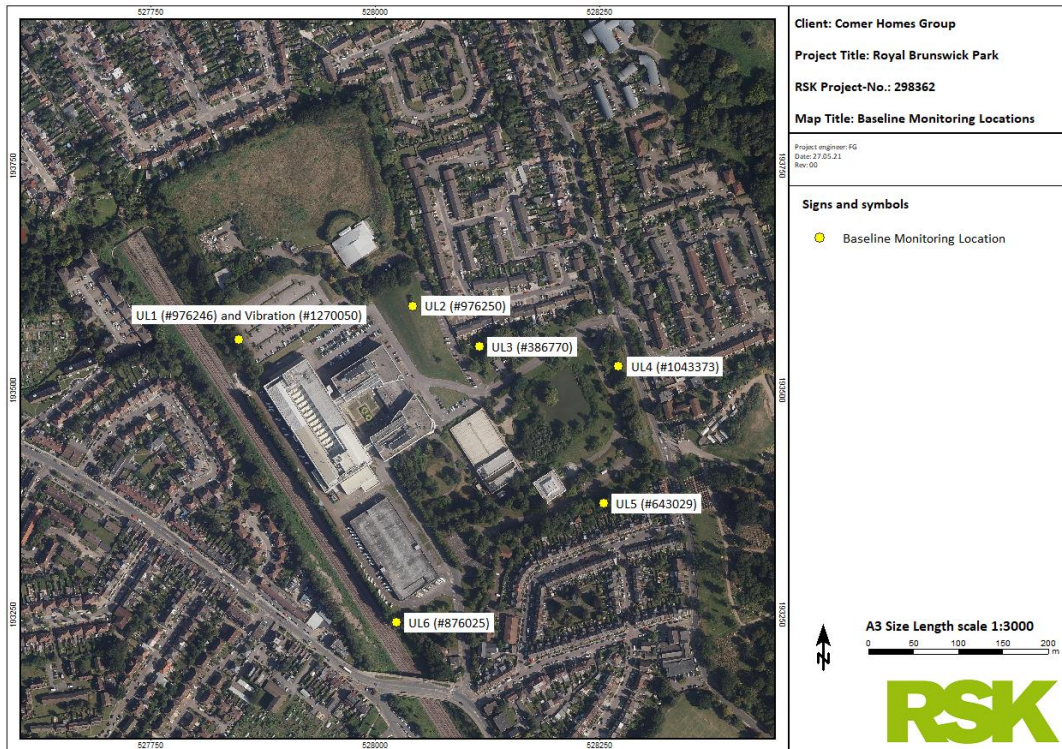
Table 13.15 Monitoring Locations

ID	Location	Observations
UL1	North-west boundary (noise and vibration)	Train movements to the west, road traffic noise (particularly the A109), NLBP vehicles entering/exiting the car park.
UL2	North-east boundary (noise)	Road traffic noise, NLBP vehicle noise, bird song.
UL3	East boundary (1) (noise)	Road traffic noise, NLBP vehicle noise, bird song.

ID	Location	Observations
UL4	East boundary (2) (noise)	Road traffic noise (particularly from Brunswick Park Road), NLBP vehicle noise, bird song.
UL5	South-east boundary (noise)	Road traffic noise (particularly from Brunswick Park Road), NLBP vehicle noise, bird song.
UL6	South-west boundary (noise)	Train movements to the west, road traffic noise (particularly the A109), NLBP vehicle noise.

- 13.74 The noise environment across the site was dominated by transportation sources, namely the railway line running adjacent to the west boundary (East Coast Main Line), Brunswick Park Road running to the east, and Oakleigh Road North to the south-west of the site. Vehicle movements along the internal business park roads also contributes to the existing daytime noise environment, particularly within the central portion of the site.
- 13.75 Due to the terrain profile, the south-west portion of the site sits at a similar ground level relative to the railway therefore, this area is currently exposed to higher noise levels from the operational line. Towards the north-west, the terrain profile raises relative to the railway, providing additional screening from this source to the northern portion of the proposed development.
- 13.76 To a lesser extent, birdsong and community noise near existing vegetated areas and boundary adjacencies with existing residential properties were noted during calm periods.

Figure 13.2 Monitoring Locations



13.77 The equipment used for the survey, calibration dates and a full breakdown of the weather conditions are provided in Appendix 13.1. Weather conditions were noted and considered suitable for monitoring purposes in accordance with BS 7445.

Monitoring Results

13.78 The following tables show the resultant noise levels measured at each monitoring location:

Table 13.16 Noise Monitoring Results – Long Term

ID	Time Period	Measured Noise Level, dB			
		L _{Aeq, T}	L _{Amax} *	L _{A10, T}	L _{A90, T}
UL1	Daytime (07:00 – 23:00)	62	90	55	41
	Night-time (23:00 – 07:00)	56	86	47	39
UL2	Daytime (07:00 – 23:00)	50	88	50	40
	Night-time (23:00 – 07:00)	46	87	43	35
UL3	Daytime (07:00 – 23:00)	52	92	52	42
	Night-time (23:00 – 07:00)	49	77	47	36
UL4	Daytime (07:00 – 23:00)	66	96	70	51

ID	Time Period	Measured Noise Level, dB			
		$L_{Aeq, T}$	L_{Amax}^*	$L_{A10, T}$	$L_{A90, T}$
	Night-time (23:00 – 07:00)	60	90	60	39
UL5	Daytime (07:00 – 23:00)	54	94	54	44
	Night-time (23:00 – 07:00)	48	72	48	36
UL6	Daytime (07:00 – 23:00)	68	103	57	43
	Night-time (23:00 – 07:00)	61	92	47	35
* Highest individual L_{Amax} throughout monitoring period					

13.79 Graphs, illustrating the noise data throughout the monitoring period are provided in Appendix 13.2.

Derivation of Maximum Noise Level (L_{Amax})

13.80 A detailed appraisal of the night-time event levels has been undertaken to establish the 10-th highest event level which occurred on each night of the survey (in line with WHO guidance). The appraisal has been undertaken by plotting the 1 second measurement data over the night-time periods, from which individual noise events can be derived. Table 13.17 presents the 10-th highest event level occurring on each night of the survey at each monitoring location. The maximum noise level highlighted in bold has been used for assessment purposes.

Table 13.17 10th Highest Maximum Night-time Event Levels

Start Date	10 th Highest Maximum Noise Level, dB L_{AFmax}					
	UL1	UL2	UL3	UL4	UL5	UL6
13 May 2021	78	66	63	78	65	85
14 May 2021	78	68	64	77	64	86
15 May 2021	77	64	64	--	64	82
16 May 2021	78	66	63	--	64	84

Derivation of background noise levels (dB $L_{A90, T}$)

13.81 Analysis of the representative baseline data to inform the assessment of fixed plant noise, has considered the context of the hourly noise levels ($L_{A90, 1hr}$) for the daytime period (07:00 – 23:00) and 15-minute samples ($L_{A90, 15min}$) for the night-time period (23:00-07:00). Such an approach is in line with the requirements of BS 4142, and is

considered to suitably provide a representative value for the background noise in the local environment.

- 13.82 A graphical representation of the statistical analysis undertaken at the unattended monitoring positions is included in Appendix 13.3. The representative background noise levels for each monitoring position are provided below:

Table 13.18 Representative Background Noise Levels

Date	Representative Background Noise Level, dB L _{A90, T}					
	UL1	UL2	UL3	UL4	UL5	UL6
Daytime (07:00 – 23:00)	39	38	39	50	45	43
Night (23:00 – 07:00)	36	30	30	36	30	34

- 13.83 Given the specific local authority requirements of fixed plant noise, the criteria at receptor location(s) are based on the local authority requirement of '5 dB below the background noise' (assuming no corrections apply).

Vibration

- 13.84 Operational vibration monitoring, accounting for train movements along the adjacent railway line, was conducted at measurement location UL1 between 13 – 17 May 2021. This position can be considered representative of the residential buildings within Phases 4 and 5 (Blocks 4B, 4C, 5A and 5B). The results of the monitoring are provided below:

Table 13.19 Measured Vibration Dose Values

Date	Vibration Dose Value, ms ^{-1.75}	
	Daytime (07:00 – 23:00)	Night (07:00 – 23:00)
13 – 14 May 2021	0.038	0.031
14 – 15 May 2021	0.048	0.046
15 – 16 May 2021	0.049	0.023
16 – 17 May 2021	0.046	0.029
TOTAL	0.065	0.050

POTENTIAL IMPACTS

During Construction

Noise

13.85 The activity noise levels used in the assessment of construction noise are summarised in Table 13.21.

Table 13.20 Construction Activity Noise Levels

No.	Activity	Activity Noise Level at 10 metres, dB $L_{Aeq,T}$
1	Demolition and Earthworks	78
2	Foundations	79
3	Construction	76

13.86 As detailed methods and phasing of construction are not currently available, the construction noise assessment is necessarily conservative. The activity levels have been used to determine worst case noise levels at existing receptors adjacent to the site through the means of spreadsheet calculations (adopting the calculation methods provided in BS 5228-1:2009+A1: 2014). A site hoarding (2 metre height) has been assumed at the perimeter of the site.

13.87 Worst-case noise predictions assume that all the plant and equipment is in operation at the closest point to each receptor (site boundary); the results are summarised in Table 13.22.

Table 13.21 Construction Activity Noise Levels

Receptor	Adopted Daytime Noise Criteria, dB $L_{Aeq,T}$	Predicted Noise Level, dB $L_{Aeq,T}$		
		Activity 1	Activity 2	Activity 3
Fernwood Crescent (UL1)	65 (Cat. A)	60	61	58
Denham Road (UL1)	65 (Cat. A)	56	56	53
Ashbourne Avenue (UL1)	65 (Cat. A)	63	65	62
Brunswick Park Gardens (UL2)	65 (Cat. A)	69	70	67
Brunswick Park Road (UL4)	70 (Cat. B)	50	65	62
Brunswick Crescent (UL5)	65 (Cat. A)	62	66	63
Oakleigh Close (UL6)	75 (Cat. C)	62	63	60

Receptor	Adopted Daytime Noise Criteria, dB L _{Aeq, T}	Predicted Noise Level, dB L _{Aeq, T}		
		Activity 1	Activity 2	Activity 3
Activity 1 – Demolition and Earthworks Activity 2 – Foundations Activity 3 – Construction				

- 13.88 Based on an indicative assessment of construction noise impacts from a variety of likely activities, noise levels have the potential to exceed the Category A threshold (ABC Method in BS 5228-1) during specific daytime operations, without mitigation in place. However, no exceedance of the noise insulation trigger requirements are expected, discarding any major effects.
- 13.89 Further discussion on suitable noise management measures, proposed mitigation and residual impact, is provided in the Mitigation section of this chapter.

Vibration

- 13.90 In the absence of specific piling methods, and pile locations, Table 13.22 provides generic estimation of vibration levels at different separation distances as a result of a typical Vibratory Piling Rig, a Percussive (Hammer) Piling Rig and compaction works. These predictions are based on the calculation method detailed in Section E of BS 5228.

Table 13.22 Indicative Piling and Compaction Vibration (for illustration only)

Vibratory piling method		Percussive (hammer) Piling method	
Distance (m)	Predicted Peak Particle Velocity (mms ⁻¹)	Distance (m)	Predicted Peak Particle Velocity (mms ⁻¹)
5	32.8	5	36.2
10	13.3	10	19.9
25	4.1	25	6.8
50	1.6	50	2.8
Assumption $V_{res} = K_v/X^{\phi}$; $K_v = 266$ (5% probability of prediction being exceeded); X = ground surface distance; $\phi = 1.3$ (all operations).		Assumption Fambo HR2000 piling rig being used under maximum energy per blow conditions. 5m pile depth. $V_{res} \leq K_p (\sqrt{W}/r^{1.3})$; $K_p = 3$ (value from BS5228-2 Table E.2 – very stiff cohesive soil);	

Vibratory piling method		Percussive (hammer) Piling method	
Distance (m)	Predicted Peak Particle Velocity (mms ⁻¹)	Distance (m)	Predicted Peak Particle Velocity (mms ⁻¹)
Max. distance to which cosmetic damage criteria may be exceeded: $15.3 \text{ mms}^{-1} = 266/x^{1.3} = \mathbf{9 \text{ metres}}$		W = 23500 (maximum energy per blow of Fambo HR2000); L=pile depth (m) (assumed 5 m); x=distance along the ground surface (m); $r = \sqrt{L^2+x^2}$.	
Max. distance to which a major effect on human comfort may be produced: $10.5 \text{ mms}^{-1} = 266/x^{1.3} = \mathbf{12 \text{ metres}}$		Max. Distance to which cosmetic damage criteria may be exceeded: $15.0 \text{ mms}^{-1} \leq 3 (\sqrt{23500/r^{1.3}}) = \mathbf{13 \text{ metres}}$	
		Max. distance to which a major effect on human comfort may be produced: $10.2 \text{ mms}^{-1} \leq 3 (\sqrt{23500/r^{1.3}}) = \mathbf{18 \text{ metres}}$	
Vibratory compaction (steady state)			
Distance (m)		Predicted Peak Particle Velocity (mms ⁻¹)*	
5		10.4	
10		4.7	
15		2.8	
30		1.1	
<p>Assumption Boomag BW213 DH-4 $V_{res} = K_s \sqrt{nd} [A/(x+L_d)]^{1.5}$ $K_s = 276$ (5% probability of prediction being exceeded); n_d=number of vibrating drums (assumed 1); A=maximum amplitude of drum vibration in mm (assumed 0.8); x=distance measured along the ground surface, in metres; L_d=vibrating roller drum width, in metres (assumed 2.1).</p> <p>Max. distance to which cosmetic damage criteria may be exceeded: $15.3 \text{ mms}^{-1} = x = \mathbf{3.4 \text{ metres}}$</p> <p>Max. distance to which a major effect on human comfort may be produced: $10.4 \text{ mms}^{-1} = x = \mathbf{5 \text{ metres}}$</p>			

- 13.91 Estimated vibration levels from piling works indicate potential exceedances of the cosmetic damage criteria for any properties situated in a radius between 9-13 metres, depending on the type of plant, soil conditions and piling technique used. In terms of human comfort, vibration levels derived from piling works within a radius of 12 – 18 metres are likely to be intolerable for any more than a very brief exposure to this level.
- 13.92 Where the contractor is intending to adopt CFA piling. Section F3.2.4 in BS 5228-2 provides the following statement in respect of vibration from CFA techniques:
- "The levels of vibration associated with continuous flight auger injected piling and pressed-in piling are minimal, as the processes do not involve rapid acceleration or deceleration of tools in contact with the ground but rely to a large extent on steady motions. Continuous vibrations at a low level could be expected from the prime movers."*
- 13.93 The use of CFA piling is also referenced in BS 5228-2 (Section 8.5.3 of the standard) as a vibration mitigation measure i.e. an alternative method that is considerably less likely to give rise to unacceptable levels of vibration. Furthermore, BS 5228-2 (Table D.6, Ref. no.100) provides measured data of an auguring procedure measured at 7 metres from the pile location. The resultant peak particle velocity vibration level was recorded at a level of 3.2 mms⁻¹. Therefore, at these distances the evidence of the likely vibration levels generated by CFA piling techniques is not considered to be significant in terms of maintaining the integrity of the structure (< 15 mms⁻¹) and human tolerance (< 10 mm^{s⁻¹}) thresholds.
- 13.94 Estimated vibration levels from compaction activities indicate potential exceedances of the cosmetic damage criteria for any properties situated closer than 4 metres from the works, depending on the type of plant used and soil conditions. In terms of human comfort, vibration levels derived from compaction activities within a radius of 5 metres are likely to be intolerable for any more than a very brief exposure to this level.
- 13.95 Once full details relating to the chosen foundation methods are known, including closest distances from vibratory activities to existing nearby buildings, an updated set of vibration calculations will be included in the Construction Environmental Management Plan (CEMP) and appropriate mitigation measurements confirmed, where necessary.

During Operation

Road Traffic Noise

- 13.96 At the time of writing, Transport for London (TfL) were not in a position to disaggregate the traffic flows associated with the committed developments in the area from the opening and future scenarios to enable a road traffic noise assessment, as requested by the project's traffic consultants (Stomor). The assessment has therefore been informed with the available data incorporated in the previously submitted ES Noise and Vibration

Addendum prepared in May 2018 in support of the HPP ES by The EQUUS Partnership noise consultants.

- 13.97 The document included predicted traffic flows for the opening year (2025) on Brunswick Park Road only, deemed the potentially most affected road section following consultation with London Borough Barnet in 2018.

Table 13.23 Change in Road Traffic Noise Levels

Road Link	Two-way Flows		Noise Level Change, dB $L_{A10, 18hr}$
	2025 Baseline + Committed	2025 Baseline + Committed + Development	Short Term
Brunswick Park Road	15,705	15,335	-0.1

- 13.98 Based on the third-party traffic data, the proposed development will lead to a small reduction in total two-way traffic flows along Brunswick Park Road when compared with the baseline plus committed development scenario in the opening year. The reduction in noise level as a factor solely of the proposed development traffic is 0.1 dB, and therefore of **Negligible** impact in the short term.
- 13.99 An updated road traffic assessment will be incorporated into a technical addendum upon receipt of the required full set of traffic flow data.

Fixed Plant Noise

- 13.100 The type and location of any fixed plant associated with the proposed development is currently undetermined. According to BS 4142: 2014, where the rating noise level (L_{Ar}) does not exceed the background sound level ($L_{A90,T}$), this is an indication of the specific sound source having a low impact. The requirement of London Borough of Barnet is more onerous in this regard and recommends that fixed plant should be designed to achieve $L_{A90} - 5$ dB (or $L_{A90} - 10$ dB where fixed plant emits tonal components). The baseline noise monitoring has been used to inform the assessment at each of the nearest receptors.
- 13.101 Analysis of the baseline data, to inform receptor criteria from operational fixed plant has considered the analysis of hourly noise levels for daytime periods (07:00 – 23:00) and 15-minute levels at night (23:00 – 07:00). Such an approach is in line with the requirements of BS 4142, and is considered to suitably represent the noise in the existing environment.
- 13.102 The following noise level thresholds would apply at nearest sensitive receptors:

Table 13.24 Fixed Plant Noise Design Targets

No.	Sensitive Receptor	Daytime Noise Criteria, dB L _{Aeq, T} * [*]	Night Noise Criteria, dB L _{Aeq, T} * [*]
1	Fernwood Crescent (UL1)	39	36
2	Denham Road (UL1)	39	36
3	Ashbourne Avenue (UL1)	39	36
4	Brunswick Park Gardens (UL2)	37	30
5	Brunswick Park Road (UL4)	50	36
6	Brunswick Close (UL5)	43	30
7	Oakleigh Close (UL6)	42	34

* To achieve local authority criteria of background noise (L_{90, T}) – 5dB (excluding tonal components)

13.103 Should it be determined that the operational regime of proposed plant items is likely to occur on a 24-hour basis, the lower night time values should be used to inform the design of any fixed plant attached to the operation of this building(s). Assuming the noise design targets are adhered to as part of the design, the proposed fixed plant would have a **Negligible** effect.

Residential

Internal Noise

13.104 A computer noise model of the site has been constructed using SoundPLAN (v8.2) noise prediction software of the proposed development site inclusive of existing buildings and the proposed development plan.

13.105 The detailed element of the proposals comprises up to 466 residential units in five blocks reaching nine storeys while the outline element comprises up to 1,951 additional residential units in buildings ranging from three to twelve storeys.

13.106 For reference, a development zone plan showing the block identification name is presented in Figure 13.3. The block labels shown in red form part of the detailed phasing while the blocks shown in blue correspond to the outline phase of the proposed development.

Figure 13.3 Development Zone Plan



Note: Extracted and edited from Drawing no. HED-1140-RBP-LA-1002 issued by HED on 21/06/2021.

13.107 The suitability of the proposed development has taken into account both the measured noise levels during the baseline noise survey and the results of the modelling exercise. The graphical output of the computer noise modelling, illustrating how the noise attenuates across the site, is provided in Appendices 13.5 and 13.6.

13.108 Table 13.25 defines the worst-case predicted noise level (one which informs the highest level of mitigation) for each of the residential blocks. Values are rounded to the nearest whole number.

Table 13.25 Highest Predicted Façade Noise Level – Residential

Block / Floor*	Highest Predicted Façade Noise Level, dB		
	Daytime, L _{Aeq} , 16hr	Night, L _{Aeq} , 8hr	Night, L _{AFmax}
1B / F1	48	42	60
1C / F9	52	45	63
1D / F9	52	46	64
1E / F6	52	45	66
1F / GF	52	45	66
2A / F2	47	41	58
2B / F1	47	41	58
2C / F2	61	54	78
3A / F10	54	47	70
3B / F3-F9	66	59	82
4A / F10	56	49	70
4B / F1	68	61	85 (F1)
4C / GF-F2	68	61	85
5A / GF-F3	68	61	85
5B / GF-F3	68	61	85

*Floor(s) which informs the highest level of mitigation from either averaged daytime and night-time levels, or night-time discrete maximum levels predicted on the block.

13.109 The results of the noise modelling have been used to inform the mitigation of the residential building façade elements. Due to the nature of the hybrid application, the recommended mitigation measures for the Phase 1 detailed application (Blocks 1C, 1D, 1E and 1F) is informed by detailed break-in calculations, in accordance with the method set out in Section G.2.1 of BS 8233: 2014, which is based on the method presented in BS EN ISO 12354-3:2017 '*Building acoustics. Estimation of acoustic performance of buildings from the performance of elements. Airborne sound insulation against outdoor sound*'. As a result, the recommended mitigation measures associated with the Phase 1 detailed application includes specific glazing and ventilator specifications (and suggested manufacturers), whereas the outline application blocks (1A, 1B, 2A, 2B, 2C, 3A, 3B, 4A, 4C, 5A and 5B), would include the noise level reduction (based on simple level difference – in dB) to which the building façade should provide. It is acknowledged that the design of the outline phases 2, 3, 4 and 5 would be refined at a later stage and it is

recommended that the results of this assessment should be used to feed into the proposed development of the final design.

- 13.110 The highest predicted noise levels upon proposed residential blocks would likely be along the south-western boundary of the site, where the separation distance between the railway line and likely building facades would be at its minimum. Predicted levels within the south-west portion of the site are 68 dB $L_{Aeq,16 \text{ hours}}$ during the daytime and 61 dB $L_{Aeq,8 \text{ hours}}$ during the night period, with likely maximum night-time noisy events (10-th highest) of 85 dB L_{AFmax} at ground, first and second floors.
- 13.111 Predicted noise levels on those proposed residential blocks facing Brunswick Park Road and positioned to the eastern portion (detailed application block reference 1C, 1D, 1E and 1F), would understandably experience a lower noise level as a result of the setback distance to this source and the screening provided by existing and proposed buildings situated to the east and west. Highest predicted noise levels at those indicative facades are 52 dB $L_{Aeq,16 \text{ hours}}$ during the daytime period, 46 dB $L_{Aeq,8 \text{ hours}}$ during the night-time period with likely maximum night-time noisy events (10-th highest) of 66 dB L_{AFmax} . A visual indication of the highest predicted daytime and night-time noise levels is included in Appendix 13.7 in the form of façade noise maps.
- 13.112 Assuming appropriate envelope specifications for glazed and non-glazed elements be incorporated through design to achieve adequate internal noise levels in accordance with guidance targets, the effects would be **Negligible**.

External Noise

- 13.113 The majority of external noise levels across public amenity areas (ground floor level) are predicted to be below the recommended upper guidance limit of 55 dB $L_{Aeq,16 \text{ hours}}$, with the exception of a small portion situated to the south-west corner of the site, off Oakleigh Avenue (adjacent to the southern site access). This is the result of their proximity to the railway line. The remaining of the site, with focus on the central portion hosting the main public amenity areas would be subject to noise levels below 50 dB $L_{Aeq,16 \text{ hours}}$ as a result of the building positioning and screening provided against the main transportation sources. The overall effect is therefore **Negligible**.
- 13.114 Most exposed balconies of detailed blocks 1C to 1F would be subject to external daytime noise levels comfortably below 55 dB $L_{Aeq,16 \text{ hours}}$. As such, the effect is deemed **Negligible**.

Operational Vibration

- 13.115 Continuous monitoring of ground borne vibration was undertaken between 13 and 17 May 2021 at the north-west boundary of the site. The monitoring enabled the calculation of the Vibration Dose Value (VDV – in $ms^{-1.75}$) during standard daytime (16hr) and night time (8hr) reference periods.

13.116 The below table shows the calculated VDV levels and their comparison against the guideline values contained within BS 6472-1: 2008:

Table 13.26 Vibration Dose Value Assessment

Time Period	Vibration Dose Value, $\text{ms}^{-1.75}$		Difference
	Measured Level	Lowest Criteria*	
Daytime (07:00 – 23:00)	0.065	0.2 to 0.4	-67.5%
Night (23:00 – 07:00)	0.050	0.1 to 0.2	-50%

* Low probability of adverse comment

13.117 Measured VDV levels are considerably below the criteria within BS 6472-1:2008. The highest appreciable levels (compared to the criteria) were recorded during the night period, which resulted in levels 50% below the lowest interpretation of the threshold criteria for the lowest probability of adverse comment. The effect is therefore deemed **Negligible**.

School Building

Internal Noise

13.118 BB93 provides guidance for indoor ambient noise levels for schools and associated space. The guidance has been used to inform the predicted noise levels and level of mitigation required for the proposed main Teaching Block. The results of the noise modelling at ground floor along with the first and second floors of the main Teaching Block are provided below.

Table 13.27 Predicted Façade Noise Level – School (Teaching Block)

Floor/Façade	Use	Noise Level, dB $L_{Aeq, 30\text{mins}}$	
		Predicted Level*	Design Target**
GF / East	Food room, constructional textiles room, general classrooms, chapel, meeting room	64	35
GF / South	Science classrooms	61	40
GF / West	Kitchen, science classrooms, store rooms, seminar room, music classrooms	44	35
GF / North	Music classroom, general classroom, office, meeting room	62	35

Floor/Facade	Use	Noise Level, dB L _{Aeq} , 30mins	
		Predicted Level*	Design Target**
F1 / East	General classroom, seminar room, meeting room	64	35
F1 / South	General classroom, staff room	62	35
F1 / West	General classroom	46	35
F1 / North	General classroom, art room, office	62	35
F2 / East	General classroom, seminar room, science lab	64	35
F2 / South	General classroom, study area	62	35
F2 / West	Social space, science labs	49	40
F2 / North	Science labs	62	40

* Free-field noise level (subtraction of +2.5 dB from CRTN façade noise calculations)

** Most sensitive use. Upper limits for new builds intended for learning and administrative use

13.119 Calculated worst case facade noise levels of the main school teaching block would be 64 dB(A) on all floors to the eastern facade. The building envelope would be required to reduce external to internal noise levels by up to 29 dB(A) (based on simple difference) assuming the space at the eastern facade is used for learning purposes.

13.120 Assuming the recommended mitigation measures be incorporated through building design (glazed and non-glazed areas), a **Negligible** effect is anticipated.

External Noise

13.121 While there is no requirement within BB93 to meet specific noise levels within external teaching spaces, the following recommendations are made within the accompanying design guide:

'For new schools, 60 dB LAeq,30min should be regarded as an upper limit for external noise at the boundary of external premises used for formal and informal outdoor teaching, and recreational areas.

Playgrounds, outdoor recreation areas and playing fields are generally considered to be of relatively low sensitivity to noise, and indeed playing fields may be used as buffer zones to separate school buildings from busy roads where necessary. However, where used for teaching, for example sports lessons, outdoor ambient noise levels have a significant impact on communication in an environment which is already acoustically less favourable than most classrooms. Noise levels in unoccupied playgrounds, playing fields

and other outdoor areas should not exceed 55 dB LAeq,30min and there should be at least one area suitable for outdoor teaching activities where noise levels are below 50 dB LAeq,30min. If this is not possible due to a lack of suitably quiet sites, acoustic screening should be used to reduce noise levels in these areas as much as practicable.'

- 13.122 External daytime noise levels derived from the noise modelling exercise indicate that those areas designated as outdoor spaces, specifically those positioned to the west of the main Teaching Block and Sports Hall would benefit from the screening provided by these blocks and would be subject to levels below 50 dB LAeq,30min.
- 13.123 An ambient noise level of this magnitude is in line with desired noise targets at the boundary of external premises, therefore a **Negligible** effect is anticipated.

MUGA

- 13.124 As part of the detailed elements of the proposals, provision for a 5-form entry secondary school, a gymnasium, a multi-use sports pitch and associated changing facilities has been made.
- 13.125 Based on the most up to date site layout, the school has two external areas that have the potential to cause disturbance to the nearest and proposed residential receptors; a rooftop MUGA (Teaching Block) and the playing fields to the south-west portion of the school boundaries.
- 13.126 The nearest receptors to the rooftop MUGA are situated approximately 35 metres to the south (along Brunswick Crescent) and between 10-15 metres to the west (proposed Block 1C).
- 13.127 It is understood that these outdoor spaces will be used during school hours only, limiting the exposure of noise levels on nearest receptors from Monday to Friday.
- 13.128 A noise criterion based on the external daytime noise levels for residential use set out in BS 8233:2014 and WHO (1999) has been adopted. For outdoor amenity spaces, desired noise levels range between 50 – 55 dB LAeq,16hour.
- 13.129 Considering a potential use of a full size MUGA and adopting a typical free-field noise level from an artificial ground pitch – AGP (at 10 metres from the sideline halfway marking) of 58 dB LAeq,1hour as per the Design Guidance Note for 'Artificial Grass Pitch (AGP) Acoustics' issued by Sport England, a distance of between 15 – 40 metres should be kept between the edge of the MUGA and nearest dwellings in order to achieve external noise levels at nearest receptors between 50 – 55 dB LAeq,T.
- 13.130 Based on the minimum distances stated above and in the context of the expected noise levels generated with consideration of the limit in noise exposure during school hours only, noise emissions from these areas would ensure the desired noise targets at nearest receptors are met. The effects are therefore deemed **Negligible**.

MITIGATION

During Construction

13.131 Construction mitigation measures and best practical means (BPM) will be discussed in the CEMP in order to keep noise and vibration emissions to a minimum during the construction phases. Measures would likely include the selection of less intrusive (lower noise and vibration emitting) plant items, temporary hoardings to screen construction activities from existing dwellings and noise management measures aimed to minimise the exposure time to likely noisy activities.

13.132 Mitigation for construction noise would take into consideration relevant case studies provided in BS 5228, whilst taking into account the BPM approach:

- Site inspections shall include checks to ensure that plant is being operated with any specified acoustic covers in place. Excessively noisy plant shall be removed from the Site for repair or maintenance. Quieter construction methods will be used, where required and where considered reasonable and feasible;
- Where generators are operated overnight, measures shall be taken to minimise noise levels at the nearest dwellings;
- Equipment will be switched off when not in use (including during breaks and down times of more than 30 minutes);
- Where possible, noisy plant should not be used simultaneously and/or close together to avoid cumulative noise impacts;
- Equipment and excavation work sites should be oriented, where possible, to reduce noise emissions to sensitive receivers;
- Normal working hours are expected to be:
 - Mon – Fri: 08:00 - 18:00;
 - Saturday: 08:00 – 13:00; and
 - No work on Sundays and Bank Holidays where noise will be audible at the site boundary.
 - Sunday working shall be undertaken only in emergencies or with prior approval from the local authority;
- Contact will be made with local authorities, where required to ensure that planned designated routes are set in place to minimise disturbance;
- Vehicle weight limits will be taken into consideration and permits obtained from transport authorities if warranted;
- Site speed limits will be set to minimise noise and vibration levels if required;

- As far as reasonably practicable, noise from reversing alarms will be managed through the following hierarchy of techniques:
- The Site layout will be designed to limit and where reasonably practicable, avoid the need for the reversing of vehicles. Measures will be undertaken to ensure that drivers are familiar with the worksite layout.
- Banksmen will be utilised to avoid the use of reversing alarms.
- Reversing alarms incorporating one of more of the features listed below or any other comparable system will be used where reasonably practicable:
 - Highly directional sounders;
 - Use of broad band signals;
 - Self-adjusting output sounders; and
 - Flashing warning lights.
 - Reversing alarms will be set to the minimum output noise level required for health and safety compliance.
- The contractor shall aim to be a proactive and considerate neighbour; any potentially affected residents shall be approached in advance of any potential disturbance and kept informed as works progress. A noise complaint handling procedure will be established and responded to quickly.

13.133 Based on the short separation between some of the proposed building blocks and existing residents, the use of least intrusive piling techniques (e.g. CFA) will be considered alongside the incorporation of attended vibration monitoring to the CEMP (secured by planning condition), in order to avoid any potential cosmetic damage or intolerable vibration levels to nearest receptors situated to the east of the site.

During Operation

Fixed Plant

13.134 Noise limits for the operation of fixed plant have been proposed. The recommended noise limits (Table 13.34), in line with the local authority requirements are based on the singular lowest measured background noise levels (day and night), indicative of those nearest receptors to the proposed development and include any possible rating penalties taking into account possible tonal elements to the installations. Fixed plant will be designed appropriately and not exceed a rated noise level of 33 dB L_{Ar} during the daytime and 25 dB L_{Ar} at nearest sensitive receptor. Mitigation of any proposed fixed plant can be secured through an appropriately worded planning condition.

Residential Facades

Detailed Phase 1

- 13.135 The insertion loss performance of a partially open window is widely accepted as being between 10 - 15 dB(A). Noise level reduction can be provided through various façade treatment methods such as glazing or ventilation products, however the level of mitigation would be dependent on factors such as room size and room volume.
- 13.136 Based on highest predicted external noise levels on Blocks 1C, 1D, 1E and 1F which form part of the detailed application, it is apparent that internal noise levels will result in a marginal exceedance of the recommended acoustic design target during a situation in which windows are partially open for ventilation purposes. Calculations of worst case internal noise levels likely to be experienced on those most exposed facades, with consideration of most restrictive bedroom sizes (taken from detailed drawings), have been undertaken in the form of break-in calculations included in Appendix 13.8.
- 13.137 The sound insulation performance of the external roof element is specified to achieve a sound insulation of 39 dB Rw+Ctr. This can be achieved with the use of tiled / slate roof, 12.5mm p/b ceiling + 200mm mineral wool. Non-glazed (wall) elements of the façades need to be designed to achieve a sound insulation performance of at least 48 dB Rw+Ctr.

Table 13.28 Acoustic Performance Specification - walls & roof

Element	Octave band centre frequency, Hz					D _{n,T} / R _w + C _{tr} , dB
	125	250	500	1000	2000	
External wall	33	41	46	50	48	48
Roof	26	39	46	50	51	39
<p>Note 1: The external wall build-up is based on masonry cavity construction, with cavity insulation infill.</p> <p>Note 2: Minimum roof performance example.</p>						

- 13.138 To ensure an appropriate internal acoustic standard within the proposed residential properties during normal conditions (non-overheating) the level of attenuation necessary for the weakest element (i.e. glazing) is 27 dB Rw+Ctr. This is assuming those facades would be occupied for sleep at night. The required level of attenuation can be achieved using standard glazing and trickle vent products.

Table 13.29 Initial Façade Treatment Recommendations

Element	Maximum Acoustic requirement for façade	
	Acoustic performance	Type
Window	27 Rw + Ctr	Saint Gobain Paniclear Double Glazing 4/16/4
Ventilation	29 Rw + Ctr	Greenwood 8000HA (6400mm EA)

13.139 It should be noted that the acoustic performance requirements set out in the table above are readily available via a number of different specifications. A tolerance of +2 dB has been assumed for the internal noise calculations following the methodology set out in BS 8233.

Outline Phases 2 – 5

13.140 Calculations of the likely noise attenuation required on those blocks which form part of the outline part of the application, have determined that blocks 4B, 4C, 5A and 5B situated adjacent to the railway line would require enhanced mitigation products. Based on simple difference calculations, the level of attenuation necessary for the indoor areas of those residential facades facing the railway line (west of the proposed development) is 40 dB(A), assuming those facades would be occupied for sleep at night (required performance governed by night-time maximum events). The required level of attenuation can be achieved using high specification glazing products; the exact type to be confirmed during the detailed design of the proposed development with consideration to most restrictive sensitive room dimensions.

13.141 Less exposed units will benefit from a slightly lower specification façade and ventilation system, although this should be confirmed at detailed design following building layouts.

13.142 At proposed residences to the west portion of the site, the general design principle should be to have ancillary rooms such as storerooms, bathrooms/toilets and kitchen/dining rooms facing the railway line, with bedrooms and living rooms on the sheltered façades. However, it is understood that this may not be practicable in all situations.

13.143 No additional mitigation is required for external public amenity spaces, assuming the buildings can effectively be used as a screening element, as per the drawings supplied.

Overheating

13.144 In line with the guidance set out in the Acoustics, Ventilation and Overheating Residential Design Guide (AVO Guide), it is considered reasonable to allow higher levels of internal ambient noise when increased rates of ventilation are required in relation to an overheating condition. The basis for this is that the overheating condition occurs for a

limited time and during this period, occupants may accept a trade-off between acoustic and thermal conditions, given that they have some control over their environment.

- 13.145 During an overheating condition, the preference is to adopt opening windows as a primary means of mitigating thermal issues, however, this is subject to the resultant internal ambient noise level.
- 13.146 On the basis that a partially open window provides 13-15 dB of attenuation, to meet an internal ambient level of 42 dB LAeq,8hr, the upper SOAEL limit for night-time hours, the external façade free-field level must not exceed 55-57 dB LAeq,8hr. Furthermore, in order to not exceed the lower SOAEL limit for night-time hours (35 dB LAeq,8hr), the external façade free-field noise level must not exceed 48-50 dB LAeq,8hr. The highest predicted external night-time noise levels across phase 1 blocks (detailed application) sit below 48 dB(A). The highest level of 46 dB(A) was predicted on the eastern façade facing Brunswick Park Road and together with the remaining building façades, noise levels are unlikely to exceed the upper or lower night-time SOAEL limit. As such, should the risk of overheating be high, the use of open windows infrequently and for short periods of time is likely to be an acceptable means of overheating control.
- 13.147 Assuming the same level of reduction for a partially open window during the daytime hours, the upper SOAEL limit for internal ambient levels would be 50 dB LAeq,16hr, meaning the external façade free-field level must not exceed 63 – 65 dB LAeq,16h. Similarly, in order to not exceed the lower SOAEL limit for daytime hours (40 dB LAeq,16hr), the external façade free-field noise level must not exceed 53-55 dB LAeq,16hr. The highest predicted external day-time noise levels across phase 1 blocks (detailed application) are 52 dB(A), and unlikely to exceed the upper or lower daytime SOAEL limit. As such, should the risk of overheating be high, the use of open windows infrequently and for short periods of time is likely to be an acceptable means of overheating control.
- 13.148 Regarding those residential facades within outline phases 2 – 5, windows will need to remain closed (although not sealed) to achieve the required level of mitigation and, as such, a suitable ventilation system, compliant with Building Regulations Part F compliant and acoustically attenuated, will be required. Any ventilation should also allow for potential overheating scenarios, taking into account the Associate of Noise Consultants (ANC) publication 'Acoustics Ventilation and Overheating – Residential Design Guide. The building fabric should also be designed and constructed to ensure that a minimum 40 dB(A) reduction is achieved. This would represent a reasonably high specification of façade and roof, with supplementary ventilation system. It is recommended input be sought from the wider design team to identify areas of high overheating risk and to ensure subsequent mitigation options compliment ventilation, architecture and structural design strategies and assessments.

School Building Facades

13.149 Based on a highest predicted noise level of 64 dB(A) on the most exposed eastern façade, the building envelope (glazed and non-glazed areas) should achieve a noise reduction index of at least 29 dB Rw+Ctr to ensure the most stringent acceptable IANL of 35 dB(A). This is based on a noise break-in calculation following the methodology outlined in Annex G of BS 8233:2014 and considering the smallest room volume exposed (seminar room 2, first floor). The required noise attenuation can be achieved with double-glazed products providing at least, the following specifications:

Table 13.30 Main Building Façade Treatment Recommendations

Element	Maximum Acoustic requirement for façade	
	Acoustic performance	Type
Window	29 Rw + Ctr	Saint Gobain Paniclear Double Glazing 6/24/4
Minimum window performance example.		

13.150 Due to the magnitude of predicted external noise levels incident upon the eastern, northern and southern facades and the proposed room type distribution as per the architect’s drawings, mechanical ventilation would be required on these facades. It is understood that the standard classrooms will be ventilated through a heat recovery unit (HRU) situated behind a suspended raft. This unit will provide both supply and extract ventilation, with openable windows used to provide additional ventilation during summer months.

13.151 It is understood that the special education needs (SEN) teaching rooms would not be located directly on any façade of the main school building.

13.152 Plant noise levels should be limited to a rating level ($L_{Ar,T}$) that is 5 dB below representative background noise levels at the façade of the nearest existing or proposed noise sensitive receptors. Individual plant items may need to be designed to a lower limit such that the cumulative noise level of all plant items operating simultaneously, including any applicable noise penalty (as defined in BS 4142: 2014+A1:2019), achieves the stated criteria above.

RESIDUAL IMPACTS

During Construction

13.153 Based on an indicative assessment of construction noise impacts from a variety of likely activities, unmitigated noise levels have the potential to temporarily exceed the Category A and B threshold according to the ABC Method in BS 5228-1 during specific daytime

operations, without mitigation in place. It should be noted that the noise predictions assume activities would operate at the closest separation distance between source and receiver, in reality this would not be the case due to the movement of construction works within the site.

- 13.154 Special consideration will be given to the piling method selection at the appropriate stage in design in order to incorporate the risks, mitigation and control measures into the detailed CEMP (secured by planning condition). Rotary bored piling offers a better noise and vibration performance in relation to driven or pressed-in techniques and will be considered for use
- 13.155 Once the exact construction plant, phasing and timings have been determined, a further assessment will be undertaken in line with appropriate methodology, localised mitigation measures and BPM, which would feed into the site specific CEMP (secured by planning condition) and confirm the detailed mitigation strategy. Potential mitigation options have been outlined above.
- 13.156 With appropriate plant selection, mitigation measures and an adequate noise and vibration management plan supplemented with a monitoring program in place, predicted noise levels at closest receptors derived from construction activities are unlikely to exceed the Noise Insulation Trigger requirements, nor to exceed the transient vibration guide values for cosmetic damage.
- 13.157 The residual effect of construction noise and vibration is therefore considered to be temporary, and of **Moderate Negative** significance.

During Operation

Fixed Plant

- 13.158 Recommended noise limits for the operation of any proposed fixed plant as part of the proposed development have been provided above. The recommended noise limits are based on existing representative background noise levels at those nearest receptors and include any possible rating penalties taking into account possible tonal elements to the installations. Assuming future fixed plant would be designed accordingly, the residual effect of such installations is **Negligible**.

Road Traffic Noise

- 13.159 The cumulative effect of future road traffic noise levels including increased road traffic on the nearby network as a result of the proposed development and committed developments is yet to be assessed. At the time of writing, Transport for London (TfL) were not in a position to disaggregate the traffic flows associated with the committed developments in the area from the opening and future scenarios to enable a road traffic

noise assessment. An updated road traffic assessment will be incorporated into the ES upon receipt of the required full set of traffic flow data.

- 13.160 Based on the third-party traffic data, the proposed development will lead to a small reduction in total two-way traffic flows along Brunswick Park Road when compared with the baseline plus committed development scenario in the opening year. The reduction in noise level as a factor solely of the proposed development traffic is 0.1 dB, and therefore of **Negligible** impact in the short term.

Residential

- 13.161 Based on mitigation embedded within the design, particularly through the use of high specification double glazed windows and supplementary ventilation systems on those blocks facing the railway line (west of the site) and standard double glazed windows on the remaining blocks (central and eastern portion), the design targets for internal and external amenity noise levels associated with residential dwellings would be met.
- 13.162 The design targets utilised for the purposes of this assessment are deemed as being the lowest interpretation of the approved guidance and represent levels by which those occupants would experience the lowest observed adverse effect level (LOAEL) in line with national planning policy. The residual effect to those occupants of the proposed development would be **Negligible**.

School

- 13.163 In line with the requirements of BB93, the existing noise climate at the proposed school development is such that acceptable internal ambient noise levels can be achieved with windows open for natural ventilation on façades screened from Brunswick Park Road. Most exposed facades to the road infrastructure (eastern rooms) would need to incorporate standard double-glazed products and a mechanical / hybrid ventilation system to comply with internal noise targets. Following the introduction of the prescribed measures in terms of building envelope and ventilation performance, the residual effect to those occupants of the proposed school is **Negligible**.
- 13.164 The likely noise impact generated by the playground activities and MUGA on the closest existing and proposed sensitive receptors has been analysed. Based on conservative assumptions of noise emissions during the use of these areas, the levels generated by students are negligible.

Operational Vibration

- 13.165 Operational vibration monitoring, accounting for train movements along the adjacent railway line, was conducted at a representative location of closest buildings to the infrastructure. Measured levels are considerably below the criteria with reference to human comfort and the effects are deemed **Negligible**.

Table 13.31 Summary of Construction Effects

Description of Impact/Receptor	Potential Impact	Mitigation Measure	Residual Impact
Noise			
Construction Noise / Fernwood Crescent, Ashbourne Avenue, Brunswick Park Gardens, Brunswick Park Road, Brunswick Crescent	Exceedance of Noise Thresholds.	Incorporate mitigation measures and BPM to a Construction Noise and Vibration Management Plan once refined calculations can be undertaken when full construction details are made available	Temporary and localised exceedances of Moderate Negative significance
Vibration			
Construction Vibration / Brunswick Park Gardens, Howard Close	Vibration affecting human perception with potential building damage from piling activities	Selection of the least intrusive piling technique (e.g. CFA) or least vibratory plant, followed by a detailed study once full construction details are known	Temporary and localised exceedances of Moderate Negative significance

Table 13.32 Summary of Operational Effects

Description of Impact/Receptor	Potential Impact	Mitigation Measure	Residual Impact
Residential			
Internal noise	Achievement of appropriate internal acoustic standards	Incorporation through design of recommended attenuation to glazed and non-glazed areas (roof, external walls, glazing and ventilation products) Adoption of supplementary ventilation systems on those blocks facing the railway line	Negligible
External	Achievement of recommended	Building positioning and orientation	Negligible

Description of Impact/Receptor	Potential Impact	Mitigation Measure	Residual Impact
	external noise levels on public and private amenity areas	design as per proposed drawings Clever room distribution to avoid sensitive room uses facing the railway line, where possible	
Operational vibration	Adverse comment from local residents facing the railway line	Incorporate appropriate stand-off distances	Negligible
Road Traffic			
Road Traffic Noise / Surrounding existing residences	Change in existing noise levels due to the proposed development's induced traffic movements along local roads	N/A	N/A (Negligible effect on Brunswick Park Road based on available data)
Fixed Plant			
Fixed Plant Noise / Nearest existing and proposed sensitive receptors	External plant noise levels above representative background noise leading to noise complaints	Mechanical plant designed (in terms of noise source output) accordingly to the requirements of Barnet Council	Negligible
School Building			
Main School Block	Achievement of internal noise targets	Incorporation of appropriate noise reduction to glazed and non-glazed areas	Negligible
External noise	Achievement of the recommended upper limit for external noise at the boundary of external premises used for formal and informal outdoor teaching, and recreational areas	School buildings' positioning and design as per supplied drawings to provide adequate screening to proposed school's external areas not overlooking Brunswick Park Road	Negligible
MUGA and playing fields / Existing nearest receptors	Change in existing noise levels due to school's outdoor activities	Incorporate appropriate stand-off distances	Negligible

CUMULATIVE IMPACTS

13.166 The cumulative impact of the proposed development in terms of noise and vibration is restricted to the impact of changing road traffic levels generated by the site in conjunction with committed developments in the area, as new road traffic has the capacity to increase the local noise environment in the surroundings of the site. Noise emissions derived from the expected fixed or mobile sources associated with these committed developments are unlikely to significantly affect local noise levels. An updated road traffic assessment will be incorporated into an ES upon receipt of the required full set of traffic flow data.

CONCLUSIONS

13.167 The assessment utilises noise propagation modelling based on existing noise levels derived from rail and road sources, to assess the site suitability and changes in road traffic noise (short and long-term).

13.168 The assessment indicates that the residual effect of construction noise is considered to be temporary, and of **Moderate Negative** significance, assuming appropriate mitigation measures are incorporated. Regarding the likely vibration effects, there is a potential for vibration to be perceived during short periods of time at near residential receptors during piling or compaction activities. The magnitude of the effect would rely on the final confirmed distances from construction areas to existing buildings. With an appropriate piling technique selection (e.g. CFA), the use of less intrusive plant and a vibration management program in place, the effect of construction vibration is considered to be temporary and of **Moderate Negative** significance.

13.169 A further assessment will be undertaken and incorporated into the site CEMP (secured by planning condition) once full details of construction plant, phasing and timings are known to confirm detailed mitigation strategy and the likely duration of the impacts.

13.170 An updated road traffic assessment will be incorporated into the ES upon receipt of the required full set of traffic flow data.

13.171 Based on mitigation embedded within the design, particularly through the use of high specification double glazed windows and supplementary ventilation systems, the criteria for internal noise levels (within BS 8233: 2014 and WHO) of the proposed residential dwellings situated adjacent to the railway line would be met. For those blocks included in the detailed application area (Phase 1), standard double glazed products and passive ventilation would ensure adequate internal noise levels and ventilation. External noise levels within residential balconies would remain below the recommended upper noise criteria of 55 dB $L_{Aeq,16hour}$. Considering the implementation of the recommended mitigation measures the residual effects would be **Negligible**.

-
- 13.172 Operational noise impacts associated with fixed plant situated on the main Teaching Block's rooftop are **Negligible** and not significant, assuming appropriate selection of plant and mitigation measures are incorporated to meet daytime and night-time thresholds (background minus 5 dB).
- 13.173 Noise generated with the use of the MUGA and external playing fields within the school site, would remain within the recommended upper guidelines for residential use at nearest and proposed receptors, therefore the residual effect of these sources are considered to be **Negligible**.
- 13.174 Based on mitigation imbedded within the design, particularly through the use of standard specification double glazed windows and supplementary ventilation systems, the criteria for internal noise levels (within BB93) of the proposed main Teaching Block facing Brunswick Park Road would be met (eastern, southern and northern facades). Rooms situated away from the road can benefit from natural ventilation. The incorporation of the recommended mitigation measures to the building design would ensure the residual effect is **Negligible**.

REFERENCES

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- 4 GLA (2021); The London Plan.
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- 6 Barnet Council (2012) Barnet Local Plan, Development Plan Document.
- 7 Barnet Council (2016); Supplementary Planning Document: Sustainable Design and Construction.
- 8 British Standards Institutions (2014); BS 5228-1:2009+A1:2014, Code of Practice for Noise and Vibration Control on Construction and Open Sites.
- 9 British Standards Institutions (2014); British Standard 8233:2014, Sound insulation and noise reduction in buildings – code of practice.
- 10 World Health Organization (1999); Guidelines for Community Noise.
- 11 British Standards Institutions (2019); BS 4142:2014+A1:2019, Methods for rating and assessing industrial and commercial sound.
- 12 Building Bulletin 93, Acoustic design of schools: performance standards, 2015.
- 13 Design Manual for Roads and Bridges, LA111, 2020. Highways Agency.
- 14 British Standards Institutions (2008); BS 6472-1:2008, Guide to evaluation of human exposure to vibration in buildings.
- 15 Acoustics Ventilation and Overheating, Residential Design Guide: 2020.
- 16 Sport England, Artificial Grass Pitch (AGP) Acoustics, 2015.

14.0 WASTE MATTERS

INTRODUCTION

- 14.1 This Chapter of the ES will focus on waste generated by the following aspects of the proposed development:
- During demolition and construction of the proposed development; and
 - Due to the residential occupation, school, commercial and community uses during operation.
- 14.2 It also describes the methods used to assess the impacts; the baseline conditions currently existing at the site and in the surrounding area; the mitigation and adaptation measures required to prevent, reduce or offset any significant adverse effects; and the likely residual impacts after these measures have been adopted.

LEGISLATION AND POLICY CONTEXT

National

National Planning Policy Framework (2021)

- 14.3 The National Planning Policy Framework (NPPF)¹ was updated in July 2021. The NPPF sets out the Government's planning policies for England and how they are expected to be applied. It sets out a framework that aims to achieve sustainable development throughout the planning system with three overarching objectives – economic, social and environmental.
- 14.4 At the heart of the NPPF is a '*presumption in favour of sustainable development*', which requires Local Authorities as part of any plan-making or decision-making, to provide clear guidance on how the presumption should be applied locally.
- 14.5 The NPPF sets out how to deliver sustainable development. Although the NPPF does not contain specific waste policies, Paragraph 8 does state that part of the environmental dimension to '*sustainable development*' is waste minimisation.
- 14.6 The National Planning Policy for Waste sets out detailed waste planning policies. It should be read in conjunction with the National Planning Policy Framework, the National Waste Management Plan for England and national policy statements for waste water and hazardous waste, or any successor documents. All local planning authorities should have regard to its policies when discharging their responsibilities to the extent that they are appropriate to waste management.

Regional

London Plan, 2021

14.7 The London Plan 2021² was formally adopted in March 2021, forming the Spatial Development Plan for London and part of the statutory Development Plan for Greater London.

14.8 The New London Plan 2021 will run from 2019 to 2041, providing a longer- term view of London's development to inform decision making. This plan replaces the old London Plan 2016 and is therefore a key material consideration in planning decisions and has therefore been referenced in this assessment.

14.9 The following policies within the London Plan are of particular relevance to this assessment:

Policy SI7 Reducing waste and supporting circular economy

'Developments should adopt Circular Economy principles and produce a Circular Economy Statement to support this, evidencing how waste and material have been reduced or reused to prevent waste in the system.'

Developments need to demonstrate:

- *'How all materials arising from demolition and remediation works will be re-used and/or recycled;*
- *How the proposal's design and construction will reduce material demands and enable building materials, components and products to be disassembled and re-used at the end of their useful life;*
- *Opportunities for managing as much waste as possible on site;*
- *Adequate and easily accessible storage space and collection systems to support recycling and re-use;*
- *How much waste the proposal is expected to generate, and how and where the waste will be managed in accordance with the waste hierarchy; and*
- *How performance will be monitored and reported.'*

14.10 Some key overarching targets set out in this policy are:

- Zero biodegradable or recyclable waste to landfill by 2026.
- 65% of municipal waste recycled by 2030.
- 95% of construction and demolition waste reused/recycled/recovered.
- 95% of excavation waste put to beneficial use.

Policy SI8 Waste capacity and net waste self-sufficiency

'Development Plans should:

- *Plan for identified waste needs;*
- *Identify how waste will be reduced, in line with the principles of the circular economy and how remaining quantities of waste will be managed;*
- *Allocate sufficient sites, identify suitable areas, and identify waste management facilities to provide the capacity to manage the apportioned tonnages of waste, as set out in table 9.2 – boroughs are encouraged to collaborate by pooling their apportionment requirements; and*
- *Identify the following as suitable locations to manage borough waste apportionments:*
 - A) existing waste and secondary material sites/land, particularly waste transfer facilities, with a view to maximising their capacity*
 - B) strategic industrial locations and locally significant industrial sites*
 - C) safeguarded wharves with an existing or future potential for waste and secondary material management.'*

Local

14.11 The Barnet Council Local Plan³ was published in September 2012 and replaces the Unitary Development Plan (UDP) (adopted May 2006). It embodies spatial planning to deliver positive social, economic and environmental outcomes and provide the overarching local policy framework for delivering sustainable development in Barnet. The Barnet Council Local Plan consists of the Barnet Core Strategy and Development Management Policies Document.

Core Strategy, 2012

14.12 The policies in the Core Strategy that are relevant to this assessment are summarised below:

- CS14 seeks suitable waste and recycling storage provision in new developments and also promotes waste prevention, reuse, recycling, composting and resource efficiency over landfill.

Sustainable Design and Construction SPD, 2016

14.13 The Barnet Sustainable Design and Construction Supplementary Planning Document (SPD)⁴ sets out more specific guidance on a range of sustainability criteria including the following that are relevant to this assessment:

- *'All non-residential developments should provide a minimum of 10m² designated waste storage space for materials for recycling, such as paper, glass bottles and jars, cans, cardboard, and plastic bottles.*
- *Proposals that employ or attract a large number of people, such as supermarkets or commercial buildings should provide appropriately designed facilities for the collection for recycling or reuse of the waste that they, their customers and staff generate. Applicants for such developments should submit a comprehensive waste and recycling management strategy in accordance with the BS5906:2005 Waste Management in Buildings –Code of Practice.*
- *Prior to commencement of work, all construction sites should put in place a Site Waste Management Plan in accordance with the DTI's Site Waste Management Plans -Guidance for Construction Contractors & Clients -Voluntary Code of Practice.'*

Barnet Draft Local Plan, 2020

14.14 The Barnet Draft Local Plan (Regulation 18)⁵ was published in January 2020. The new Local Plan is due to be adopted in 2022 following the Examination in Public. Given that the Plan has not yet been adopted, only moderate weight should be given to these policies.

14.15 The following draft policies are of relevance to this assessment:

Policy ECC03 Dealing with Waste

This policy encourages sustainable waste management by:

- *'promoting waste prevention, re-use, recycling, composting and resource efficiency over disposal.*
- *ensuring development is designed to provide appropriate space for storage and collection of waste and recycling facilities which fit current and future collection practices and targets.'*

ASSESSMENT METHODOLOGY

14.16 The aim of the waste assessment has been to determine the likely waste generation rates and how waste should be managed during site clearance, construction and during operation of the proposed development. The desk-based waste assessment has involved the following:

- An assessment of current baseline conditions in relation to waste generation rates within the London Borough of Barnet (Waste Disposal Authority) area;
- A review of the typical waste arisings, management practices and recycling rates within the London Borough of Barnet area from publicly available statistics e.g.

Department of Environment, Food and Rural Affairs (DEFRA) Waste Statistics (where available) and information on Barnet Council website;

- Estimates of the amount of waste generated from demolition, excavation and construction; and
- An estimate of waste generation for the residential elements and school and storage requirements for the completed, occupied development.

Significance Criteria

14.17 In March 2020, the Institute of Environmental Management and Assessment (IEMA) published the Guide to Materials and Waste in Environmental Impact Assessment⁶. This is the first industry publication to offer guidance and recommendations for EIA practitioners and stakeholders concerned with the impacts and effects of materials and waste on the environment. Where relevant this current guidance and has been considered throughout this Chapter.

14.18 The IEMA guide states that whilst waste processing and recovery facilities may not be able to divert all received resources from landfill, these operations are a beneficiary of incoming feedstock, and are (ultimately) being used to drive arisings up the Waste Hierarchy. They, hence, create conditions that support the national and wider drive to a circular economy.

14.19 Accordingly, the IEMA guidance does not consider waste processing and recovery facilities as sensitive receptors, rather: they are part of a system that has the potential to reduce the magnitude of adverse impacts associated with waste generation and disposal. Waste processing and recovery facilities are, hence, different to landfills, in that the latter are finite resources.

14.20 Therefore, for waste, the sensitive receptor is landfill capacity. Landfill is a finite resource, and hence, through the ongoing disposal of waste, there is a continued need to expand existing and develop new facilities. This requires the depletion of natural and other resources which, in turn, adversely impacts the environment.

14.21 Therefore, the following criteria have been used from the IEMA Guidance in order to assess the significance of inert and non-hazardous waste generation from the proposed development:

Table 14.1 Significance of waste impacts

Significance	Criteria
Negligible	Waste generated by the development will reduce Hertfordshire and North London landfill void capacity baseline by <1%.

Minor Negative	Waste generated by the development will reduce Hertfordshire and North London landfill void capacity baseline by 1-5%.
Moderate Negative	Waste generated by the development will reduce Hertfordshire and North London landfill void capacity baseline by 6-10%.
Major Negative	Waste generated by the development will reduce Hertfordshire and North London landfill void capacity baseline by >10%.

Source: IEMA Guidance on Materials and Waste in EIA

ASSUMPTIONS AND LIMITATIONS

14.22 This Chapter has been prepared based on the following data sources:

- UK Government waste and recycling statistics (for England) under the ENV18 (Local authority collected waste: annual results tables);
- Residual household waste statistics for Barnet Council and England;
- Current landfill void capacity from the Environment Agency;
- Excavation waste has been calculated based on input from the structural engineer using a bulking factor of 1.2 for soil;
- Construction waste targets from BREEAM;
- Operational waste metrics from Barnet and Lambeth Council; and
- Waste conversion factors from Scottish Environmental Protection Agency’s (SEPA) UK conversion factors for waste.

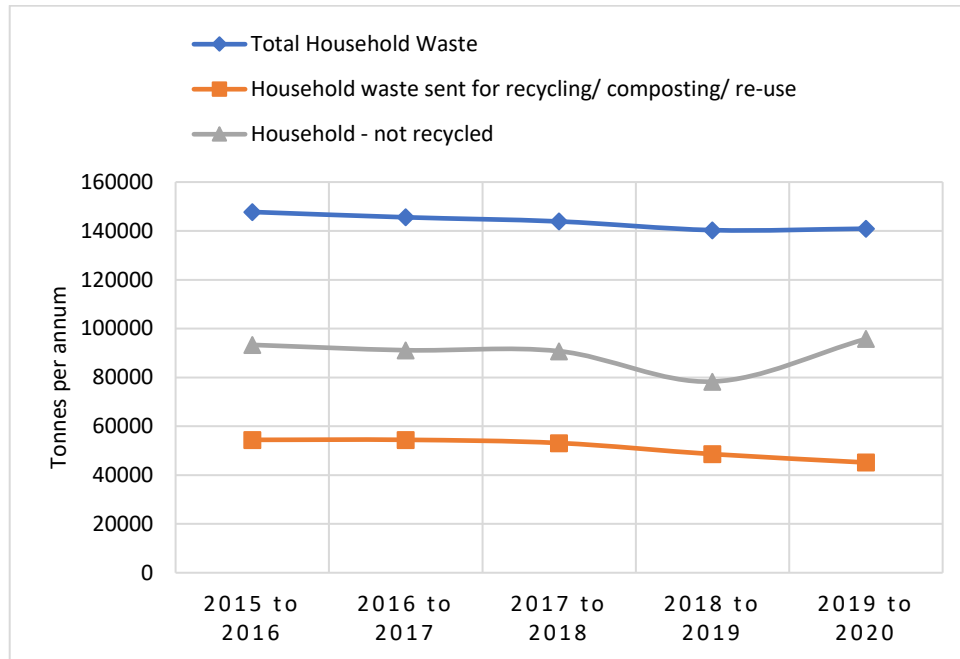
14.23 In the absence of a Pre-Demolition survey, demolition waste has been estimated based on the existing site plans and building heights.

BASELINE CONDITIONS

14.24 The UK Government collates and reports several waste and recycling statistics (for England) under the ENV18 (Local authority collected waste: annual results tables) dataset⁷. Specific data and trends for Barnet Council for the period 2015-2020 are outlined below.

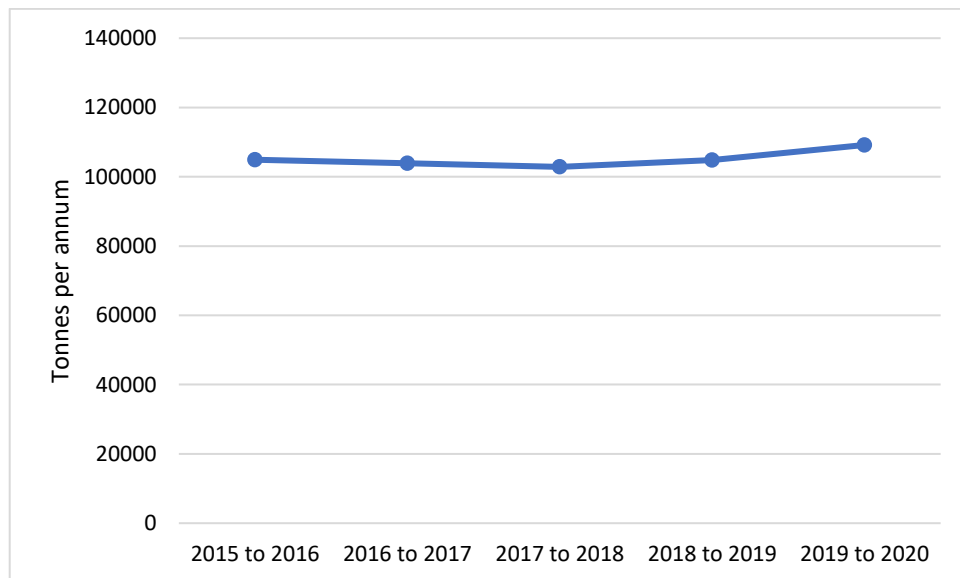
14.25 The volume of household waste sent for either recycling, composting or reuse in Barnet has remained largely consistent between 2015 and 2020. The volume of waste not sent for recycling has fell slightly from 2015-2016 to 2018-2019 but increased in 2019-2020. These trends along with the total volume of household waste in Barnet are shown in Figure 14.1 below.

Figure 14.1 Household waste in Barnet, 2015-2020



14.26 The volume of waste landfilled by Barnet has remained relatively constant between 2015 and 2020⁷ as shown in the figure below.

Figure 14.2 Landfilled waste in Barnet, 2015-2020



14.27 The UK Government tracks selected waste indicators to benchmark the weight of waste produced by individual households. The number of kilograms of residual household waste collected per household in Barnet (i.e. that is not sent for reuse, recycling or composting) have reduced since 2013-2014 (from 639 kg to 630 kg). The current national (England) average is 529.3 kg/household (2019-2020)⁸.

- 14.28 According to the most recent data from the Environment Agency, the remaining landfill void capacity for site in Hertfordshire and North London at the end of 2019 was 337.5 million tonnes.

POTENTIAL IMPACTS

During Construction

Demolition

- 14.29 The quantity of demolition waste is estimated to be 91,387 tonnes across the site (55.85 tonnes/ 100m² GIA). This has been estimated based on the existing site plans and building heights. The precise quantum of demolition waste will be confirmed from the pre-demolitions audit or contractor once is on-site.
- 14.30 Therefore, the waste arising from demolition is predicted to be less than 0.01% of landfill void capacity in Hertfordshire and North London and as set out in the mitigation section below, the majority of this will be recycled through the implementation of a Site Waste Management Plan. This is therefore considered to be a **Negligible** impact.

Excavation

- 14.31 The quantity of excavation waste is estimated to be 360,000 m³ which is equivalent to 381,600 tonnes across the site (686.78 tonnes/ 100m² GIA) based on Scottish Environmental Protection Agency's (SEPA) UK conversion factors for waste⁹. This has been calculated based on input from the structural engineer using a bulking factor of 1.2 for soil.
- 14.32 Therefore, the waste arising from demolition is predicted to be 0.01% of landfill void capacity in Hertfordshire and North London and as set out in the mitigation section below, the majority of this will be recycled through the implementation of a Site Waste Management Plan. This is therefore considered to be a **Negligible** impact.

Construction

- 14.33 The estimated waste arisings from the proposed development for construction (excluding demolition, excavation and groundworks) will be targeted as 6.5 tonnes/ 7.5 m³ waste per 100m² GIA based on the BREEAM targets. Therefore, the maximum predicted waste arisings during construction (excluding demolition, excavation and groundworks) for the whole site are 18,223 tonnes (21,026 m³) assuming that the GIA is 90% of GEA.
- 14.34 Therefore, the waste arising from construction is predicted to be 0.001% of landfill void capacity in Hertfordshire and North London and as set out in the mitigation section

below, the majority of this will be recycled through the implementation of a Site Waste Management Plan. This is therefore considered to be a **Negligible** impact.

During Operation

14.35 Waste from the operation / use of the site will include that arising from the:

- Residential households and collected by the Barnet Council collection system;
- Commercial users of the site - dealt with as commercial waste;
- Community uses - dealt with as commercial waste; and
- School - dealt with as commercial waste.

14.36 The predicted municipal waste from the proposed development for the school and residential uses is set out in the table below.

Table 14.2 Municipal Waste

Phase	Tonnes waste Per annum	Source
Phase 0	323	Calculations for the Educational Building in Phase 1 are based on metrics from Lambeth Council: 1,500 lt waste from every 100 pupils. Currently school has capacity for 1,050 pupils as confirmed.
Phase 0-1	1815	Calculations for residential are based on Barnet Council’s metrics ¹⁰ , using the area schedule of the project. Conversion factors from volume (lt) to weight (t) are taken from Scottish Environmental Protection Agency’s (SEPA) UK conversion factors for waste.
Phase 1-5	8,128	
Total	10,266	

14.37 The majority of this municipal waste would be diverted from landfill in line with local and regional policy requirements.

14.38 Therefore, the total municipal waste sent to landfill from is predicted to be less than 0.001% of landfill void capacity in Hertfordshire and North London and is considered to be a **Negligible** impact.

MITIGATION

During Construction

Design Embedded Mitigation

- 14.39 The applicant is committed to designing out construction, demolition, excavation waste as set out in the Circular Economy Statement. Measures to design out waste will include:
- Using structural efficiency measures to reduce resultant construction and demolition waste;
 - Specifying building elements which adopt standardisation practices;
 - Engage with a principal contractor at an early stage, if possible, to obtain specialist advice on low waste construction techniques;
 - Utilise materials suppliers who provide low-waste materials;
 - Manufacture elements via off site manufacturing; and
 - Maximise percentage of modular / standardised elements.

Pre-Demolition Audit

- 14.40 In accordance with best practice, a Pre-Demolition Audit will be carried out for each phase to inform the reuse of materials from existing structures where possible.

Site Waste Management Plan (SWMP)

- 14.41 The SWMP regulations were revoked by the UK Government in December 2013 and are no longer a legal requirement in England for all construction projects starting onsite after the 1st of December 2013. However, despite this change in regulation SWMPs are still considered the standard practice onsite, as these plans are designed to encourage better waste management practices, improve environmental performance and reduce the cost of waste disposal. A Site Waste Management Plan would be included as part of the CEMP.
- 14.42 A Construction Environmental Management Plan (CEMP) would be produced prior to demolition and construction. Within the CEMP it would be specified what waste control, sorting, recycling and disposal methods are to be used. Waste transported to and from the site would follow the Duty of Care requirements for ensuring waste is transported by registered carriers, taken to appropriately licensed sites and for completing and keeping appropriate waste transfer documentation.
- 14.43 The Site Manager would be required to maintain documented evidence that these requirements are being met, including a register of carriers, disposal sites (including transfer stations) and relevant licensing details for each waste stream. These would be

made available to the Contracts Manager and any relevant statutory bodies for inspection as required.

- 14.44 Waste contractors that remove waste from site should be registered with the Environment Agency. The production, reuse and recycling of waste on site would be monitored and reported on a monthly basis to be able to identify trends in waste creation, and to identify opportunities for reducing waste or increasing the rate of recycling where possible.
- 14.45 The Site Waste Management Plan will aim for the following targets as set out in the Circular Economy Statement for demolition, excavation and construction:

Table 14.3 Waste Targets during Demolition, Excavation and Construction

Stage	Targets
Managing demolition waste	<ul style="list-style-type: none"> • Exceed 95% of uncontaminated demolition waste (by volume, equivalent to 90% by weight) to be diverted from landfill through reusing, recycling or backfilling; • All unwanted crushed hardcore will be removed from site and reused; and • Consider reclamation or salvaging of certain products and materials through a close-loop system, segregated on site space or salvage merchants.
Managing excavation waste	<ul style="list-style-type: none"> • Reuse excavation waste on site, where possible; and • ≥95% of uncontaminated excavation waste to be diverted from landfill.
Managing construction waste	<ul style="list-style-type: none"> • ≥95% of construction waste to be diverted from landfill through reusing, recycling or backfilling; • Manufacture elements via off site manufacturing; and • Segregate waste on site.

- 14.46 The Site Waste Management Plan will ensure that waste is managed sustainably and to the highest value in accordance with the waste hierarchy.

During Operation

Site-wide

- 14.47 Design measures to manage waste and encourage recycling will include the provision of dedicated space to cater for the segregation and storage of operational recyclable waste volumes generated clearly labelled, accessible and of an appropriate capacity.
- 14.48 An operational waste management strategy will be prepared at an appropriate detailed design stage including the number of bins, collection times, expected generation and bin store capacity.

Residential

14.49 Measures to manage waste within the apartment blocks will include:

- The storage and segregation areas in the service areas of the basement of the apartment blocks;
- Communal food waste contained within a sturdy enclosure; and
- Ease of access essential for collection crews to collect bins efficiently and consistently. The use of key pad entry due to the simplicity of use.

Waste collection

14.50 Barnet Council operate a municipal waste collection system based on two categories:

- Category 1 - residents who live in houses, converted flats in houses and small blocks of flats with five or less properties; and
- Category 2 -residents who live in blocks with 6 or more flats (communal storage area).

Table 14.4 Bin Collection System in LB Barnet

Category	Bin Collection System and Frequency
1	<p>Blue bin for mixed dry recycling – 240 litre mixed recycling (cardboard, cartons, food tins and drinks cans, household plastic packaging, mixed glass, bottles and jars, mixed paper including loose shredded paper) collected weekly.</p> <p>Brown bins for food waste – 7 litre food waste caddy for the kitchen plus a 23 litre food waste bin (kept outside and lockable) for all cooked and uncooked food - collected weekly.</p> <p>Green bin for garden waste – (optional) collected every 2 weeks. Black bin for non-recyclable waste – collected weekly.</p>
2	<p>Blue bins – mixed dry recycling.</p> <p>Black bin and communal metal bin.</p> <p>Note: Food waste – not currently collected.</p>

14.51 In addition, there is a Civic Amenity and recycling centre for batteries, textiles, electrical items that residents can make use of.

14.52 It will be important to emphasise to householders the importance and value in recycling and to this end an information pack would be included within their purchaser’s pack detailing waste collection by Barnet Council bin system as well as signposts to other recycling opportunities and websites that identify the benefits of recycling.

Commercial Uses

14.53 Design measures to manage waste will include:

- Centralised storage for commercial tenants will be provided within the basement service areas. This will be managed by the Company with waste collected and removed from site by licenced waste contractors; and
- Compaction systems – design to allow space for collection.

School

14.54 Based on the calculated levels and types of waste estimated sufficient space is allowed in the design for the safe, secure and segregated storage of waste on site prior to collection by commercial waste contractors. In addition, space is allowed for requirements for increased storage if and when anticipated recycling rates at the school increase over time.

14.55 Waste storage provision for the school will be provided in accordance with the relevant minimum BREEAM criteria.

Waste Hierarchy

14.56 The following measures will also ensure that waste is managed sustainably and to the highest value during operation.

Preparing for re-use

- Regular maintenance checks in accordance with a timescale specification prepared by the Management Company.

Recycling

- Recycling of municipal waste in accordance with Barnet Council on-site bin collection systems and then sorted at a Materials Recovery Facility. Recyclable waste either sent to MRF, anaerobic digestion or composting facilities.
- Encourage householders to get a composter or wormery for home use – available from Barnet Council.
- Opportunities for communal composting on-site will be explored at the detailed design stage.
- Basement storage areas for bins within apartment blocks.
- Achieve 50% municipal recycling rate in 2020, increasing in line with Barnet Council targets until 2030.

- Recycling of office waste – sorting collection space available within apartment blocks
- Destination of commercial waste to be confirmed with licenced waste carrier.

Other Recovery

- Food waste collected by Barnet Council in municipal brown bins sent to an in-vessel composting facility; and
- Residual waste collected by Barnet Council is sent to an Energy from Waste (EfW) facility.

Disposal

- Dependant on Barnet Council disposal of municipal waste and end destination of commercial waste.

RESIDUAL IMPACTS

14.57 The residual impacts are as started above.

Summary

Table 14.5 Residual Impacts and Mitigation

Description of Impact/Receptor	Potential Impact	Mitigation	Residual Impact
During Construction			
Demolition Waste	Negligible	Pre-demolition audit for each phase and Site Waste Management Plan (SWMP)	Negligible
Excavation waste	Negligible	Site Waste Management Plan (SWMP)	Negligible
Construction waste	Negligible	Site Waste Management Plan (SWMP)	Negligible
During Operation			
Operational waste from residential and school use	Negligible	Operational Waste Management Strategy at detailed design stage	Negligible

CUMULATIVE IMPACTS

During Construction

- 14.58 Demolition and construction of the cumulative schemes would result in the generation of construction, demolition and excavation waste similar in composition to that generated by the proposed development. Due to uncertainty regarding the specific demolition and construction materials and activities associated with the other developments, it is difficult to accurately quantify the volume of waste expected to be generated.
- 14.59 The cumulative developments outlined in Chapter 16.0 Cumulative Impacts are likely to be required to employ mitigation measures (in accordance with best practice and GLA policy) which should result in all waste materials produced during this phase being effectively and appropriately managed. As such, it is anticipated that most waste materials generated by demolition and construction works would be segregated for recycling and re-use purposes and diverted from landfill (in-line with the waste hierarchy). Therefore, through the implementation of these mitigation measures, a negligible impact would be expected during the demolition and construction phase of the proposed development in combination with other developments.

During Operation

- 14.60 Once all the considered cumulative schemes are complete and operational, waste arisings are anticipated to be produced due to activities associated with the use of each development. It is anticipated that due to the likely end-uses of the other developments (i.e. mixed use schemes of residential and commercial land uses), the composition of waste arisings generated by the developments would be of largely inert and non-hazardous (i.e. like that of the proposed development).
- 14.61 Each proposed cumulative scheme will need to consider waste generated during their operational phase and will be required to apply management techniques that are in accordance with the waste hierarchy. Therefore, while wastes from these schemes would increase the total waste but the effect is not likely to be significant.

CONCLUSIONS

- 14.62 Matters with respect to waste have been addressed during the design with reference to design codes for providing adequate storage within and outside of buildings.
- 14.63 Waste from the commercial aspects of the site will be managed by the Site Management Company amongst their other duties and responsibilities for the smooth running of the proposed development.

-
- 14.64 Waste arising during construction would be managed through a Site Waste Management Plan as part of the Construction Environmental Management Plan. Measures and targets for reducing and recycling waste have been outlined in this chapter. Reference has been made to the waste hierarchy and looking for opportunities to reduce, re-use and recycle waste with the intention of reducing waste to landfill.
- 14.65 Residents of the proposed development will be encouraged to recycle more in line with Barnet Council targets. The storage and disposal of municipal waste would accord with LB Barnet collection systems and an operational waste management strategy will be prepared at the appropriate detailed design stage.

REFERENCES

- 1 Ministry of Housing, Communities and Local Government, (2021); National Planning Policy Framework.
- 2 GLA (2021); The London Plan.
- 3 Barnet Council (2012); Core Strategy.
- 4 Barnet Council (2016); Barnet Sustainable Design and Construction Supplementary Planning Document.
- 5 Barnet Council (2020); Barnet Draft Local Plan (Regulation 18).
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- 8 Local Government Association (2021); LG Inform. https://lginform.local.gov.uk/reports/lgastandard?mod-metric=45&mod-period=7&mod-area=E92000001&mod-group=AllRegions_England&mod-type=namedComparisonGroup
- ⁹ SEPA (2021); <https://www.sepa.org.uk/media/163323/uk-conversion-factors-for-waste.xlsx>.
- ¹⁰ Barnet Council (2021); Recycling and waste guidance for architects and developers.

15.0 SOCIO-ECONOMIC

INTRODUCTION

- 15.1 This Chapter addresses the likely significant impacts of the proposed development on the environment with regard to socio-economic impacts. It also describes the methods used to assess the impacts; the baseline conditions currently existing at the site and in the surrounding area; the mitigation measures required to prevent, reduce or offset any significant adverse effects; and the likely residual impacts after these measures have been adopted.
- 15.2 For the purposes of this Chapter, socio-economic impacts are considered to be the social and economic direct and indirect impacts of the proposed development.

LEGISLATION AND POLICY CONTEXT

National

National Planning Policy Framework, 2021

- 15.3 The National Planning Policy Framework (NPPF)¹ sets out how to deliver sustainable development and breaks this down into 17 chapters. Of these chapters, the following are the most relevant for the potential social and economic impacts of the proposed development:
- Delivering a sufficient supply of homes: This objective states that local planning authorities should establish a housing requirement figure for their area, understand the availability of land in the area, and ensure that the supply and delivery of housing is maintained.
 - Building a strong, competitive economy: This objective sets out the need for planning policies to identify opportunities for local investment and seek to address potential barriers to investment, including poor environments or a lack of housing. It states that local planning authorities should encourage sustainable economic growth and enable the development of accessible local services and community facilities.
 - Promoting healthy and safe communities: This objective states that planning policies need to create new places that encourage social interaction and provide safe and accessible environments. Policies should also enable and support healthy lifestyles.

Regional

London Plan, 2021

- 15.4 The London Plan 2021² was formally adopted in March 2021, forming the Spatial Development Plan for London and part of the statutory Development Plan for Greater London.
- 15.5 The New London Plan 2021 will run from 2019 to 2041, providing a longer- term view of London's development to inform decision making. This plan replaces the old London Plan 2016 and is therefore a key material consideration in planning decisions and has therefore been referenced in this assessment.
- Policy GG1 'Building strong and inclusive communities' has a focus on promoting inclusive growth and minimising inequalities. This sets out a number of aims including to provide access to good quality community services and facilities, provide a wide range of economic opportunities, ensure new developments are adaptable to community needs and minimising inequalities, barriers and challenges faced by different social groups;
 - Policy GG3 'Creating a Healthy City' aims to improve Londoners' health and address health inequalities;
 - Policy GG4 'Delivering the Homes Londoners Need' and Policy H4 'Delivering affordable housing' set a strategic target of 50% of all new homes being genuinely affordable;
 - Policy D7 'Accessible housing' sets a target for residential developments to provide at least 10% wheelchair user dwellings in accordance with M4(3) and with all other dwellings being accessible and adaptable in accordance with M4(2);
 - GG5 'Growing a Good Economy' aims to '*conserve and enhance London's global economic competitiveness and ensure that economic success is shared amongst all Londoners.*' This includes promoting local investment in employment and skills. This policy also emphasises the need for high quality affordable housing, affordable workspace and social infrastructure; and
 - Policy S4 'Play and informal recreation' states that developments should meet a variety of requirements including:
 - '*2) for residential developments, incorporate good-quality, accessible play provision for all ages. At least 10 square metres of playspace should be provided per child.*'
 - '*3) incorporate accessible routes for children and young people to existing play provision, schools and youth centres, within the local area, that enable them to play and move around their local neighbourhood safely and independently.*'

Local

LB Barnet Local Plan 2012

- 15.6 The London Borough (LB) Barnet Local Plan³ was published in September 2012 and replaces the Unitary Development Plan (UDP) (adopted May 2006). It embodies spatial planning to deliver positive social, economic and environmental outcomes and provide the overarching local policy framework for delivering sustainable development in Barnet.
- 15.7 The policies that are relevant to this assessment are summarised below:
- 15.8 Policy CS4 'Providing quality homes and housing choice in Barnet' seeks to ensure a mix of housing products in the affordable and market sectors to provide choice for all households, a variety of housing related support options that maximise the independence of vulnerable residents and ensures that all new homes are built to Lifetime Homes Standards. It sets out a target of 40% affordable homes on sites capable of accommodating ten or more dwellings. This will contribute to the targeted, 'appropriate mix' of affordable housing of 60% social rented and 40% intermediate for Barnet.
- 15.9 Policy CS7 'Enhancing and protecting Barnet's open spaces' secures improvements to open spaces including provision for children's play, sports facilities and better access arrangements, where opportunities arise, from all developments that create an additional demand for open space.
- 15.10 Policy CS8 'Promoting a strong and prosperous Barnet' aims to provide work for Barnet residents by requiring major developments to provide financial contributions and to deliver employment and training initiatives in consultation with the Skills Development and Employability Group; encouraging development that improves the quality of existing employment provision.
- 15.11 Policy CS10 'Enabling inclusive integrated community facilities and uses' ensures that community facilities including schools, libraries, leisure centres and pools, places of worship, arts and cultural facilities, community meeting places and facilities for younger and older people, are provided for Barnet's communities. It sets out an expectation for developments that increase the demand for community facilities and services to make appropriate contributions towards new and accessible facilities.
- 15.12 Policy CS11 'Improving health and well-being in Barnet' aims to enable better service integration, locating services where access can be improved, particularly for vulnerable groups. It also seeks to ensure that vulnerable residents benefit from housing choice and residents benefit from increased access to Barnet's green spaces and opportunities for higher levels of physical activity through the Green Infrastructure SPD.

- 15.13 Policy CS12 'Making Barnet a safer place' encourages appropriate security and community safety measures in buildings, spaces and the transport system by requiring developers to demonstrate that they have incorporated design principles which contribute to community safety and security in all new development.

Barnet Planning Obligations SPD, 2013

- 15.14 This SPD⁴ sets the requirements and planning obligations for different scales of development as well as the procedures and processes for delivering the appropriate legal agreements. It details an approach towards Planning Obligations for open spaces, transport, community facilities and environmental requirements.

Community Facilities

- 15.15 In the case of some larger developments (circa 200 dwelling and above), accessibility to community facilities will need to be demonstrated as part of the planning proposal. Provisions for new facilities on site will be secured where a proposal directly increases the need for local access to a community facility, and where no spare capacity exists in the nearby vicinity - nor is reasonably expected to be provided in the near future. Provision in this manner will be secured through a Planning Obligation.

Education

- 15.16 The SPD ensures that on-site provision will be secured through Planning Obligations and will be agreed on a case by case basis. The approach towards determining the scale of educational provision will take into account the following considerations:
- The local demand and supply of school places. There is reference to a significant shortfall of permanent primary school places across the borough which is starting to impact on the secondary sector.
 - The latest available data. For example, local, national, and regional data on child yield and population projections.
 - The wider need for educational provision. Statutory educational provision is broader than primary and secondary schools. It is currently required for children from the ages of 3 to 16 and in line with legislation this is due to increase to the ages of 2 to 18 by 2015. Young people with learning difficulties and disabilities require access to educational provision up to the age of 25.
 - School Capacity. The Council has a statutory responsibility, under the 1996 Education Act, to ensure that there are sufficient school places in its area, taking into account the different ages, aptitudes and special educational needs of pupils of school age.

Barnet Draft Local Plan

15.17 The LB Barnet Draft Local Plan (Regulation 18)⁵ was published in January 2020. The new Local Plan is due to be adopted in 2022 following the Examination in Public. Given that the Plan has not yet been adopted, only moderate weight should be given to these policies.

15.18 The following draft policies are of relevance to this assessment:

- Policy HOU01 Affordable Housing – seeks a minimum of 35% affordable housing from all major developments consisting of 60% affordable rent and 40% intermediate;
- Policy HOU02 Housing Mix – requires new developments to provide a mix of dwelling sizes;
- Policy CHW01 Community Infrastructure – this policy states that development that increases the demand for community facilities and services should make appropriate contributions towards new and accessible facilities;
- Policy CHW02 Promoting health and wellbeing states that the Council will '*will promote creation of healthy environment by requiring developers to consider building safe, accessible, sustainable and high-quality places which promote development for health and wellbeing*';
- Policy ECY02 Affordable Workspace – this policy supports the provision of affordable workspace; and
- Policy ECY03 Local Jobs, Skills and Training – this policy require development to provide a Local Employment Agreement and deliver construction phase training.

ASSESSMENT METHODOLOGY

15.19 This Chapter comprises the following:

- A brief overview of the national, regional and local planning policy context;
- A description of the methodology used and assessment of the results of the baseline conditions, potential direct, indirect and induced effects during the demolition, construction and operational phases, the wider socio-economic impacts of the proposed development, mitigation measures and the relevant residual effects;
- An economic assessment, including employment impact on the labour market and additional local spending;
- An assessment of the provision of additional housing; and
- A review of other relevant socio-economic impacts, including the demand for social infrastructure such as education, healthcare and open space.

Assessment Modelling

- 15.20 No specific comprehensive quantitative, socio-economic assessment methodology exists, and as such a quantitative analysis of the potential social and economic benefits has been undertaken using the 'Additionality Guide', a standard method of assessing the effects of projects published by the Homes and Communities Agency⁶. 'Additionality' is considered to be the difference between the reference case position (what would happen anyway) and the position if the project (the proposed development) were implemented.
- 15.21 The Homes and Communities Agency guidance recommends accounting for the following factors when assessing additionality:
- Leakage: The number or proportion of outputs that benefit those outside of the project's target area;
 - Displacement: The number or proportion of project outputs accounted for by reduced outputs elsewhere in the target area; and
 - Economic Multiplier Effects: Further economic activity (jobs, expenditure or income) associated with additional local income, local supplier purchases and longer-term development effects that should be accounted for within project's benefits.
- 15.22 Further details regarding the application of additionality assessments are provided in the assessment section.
- 15.23 The significance of these effects has then been evaluated in a qualitative manner, using professional judgement and applying the criteria below as a standard.

Study Area

- 15.24 It is important when undertaking an assessment of the socio-economic effects that the geographical scope of the assessment is clearly understood.
- 15.25 The proposed development is located at North London Business Park and is located within the London Borough of Barnet (LB Barnet). The proposed development is located in Brunswick Park ward.
- 15.26 For comparison purposes and to understand the wider context of the baseline conditions reviewed, the following additional geographic scopes have been considered where appropriate:
- Lower Layer Super Output Areas (LSOAs): Barnet 010C and Barnet 010D;
 - Site ward: Brunswick Park ward;
 - Borough: LB Barnet;
 - Regional: London; and

- National: averages for England or the United Kingdom dependent upon data availability to provide context.

15.27 Effects on infrastructure are assessed by various geographical impact areas, according to the latest socio-economic data or policy standards available. The geographical impact areas used in this chapter are consistent with the 2015 ES except for the assessment of primary school and secondary school capacity where shorter distances have been used to reflect how far children are likely to walk or travel to their nearest school.

15.28 Table 15.1 below presents the different components of the assessment and the geographical scale at which they are assessed.

Table 15.1 Socio-economic Impacts by Geographical Scale

Impact	Geographical Area of Impact
Employment generation during the demolition and construction phase (direct, indirect and induced effects)	Greater London
Employment generation during the operational phase (direct, indirect and induced effects)	Greater London
Additional Local Spending	Greater London
Housing	LB Barnet
Early years education provision	Within 2 km of the site
Primary education provision	Within 2km of the site (assessed as 2.7km in 2015 ES)
Secondary education provision	Within 3km of the site (assessed as 5.1km in 2015 ES)
Primary healthcare provision – GP surgeries	Within 1.2km of the site
Open space	Within 8km; 3.2km; 800m; and 400m of the site
Play space	Within 800m; 400m; and 100m of the site

Assessment Criteria

15.29 The assessment of potential socio-economic effects as a result of the proposed development, has taken into account both the construction and operational phases. The significance level attributed to each effect has been assessed based on the magnitude

of change due to the proposed development, and the sensitivity of the affected receptor/receiving environment to change. Magnitude of change and the sensitivity of the affected receptor/receiving environment are both assessed on a scale of major, moderate, and minor.

Significance of Impacts

- 15.30 The definition and terms used to describe the significance of impacts accords with those set out in Chapter 3.0: EIA Methodology.
- 15.31 A distinction between temporary, short, medium and long term; positive and negative; and cumulative impacts; has been made, where applicable. The geographical extent of impacts has been defined where applicable.

ASSUMPTIONS AND LIMITATIONS

- 15.32 For the baseline assessment, the main source of data is the 2011 census, which was published on 16 July 2012⁷. This has been supplemented with recent mid-year annual estimates from the Office of National Statistics where these were available, as well as other data sources where appropriate. For the purposes of this assessment, this is considered to form a reliable and robust baseline given that the 2011 census provides the most accurate demographics data at neighbourhood level.
- 15.33 In order to calculate the predicted population of the proposed development, this Socio-economic ES Chapter has assumed that the affordable housing element of the scheme is 20% and this will include 60% affordable rented and 40% intermediate.

BASELINE CONDITIONS

Population

Age

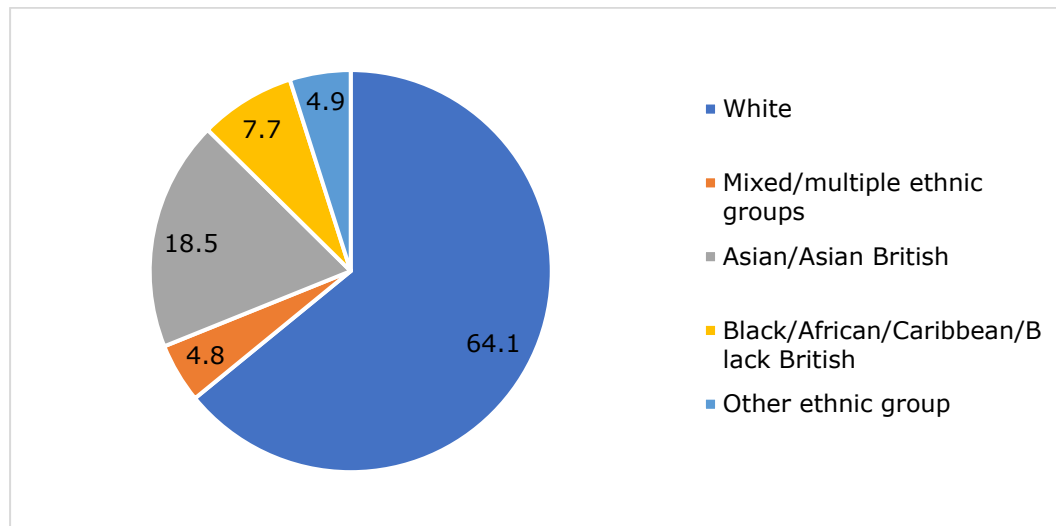
- 15.34 Within LB Barnet, the majority of residents are aged 30 to 44 years, equating to 23.5% of residents, followed by those aged 45 to 59 years, equating to 17.5% of residents. The median age in LB Barnet is 35⁸. This is similar to the ward, within which 21.9% of residents are aged 30 to 44 years, followed by those aged 45 to 59 years, equating to 20.4% of residents. The median age in Brunswick Park ward is 39 which is higher than at borough level and regional level (33), but similar when compared to England (39).

Ethnicity

- 15.35 The majority of residents in LB Barnet are of White ethnicity, equating to 64.1% of residents, followed by those who are of Asian/Asian British ethnicity, equating to 18.5%

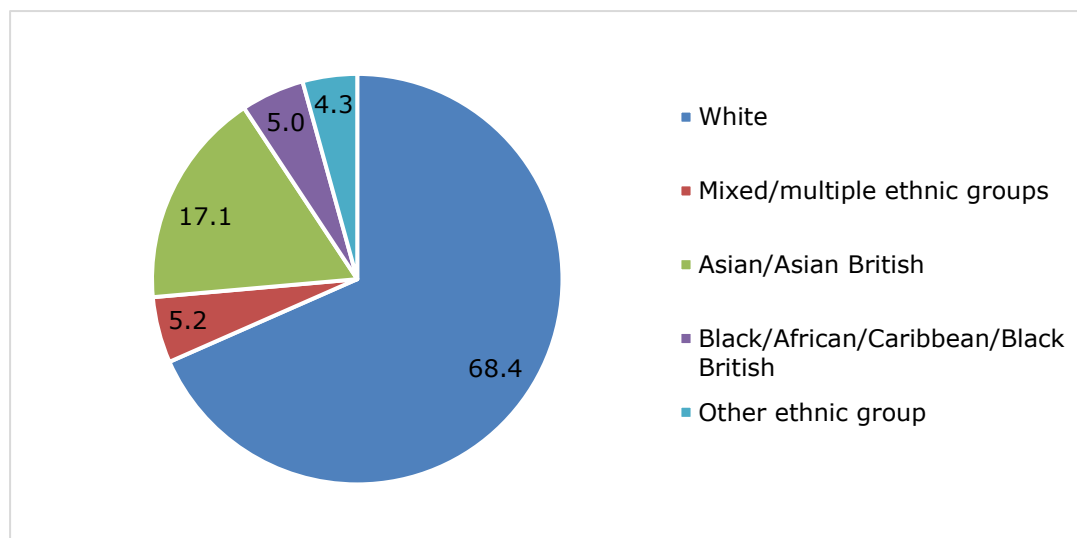
of residents⁹. This is similar to Brunswick Park ward where 68.4% of residents are white and 17.1% are of Asian/ Asian British ethnicity. These proportions are also similar in comparison to London, where 18.5% of residents are of Asian/Asian British whilst 59.8% of residents are White. The two figures below illustrate these ethnicities.

Figure 15.1 Ethnicity in LB Barnet



Source: 2011 Census

Figure 15.2 Ethnicity in Brunswick Park ward



Source: 2011 Census

Population Forecasts

15.36 Population change comprises the difference between birth rates and death rates, and the effects of internal and international migration.

15.37 Population forecasts for LB Barnet show that the population is expected to increase by 51,006 persons between 2018 and 2043¹⁰. The largest driver of this population increase is anticipated to be from the 90+ age bracket where the population is estimated to increase by 3,863 persons; 111% of the overall increase. The proportion of residents over the age of 65 was 14.3% in 2018, this is expected to increase to a proportion of 21.9% by 2043.

Households

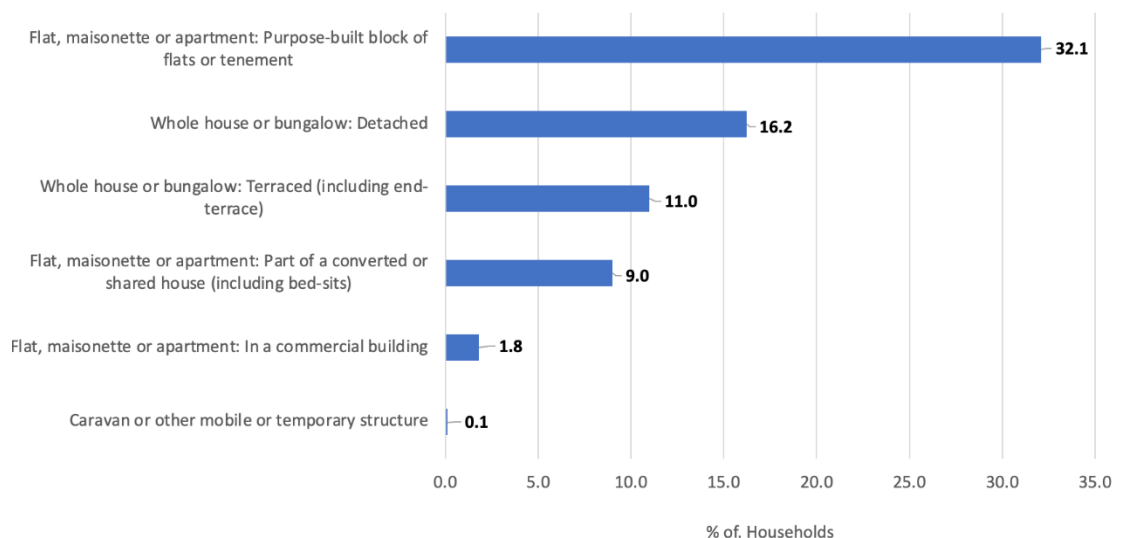
15.38 According to the 2011 Census, there are 139,346 houses within LB Barnet. Of these, 99.8% are unshared dwellings¹¹. A household space is defined as being in an unshared dwelling if it does not meet the following conditions:

- It is 'part of a converted or shared house';
- Not all the rooms are behind a door that only that household can use; and
- There is at least one other household space at the same address with which can be combined to form a shared dwelling¹².

15.39 Therefore, an unshared dwelling is one that consists of only one household space.

15.40 The greatest number of homes in LB Barnet are Flats, maisonettes or apartments in purpose-built block of flats or tenement, equating to 32.1% of households, followed by semi-detached households and terraced whole houses, equating to 29.7% and 16.2%, respectively¹³. The smallest proportion of households in LB Barnet are caravans or other mobile or temporary structures, equating to only 0.1% of households. The accommodation type of unshared dwellings across LB Barnet is outlined in Figure 15.3.

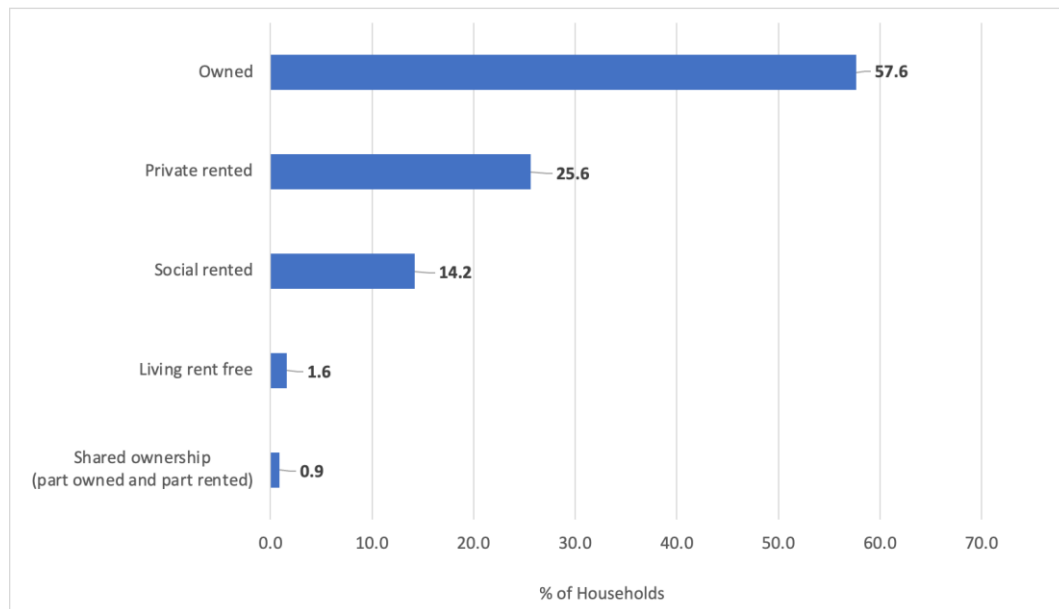
Figure 15.3 Accommodation Type of Unshared Dwellings



Source: 2011 Census

15.41 In addition, 57.6% of households in LB Barnet are owned, 14.2% are socially rented and 25.6% private rented¹⁴. The figures in LB Barnet correspond well in comparison to London. The figure below illustrates tenure in LB Barnet.

Figure 15.4 Tenure in LB Barnet

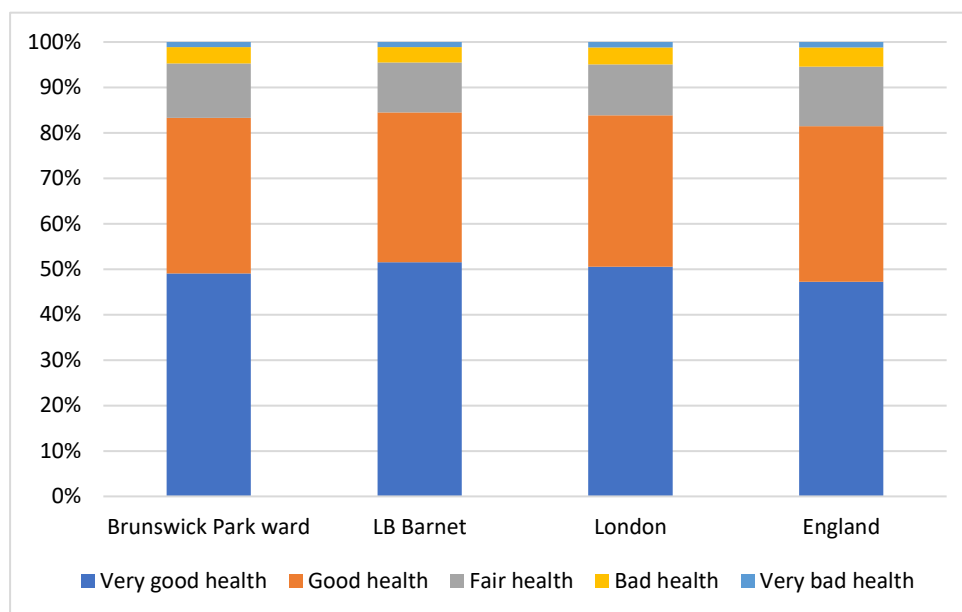


Source: 2011 Census

Health

15.42 51.5% of residents in LB Barnet are in 'Very Good Health' and 33.0% of residents are classified as in 'Good Health'. The proportion of residents in 'Very Good Health' is slightly lower at ward level, equating to 49.1% of residents¹⁵. The general health profile in Brunswick Park ward and LB Barnet is very similar to London and England. The general health by area is shown in Figure 15.5 below.

Figure 15.5 General Health by Area



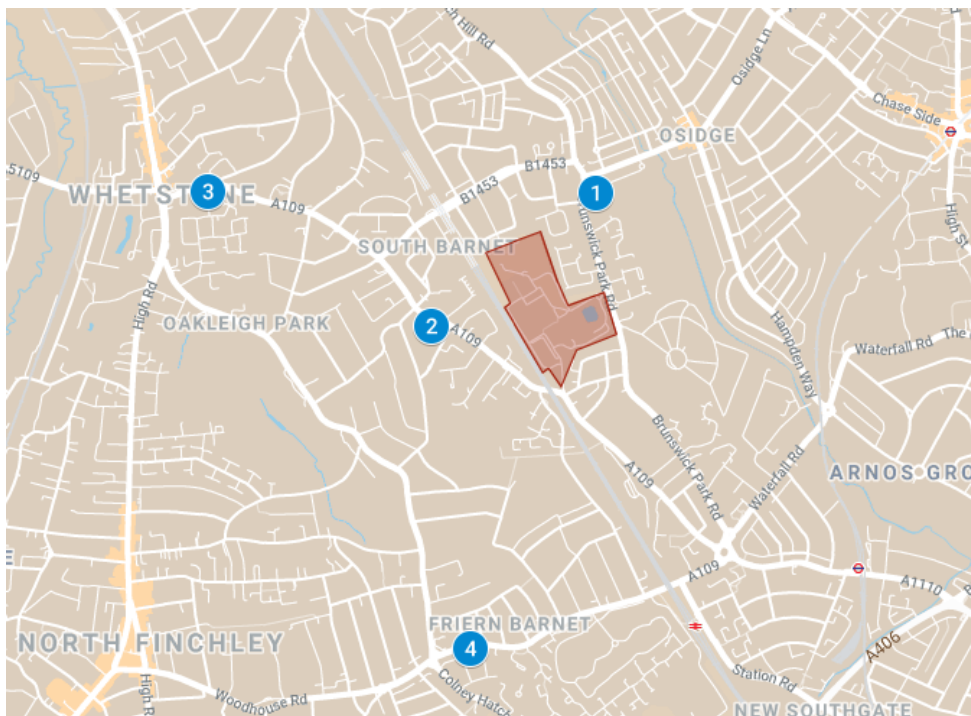
Source: 2011 Census

Local Healthcare Provision

GP Surgeries

15.43 Using the NHS search tool¹⁶, it was identified that there are 5 GP surgeries within 1200 metres of the site using the postcode NW11 1GN. This is summarised in Figure 15.6 Figure 15.6 and Table 15.2 below.

Figure 15.6 GP Surgeries within 1,200m of the site



Source: Google my maps

Table 15.2 GP Surgeries within 1,200m of the site

GP Surgery	Distance (m)	No. of FTE GPs	No. of Patients	GP to Patient Ratio	Accepting New Patients?
Brunswick Park Medical Centre	400	6.6	8,530	1,292	Yes
Oakleigh Road Health centre	400	5.8	9,133	1,575	Yes
St Andrews Medical Practice	1100	6.5	11,171	1,719	No, proposed development is not within catchment area
Friern Barnet Medical Centre	1200	4.4	9,510	2,161	Yes
Total		23.3	38,344	1,646	

Source: NHS service search and General Practice workforce data

- 15.44 It is considered best practice by the General Medical Council used by the Department of Health and Primary Care Trusts that GP surgeries have a GP to patient ratio of 1,800 patients per GP.
- 15.45 Across these 4 GP surgeries, the average GP to patient ratio is 1 GP to 1,646 patients. This is below the best practice ratio and suggests that there is capacity to accommodate new patients.

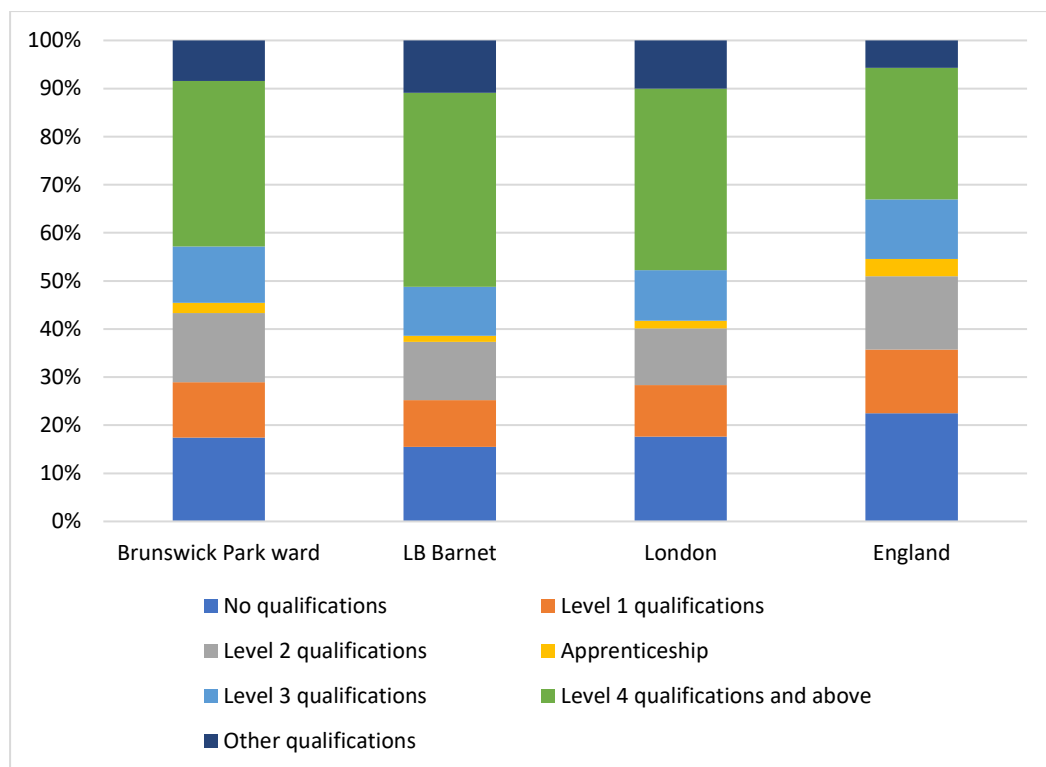
Education

Qualifications

15.46 Within LB Barnet¹⁷, 40.3% of its residents aged 16 and over have Level 4 qualifications and above, the highest level of qualification in this category encompassing different types of university degrees. This is higher than at ward, regional and national level, where the proportion of residents with Level 4 qualifications and above is 34.4%, 37.7% and 27.4% respectively.

15.47 Additionally, the proportion of residents with no qualifications in LB Barnet and Brunswick Park ward is 15.5% and 17.4% respectively. The proportion of residents with no qualifications in LB Barnet is lower than London (17.6%). Figure 15.7 demonstrates the levels of qualifications across the different scales.

Figure 15.7 Qualifications by Area



Source: 2011 Census

Local Education Provision

Early Years

- 15.48 Early years education is provided in a number of ways; through places at local authority maintained nursery schools, children’s centres or primary schools with nursery classes. Early years provision is also made privately, through attendance at independent nursery schools, child-minders, playgroups or crèches.
- 15.49 As early year’s education facilities are typically accessed locally from the family home, this chapter examines all such facilities within a 2 km walking distance of the site.
- 15.50 In England, all 3 to 4-year olds are entitled to 15 hours of free early years childcare education for 38 weeks of the year¹⁸. Children between 3 to 4-years old of working parents are entitled to 30 hours of free childcare for 38 weeks of the year as of 2017. In addition, 2-year old children of parents receiving income support are entitled to 15 hours of free childcare for 38 weeks of the year. Therefore, as well as paid childcare, it is likely that the proposed development will create a demand on childcare as a result of the entitlement for free childcare.
- 15.51 The report has identified 12 nurseries/ early years’ providers within a 2km walking distance from the edge of the site. Little Leo’s nursery is also located on-site and provides 55 places for nursery school children aged 3 months to 5 years.

Table 15.3 Nurseries within 2km of the Proposed Development

Nursery	Walking Distance (km)	Age range
Brunswick Park Nursery	0.5	3 to 5 years
Bright Horizons New Southgate Nursery and Pre-school	0.8	3 months to 5 years
Hampden Way Nursery School	1.0	2 to 4 years
Puddle Ducks New Southgate	1.1	3 months to 5 years
Holly Park Nursery	1.4	3 to 5 years
Academy 4 Kids	1.6	3 months to 5 years
Shanay Nursery	1.8	3 months to 5 years
Osidge Primary	1.9	4 to 5 years
Queenswell Infant and Nursery School	1.9	2 to 5 years
St John’s CofE Junior Mixed and Infant	2.0	3 to 5 years
Apple Day Nursery	2.0	6 months to 5 years

Nursery	Walking Distance (km)	Age range
Bright Horizons Whetstone Day Nursery	2.0	3 months to 5 years

Primary

15.52 Using the government’s search tool for schools¹⁹, primary schools within a 2km radius from the edge of the site are listed below. This search identified 18 primary schools. The surplus capacity of each school has also been identified using data from the Education Funding Agency and the Department for Education²⁰ from the 2018/ 2019 academic year.

Table 15.4 Primary schools within 2km of the proposed development

Primary school	Distance (km)	School places	Number on roll	Net capacity	Surplus capacity (%)
Brunswick Park Primary and Nursery School	0.5	420	413	7	1.7%
Sacred Heart Roman Catholic Primary School	0.7	415	409	6	1.4%
Holly Park Primary School	0.8	475	474	1	0.2%
Church Hill School	0.8	240	208	32	13.3%
All Saints Primary School	0.8	207	192	15	7.2%
St Paul’s CofE Primary School	1.0	204	198	6	2.9%
Monkfrith Primary School	1.0	420	362	58	13.8%
Queenswell Infant & Nursery School	1.0	210*	210	0	0.0%
Queenswell Junior School	1.0	389	350	39	10.0%
Ashmole Primary School	1.2	630	630	0	0.0%
Osidge Primary School	1.2	510	473	37	7.3%
Alma Primary	1.3	210	180	30	14.3%

Primary school	Distance (km)	School places	Number on roll	Net capacity	Surplus capacity (%)
Garfield Primary School	1.4	630	373	257	40.8%
St John's CofE Junior Mixed and Infant School	1.5	210	208	2	1.0%
Walker Primary School	1.4	420	421	-1	-0.2%
Our Lady of Lourdes Catholic Primary School	1.5	210	205	5	2.4%
Wren Academy Finchley**	1.5	420	376	44	10.5%
St Andrew's Southgate Primary School (CE)	1.8	210	210	0	0.0%
Total		6,430	5,892	538	8.4%

Source: DFE (2020) School capacity: academic year 2018 to 2019

*Total school places defined as 210 based on the Barnet School Place Planning Report (2020) due to permanent reduction in capacity.

**All through school, average primary school capacity assumed to be equal to secondary school capacity.

15.53 The table above demonstrates that there is the currently capacity for 538 primary school pupils across the 18 primary schools. The Government recommends that for surplus capacity, in mainly urban areas, a reasonable target is 5%, a figure that both enables accommodation of unanticipated in migration, and minimises the expenditure on running oversized premises. Of the 18 primary schools identified, eight meet this target and the average surplus capacity is 8.4%.

15.54 The latest LB Barnet school place planning report²¹ indicates that there is sufficient capacity in Planning Area 6: East Barnet, Brunswick Park & Oakleigh (within which the site is located) up to 2025/ 2026.

Secondary

15.55 Using the government's search tool for schools¹⁹, secondary schools within a 3km radius of the proposed development are listed below. This search identified 10 secondary schools. The surplus capacity of each school is also identified using data from the Education Funding Agency and the Department for Education²⁰ from the 2018/ 2019 academic year.

Table 15.5 Secondary schools within a 3km radius

Secondary school	Distance (km)	School places	Number on roll	Net capacity	Surplus capacity (%)
St Andrew the Apostle Greek Orthodox School (on-site)	0.0	1,050	672	378	36.0%
Ashmole Academy	1.1	1,512	1,568	-56	-3.7%
Wren Academy Finchley*	1.6	1180	1057	123	10.4%
The Compton School	1.8	1350	1338	12	0.9%
Broomfield School	1.9	900	632	268	29.8%
Finchley Catholic High School	1.9	1107	1187	-80	-7.2%
St Michael's Catholic Grammar School	2.2	767	705	62	8.1%
Southgate School	2.2	1542	1508	34	2.2%
Alexandra Park School	2.7	1567	1678	-111	-7.1%
St Anne's Catholic High School for Girls	2.9	1089	1064	25	2.3%
Total		12,064	11,409	655	5.4%

Source: DFE (2020) School capacity: academic year 2018 to 2019

*All through school, average primary school capacity assumed to be equal to secondary school capacity.

15.56 There is currently the capacity for 655 children across these ten secondary schools. Of the 10 secondary schools identified, nine meet the 5% surplus capacity target and the average surplus capacity is 5.4%.

15.57 The latest LB Barnet school place planning report²¹ indicates that there is sufficient capacity in secondary schools in LB Barnet to meet the projected need up to 2025/ 2026.

Employment and Economy

15.58 Across LB Barnet, 79.5% of residents aged 16-64 were economically active in 2020 which is similar to London (80.1%) and England (79.5%)²². The proportion of unemployed residents in LB Barnet aged 16-64 in 2020 was 5.3% which is slightly lower than London (6.0%) but higher than England (4.7%).

15.59 According to data from the Office for National Statistics (ONS), the average Claimant Count, which measures the number of unemployed people who have registered as Job Seekers and are receiving Job Seekers' Allowance, in LB Barnet was 6.9% in April 2020-

March 2021²³. This is lower than the average for London (7.7%) but similar to the national average (6.3%).

15.60 Within LB Barnet, 66.4% of employees work full-time which is lower than the London average (74.1%) but similar to England (67.8%).

15.61 Compared to London, a higher proportion of residents in LB Barnet work in Wholesale and Retail Trade, Human Health and Social Work Activities, Education and Construction. The industry jobs by industry for LB Barnet, London and Great Britain is shown in the table below.

Table 15.6 Employee Jobs by Industry

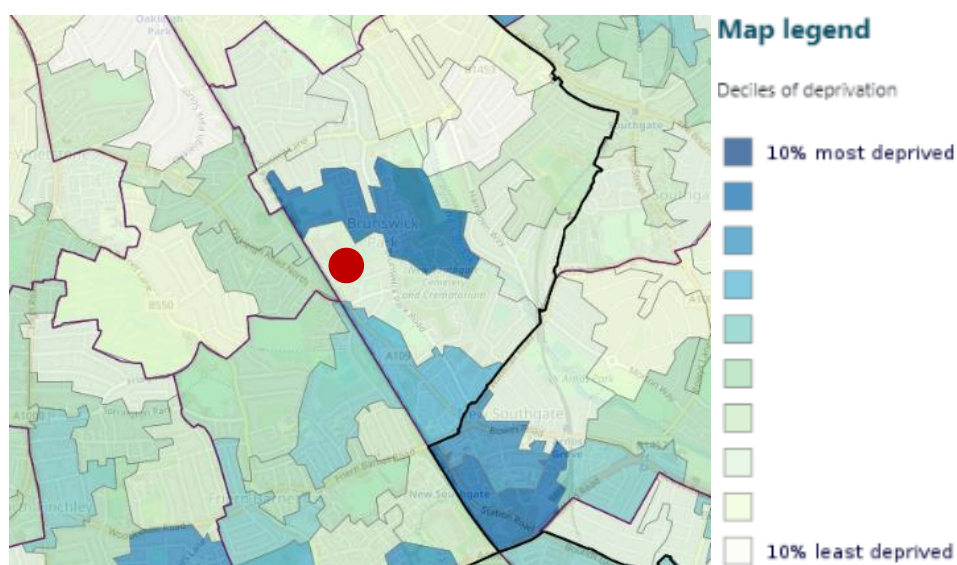
Industry	LB Barnet (Jobs)	LB Barnet (%)	London (%)	Great Britain (%)
Wholesale And Retail Trade; Repair of Motor Vehicles and Motorcycles	21,000	16	11.5	15
Human Health and Social Work Activities	20,000	15.3	10	13.1
Education	15,000	11.5	7.1	8.7
Administrative And Support Service Activities	12,000	9.2	10.8	8.9
Professional, Scientific and Technical Activities	11,000	8.4	12.9	8.8
Construction	9,000	6.9	3.8	4.9
Accommodation And Food Service Activities	9,000	6.9	8.1	7.7
Information And Communication	7,000	5.3	8.4	4.3
Real Estate Activities	7,000	5.3	2.7	1.7
Manufacturing	3,500	2.7	2.3	8
Other Service Activities	3,500	2.7	2.3	2
Public Administration and Defence; Compulsory Social Security	3,000	2.3	4.4	4.4
Arts, Entertainment and Recreation	3,000	2.3	2.7	2.5

Industry	LB Barnet (Jobs)	LB Barnet (%)	London (%)	Great Britain (%)
Financial And Insurance Activities	2,250	1.7	7.3	3.5
Water Supply; Sewerage, Waste Management and Remediation Activities	175	0.1	0.3	0.7
Electricity, Gas, Steam and Air Conditioning Supply	150	0.1	0.2	0.4
Mining And Quarrying	0	0	0	0.2

Deprivation

- 15.62 The Indices of Multiple Deprivation (IMD)²⁴ measure the relative deprivation of small areas of England called Lower Layer Super Output Areas (LSOAs) according to a range of variables including wealth, health and quality of life.
- 15.63 The LSOA within which the site is situated (Barnet 010D) is in the 30% least deprived LSOAs nationally based on the Indices of Multiple deprivation domain. However, the residential neighbourhood to the north of the site is within the 20% most deprived areas. This domain combines indicators under seven different domains of deprivation: Income Deprivation; Employment Deprivation; Education Skills and Training Deprivation; Health Deprivation and Disability; Crime; Barriers to Housing and Services and Living Environment Deprivation. The deprivation levels in the local area based on this domain are illustrated in Figure 15.8 below.

Figure 15.8 Indices of Multiple Deprivation



Source: IMD 2019

- 15.64 Under the Income Deprivation domain, the site is in one of the 30% least deprived areas nationally with the LSOA to the north of the site located in the 20% most deprived areas nationally. This measures the proportion of local people experiencing deprivation relating to low income including those who are out of work and those who are in work with low earnings.
- 15.65 Under the Employment Deprivation domain, the site is in one of the 30% least deprived areas nationally with the LSOA to the north of the site located in the 10% most deprived areas nationally. This measures the proportion of local residents involuntarily excluded from the labour market.

Community Facilities

- 15.66 Within 2km of the site, there are 5 community centres including Church Farm Youth Centre (700m north), Sam Beckham Centre (1.3km southwest), Greek Cypriot Community Centre (1.6km west), Freehold Community Centre (1.7km south) and Friend in Need Community Centre (2km north).
- 15.67 Within 2km of the site, there are 3 libraries including Osidge Library (350m northeast), Friern Barnet Community Library (1km southwest) and North Finchley Library (1.7km west).

Open, Amenity and Play Space Provision

- 15.68 Table 15.7 identifies the existing open space that is considered to be accessible to the proposed development, in line with guidance produced by the GLA. Due to the site's proximity to LB Enfield, parks and open space within LB Enfield have also been considered within the GLA Open Space hierarchy.

Table 15.7 Existing Open Space Provision

GLA Open Space Categorisation	Parks within Catchment Area	Approx size (ha)	Distance (km)
Regional Parks	Lee Valley Regional Park	4,047	8
Metropolitan Parks	Trent Park	185	3.1
District Parks	Arnos Park	17.2	1.2
	Oak Hill Park	33.5	1
Local Parks and Open Spaces	Brunswick Park and Waterfall Park	19.6	0.4
Small Open Spaces	Barfield Avenue Playground	0.16	0.4

15.69 Both New Southgate Recreation Ground (5.8ha) and Bethune Park (5ha) are within 600m of the site however, neither are designated as Local Parks in the Barnet Open Space Assessment.

15.70 The table below sets out the existing play space within walking distance of the site for each age group based on GLA standards.

Table 15.8 Existing Play Space

Age	Recommended Walking Distance	Play Space	Type of Play Space	Size (ha)	Walking distance (m)
Under 5	100m	Not applicable, no play space within this distance			
5-11 years old	400m	Brunswick Grove Play Area	Local Equipped Area of Play (LEAP)	0.19	350m
12+ years	800m	New Southgate Recreation Ground	LEAP	3	480m
		Barfield Avenue Playground	LEAP	0.16	960m*

15.71 Table 15.8 above shows the existing play spaces which are currently within an acceptable walking distance of the site.

15.72 Although Barfield Avenue Playground is currently outside of this range, it is important to include at this point as the proposed development would open up the extinguished connection at Ashbourne Avenue, connecting to Russell Lane and reducing the walking distance to the playground to 700 metres.

POTENTIAL IMPACTS

During Construction

Employment and Economy

Direct Construction Employment Generation

15.73 Construction employment is important as it represents part of the continual supply of work that construction firms and local tradesmen rely upon. Without such schemes, construction and related employment opportunities are significantly reduced.

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- 15.74 The scale of employment is a direct function of the scale and type of construction project being undertaken, which in turn is reflected in the overall capital construction costs. Thus, the scale of employment is a direct function of the overall capital construction costs.
- 15.75 A calculation based upon Annual Business Survey (ABS) construction sector data has been made to estimate the likely impact on the local area in terms of construction employment.
- 15.76 The average amount of construction expenditure required to support a construction job for a year has been derived from the ABS' data, on the turnover of construction businesses in UK for 2018 (£287.1 billion)²⁵, divided by the number of construction workers for that year (2,360,000)²⁶.
- 15.77 The resulting figure of £121,652 is the approximate amount of capital construction expenditure that supports one-person year of employment. Based upon a ratio of the capital construction cost of the proposed development provided by the applicant, it is estimated that approximately 7,318 gross person years of employment (PYE) will be generated over the life of the construction period of the proposed development.
- 15.78 Using a standard ratio of 10 person years of construction work being equivalent to one permanent job in the economy, this is equivalent to some 731.8 permanent jobs in the economy.

Additionality Assessment of Construction Employment Generation

- 15.79 Further to the direct employment generated from the construction of the proposed development, other effects and additional benefits will result from the construction phase. These secondary impacts will arise from the need to purchase supplies for the proposed development (indirect employment), and from the increased expenditure in the locality by the construction workers (induced employment). Together this beneficial economic multiplier effect will sustain and generate further economic activity in the area, boosting the local economy.
- 15.80 The concept of 'additionality' combines the direct and indirect employment impacts of a proposal against the reference baseline position (known as the 'deadweight') to identify the overall net impact.
- 15.81 By undertaking an appraisal of the additional benefits using the adjustment factors from the Additionality Guide⁶, estimations of indirect and induced employment levels can be calculated (for calculations see Appendix 15.1). Three adjustment factors have been applied to understand the employment arising from the construction stage: leakage, multipliers and displacement, all of which are significantly affected by the scale and significance of the proposed development.

Leakage

15.82 First, a leakage factor is applied; this estimates the proportion of outputs that benefit those outside the target area. In accordance with guidance provided by the Homes and Communities Agency⁶ a medium level of leakage has been assumed at 27%, i.e. 73% of benefits will be retained within the Greater London, with leakage of 27% occurring due to the significance of the proposed development attracting wider interest.

Displacement

15.83 The second adjustment factor is a displacement adjustment factor. Displacement takes into account the proportion of development outputs accounted for by reduced outputs elsewhere. In respect to construction employment, this may result from competition for construction staff that could result in delays and increased costs etc. However, considering that there are a number of individuals seeking jobs in the area it is unlikely to be a shortage of construction labour. Nevertheless, for the purposes of this assessment a low level of displacement has been accounted for. This has been estimated to be at 25% in accordance with the Homes and Communities Agency Additionality guide where there is anticipated to be 'some displacement effects, although only to a limited extent.' Thus, the assessment of additional benefits should be considered conservative.

Multiplier

15.84 The final adjustment factor is a multiplier; this calculates the secondary (indirect and induced) benefits as a result of the construction phase, as discussed above. The multiplier adjustment factor varies according to the project size and geographic area. The larger the project and geographic area under consideration, the greater the multiplier factor. Greater London is likely to have 'strong' supply linkages based on the scale of its economy and therefore a multiplier of 1.7 is determined from the HCA guidance to be the most appropriate measure of multiplier effects.

15.85 Thus, as set out in the table below, the leakage, displacement, and multiplier factors have been applied and the net additional employment generated during the construction phase arising as a consequence of the proposed development is an estimated total of 681 FTE jobs in the Greater London Economy. This is considered to be a temporary **Moderate Positive** impact to Greater London.

Table 15.9 Construction Employment Additionality Assessment

Additionality Steps	Result
Gross direct construction employment	731.8
Estimated leakage	197.6

Additionality Steps	Result
Gross direct construction employment to target area	534.2
Less displacement	133.6
Net direct construction employment to target area	400.7
Plus multiplier effects	280.5
Total Jobs	681.1

During Operation

Population & Demography

Total Population

15.86 The proposed development will bring forward 2,433 residential units. Based on the GLA population yield calculator²⁷, Phase 1 accommodation schedule and indicative accommodation schedule for Phase 2-5, this will result in a population of 5,501 persons.

Child Yield

15.87 Child yield for developments is based on multipliers applied to the proposed numbers of units adjusted according to the tenure and unit size (number of beds). To calculate child yield, the GLA population yield calculator has been used (Appendix 15.1). This is shown in the below table.

Table 15.10 Child Yield

Age (years)	Yield
0 to 4	576
5 to 11 (Primary)	405
12 to 18 (Secondary)	206
Total	1,187

15.88 It is estimated that the proposed development will generate 576 children aged 0 to 4 years (nursery age), 405 children aged 5 to 11 years (primary school age) and 206 children aged 12 to 18 years (secondary school age).

15.89 The socio-economic effects of the incoming children and adult residents due to the proposed development will be assessed further below.

Housing

15.90 The proposed development will bring forward 2,433 units which will be a mix of flats and houses of varying sizes and tenure. A proportion of these units will be affordable, but the extent of affordable housing delivery on the site is yet to be concluded and will be subject to viability appraisal.

15.91 The table below shows a breakdown of the proposed residential units for Phase 1.

Table 15.11 Accommodation Mix for Phase 1

Accommodation size	Quantity
1 bed flat	166
2 bed flat	202
3 bed flat	88
4 bed flat	3
4 bed house	7
Total	466

15.92 For the outline element of the scheme, the proposed development will provide 1,967 residential units in a range of sizes.

15.93 Due to the provision of new housing of a range of sizes and tenures, this is considered to be a long term, local **Moderate Positive** impact.

Employment and Economy

Generation of Employment

15.94 The scale of the opportunities arising from the commercial space can be forecast through the application of 'employment densities'. The term 'employment density' refers to the average floor space per person in an occupied building. It is a measure of intensity of use and indicates how much space each person occupies within the workplace.

15.95 The Homes and Communities Agency (HCA) have produced the third edition of the Employment Density Guide²⁸ (hereafter, 'The Guide'), which provides advice to appraisers of regeneration and economic development projects on the employment densities associated with different types of property use.

15.96 To forecast the number of 'workspaces' associated with the proposed development and to quantify the benefits, the recommended employment densities have been applied.

- 15.97 The gross employment generated by the secondary school is calculated from the anticipated number of employees following the redevelopment and expansion of the existing school. The gross employment generated by the nursery has been calculated by applying the OFSTED minimum size requirements for daycare premises (2.8 sqm per child) to the NIA of the nursery. This figure has then been divided by the OFSTED minimum requirements for the number of staff (1 member of staff for every 5 children), resulting in the gross employment generated.
- 15.98 Employment figures from the proposed community uses have been excluded from this assessment given that no employment density figures are provided for this use in the Employment Density Guide.
- 15.99 As shown in Table 15.12, it is projected that the proposed development will provide an average of 437 FTE jobs during the operational phase.

Table 15.12 Operational Employment Generation

Use	GEA (sqm)	NIA* (sqm)	Employment Density	Average number FTE employees
School	Not applicable	Not applicable	Not applicable	92
Office (including 10% affordable workspace)	3360 sqm	2570.4	12 sqm	150
Flexible commercial mixed use**	650 sqm	497.3	12-17.5 sqm	179
Childcare	300 sqm	229.5	Not applicable	16
Total				437

Source: Homes & Community Agency (2015) and Homes & Community Agency (2010)

Note: * The GIA was calculated as 90% of the proposed GEA and NIA was calculated as 85% of the GIA in accordance with the employment density guide. **10% of flexible commercial use assumed to be for community space/ medical centre

Indirect and Induced Employment

- 15.100 Further to the direct employment generated during the operation of the proposed development, additional benefits will result. These secondary impacts will arise from the need to purchase supplies for the businesses operating within the proposed development (indirect employment), and, for example, from the increased expenditure in the locality by the workers (induced employment). Together this beneficial economic multiplier effect will sustain and generate further economic activity in the area, boosting the local economy.

15.101 The concept of 'additionality' combines the direct and indirect employment impacts of a proposal against the baseline position or reference case to identify the overall 'net' impact. By undertaking an appraisal of the additional benefits using the adjustment factors from the Additionality Guide⁶ estimations of indirect and induced employment levels can be calculated (for details see Appendix 15.1). As per the construction employment consideration, three adjustment factors will be applied to understand the employment arising from the operational phase.

Leakage

15.102 First, a leakage factor is applied; this estimates the proportion of outputs that benefit those outside the target area of Greater London.

15.103 Therefore, leakage effects have been considered to be medium because '*a reasonably high proportion of benefits will go to the people living within the target area*' in accordance with the Additionality Guide. A medium level of leakage has been assumed at 27.2%, i.e. 72.8% of benefits will be retained within the target area of Greater London.

Displacement

15.104 The second adjustment factor is displacement. Displacement takes into account the proportion of the proposed development's outputs accounted for by reduced outputs elsewhere. The retail and leisure space in the proposed development is predominately aimed at the local community and the office space will not result in significant displacement. Therefore, it is likely that there will be some displacement effects, but to a limited extent. For the purpose of this assessment this has been estimated at 25%.

Multiplier

15.105 Finally, the last adjustment factor is the multiplier; this calculates the secondary (indirect and induced) benefits as a result of the operational phase employment. The multiplier relates to two aspects:

- A supply linkage multiplier: purchases made as a result of the proposed development and further purchases associated with linked firms further along the supply chain; and
- An income multiplier: associated with local expenditure as a result of those who derive incomes from the direct and supply chain linkages.

15.106 Therefore, the multiplier effect is considerably influenced by how local in nature the businesses are, as this will affect the number of linkages, both supply and income related, which are likely to take place. For the purpose of this assessment a medium composite regional multiplier of 1.5 has been applied to account for average linkages.

15.107 Further to the 'leakage', 'multiplier' and 'displacement' adjustment factors, it is also necessary to take account of the reference case. The reference case can be defined as

the output that would have occurred in the event that the proposed development was not brought forward. Consequently, it is necessary to subtract the reference case additional benefits from the proposed development additional benefits, to leave the net additional benefits.

Reference Case

15.108 The reference case is considered to be what would occur if no development was brought forward. Therefore, the reference case is considered to be the existing state of the site.

15.109 For the purposes of this assessment, the reference case has been defined as the 300-400 people current employed within the site (average of 350 FTE employees). This is the same number of employees as stated in the 2018 ES Addendum.

Table 15.13 Operational Employment (FTE) Additionality Assessment

Additionality Steps	Reference Case	Average Operational Employment
Gross direct operational employment	350.0	437.0
Estimated leakage	95.2	118.9
Gross direct operational employment to target area	254.8	318.1
Less displacement	63.7	79.5
Net direct operational employment to target area	191.1	238.6
Plus multiplier effects	95.2	119.3
Total	286.7	357.9
Net employment minus reference case		71.3

15.110 The additionality analysis is summarised in Table 15.13 above and it shows that overall net operational employment following displacement, leakage, and multiplier effects, and the deduction of the reference case is 71 FTE employment opportunities to the target area of Greater London. Therefore, the operational phase employment benefits are considered to be a local **Minor Positive** impact over the long term.

Additional Local Expenditure

15.111 To estimate the benefit of the proposed development in terms of additional local expenditure, average weekly spending figures for residents in Greater London²⁹ have been applied to the population arising from the proposed development.

15.112 Using the GLA Population Yield Calculator, it is anticipated that the population of the proposed development would be approximately 5,501 residents once fully occupied.

15.113 Those residents occupying social rented accommodation are likely to already reside in London and be on housing waiting lists and as such, these residents have been excluded from the expenditure calculation. The remaining population occupying both market and intermediate housing under the assumed population scenario is therefore approximately 4,490.

15.114 To ensure a conservative estimate of new local spending, it is further assumed that some of those moving to the new market and intermediate tenure units would already be resident in the local area and would thus not generate net new expenditure. To account for this, a displacement rate of 25% has been applied.

15.115 As Greater London is a large urban economy with a strong retail and services offer, it is anticipated that 90% of household expenditure would be retained within the metropolitan area and therefore a 10% leakage is included.

Table 15.14 Net Additional Spending per Annum in Greater London

	Gross Direct Expenditure	Net Direct Expenditure (including 25% displacement)	Total Net Expenditure (including further 10% leakage)
Expenditure per person	£13,540	£10,156	£9,140
Total for 4,490 residents occupying Market & Intermediate Accommodation	£60.8 million	£45.6 million	£41.0 million

15.116 Therefore, it is anticipated that the additional local expenditure would have a long term **Major Positive** impact on the Greater London economy contributing a net expenditure of £41.0 million per annum.

Local Education Provision

Early Years

15.117 The child yield of the proposed development estimates that the proposals will result in a child yield of 576 children aged 0 to 4 years. According to the Department of Education's Childcare and Early Years Survey of Parents in England (2018)³⁰, a total of 52% of pre-school children (aged 0 to 4) were likely to receive formal childcare. This includes day nurseries, nursery schools, nursery classes and playgroups or pre-schools. Therefore,

the proposed development will bring forward 299 children who will require formal childcare places.

15.118 The proposed development provides for a new nursery provision of 960sqm which can accommodate 256 children. Considering that Little Leo's Nursery currently provides nursery spaces for 55 children on-site, this is a net increase of 201 nursery spaces. However, this leaves 98 children who will not be accommodated in nursery provision on-site and it is considered likely that around half of these children could be accommodated at the 12 nurseries identified within 2km of the site.

15.119 It is considered that there would be a long term **Negligible** to **Minor Negative** impact.

Primary

15.120 Primary school children are those within the 5 to 11 years age bracket, thus it is predicted that the proposed development will result in a child yield of 405 primary school children.

15.121 The baseline assessment identified that there is currently the capacity for 538 primary school pupils across the 18 primary schools identified. As the proposed development will bring forward 405 children to the area of primary school age, it is considered that there is sufficient capacity to accommodate these children at existing primary schools.

15.122 It is considered that there would be a long term **Negligible** impact and local CIL payments would help to maintain future capacity.

Secondary

15.123 Secondary school children are those within the 12 to 18 years age bracket, thus it is predicted that the proposed development will result in a child yield of 206 secondary school children.

15.124 The baseline assessment identified that there is the capacity for 655 secondary school pupils across the 10 secondary schools identified within a 3km radius of the site. The proposed development would include the provision of permanent facilities for a new secondary school for St Andrew the Apostle Free School which will provide a total of 1050 places (750 places for Years 7-11 and 300 places for Sixth Form).

15.125 Therefore, it is considered that there would be a long term **Major Positive** impact.

Local Healthcare Provision

GP surgeries

15.126 The baseline conditions identified 4 GP surgeries within 1200m of the site with an average patient to GP ratio of 1,646 patients per GP.

15.127 The proposed development is estimated to create an additional population of 5,501 persons. Combined with the current total of registered patients across the 4 GP surgeries, this would increase the average GP to patient ratio to 1,882 patients per GP. This is above the best practice ratio of 1,800.

15.128 It is considered that there would be a local **Minor Negative** impact in the long term.

Community Facilities

15.129 The proposed development will include the provision of a 3,835 sqm of flexible commercial/ community space which could include a new community centre. Further detail regarding the proposed use classes will be provided at reserved matters stage.

15.130 The baseline assessment has identified 3 libraries within 2km of the site. It is uncertain whether local library services are currently at their capacity and whether they would be able to provide for new residents. Despite this, local CIL payments which will help to maintain access to existing public community facilities.

15.131 Therefore, it is considered that the proposed development would have an overall long term **Negligible** to **Minor Positive** impact on community facilities.

Open, Amenity and Play Space Provision

15.132 The proposed development would provide a total of 20,530 sqm of usable public open space including play space. This is laid out in three main parks with additional publicly accessible open space. A new artificial turf 3G pitch (5,369 sqm), roof top multi- use games area (684.5 sqm) and 50m sprint track are also proposed as part of Phase 0 in addition to the open space.

15.133 The on-site provision represents the equivalent of 0.37 ha per new 1,000 residential population on the site.

15.134 The existing site does benefit from large landscaped areas although these are not usable areas of open space and have been part of the historic landscaping around the existing business park.

15.135 The provision of new public open spaces would assist in mitigating the impacts of the new population on the site and provide space for local residents, employees and members of the surrounding communities.

15.136 The proposed development would also generate a need for approximately 1,890 sqm of play space in Phase 1 and 9,998 sqm in the remainder of the site using the GLA's child yield calculator. This includes a total requirement of 9,810sqm for 0-5 years old and 5-10 year olds. A minimum of 5,103sqm of play space would be brought forward on-site for 0-5 year olds and 5-10 year olds via a mix of doorstep playable space in communal courtyards (2,532sqm) and Neighbourhood Playable Space (2,571sqm).

15.137 There is no specific provision for 11 years and older children on the site. However, the proposed artificial turf 3G pitch and multi-use games area would be available for use by the wider community outside of regular school hours including school holidays. In addition to this the New Southgate recreation ground is less than 600m from the site and is well equipped with formal and informal recreation for older children.

15.138 Therefore, it is considered that there would be a long term, local **Moderate Positive** impact.

MITIGATION

During Construction

Employment & Economy

15.139 The net additional employment generated in Greater London directly and indirectly during the construction phase directly is estimated at 681 FTE employees. This is considered to be a temporary, **Moderate Positive** impact to Greater London.

15.140 To ensure that the construction phase has a positive impact on the local economy of LB Barnet and helps to reduce local employment and skills deprivation, the following enhancements will be provided for the proposed development that are consistent with the existing Section 106 Agreement:

- Local Employment Agreement including a 30% local labour target;
- Provision of an Employment and Skills contribution;
- Provision of local apprenticeships and work placements; and
- Provision of school/ college workshops and site visits.

During Operation

15.141 The proposed development will have Negligible to Positive impacts on the following and therefore no mitigation is required in addition to the provision of local CIL payments for:

- Operational employment;
- Local Spending;
- Housing and affordable housing provision;
- Nurseries;
- Primary Schools;
- Secondary Schools; and
- Community Facilities.

15.142 This ES Chapter has identified a Minor Negative impact on local GP surgeries and therefore it is recommended that a Section 106 primary healthcare contribution is provided.

15.143 In addition, given that the play space provision on-site is below the GLA Policy requirements, it is recommended that a Section 106 contribution is provided towards additional off-site play space provision for under 11s.

RESIDUAL IMPACTS

During Construction

Employment & Economy

15.144 Following the provision of enhancements through the Employment & Skills requirements of the Section 106 Agreement, the residual impacts remain temporary **Minor Positive**.

During Operation

15.145 For GP surgeries, after the provision of a Section 106 primary healthcare contribution the residual impact is considered to be **Negligible**.

15.146 For all other impacts, the residual impacts are as stated above.

Summary

Table 15.15 Summary of Residual Impacts

Description of Impact/Receptor	Significance of Impact/Receptor	Mitigation Measure	Residual Impact
During Construction			
Employment and economy	Moderate Positive	Employment & Skills requirements set out in Section 106 Agreement	Moderate Positive
During Operation			
Housing (including affordable)	Moderate Positive	None required	Moderate Positive
Operational employment	Minor Positive	None required	Minor Positive
Additional local expenditure from residents	Major Positive	None required	Major Positive
Primary Healthcare facilities: GP surgeries	Minor Negative	Section 106 contribution	Negligible

		towards primary healthcare	
Nurseries	Negligible to Minor Negative	None required given nursery provision on-site	Negligible to Minor Negative
Primary Schools	Negligible	Local CIL payments	Negligible
Secondary Schools	Major Positive	None required	Major Positive
Community Facilities	Negligible to Minor Positive	Local CIL payments	Negligible to Minor Positive
Open space and play space	Moderate Positive	Play Space Section 106 contribution	Moderate Positive

CUMULATIVE IMPACTS

15.147 With regard to cumulative impacts, it is considered unlikely that the proposed development would generate any cumulative impacts that would warrant mitigation with regard to those aspects identified above that result in a Positive impact. As such, only those areas where the potential residual impacts were considered to be of Negative or Negligible significance, is there potential for a cumulative effect to occur that could result in a Negative impact.

15.148 Further, certain aspects are considered unlikely to result in cumulative effects, such as housing. Therefore, the following aspects have been considered with regard to cumulative effects:

- Primary healthcare facilities (local GP facilities); and
- Local education provision (early years' and primary).

15.149 Of the schemes identified for consideration with regard to cumulative effects as listed in Chapter 16.0: Cumulative Impacts, all of these schemes have been considered as cumulative to the proposed development for the purposes of this Chapter.

15.150 As the cumulative schemes will generate employment opportunities during their construction phases, it is anticipated that the overall cumulative impact of the identified cumulative schemes and the proposed development will be a temporary **Major Positive** impact.

During Operation

15.151 Out of the seven listed cumulative schemes, two do not include any residential elements. Therefore, these schemes are not anticipated to have a cumulative impact on healthcare facilities and education facilities.

15.152 The remaining cumulative schemes propose residential developments. Therefore, they are anticipated to have a cumulative impact on the provision of health and education facilities as they will bring forward residential units. In total, the schemes will bring forward 1,362 units. According to the Office of National Statistics, the average household size in the UK was 2.4 people in 2016³¹. Considering an average sized household in each residential unit, the cumulative developments will generate a resident population of 3,269 individuals. Together with the 5,501 persons generated by the proposed development, this is a total of 8,770 new residents in the area. Table 15.16 shows the breakdown of these calculated populations per scheme.

Table 15.16 Population of Cumulative Schemes and Proposed Development

Scheme	Number of Units	Population
Sweets Way	288	691
70-84 And Land R/o Oakleigh Road North	115	276
Ladderswood Estate	517	1,241
Gas Holder, Pinker Way	182	437
Barnet House	260	624
Proposed development	2,433	5,501
Total	3,826	8,770

Local Healthcare Provision

15.153 In total the cumulative schemes and proposed development will bring 8,770 new residents to the area.

15.154 Considering the capacity of existing GP surgeries, this would result in an increased GP to patient ratio of 2,011 patients to each GP across the 4 GPs identified within 1.2km of the proposed development. This is slightly above the General Medical Council best practice ratio of 1 GP to 1,800 patients.

15.155 Therefore, this is predicted to have a long term **Minor Negative** impact on GP capacity.

Local Education Provision

15.156 The child yield for each of the cumulative schemes was calculated based on the ratios provided in the GLA population yield calculator and the Barnet House Socio-economic Assessment. The breakdown of child yield is provided in the table below.

Table 15.17 Child yield for the Cumulative Schemes and Proposed Development

Scheme Name	Child yield			Total
	Early years (0 to 4 years)	Primary (5 to 11 years)	Secondary (12 to 18 years)	
Sweets Way	63	49	36	148
70-84 And Land R/o Oakleigh Road North	16	11	5	32
Ladderswood Estate	100	75	48	223
Gas Holder, Pinker Way	21	14	7	42
Barnet House	24	16	7	47
Proposed development	576	405	206	1187
Total	800	570	309	1679

15.157 As shown in the table above, the cumulative schemes and proposed development will bring forward 800 children of nursery school age, 570 children of primary school age and 309 children of secondary school age.

15.158 Given that approximately 52% of nursery school age children receive formal childcare, the cumulative schemes and proposed development are predicted to bring forward 416 children requiring formal childcare.

15.159 The baseline assessment identified potential capacity for 12 nurseries and pre-schools within 2km of the site and the proposed development will provide a nursery with space for 256 children. However, it is not considered that there will be sufficient capacity to accommodate all of these 416 children.

15.160 Therefore, it is considered that there will be a long term **Minor Negative** impact.

15.161 In terms of primary school provision, the proposed development and cumulative schemes will bring forward a total of 570 children of primary school age. As the baseline assessment identified space for 538 pupils of primary school age across the 18 primary schools within 2km of the site, it is concluded that there is likely to be sufficient capacity to accommodate most of these new pupils although there may be some pressure on particular schools.

15.162 Therefore, there will be a long term **Minor Negative** impact.

Summary

Table 15.18 Summary of Cumulative Impacts

	Construction Phase Cumulative Impacts	Operation Phase Cumulative Impacts
Cumulative Impact Assessment for all schemes	There is predicted to be an overall cumulative Major Positive impact on employment.	The cumulative impacts are predicted to be Minor Negative for GP services, nurseries and primary schools based on the following residential cumulative schemes: <ul style="list-style-type: none"> • Sweets Way; • 70-84 And Land R/o Oakleigh Road North; • Ladderswood Estate; • Gas Holder, Pinker Way; and • Barnet House.

CONCLUSIONS

- 15.163 The proposed development has been assessed across all relevant aspects of socio-economic consideration as identified in national, regional and local policy. This Chapter has considered and assessed a variety of topics including employment, local healthcare, local education and open space provision.
- 15.164 The assessment identified that during construction, job opportunities will be generated resulting in a temporary **Minor Positive** residual impact and local employment and skills opportunities will be secured through the Section 106 Agreement.
- 15.165 During operation, there will be **Minor to Major Positive** residual impacts through the provision of housing and affordable housing, increased operational jobs on-site, increased local spending, new facilities for St Andrew the Apostle School, new flexible commercial/ community space and open space.
- 15.166 The impact on local GP surgery capacity was **Minor Negative** and therefore it is recommended that a Section 106 primary healthcare contribution is provided.
- 15.167 The residual impacts on primary schools were determined to be **Negligible** and the provision of a 960sqm nursery on-site will accommodate most children from the proposed development resulting in a **Negligible to Minor Negative** residual impact.
- 15.168 It can therefore be concluded that for Socio-Economic impacts, the proposed development will have an overall Positive impact through helping to meet Barnet Council’s housing targets, the provision of a new secondary school, stimulating the local economy and the provision of new open space and public realm.

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-

16.0 CUMULATIVE IMPACTS

INTRODUCTION

- 16.1 This Chapter presents an assessment of the likely significant cumulative impacts of the proposed development. It has been prepared with input from the technical specialists who have contributed to the EIA.
- 16.2 There are two main types of cumulative impact which are considered within this ES:
- Type 1 - Combined effects of individual residual impacts, for example noise, dust and visual impacts, from one development on a particular receptor; and
 - Type 2 - Residual impacts from several developments, which individually might be insignificant, but when considered together, there could be a significant cumulative impact.
- 16.3 The residual impacts identified in the Technical Chapters (6.0-15.0) have been reviewed to determine the potential for Type 1 effects. This assessment is presented within this Chapter. Type 2 effects have been considered within each Technical Chapter to assist the reader with a summary provided within this Chapter.
- 16.4 This Chapter describes the methods used to assess the cumulative impacts, the scope of the cumulative assessment in terms of the other activities under review, the potential for cumulative residual impacts to arise and any additional mitigation measures (if applicable) required to prevent, reduce or offset the cumulative residual impacts. Unless stated otherwise, the impacts described in this cumulative impact assessment are the residual impacts arising following mitigation.

ASSESSMENT METHODOLOGY

Type 1 Impacts

- 16.5 In-combination (Type 1) effects may arise where the interaction between different impacts of a proposed development (e.g. air quality, lighting and noise) combine to affect a receptor. Receptors may include local residents, commercial occupiers, protected species, habitats, or other forms of social or environmental assets.
- 16.6 Technical assessments focus on describing how a stressor (such as lighting or noise) acts upon a receptor (such as local residents or ecological resources), or they describe how various stressors act upon a single receptor group. Other assessments tend to focus on a single pressure acting upon a single receptor.

-
- 16.7 Likely significant Type 1 cumulative impacts have been identified and qualitatively assessed using the findings of all technical assessments reported within this ES, together with professional judgement.
- 16.8 Technical assessments that focus on the receptor group are, by their nature, in-combination assessments since they consider the effects of numerous stressors acting upon single or multiple receptors. This is the case for ecological receptors (Chapter 8.0: Biodiversity) and they have therefore been excluded from further assessment here.
- 16.9 Type 1 cumulative impacts likely to arise from the proposed development have only been considered during the construction phase and not once the proposed development is completed and operational. This is because it is considered that the greatest likelihood of impact interactions, and hence likely significant impacts, would occur during the construction works.
- 16.10 In consideration of the comprehensive range of environmental management controls and other mitigation measures committed to by the applicant specific to the construction works of the approved development, Type 1 cumulative impacts have only been considered for the likely significant residual impacts of the development (e.g greater than Neutral or Negligible).
- 16.11 The likely significant residual socio-economic construction stage impacts have not been included in the assessment of Type 1 cumulative impacts as these (additional employment and local spending during the construction works) would not have the potential to interact with any other identified environmental impact.

Type 2 Impacts

- 16.12 Schedule 4 Paragraph 5(e) of the Town and Country Planning Regulations (EIA) 2017¹ states that an Environmental Statement (ES) must include:
- 'A description of the likely significant effects of the development on the environment resulting from, inter alia:*
- ...(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...'*
- 16.13 Various criteria have been adopted for establishing the scope of the cumulative assessment of impacts from more than one development (Type 2). Examples of criteria used for guidance includes The Planning Inspectorate Advice Note Seventeen: Cumulative Impacts Assessment (2015)² (PINS guidance).
- 16.14 The PINS guidance outlines a staged approach to cumulative impact assessments. The approach requires the establishment of a zone of influence (ZOI) of the scheme through a desk-based study to identify other developments within the ZOI. The identification of
-

developments is then shortlisted by setting a threshold criteria, as seen in Table 16.1. Information regarding these shortlisted developments is gathered in order to assess whether cumulative impacts may arise. Mitigation measures are then identified if there is anticipated to be adverse cumulative effects.

- 16.15 The scope of the assessment has been guided by the screening criteria listed in the table below, which other developments must meet in order to be included within the cumulative impact assessment. Further, in screening those cumulative impacts that should be included within the assessment, other developments under consideration must, when taken in isolation, generate an impact (positive or negative) of at least minor significance for a particular issue.

Table 16.1 Criteria for Inclusion of Developments within Cumulative Impact Assessment

Screening Criteria
<p>To be considered within the cumulative impact assessment, other development schemes must meet the following criteria:</p> <ul style="list-style-type: none"> • Generate their own residual impacts of at least minor significance; • Be likely to be constructed or operate over similar time periods; • Be spatially linked to the proposed development (for example using the same local road network of the application site); and • Be either consented (but not operational) or be the subject of applications with the relevant statutory authority in the area or be the subject of another statutory procedure.

*The above screening criteria has been adapted from the PINS guidance (2015)

- 16.16 Each of the schemes under assessment has been reviewed to determine potential cumulative impacts. Where possible, a quantitative assessment of the individual environmental impacts from the proposed development in cumulation with other developments has been undertaken. However, for a number of the environmental components under consideration as part of this cumulative assessment, a quantitative assessment of cumulative impacts is not possible. Equally, for future planned developments that are not currently tied to any implementation timescale, uncertainty exists with respect to the occurrence of cumulative impacts. In such instances, where a quantitative cumulative assessment is not possible and/or where uncertainty exists, a qualitative assessment about the reasonable likely cumulative effects has been undertaken using professional judgement, based upon a realistic worst-case scenario.

Schemes Considered within the Assessment

- 16.17 The sources of information used to identify current and proposed projects involved searches of the online planning register (completed August 2021) for Barnet Council.

Table 16.2 Schemes Considered in Cumulative Assessment

Scheme	Description	Reference and Planning Status
Former Abbots And Winters Haulage Site, Oakleigh Road South, N11 1HJ	The relocation of the waste management highways and fleet maintenance facilities provided by London Borough of Barnet, currently based at the Mill Hill Depot at Bittacy Hill., The proposed scheme will provide the following facilities: A vehicle maintenance building; staff office and welfare building; a covered bulking facility for transferring dry recyclables and food waste to larger vehicles for processing outside the borough; a salt barn for winter gritting; parking for Barnet's refuse and recycling collection vehicles; and winter gritting fleet; a vehicle cleaning bay and fuel station and parking for employees 400m south	Approved: 10/11/2015 Ref: 15/04005/FUL
Sweets Way, Whetstone, N20 0LS	Reserved matters application seeking approval of appearance, landscaping and scale for Sweets Way pursuant to Outline planning permission reference B/04309/14 dated 24.07.2015 involving the erection of 288 dwellings (Use Class C3) and a community building (Use Class D1). 1.1km west	Outline planning application approved: 24/07/2015 and reserved matters approved 17/07/2016 Ref: B/04309/14 and 16/4513/RMA
Pavilion Study Centre, 58B Chandos Avenue, N20 9DX	Full planning application for the demolition of the existing pavilion and main school building and the erection of a new 1941 sqm two storey main school building, a 220 sqm single storey pavilion building, associated playground with MUGA facilities and car park. 1.1km northwest	Planning Permission Approved: 10/03/2020 Ref: 20/1304/FUL
70-84 And Land R/o Oakleigh Road North, N20 9EZ	Full Planning Permission for the erection of 2 apartment blocks ranging from 3-5 storeys in height comprising 115 residential units (Use Class C3), together with plant, car parking, cycle parking, refuse stores, servicing areas and associated hard and soft landscaping and associated works. New sub-station (subject to Section 106 legal agreement dated 5th November 2019). And non-material amendment including relocation of proposed substation. 1.1km west	Planning Permission Approved: 05/11/19 Ref: 19/1950/FUL and 20/3463/NMA
Ladderswood Estate, Bounded By, Station Road, Palmers Road And Upper Park	Phased redevelopment of site involving demolition of existing buildings, construction of new roads and erection of a total of 517 self-contained residential dwellings.	Full Planning Approved: 14/02/2014

Scheme	Description	Reference and Planning Status
Road, London, N11 (Located in LB Enfield)	1.5km south	Ref: P12-02202PLA
Gas Holder, Pinkham Way, London, N11 1QJ (Located in LB Enfield)	Redevelopment of the site to provide a mixed use development including the erection of two blocks ranging between 14 and 19 storey's in height, comprising of 182 residential units (Use Class C3), 371 sqm of commercial floorspace (Use Class E), common amenity space, together with accessible car parking spaces, bike parking spaces for residents and for the commercial use,hard and soft landscaping and associated works. 1.5km south	Pending consideration Ref: 20/04193/FUL
Barnet House, 1255 High Road, London, N20 0EJ	Redevelopment of the site, including the conversion of Barnet House from offices to residential, including extension at roof level, and the front, rear and side elevations. Provision of Class E use at ground floor of Barnet House. Demolition of rear annex and erection of new residential buildings. Together with associated public realm, landscaping, access improvements, car and cycle parking. 1.3km west	Pending determination Ref: 21/3726/FUL

- 16.18 The information obtained for these projects is not always available in the same detail as that for the proposed development. Where this is the case, professional judgement has been used to adopt and apply relevant available information.
- 16.19 Some other developments in the area have not been considered within the scope of this assessment due to their status, scale of development or distance from the proposed development; consequently, they have been screened out in accordance with the screening criteria in the table above. This includes small-scale developments (e.g. a domestic development) with limited zones of influence or developments with a limited construction phase.
- 16.20 A map showing the location of the cumulative developments in relation to the site is presented within Figure 16.1.
- 16.21 It has been assumed that other committed developments considered in the cumulative assessment would have their own site-specific Construction Environmental Management Plans (CEMPs) in order to manage and minimise the potential adverse environmental impacts of their construction works.

ASSESSMENT

Type 1

16.22 In view of the assessment methodology employed and the results of the technical assessments contained within this ES, the only impacts with potential for Type 1 impact interactions during the construction works are the following:

- Archaeology and Cultural Heritage residual impacts are **Minor Negative**. The receptors for these impacts are the surviving air raid shelters, the Great Northern Cemetery and Standard Telephones and Cables (STC) Buildings.
- Visual impacts are **Moderate to Minor Adverse** for a number of viewpoints. The receptors for these impacts are pedestrians, residents, road users and officer workers.
- Townscape impacts of **Moderate to Minor Adverse** for a number of viewpoints. The receptors are the character areas and those experiencing them.

16.23 Whilst, the residual impacts described above have potential to act upon the same receptors (e.g. residents from surrounding residential development), an in-combination effect is not anticipated. Impacts will be temporary in nature and will be controlled as far as practicable through implementation of a CEMP.

Type 2

16.24 The Type 2 assessments set out below have been undertaken by the technical specialists who have contributed to the EIA and the ES.

Table 16.3 Type 2 Cumulative Impact Summary

Assessment	During Construction	During Operation
Access and Transport	Traffic associated with the future operation of cumulative schemes is accounted for in the future year scenarios within the modelling undertaken. As traffic associated with the identified cumulative schemes has been incorporated into the traffic modelling work detailed within this Chapter, no additional cumulative assessment has been undertaken.	
Air Quality	There is one committed development located within 350m of the site (the zone of influence for air quality). However, with the implementation of appropriate mitigation (incorporated into a CEMP), there are anticipated to be no cumulative effects if construction occurs at the same time.	The traffic flows used for the assessment include a contribution from the committed developments in the area. The assessment of the significance of the proposed development effects has therefore taken into account the cumulative effect of the site and the relevant cumulative development on predicted future pollutant concentrations.
Biodiversity	All cumulative developments are considered to be beyond the zone of influence for cumulative effects during the construction stage.	During the operational phase, whilst the schemes may lead to a minor increase in recreational pressure on the adjacent New Southgate Cemetery SINC, the nature of this

Assessment	During Construction	During Operation
		site and associated existing management/maintenance means that effects are anticipated to be Negligible.
Archaeology and Cultural Heritage	<p>Cumulative impacts relating to cultural heritage are for the most part limited to indirect effects upon the settings of heritage assets. While there can, in some rare cases, be cumulative direct effects, none are anticipated to result from the construction or operation of the proposed development.</p> <p>The possibility of cumulative effects, the potential for additional cumulative change, resulting from the effects of the proposed development in combination with other schemes, has also been considered. No significant cumulative effect were identified.</p>	
Drainage and Water Environment	<p>Water resources and flood risk associated with construction impacts are typically site-specific. Consequently, it is likely that there would be no cumulative interaction between the proposed development and the cumulative developments in this regard. A Negligible cumulative impact is anticipated.</p>	<p>All committed major developments in the area surrounding the proposed development will have to discharge at the current greenfield runoff rate or the provision of a betterment in runoff rates post-development. Therefore, the cumulative effect of other local developments should result in a net positive effect.</p> <p>The cumulative effects of new development on water supply and foul drainage infrastructure are managed at the regional level by the appropriate water companies in consultation with statutory bodies. The cumulative effect of increases in mains water and foul drainage demand have to be offset by sustainable design and water efficiency measures and infrastructure contributions for sewage treatment works, where necessary. These measures should collectively ensure that the cumulative effects on regional water resources and treatment performance are controlled to an acceptable level.</p>
Ground Conditions	<p>No relevant cumulative impacts have been identified in relation to the proposed development works.</p>	
Townscape and Visual	<p>A number of cumulative schemes have been identified for cumulative assessment. These are all located 500m or more from the centre of the site, and in most cases they are considerably more than 1km away. At the distances involved, and taking into account the scale of development proposed in the cumulative schemes, it is assessed that there would be no significant cumulative effect with the proposed development in any case.</p>	
Noise and Vibration	<p>The cumulative impact of the proposed development in terms of noise and vibration is restricted to the impact of changing road traffic levels generated by the site in conjunction with committed developments in the area, as new road traffic has the capacity to increase the local noise environment in the surroundings of the site. Noise emissions derived from the expected fixed or mobile sources associated with these committed developments are unlikely to significantly affect local noise levels.</p> <p>There is limited potential for overlap of construction phases and scale of developments within the potential zone of influence mean no cumulative impacts anticipated.</p> <p>Planning conditions imposed upon the cumulative schemes require the developers to control the noise of their mechanical plant to acceptable levels for all noise sensitive receptors. Accordingly, there is no increased magnitude of impact arising from these effects.</p>	

Assessment	During Construction	During Operation
Waste Matters	<p>The cumulative developments are likely to be required to employ mitigation measures (in accordance with best practice and GLA policy) which should result in all waste materials produced during this phase being effectively and appropriately managed. Therefore, through the implementation of these mitigation measures, a negligible cumulative impact would be expected during the demolition and construction phase of the proposed development.</p>	<p>Each proposed cumulative scheme will need to consider waste generated during their operational phase and will be required to apply management techniques that are in accordance with the waste hierarchy. Therefore, while wastes from these schemes would increase the total waste but the effect is not likely to be significant.</p>
Socio-economic	<p>As the cumulative schemes will generate employment opportunities during their construction phases, it is anticipated that the overall cumulative impact of the identified cumulative schemes and the proposed development will be a temporary Major Positive impact.</p>	<p>All cumulative impacts are anticipated to be Minor Negative for GP services, nurseries and primary schools.</p>

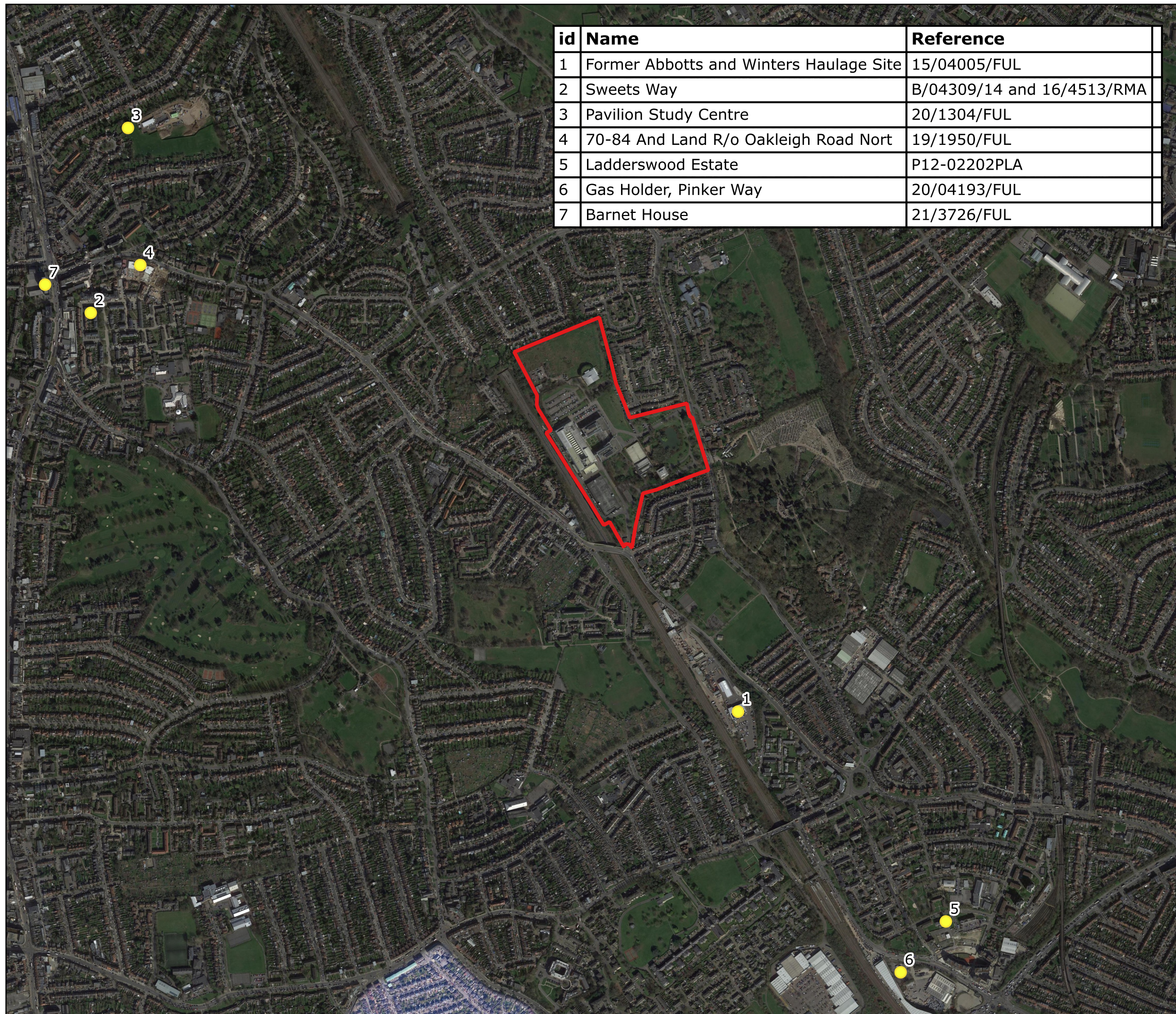
REFERENCES

- 1 HMSO The Town and Country Planning (Environmental Impact Assessment) Regulations 2017
- 2 The Planning Inspectorate (2015) Advice note seventeen: Cumulative effects assessment relevant to nationally significant infrastructure projects, available at <https://infrastructure.planninginspectorate.gov.uk/wp-content/uploads/2015/12/Advice-note-17V4.pdf> [accessed on 10/12/18].

Royal Brunswick Park ES

- Application Site Boundary
- Nearby Schemes

id	Name	Reference
1	Former Abbotts and Winters Haulage Site	15/04005/FUL
2	Sweets Way	B/04309/14 and 16/4513/RMA
3	Pavilion Study Centre	20/1304/FUL
4	70-84 And Land R/o Oakleigh Road Nort	19/1950/FUL
5	Ladderswood Estate	P12-02202PLA
6	Gas Holder, Pinker Way	20/04193/FUL
7	Barnet House	21/3726/FUL

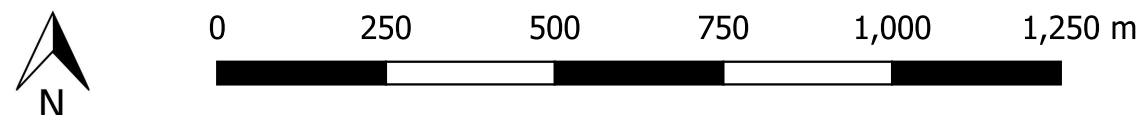


Greengage Environmental Ltd
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Figure 16.1 Cumulatives Plan

Project Number 551510
August 2021
1 to 18000 at A3



17.0 RESIDUAL IMPACTS AND CONCLUSIONS

17.1 This Chapter provides a tabulated summary of the identified mitigation measures and residual impacts for the following Technical Chapters within this ES:

- Access and Transport (Chapter 6.0);
- Air Quality (Chapter 7.0);
- Biodiversity (Chapter 8.0);
- Archaeology and Cultural Heritage (Chapter 9.0);
- Drainage and Water Environment (Chapter 10.0);
- Ground Conditions (Chapter 11.0);
- Townscape and Visual (Chapter 12.0);
- Noise and Vibration (Chapter 13.0);
- Waste Matters (Chapter 14.0); and
- Socio-economic (Chapter 15.0).

17.2 This Chapter is intended to provide an overview only and for more detailed analysis, including details of the baseline, and unmitigated impacts at the construction and operational phase for each technical area, reference should be made to the relevant Chapters within this ES.

17.3 The cumulative and in-combination impacts are summarised separately in Chapter 16.0: Cumulative Impacts.

17.4 Tables 17.1 – 17.10 summarise the mitigation/enhancement and residual impacts identified within the technical Chapters of this ES. These tables provide confirmation of the following:

- Proposed mitigation/enhancement; and
- The residual effects following implementation of mitigation.

Table 17.1 Access and Transport

Chapter 6.0 – Access and Transport	
Mitigation / Enhancement	Residual Impacts
<p>Construction</p> <p>Construction Management Plan (CMP) has been submitted with this application and a detailed Construction Environmental Management Plan (CEMP) will include traffic management measures. The detailed CEMP will be secured by planning condition.</p> <p>Operation</p> <ul style="list-style-type: none"> • Low levels of car parking to encourage sustainable travel (in accordance with the London Plan). • Travel Plan; servicing and vehicle booking system. • Improved pedestrian and cyclist environment. • Proposed increased financial contribution (previously agreed as part of extant permission) to Bus Route 382 to reflect the uplift in the development quantum. 	<p>Construction</p> <p>Given both the peak number of construction vehicles associated with the proposed development (175 as a worst case) and the management and mitigation measures that would be implemented during construction, the significance of the effects of construction to pedestrians, cyclists and the public transport network are considered to be Negligible.</p> <p>Operation</p> <p>A Negligible increase in traffic flows will be experienced on the local highway network as a result of the proposed development.</p> <p>Servicing vehicle movements at the commercial elements of the proposed development can be strictly controlled in terms of vehicle size and arrival and departure times. This will be managed through a vehicle booking system. A similar system will be implemented for large residential deliveries</p> <p>As such, the residual effect of the proposed development on traffic and the local highway network is considered to be Negligible. There will be a Negligible to Minor Positive effect for pedestrians and cyclists.</p>

Table 17.2 Air Quality

Chapter 7.0 – Air Quality	
Mitigation	Residual Impacts
<p>Construction</p> <p>Implementation of best practice dust mitigation techniques into as part of the detailed CEMP (secured by planning condition).</p> <p>Operation</p> <p>No specific mitigation measures will be required. Transport related mitigation measures (such as provision of electric vehicle charge points and a Travel Plan) will be included.</p>	<p>Construction</p> <ul style="list-style-type: none"> • Combustion emissions from increased traffic and equipment exhausts - Negligible • Dust – Negligible <p>Operation</p> <p>Combustion emissions from increased traffic - Negligible</p>

Table 17.3 Biodiversity

Chapter 8.0 – Biodiversity	
Mitigation / Enhancement	Residual Impacts
<p>Construction</p> <p>To mitigate against ecological impacts, measures will include:</p> <ul style="list-style-type: none"> • Implementation of detailed CEMP (secured by planning condition) incorporation measures to reduce dust, light and noise disturbance; • Removal of fish during waterbody reconstruction subject to Environment Agency Approval; • Covering ditches, holes and trenches at night; • Treatment for Japanese knotweed; • Relocation of reptiles to receptor site; and • Clearance/ demolition of the vegetation and buildings outside of bird nesting season or after a suitably qualified ecologist has confirmed absence. <p>Operation</p> <p>Landscaping proposals incorporate ecological compensation/enhancements including the following:</p> <ul style="list-style-type: none"> • New trees and hedgerows; • Grassland habitats; • Wildflower habitats; • Planting of value for wildlife; • Enhancement of the waterbody; • Reptile receptor area at western boundary; and • Bird and bat boxes. <p>Implementation of Green Infrastructure and Ecological Management Plan in addition to sensitive lighting strategy.</p>	<p>Construction</p> <p>All statutory designated sites are considered to be located sufficiently far from the site that no construction phase impacts are anticipated. A Negligible residual impact was anticipated for all sites.</p> <p>Following the implementation of measures to be set out in a Detailed CEMP residual impacts for local non-statutory sites are considered to be Negligible.</p> <p>Following the implementation of the landscaping proposals there was considered to be a Long-term Positive impact for habitats onsite. This included a Long-term Positive impact from tree planting, a Long-term Positive impact through waterbody enhancement and a Negligible impact from Japanese knotweed following removal.</p> <p>The following residual impacts are anticipated for protected/notable species on site:</p> <ul style="list-style-type: none"> • Badgers - Negligible • Bats – Negligible following implementation of construction activity mitigation measures and long-term Positive on roosting and foraging bats • Birds – Negligible following implementation of construction activity mitigation measures and long-term Positive following new landscaping • Reptiles – Negligible • Invertebrates – Negligible • Hedgehogs - Negligible <p>Operation</p> <ul style="list-style-type: none"> • Recreational impact on habitats and surroundings – Negligible • Impact on bat activity following implementation of lighting strategy - Negligible

Table 17.4 Archaeology and Cultural Heritage

Chapter 9.0 – Archaeology and Cultural Heritage	
Mitigation	Residual Impacts
<p>Construction</p> <p>Implementation of a watching brief for specific potential significant impacts identified.</p> <p>Operation</p> <p>No mitigation required.</p>	<p>Construction</p> <ul style="list-style-type: none"> Surviving air raid shelters – Minor Negative The Great Northern Cemetery - Minor Negative Standard Telephones and Cables (STC) Buildings – Minor Negative <p>Operation</p> <ul style="list-style-type: none"> New Southgate Cemetery – Negligible Memorial to German First World War Internees – Minor Negative

Table 17.5 Drainage and Water Environment

Chapter 10.0 – Drainage and Water Environment	
Mitigation / Enhancement	Residual Impacts
<p>Construction</p> <p>Implementation of a CEMP (secured by planning condition) for the proposed development which would contain measures to manage and control all ground works, including management of wastewater and the storage of fuel and chemicals.</p> <p>Operation</p> <p>SuDS measures embedded into design through drainage strategy including a 40% climate change allowance.</p> <p>Implementation of SuDS Management Plan at detailed design stage.</p> <p>Implementation of water conservation measures to meet water consumption target of 105 litres or less per head per day.</p>	<p>Construction</p> <ul style="list-style-type: none"> • Surface water – Negligible • Groundwater - Negligible • Downstream residential receptors - Negligible <p>Operation</p> <ul style="list-style-type: none"> • Potential Contamination of Surface and Groundwater - Negligible • Surface water runoff – Moderate to Major Positive • Groundwater - Negligible • Potable water supply – Minor Negative • Foul Drainage - Negligible

Table 17.6 Ground Conditions

Chapter 11.0 – Ground Conditions	
Mitigation	Residual Impacts
<p>Construction</p> <p>Good practice during construction as detailed in a CEMP.</p> <p>Preparation of a piling risk assessment to set out most appropriate piling methodologies and procedures.</p> <p>Toolbox talks to workers to raise awareness of UXOs.</p> <p>Operation</p> <p>Preparation of a detailed remediation method statement setting out appropriate mitigation measures following further intrusive investigation works across the wider site footprint in consultation with Barnet Council Environmental Health Officer.</p> <p>Inclusions of appropriate gas protection measures in proposed properties following completion of works to quantify the ground gas regime.</p> <p>Design of appropriate construction materials (potentially barrier pipes for water supply pipes and appropriate concrete class to resist chemical attack) for use during construction.</p>	<p>Construction</p> <p>The following residual impacts were predicted following the implementation of mitigation:</p> <ul style="list-style-type: none"> • Risk to neighbouring properties and residents – Negligible • Risk to surface water bodies - Negligible • Risk to deep Aquifer - Negligible <p>Operation</p> <p>The following residual impacts were predicted following the implementation of mitigation:</p> <ul style="list-style-type: none"> • Risk to future site occupants/ adjacent occupants – Negligible • Risks to future vegetation - Negligible • Risk to deep Aquifer - Negligible • Risk to construction materials - Negligible

Table 17.7 Townscape and Visual

Chapter 12.0 – Townscape and Visual	
Mitigation	Residual Impacts
<p>Construction Erection of hoarding.</p> <p>Operation No additional mitigation has been identified beyond that already embedded into the designs.</p>	<p>Construction Residual construction impacts are considered to be:</p> <ul style="list-style-type: none"> • Townscape: <ul style="list-style-type: none"> o The site – Moderate Adverse (temporary) o All other TCAs – Minor to Moderate Adverse (temporary) • Visual: <ul style="list-style-type: none"> o Views 7, 9, 10, 11 - Moderate Adverse (temporary) o All other views – Minor to Moderate Adverse or Neutral <p>Operation Townscape:</p> <ul style="list-style-type: none"> • The site – Moderate to Major Beneficial • TCAs A and B – Moderate Beneficial • TCAs C and D – Neutral (minor to moderate) • TCA E – Neutral (minor) <p>Visual:</p> <ul style="list-style-type: none"> • Neutral to Moderate Beneficial impacts

Table 17.8 Noise and Vibration

Chapter 13.0 – Noise and Vibration	
Mitigation	Residual Impacts
<p>Construction</p> <p>Incorporate mitigation measures and Best Practicable Means (BPM) to a Construction Noise and Vibration Management Plan as part of the CEMP.</p> <p>Operation</p> <p>Mitigation set out in this ES includes:</p> <ul style="list-style-type: none"> • Mechanical plant designed (in terms of noise source output) accordingly to the requirements of Barnet Council; • Incorporation of appropriate noise reduction to glazed and non-glazed areas; and • Incorporate appropriate stand-off distances for MUGA and playing fields. 	<p>Construction</p> <ul style="list-style-type: none"> • Construction Noise - Temporary and localised exceedances of moderate significance. • Construction Vibration - Temporary and localised exceedances of moderate significance. <p>Operation</p> <ul style="list-style-type: none"> • Fixed Plant Noise / Nearest existing and proposed sensitive receptors – Negligible • Road traffic noise (Based on available data, Brunswick Park Road only)– Negligible • MUGA and playing fields / Existing nearest receptors – Negligible

Table 17.9 Waste Matters

Chapter 14.0 – Waste Matters	
Mitigation	Residual Impacts
<p>Construction</p> <p>Reduce waste at detailed design stage using structural efficiency measures and specifying building elements which adopt standardisation practices.</p> <p>Pre-demolition audit.</p> <p>Implementation of Site waste management plan (SWMP) as part of CEMP with the following targets for diversion from landfill:</p> <ul style="list-style-type: none"> • ≥ 95% of uncontaminated demolition waste; • ≥ 95% of uncontaminated excavation waste; and • ≥ 95% of construction waste. <p>Operation</p> <p>Detailed Operational Waste Management Strategy and provision of sufficient storage space for waste, recycling and food waste for all uses.</p>	<p>Construction</p> <ul style="list-style-type: none"> • Demolition waste – Negligible • Excavation waste - Negligible • Construction waste – Negligible <p>Operation</p> <ul style="list-style-type: none"> • Operational waste from residential and school use - Negligible

Table 17.10 Socio-Economic

Chapter 15.0 – Socio-economic	
Mitigation / Enhancement	Residual Impacts
<p>Construction Local employment & Skills requirements set out in Section 106 Agreement.</p> <p>Operation Section 106 Contribution towards primary healthcare and play space provision. Local CIL payments towards primary school capacity and community facilities.</p>	<p>Construction</p> <ul style="list-style-type: none"> • Employment– Moderate Positive; <p>Operation</p> <ul style="list-style-type: none"> • Employment – Minor Positive; • Additional residential spending – Major Positive; • Housing and affordable housing– Moderate Positive; • Nursery capacity – Negligible to Minor Negative; • Primary School capacity– Negligible; • Secondary School capacity – Major Positive; • Healthcare – Negligible; and • Open space and play space – Moderate Positive; and • Community facilities – Negligible to Moderate Positive

18.0 GLOSSARY AND ABBREVIATIONS

AADT - Annual Average Daily Traffic

ABS - Annual Business Survey

ADMS-Roads Atmospheric Dispersion Modelling System - Roads (a dispersion modelling software application)

AGP - Artificial Grass Pitch

ANC - Association of Noise Consultants

AOD - Above Ordnance Datum

APA - Archaeological Priority Area

AQAP - Air Quality Action Plan

AQMA - Air Quality Management Area

AQS - Air Quality Strategy

AVR - Accurate Visual Representation

BAP - Biodiversity Action Plan

BCT - Bat Conservation Trust

BGS - British Geological Survey

BNG - Biodiversity Net Gain

BREEAM - Building Research Establishment's Environmental Assessment Method

CBD - Convention on Biological Diversity

CCS - Considerate Contractors Scheme

CEMP - Construction Environmental Management Plan

CFA - Continuous Flight Auger

CIEH - Chartered Institute of Environmental Health

CIL - Community Infrastructure Levy

CMP - Construction Management Plan

CNVMP - Construction Noise and Vibration Management Plan

CRTN - Calculation of Road Traffic Noise

DCMS - Department of Media, Culture and Sports

Defra - Department for Environment, Food and Rural Affairs

DfT - Department for Transport

DMP - Dust Management Plan

DMRB - Design Manual for Roads and Bridges

EA – Environment Agency

EC - European Commission

EFT - Emission Factors Toolkit

EHO – Environmental Health Officer

EIA – Environmental Impact Assessment

EMP - Ecological Management Plan

EPUK - Environmental Protection UK

ES – Environmental Statement

EU – European Union

EUBS - European Union Biodiversity Strategy

FORS - Fleet Operators Recognition Scheme

GEA – Gross External Area

GI – Green infrastructure

GIA - Gross Internal Area

GiGL - Greenspace information for Greater London

GLA - Greater London Authority

GLAAS - Greater London Archaeology Advisory Service

GLHER - Greater London Historic Environment Record

GLVIA - Guidelines for Landscape and Visual Impact Assessment

QORA - generic quantitative risk assessment

Ha – Hectares

HCA - Homes and Communities Agency

HDV - Heavy Duty Vehicle

HER - Historic Environment Record

HGV - Heavy Goods Vehicles

HPP – Hybrid Planning Permission

IAQM - Institute of Air Quality Management

IEA - Institute of Environmental Assessment

IEMA - Institute of Environmental Management and Assessment

IMD - Indices of Multiple Deprivation

IOA - Institute of Acoustics

JNCC - Joint Nature Conservation Committee

LAQM - Local Air Quality Management

LBB - London Borough of Barnet

LDV - Light Duty Vehicle

LLAQM - London Local Air Quality Management

LOAEL - Lowest observed adverse effect level

LPA - Local Planning Authority

LSOA - Lower Layer Superior Output Area

LVMF - London View Management Framework Supplementary Planning Guidance

MAGIC - Multi-Agency Geographic Information for the Countryside

MHCLG - Ministry of Homes, Community and Local Government

MSOA - Middle Superior Output Area

NDG - National Design Guide

NHS - National Health Service

NIA - Net Internal Area

NLBP - North London Business Park

NLS - National Library of Scotland

NO₂ - Nitrogen dioxide

NOMIS - National Online Manpower Information System

NO_x - Oxides of nitrogen

NPPF - National Planning Policy Framework

NPSE - Noise Policy Statement for England

ONS - Office for National Statistics

OS - Ordnance Survey

PEA - Preliminary Ecological Appraisal

PIC - Personal Injury Collision

PM – Particulate Matter

PM₁₀ - Particulate matter of size fraction approximating to <10mm diameter

PM_{2.5} - Particulate matter of size fraction approximating to <2.5mm diameter

PPG - Planning Practice Guidance

PPV - Peak Particle Velocity

ProPG - Professional Practice Guidance on Planning and Noise

RMS - Remediation Method Statement

SAC - Special Area of Conservation

SEPA - Scottish Environmental Protection Agency

SFRA – Strategic Flood Risk Assessment

SINCs - Sites of Importance for Nature Conservation

SOAEL - significant observed adverse effect level

SPA - Special Protection Area

SPD - Supplementary Planning Document

SPZ - Source Protection Zone

SSSI – Site of Special Scientific Interest

STC - Standard Telephones and Cables

SuD_s - Sustainable Drainage Systems

SWMP - Site Waste Management Plan

TA – Transport Assessment

TCA – Townscape character area

TP - Travel Plan

TVIA – Townscape and Visual Impact Assessment

UDP - Unitary Development Plan

UXO - unexploded ordnance

VDV - Vibration Dose Value

WFD – Water Framework Directive

WHO – World Health Organisation

WLA - West London Alliance