Tritax Symmetry Limited

Symmetry Park, Oxford North

Environmental Statement

March 2022

Document title:	Environmental Statement
Project:	Symmetry Park, Oxford North
Client:	Tritax Symmetry
Job number:	484968
File location:	WimbornePlanning(G):\JOBS\Tritax Symmetry\Tritax Symmetry OXFORD NORTH

Date
03.2022

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1 Environmental Statement for Symmetry Park, Oxford North

1.1 Introduction

1.1.1 Tritax Symmetry Limited and Siemens Healthineers (the Applicants) have submitted a planning application to Cherwell District Council (CDC, the Council) seeking full planning consent for the development of employment floorspace on land north of the A41 and east of the M40 near Junction 9, known as Symmetry Park, Oxford North.

1.1.2 The planning application is for a new facility to be used by Siemens Healthineers, a long-established, existing Oxfordshire-based business. Siemens Healthineers is working with development partner, Tritax Symmetry, who would be responsible for securing planning permission and the construction of the facility and associated infrastructure.

1.1.3 The proposal is for the development of a new high-quality combined research, development and production facility, to produce superconducting magnets for medical devices used in MRI systems. Its purpose is to accommodate the current and future requirements of Siemens Healthineers.

1.1.4 This Environmental Statement has been prepared on behalf of the Applicants for a full planning application for the development of employment floorspace at the Application Site.

1.1.5 The location and the extent of planning application Site is identified by the red line shown on the Figure below (see separate Figure 2.1 to view full size drawing 13-222-SGP-STE-00-DR-A-131009). In total, the Site covers an area of 19.35 hectares (ha).

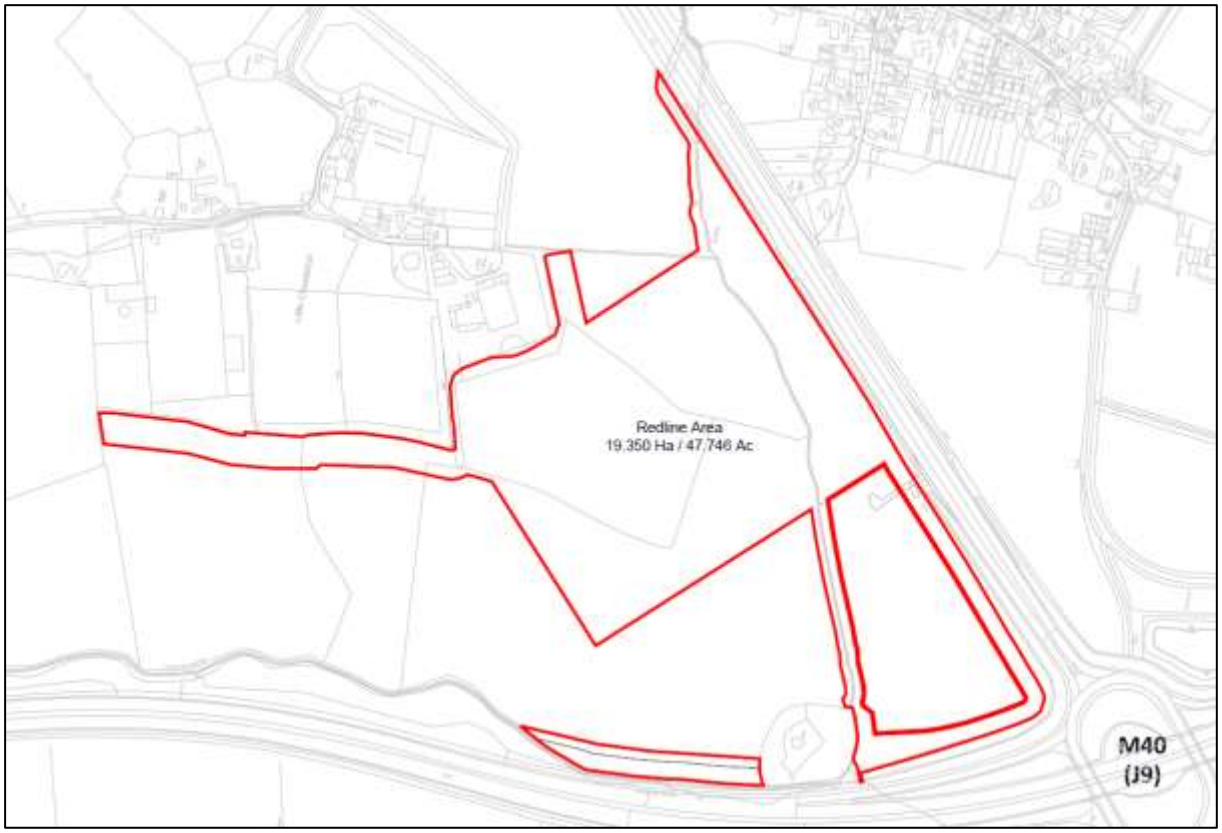


Figure 1.1 Site location

Environmental Impact Assessment

1.1.6 Environmental Impact Assessment (EIA) is a process that formally considers the construction and operational aspects of a proposal that may have significant effects on the environment. The findings of an EIA are described in a written report known as an Environmental Statement (ES). An ES provides environmental information about the scheme, including a description of the development, its predicted environmental effects and the measures proposed to mitigate adverse effects: information that is taken into account in the planning decision.

1.1.7 This document is the ES submitted with the planning application for the Proposed Development and sets out the results of the EIA undertaken. This ES is prepared in accordance with The Town and Country Planning (Environmental Impact Assessment) Regulations 2017 (the 'EIA Regulations'). A separate Non-Technical Summary (NTS) provides a summary of the main findings of the ES.

1.1.8 A request was made to the Council for its EIA scoping opinion in August 2021. The purpose of this was to identify what the Council considers to be the main environmental issues associated with the Proposed Development (Appendix 3.1). The Council consulted with statutory consultees and issued a formal EIA scoping opinion (see Appendix 3.2).

1.1.9 An EIA has been undertaken for the Proposed Development described in Chapter 2 and illustrated by Figures listed at paragraph 2.1.2. Subsequently, when the Council is deciding whether to grant planning permission, it can do so in the full knowledge of any significant effects predicted, and take this into account in the decision-making process.

1.2 This Environmental Statement

1.2.1 This ES comprises the Main Report, Figures, supporting Appendices and a separate NTS. Following this introduction and description of the Site, the ES Main Report is organised as follows:

2. Proposed Development
3. Approach to assessment
4. Planning policy
5. Transport
6. Air quality
7. Noise
8. Biodiversity
9. Landscape and visual effects (including Lighting)
10. Heritage
11. Hydrology, flood risk and drainage
12. Ground conditions and soils
13. Climate change
14. Socio-economic effects
15. Summary of mitigation, residual effects and interaction effects
16. Glossary and abbreviations

1.2.2 Chapter 1 provides a description of the Site and its surroundings, and Chapter 2 explains each element of the Proposed Development, which, with Figures listed in 2.2.1, define the physical and operational aspects assessed by the EIA. The alternative options considered during the site selection and environmental influences on the design process are also explained. Chapter 3 sets out the approach taken to the assessment, and Chapter 4 describes the planning policy

context.

1.2.3 Environmental issues assessed in the EIA process are then reported in Chapters 5 to 14, with the majority of associated figures provided as separate files (PDF), although some are set within the text of the Chapters. Chapter 15 provides a summary of the proposed mitigation, residual and interaction effects.

The project team

1.2.4 Those working on the EIA of the Proposed Development are as follows:

- Savills: EIA co-ordination;
- Framptons: Reasonable alternatives; planning policy;
- Stephen George & Partners: scheme design and plans, Design and Access Statement;
- Vectos: transport;
- SLR: air quality; noise;
- EDP: Landscape and visual; biodiversity; heritage;
- Tier: Hydrology, flood risk and drainage; ground conditions and soils;
- Ridge: Climate change;
- SQW: Socio-economic.

1.2.5 The EIA has been coordinated by Savills with the technical assessments and input undertaken by the project team. An outline of the qualifications/experience of the assessors to demonstrate competency in accordance with the EIA Regulations is provided in Appendix 1.1.

1.2.6 Siemens Healthineers and their project team has provided information on the design of the facility in terms of the spatial and operational requirements, its design and the architectural response.

Other planning application documents

1.2.7 The information included in the planning application to CDC includes: the Planning Statement; Design and Access Statement; Statement of Community Engagement; Sustainability Statement; Waste Management Strategy; Health Impact Assessment; Socio-Economic Benefits Report.

Availability of information

1.2.8 The Environmental Statement and other planning application documents can be viewed on the Council's planning applications website:

https://www.cherwell.gov.uk/info/115/planning/443/see-or-comment-on-a-planning-application

1.2.9 A copy of the ES on USB Flash Drive can be obtained for a charge of £25 from: wimborneplanning@savills.com, Telephone 01202 856 800. A printed copy of the NTS can also be obtained free of charge from Savills.

1.3 Description of the Site

1.3.1 The boundary of the Site fronts the A41 road and extends across several open fields that are currently in agricultural use. There are a number of buildings in agricultural or commercial use located in the north east part of the Site.

1.3.2 The eastern extent of the Site is defined by field boundaries and hedgerows, the Grange Farm Industrial Estate, and Lower Grange Farm. The Wendlebury Brook defines the western edge of

the Site, flowing from north to south towards a small area of woodland, where its course then changes to flow east across the Site, before passing under the A41.

1.3.3 Generally, ground levels fall from north to southeast, from approximately 77.50 metres Above Ordnance Datum (mAOD) to approximately 64.00 mAOD.

1.3.4 Fields within the Site are enclosed by hedgerows having few associated mature trees. The arable use offers negligible ecological value. A site survey has found the agricultural land to be of moderate quality (Grade 3b), which is not categorised as the best and most versatile.

1.3.5 The Environment Agency's flood map indicates that the majority of the Site is located within Flood Zone 1. It therefore has a 'low probability' of river flooding, with less than a 1 in 1,000 annual probability (<0.1%). A small proportion of the Site, located immediately adjacent to the Wendlebury Brook, is located within Flood Zone 2 where there is currently a 'medium' annual probability of river flooding (1% - 0.1%) in any year.

1.3.6 Footpath 161/4/20 traverses the Site and crosses the A41 into the village of Wendlebury. At present there are no formal crossing points, but there is a pedestrian refuge area provided in the central reserve of the A41.

1.3.7 There are no designated heritage assets (world heritage sites, scheduled monuments, listed buildings, conservation areas, registered parks and gardens or registered battlefields) located within the Site.

1.4 Local context

1.4.1 The Site is located approximately 4 km south-west of Bicester in Oxfordshire, adjacent to the A41 and M40 at Junction 9. The A41 provides direct access to Bicester and the M40 provides access to London to the south-east and Birmingham to the north-west.

1.4.2 The surrounding landscape is generally low-lying agricultural land, dissected by major vehicular corridors, each being lined with native mature tree and hedgerow cover, which restricts views towards the Site.

1.4.3 The Site is served by the S5 Bus Route that provides:

- Four buses per hour Monday to Friday.
- Four buses per hour on Saturdays.
- Two buses per hour on Sundays
- Bus stops in close proximity to Bicester North Railway Station, which enables combined bus-rail trips.
- A journey time to Bicester of 10-15 minutes, and to Oxford between 25 and 30 minutes.

1.4.4 In addition, there is a night bus service (NS5) which runs one service a day Monday-Thursdays after midnight and on Fridays there are four services running from midnight to 3am.

1.4.5 The Site is well located to the National Cycle Network, with Route 51 to the northwest identified as a lightly trafficked route with good connectivity to Bicester.

1.4.6 The town centre of Bicester contains an Air Quality Management Area, which is situated approximately 3.1 km from the Site. Consideration of this in ES Chapter 6 confirms that the increase in traffic flows into or adjacent to the AQMA as a result of the Proposed Development would not have a significant effect (6.3.2).

1.4.7 There are a number of Grade II listed buildings within Wendlebury on the southern side of the

A41 to the south-east of the Site. To the north-east of the Site in Chesterton there are a number of Grade II listed buildings and two Grade II* listed buildings - the Manor Farm House and the Church of St Mary. The Alchester Roman Site Scheduled Monument is located 0.9 km to the north-west. The Site is not considered to form a part of the setting of any of these heritage assets (ES paragraph 10.3.5).

1.4.8 The closest ecology designation is the Wendlebury Meads and Mansmor Closes SSSI, some 2 km south of the Site. The Site falls within the Cherwell and Woodeaton Brook Nitrate Vulnerable Zone (NVZ) which relates to surface water nitrate limits. The area on the western side of the M40 is designated as a Drinking Water Safeguard Zone for surface water.

1.4.9 The Wendlebury Brook outfalls into the Langford Brook downstream from the Site, after flowing through Wendlebury Village.

1.4.10 To the north-west (approximately 965 m), RAF Weston-on-the-Green is a grass airfield that is currently used for parachute training, a gliding school and a sky diving centre.

1.5 Sensitive receptors

1.5.1 Aspects of the Application Site and the locality considered in the design and assessment of the Proposed Development are:

- Wendlebury Brook and Site drainage;
- Ancient woodland, trees, hedgerows;
- Soil resources;
- Public Right of Way 161/4/20 on the Site and crossing the A41;
- Adjacent uses – Commercial and residential uses to the north of the Site;
- The A41 road and bus stops;
- M40 Junction 9;
- Landscape character; and,
- Air Quality Management Area (Bicester).

2 The Proposed Development

2.1.1 The EIA has assessed the development of:

- A site of 19.35 hectares;
- Demolition of agricultural buildings;
- New signal-controlled access from the A41;
- Employment floorspace (Use Class B2);
- Loading bays, service yard, waste management area;
- Facilities management building;
- Security gatehouse;
- A building for use as an energy centre;
- Parking for electric cars, accessible parking, bicycles, cars and motorcycles;
- Landscaping including landscape mounds;
- Re-alignment of Wendlebury Brook within the Proposed Development area; and,
- Sustainable drainage.

2.1.2 Figures in the ES illustrating the Proposed Development are:

Figure 2.1 131009 Location plan;
Figure 2.2 131004 Rev.P5 Location plan;
Figure 2.3 131000 Rev.R Phase 1 Site Plan;
Figure 2.4 131001 Rev.R Site Plan Phase 1 & 2;
Figure 2.5 131300 Rev.E Phase 1 Elevations;
Figure 2.6 131003 Rev.E Phase 2 Elevations;
Figure 2.7 131115 Rev.D Facilities Management Building;
Figure 2.8 121404 Rev.A Energy Centre Plan and Elevations.

2.1.3 The site plans show the specific layout and characteristics for the Proposed Development. The building will be delivered in 2 phases: Phase 1 due to become operational in 2024 and, Phase 2 due to become operational in 2030, subject to projected demand.

2.1.4 When complete and fully operational, the facility would provide approximately 1,345 jobs, including third party and visitor jobs. The production staff work in a shift pattern over a 24-hour period, 7-days a week.

2.1.5 The extent of the application site area includes the land needed to undertake construction, the re-alignment of the Wendlebury Brook, and landscaping including landscape mounds. Development would also require the removal of the existing agricultural buildings located within the north-east part of the Site.

Inherent mitigation measures

2.1.6 Those elements of the scheme design introduced to mitigate potential adverse effects are known as inherent mitigation. These measures are a fundamental part of the scheme and can generally be represented in the plans provided and the description of the development.

- Access: the creation of a new signalised junction on the A41;
- Pedestrian and cyclists: delivery of a toucan crossing on the A41;
- Bus stops: relocated and improved, with shelters and real-time journey information provided;
- Building footprint and heights: Overall, the main built structure would be up to 13.0 m

(parapet height) and with a zone for plant in the goods section of up to 14.95 m.;
- Surface water runoff: capacity to accommodate the 100 year rainfall event including a 40% increase in rainfall intensity that is predicted to occur as a result of climate change;
- Landscaping: including landscape mounding and a landscape management plan.

2.1.7 Additional mitigation is generally not capable of being shown in the plans because it may, for example, involve contributions to the provision of off-site measures, or require controls on the construction or operation of the Proposed Development that cannot be shown visually. The measures proposed as additional mitigation are identified in each of the assessment chapters within this ES, and a summary of them is incorporated in Chapter 15. The delivery of the necessary infrastructure and additional mitigation measures can be secured through the imposition of planning conditions or legal obligations associated with a grant of planning permission for the Proposed Development.

Design evolution

2.1.8 A series of environmental baseline studies informed the design framework within which the layout of the proposal has progressed. The baseline work informed a constraints plan for the Site, which has informed the evolution of the design.

2.1.9 As part of the detailed design process careful consideration has been given to:

- creating a comprehensive flood management and surface water drainage strategy;
- ensuring that site levels to respond to the existing topography and that these tie into the surface water drainage strategy;
- landscape treatment to minimise the impact of the development on the surrounding area in visual terms, and also to connect into wider Green Infrastructure corridor proposals;
- integrate landscape and drainage features to create a sustainable and robust strategy that also enhances biodiversity;
- provide an access strategy that does not impact on the surrounding network, and does not prejudice delivery of future highways projects;
- designing the building mass, form and overall height to minimise the visual impact.

2.1.10 The facility is positioned on the site to provide a functional connection between the principal areas; for an optimised linear process route; to provide a functional route for logistical access around the buildings within the constraints of the site boundary; to orientate the principle elevation of the building towards the site approach; and compose a rectilinear building form to create a well ordered appearance.

2.1.11 The building has two production halls and a spine. The spine building acts as a conduit which serves the length of the production hall. From here goods loading, innovation centre, plant and personnel can serve both phases of production spaces. Access for Goods into the building is centrally located on the spine to allow for efficient distribution of materials to different stages of the production line. A number of external buildings required to support the production process are situated to the north-west side of the facility, away from the site approach.

2.1.12 The roof profile of the main facility is driven by the requirements for natural daylight into occupied areas as well as an efficient structural design and a distinctive internal environment. The roof design aims to provide daylight in occupied areas; improve the wellbeing of occupants through a visual connection to the external conditions including time of day and weather; and is orientated to maximise north light to the production areas, minimising solar gains and the use

of artificial light.

Highways and access

2.1.13 Access to the Site will be achieved via the creation of a new signalised junction on the A41, which runs south-west to north-east and connects the M40 with the town of Bicester in the east.

2.1.14 The junction will comprise a four-lane approach in the northbound direction and a three-lane approach in the southbound direction, providing a dedicated right turning lane for vehicles wishing to access the Site. The signalised junction will be in the form of a toucan crossing for pedestrians and cyclists, who will not need to dismount. It makes provision for the continued use of public footpath 161/4/20, albeit provides a safe alternative crossing point.

2.1.15 The existing bus stops on the A41 will be relocated and improved, with real-time journey information and shelters provided. The signalised site access incorporates dedicated crossing points that connect the bus stops with the internal pedestrian and cycle routes, and beyond into the village of Wendlebury. Cycle parking will be provided at a level that is consistent with both emerging policy requirements and expected demands.

2.1.16 The junction has been designed to be compatible with the A41 junction of the South East Bicester Perimeter Road. The access strategy is also compatible with the potential reduction of the speed limit on the A41 to 50mph, which builds on recent reductions on the approaches of the Vendee Roundabout.

2.1.17 Most vehicle movements associated with Siemens Healthineers operation will occur on the road network outside of peak hours, with the exception of office staff. The Transport Assessment indicates that the majority of traffic will come from the southwest rather than the built-up area of Bicester and surrounding villages.

2.1.18 In respect of parking, the provision of 474 car parking spaces takes into account the staff shift changes, when the greatest demand for parking will occur (expected between 14:00 and 15:00). The provision is policy compliant and includes appropriate provision for disabled users, i.e. tactile paving and disabled spaces.

2.1.19 Electric Vehicle parking spaces will be provided at a level of 25% to meet current CDC policy expectations. The blue badge and EV spaces are located in close proximity to the main site entrance.

2.1.20 Access to the staff car park will be subject to a barrier control system that will restrict unauthorised use. A rejection area has been accommodated within the layout to enable unauthorised vehicles to turn around.

2.1.21 The scheme makes provision for 160 cycle parking spaces and 13 motorcycle bays. Both are located in areas that benefit from good levels of surveillance and within a short walk of the main entrance.

2.1.22 In general it is anticipated that the development will be served by 12 Heavy Good Vehicles (HGVs) a day. There will also be a smaller number of van deliveries of catering and office supplies and refuse vehicles will also serve the facility. The requirements for deliveries and servicing have been considered in the scheme layout to promote the separation of pedestrians/cyclists from HGVs. There is a separate access to the servicing yard.

Drainage

2.1.23 The development includes the proposed diversion of approximately 450m of the Wendlebury Brook. A number of different options for the new channel dimensions have been modelled to

ascertain the optimum solution, which does not increase flood risk, maintains the flood storage capacity of the Site, and preserves the overall movement of water within the developed site and surrounding area. The proposal includes the creation of a 10m buffer strip on each side of the Wendlebury Brook. This will allow access for maintenance of the watercourse, whilst also making space for any flooding. The majority of rainwater falling on landscaped areas will soak into the ground. Any surface water runoff would be directed to the drainage system located around the perimeter of the buildings and through contouring of the hardstanding areas.

2.1.24 The Surface Water Drainage Strategy ensures that a sustainable drainage solution can be achieved which reduces the peak discharge rate to manage the surface water runoff from the site. As a consequence of limiting the rate of discharge, at times of heavy rainfall the volume of water leaving the Site will be significantly less than that draining within it. In order to prevent this water backing up in the system and causing flooding, attenuation storage will be provided. The size of this attenuation storage has been calculated such that the proposed development has the capacity to accommodate the 100 year rainfall event, including a 40% increase in rainfall intensity that is predicted to occur as a result of climate change.

Landscape strategy

2.1.25 The landscape strategy retains boundary hedgerows and trees where possible. Existing landscape features within the northern areas of the Application Site would be reinforced with additional planting measures, with landscaped bunds and native tree planting where neighbouring properties and PRoW are closest to the Site. Native heavy standard tree planting is proposed to fragment views of the proposed development for receptors in close proximity to the north-eastern and eastern boundaries. Additional structural landscaping to the western boundary will enhance the landscape corridor along the M40 and provide visual screening from the M40 and the wider context to the west.

2.1.26 The provision of native trees and shrubs will reflect the local context throughout the scheme to protect visual amenity and landscape character as well as providing commuting and foraging opportunities for protected species. New scrub planting including blackthorn will provide new egg-laying opportunities for brown hairstreak butterflies, and shelter for small mammals, birds and other wildlife. Species-rich wildflower grassland to be created within areas of green open space will provide nectar-rich habitats for pollinating insects such as bees, butterflies and moths.

2.1.27 The landscaping to the approach of the building and dividing up the car park will be compartmentalised into different zones, using a variety of character inspired by the surrounding countryside, English wild gardens and the ordered layout of the Oxford Botanical Garden.

2.1.28 The landscaping will be brought into regular, long-term management as part of the proposed development.

Lighting

2.1.29 The external lighting proposed has been designed in accordance with British Standards, CIBSE Codes and ILP Guidance Note 08/18 to limit the light pollution in the vicinity and in particular the adjacent residential areas. Shields will be fitted to luminaires to prevent light intrusion, to protect adjacent properties from direct glare and to limit lighting level to 1.0lux in the potential Bat feeding zone adjacent to the A41.

2.1.30 Lighting will be operational every day of the week, including public holidays. All external lighting will be operated via photocells with each zone of lighting having its own time switch override control. Similarly, roadway lighting will be photocell controlled. The proposed lighting has been

designed so as not to cause visual intrusion and unacceptable light spillage to residential properties.

Climate Change and Energy Use

2.1.31 In terms of planning, addressing climate change is one of the core land use planning principles which the National Planning Policy Framework expects to underpin both plan-making and decision-taking. It recognises that planning plays a key role in minimising vulnerability, providing resilience and managing the risks associated with climate change.

2.1.32 An effective approach to reducing greenhouse gas emissions from new development is the use of efficient designs and insulation products to achieve high levels of thermal efficiency – the 'fabric first' approach. The construction of the building shell will achieve a minimum rating of BREEAM Very Good, and Siemens Healthineers will target a rating of BREEAM Excellent for the final fitted-out operational building. Solar photovoltaic (PV) will be provided on the roof.

2.1.33 For the Proposed Development, the focus of the design would limit the energy consumption and carbon dioxide (CO_2) emissions through optimising the building performance together with energy efficiency measures following the steps of the energy hierarchy:

- Using less energy / demand reduction;
- Supplying energy efficiently; and,
- Using renewable energy.

2.1.34 Climate change and sustainability mitigation and adaptation considerations have been considered to promote sustainable transport, management of surface water drainage, and planting and landscape measures resilient to predicted climate change, for which, relevant aspects are described in each assessment. Chapter 13 reports the outcome of the assessment of likely significant environmental effects arising from the Proposed Development in relation to climate change and how these effects have been reduced.

2.1.35 Construction of the building will be delivered to Net Zero Carbon in Construction to accord with the UK Green Building Council's (UKGBC) definition.

Displacement of current use on the Site

2.1.36 The Site comprises predominantly agricultural land with a small number of associated agricultural buildings that will be demolished as part of the proposed development. For the purpose of this assessment, it is assumed that the existing level of employment supported by the Site is negligible (14.4.1).

Soils

2.1.37 All natural soils are finite resources, but where sites are to be developed, their quality as a resource for reuse varies. The primary measures to mitigate the impacts on soil resources during the site preparation, earthworks and construction activities will be to store and re-use surplus soils in a sustainable manner (for an after-use appropriate to the soil's quality) in accordance with Defra's Construction Code of Practice for the Sustainable Use of Soils on Construction Sites. This approach will ensure that the quality of soils retained on-site and exported off-site (if required) is maintained by good soil handling and storage, particularly to avoid compaction and biodegradation of soils that are in storage.

Site remediation

2.1.38 There are two localised areas identified with the potential to present areas of potential

contaminants of concern, the southern area with the access road and the outbuildings of Grange Farm to the north. Additionally, there is the possibility of localised contamination from access areas between fields from historical usage of waste to provide a suitable surface for farm equipment to traverse during wet weather. In the event that contaminated material is identified during the demolition/construction process, the contractor would follow the following standard procedure to:

- notify the Environmental Health department of CDC of the discovery.
- secure the area / take action to prevent the release of contamination.
- appoint a specialist to carry out the necessary analysis to identify the substance and appropriate containment/disposal options.
- dispose of the material in accordance with applicable legislation after obtaining the necessary consents and / or licenses.
- record waster transfer / disposal certificates.

2.1.39 The area recorded one air raid between Chesterton and Weston-on-Green during August 1940. It is probable that the target was the airfield located 965 m to the north west of the Site. The unexploded ordnance (UXO) risk for this site is considered to be low.

Traffic Movements during Construction

2.1.40 An indicative level of traffic movements has been developed based on the likely construction activities and previous experience from similar projects. HGV movements would be principally associated with the delivery of plant and materials, and the removal of construction waste. In addition, construction personnel and visitors to the Site would also generate car and van movements as they arrive and depart.

2.1.41 For the construction phase of the Proposed Development there would be less than 100 HGV movements per day (AADT). All construction traffic for the Proposed Development would be expected to access the Site via the A41.

Construction Management

2.1.42 A framework Construction Environmental Management Plan (CEMP) has been prepared to outline the control of construction activities on site. Should further detailed mitigation subsequently be identified for the construction phase, the CEMP can be a mechanism for the implementation of these measures. The appointed contractor would be required to comply with the CEMP.

2.1.43 The safe storage and use of fuels for the plant would be a priority in site management. Drainage within the temporary secure site compounds where construction vehicles would park and where any diesel fuel would be stored, would be directed to an oil interceptor to prevent pollution should any spillage occur. Diesel storage and refuelling would be within a designated area or a self-bunded tank in accordance with the Oil Storage Regulations. All oil storage tanks should be self-bunded to equal the quantity of oil held. This is regarded as industry standard practice and also includes mandatory legal requirements which are considered as integral to the development. Spill kits and mandatory spill reporting would also form part of the management regime in line with standard procedures.

2.1.44 Water used during construction would be sourced from existing grid connections, or, where this is not possible, water would be supplied by tankers. Primary uses for water during the construction phase would include: use in welfare facilities; dust suppression; cleaning (of plant, materials, surfaces etc.); wheel wash; commissioning/testing of water supply services, and the

commissioning of mains and heating systems.

Construction waste management

2.1.45 In order to minimise the volume of waste generated, a Site Waste Management Plan (SWMP) would be prepared. The implementation of this would ensure that significant adverse effects from the management of waste would be unlikely.

2.2 Consideration of reasonable alternatives

2.2.1 Siemens Healthineers has carried out a search for suitable sites to accommodate a new facility. The extent of the site search was agreed with Cherwell District Council through pre-application discussions and extends across Banbury, Bicester and Kidlington, and the rural areas.

2.2.2 The criteria used in the exercise are set out below:

- Availability of the land - Operational by the first quarter of 2024.
  (Reason: to ensure that the SH anticipated growth strategy is achieved.)
- Minimum site area of 20ha.
  (Reason: to ensure that the building components and infrastructure can be accommodated on the site).
- The capacity of the site to accommodate 55,000sqm.
  (Reason: SH needs a site where the production and office space can be accommodated in one building.).
- The overall suitability of the location for its headquarters and manufacturing operation.
  (Reason: to ensure that the proposed development is able to integrate within the surrounding area effectively).
- Accessibility of the site for staff travelling to the site other than by car.
  (Reason: to ensure the site can be accessed using sustainable modes of transport)
- The geographical proximity to its existing Eynsham premises.
  (Reason: to ensure that the existing specialist workforce is able to relocate to the new facility).

2.2.3 The suitability and availability of strategic employment allocations identified in the Cherwell Local Plan to accommodate the SH operation was assessed. The analysis concluded that there is no allocated employment site of a strategic scale and no other site committed for employment within Banbury, Bicester or Kidlington that can accommodate the requirements of SH.

2.2.4 A further assessment of the urban areas of Banbury, Bicester and Kidlington has been undertaken to establish whether an urban area of land that lies vacant, or awaits redevelopment and is of a suitable scale to accommodate the SH Operation.

2.2.5 Further investigation of potential sites within the rural area that may be suitable and available has been undertaken by a review of the Cherwell Housing and Economic Land Availability Assessment (HELAA) (February 2018). The rural employment sites that the Council considers suitable for employment use are not of a scale required to accommodate the SH operation.

2.2.6 SH has outgrown its existing facilities in Eynsham and has undertaken a search for its new manufacturing, research and production facility. To meet its bespoke operation within the required timeframe for delivery, the only option for SH to remain in Oxfordshire is to develop the parcel of land known as Symmetry Park Oxford North.

3 The approach to assessment

3.1 EIA scoping

3.1.1 In August 2021, a request for the formal EIA scoping opinion of CDC was submitted on behalf of the Applicants (Appendix 3.1). The request was accompanied by an EIA scoping report that set out the proposed study of environmental issues for the Proposal. CDC adopted an EIA scoping opinion in September 2021. A copy of CDC's letter and consultation responses to the scoping request can be found in Appendix 3.2.

3.1.2 A summary of the comments received and any additional specific matters identified by the consultees is provided below.

Table 3.1 EIA Scoping consultation

Consultee	Summary of comments / advice	Refer to
Thames Water	Demand for sewage treatment and network infrastructure, surface water drainage requirements and flood water	ES Appx 11.1 FRA Section 5.5
National Highways	Expects assessment of effects on A34 and M40, particularly J9.	ES Appx 7.1 TA Section 7
Natural England	Impact Risk Zone of Wendlebury Meads and Mansmoor Closes SSSI.	ES Appx 8.1 see S4 & 3.6
Heritage England	Approach to assessment agreed.	10.2.24
CPRE	Landscape character and appearance. Number of parking spaces. Traffic effects on the road network should be assessed. Habitat features plan. BNG calculations.	ES section 9.4 2.1.13 ES Appx 7.1 ES Figure 8.1 ES Appx 8.2
BBO Wildlife Trust	Mitigation for impacts to Ancient Woodland. Hedgerows should be retained and enhanced. All protected species surveys should be included. Require lighting assessment. BNG / biodiversity improvements.	ES section 8.6 2.1.20 ES Appx 8.1 8.6.3 / Lighting strategy LEMP
Environment Agency	River modelling	ES Appx 11.1 FRA Section 4.7
CDC Ecology	Provide connectivity with green infrastructure. 10% BNG in addition to enhancements such as bat and bird nests.	8.6.19
CDC Heritage	Designated heritage assets should be scoped in. Consider non-designated heritage assets within Chesterton and Weston on the Green Conservation Area Appraisals. Consider impact to heritage setting and views. Consider impact to the significance of St Giles Church.	10.3.3-10 10.3.11-24 ES Section 10.5 10.5.4-7
OCC Transport	ES to consider daily traffic flows.	ES Section 5.10
OCC LLFA	An FRA and surface water management strategy must follow local guidance. Runoff must be managed at source.	ES Appx 11.1 FRA Section 5.5
OCC Archaeology	A pre-determination archaeological investigation is required, to include geophysical and trench evaluation.	10.2.10 10.8.8
OCC Waste	Waste strategy.	Scoped out of EIA

3.1.3 As part of the scoping exercise and subsequent assessment work, a number of issues were

considered unlikely to give rise to significant environmental effects and have been scoped out of detailed assessment in the EIA, as described below.

Waste

3.1.4 The development, being on a greenfield site, will not generate any unusual or complex waste requiring specialist control or management and will therefore be unlikely to result in significant adverse effects to the environment. The issue of waste disposal is not considered likely to result in significant effects and therefore the ES does not contain a specific chapter for waste.

Human health

3.1.5 The subject of human health is addressed in a number of the proposed topic areas. Protection of human health is considered within the assessments of ground conditions, air quality, noise, in relation to relevant published standards and thresholds. CDC's scoping opinion confirmed that a specific chapter for human health is not required.

Accidents and Disasters

3.1.6 The potential for accidents or disasters resulting from the occupation and use of the Proposed Development is considered to be negligible.

3.1.7 Potential emergency situations are considered by the Thames Valley Local Resilience Forum and published in their community risk register. The risks identified as most relevant are considered below.

3.1.8 RIVER FLOODING – Whilst the Site is in an area that is at a low risk from flooding, a flood risk assessment is required for the proposal as it covers an area of more than 1 hectare. The FRA and drainage strategy demonstrate that the development will not result in flooding on the Site or elsewhere downstream. Reference to the flood risk information published by the Environment Agency shows that there is no potential for a reservoir breach to affect the application Site.

3.1.9 ENVIRONMENTAL POLLUTION – The drainage of surface water from the Site has the potential to lead to pollution. Measures design to avoid this are identified in the assessment at Section 11.5.

3.1.10 TRANSPORT ACCIDENTS – The proposal will deliver a new junction on a section of the A41 Road. This is designed to approved highway standards and subject to appropriate speed limits. There are no expected significant effects in relation to this.

3.1.11 Upon completion the potential for accidents or disasters affecting the development and resulting in adverse effects on human health, cultural heritage or the environment is considered to be negligible. CDC's scoping opinion confirmed that a specific assessment in the ES of this topic is not required.

Lighting

3.1.12 Lighting at the proposal is designed to limit light spill into the surroundings in accordance with Guidance Note 1 for the reduction of obtrusive light (Institution of Lighting Professionals, 2021). A light design report prepared by Dunwoody (20944/REP/005.P3) includes Lux plots and the consideration of construction site lighting.

3.1.13 It is not considered that lighting of the development would adversely affect users of the M40, the A41, or residential properties at Little Chesterton or Wendlebury. The closest residential receptors are to the north of the Grange Farm Industrial Estate buildings, and these are not considered likely to be significantly affected due to the intervening distance and the screening effect of other buildings.

Other consultation

Local consultation

3.1.14 A virtual presentation to local Ward Councillors was undertaken on Monday 13 September 2021 to explain the development proposals, and received Councillors' feedback on the scheme.

3.1.15 A public exhibition was held at the Chesterton Community Hall, Chesterton on the 14th September 2021 with the opportunity to view the proposals and speak with the project team.

3.1.16 During the public consultation, concerns were raised by residents of Little Chesterton and Wendlebury that traffic associated with the proposed development will use the roads of these villages as an alternative to the A34 and A41. In light of these comments a review of journey times at peak times on a neutral weekday has been undertaken through reference to on-line journey planners. The outcome of this exercise and taking into account the likely distribution of development traffic, there is expected to be very limited traffic routing on local roads including through Little Chesterton and Wendlebury.

3.1.17 Following these two events, meetings were held with Weston on the Green Parish Council on Wednesday 06 October, Chesterton and Wendlebury Parish Council on Friday 08 October.

Air Quality Assessment

3.1.18 CDC's Environmental Protection & Enforcement Manager was consulted on the proposed scope and approach to the Air Quality Assessment, which was agreed (ES Appendix 6.5). The requirement for a 'Damage Cost Calculation' was raised, which is provided with the planning application, not in the ES.

Noise Assessment

3.1.19 CDC's Environmental Health Officer was contacted in June to consult on the scope and approach to the assessment. The EHO confirmed agreement (ES Appendix 7.2).

Ecology

3.1.20 EDP sought the views of the Ecologist for Cherwell District Council; Natural England; and Berkshire, Buckinghamshire and Oxfordshire Wildlife Trust in respect of likely ecological sensitivities.

LVIA

3.1.21 The approach to the Landscape Assessment was discussed and agreed with CDC, informed by dialogue between EDP, CDC and its advisor, LUC.

Archaeology

3.1.22 The approach to the Heritage Assessment was developed in consultation with OCC's Lead Archaeologist, which was then set out in a Written Scheme of Investigation approved by the Lead Archaeologist.

3.1.23 Consultation took place with Oxfordshire County Council's Lead Archaeologist between July and September 2021. Initially a Written Scheme of Investigation in relation to the Archaeological and Heritage Assessment report was agreed, followed by an agreed scope and methodology for the Geophysical Survey.

3.1.24 The Geophysical Survey report was issued to the Lead Archaeologist, who confirmed that the report is acceptable, and also requested that trial trenching would be required.

Flood risk assessment

3.1.25 Information regarding the current flood risk at the application site, local flood defences and flood risk has been obtained from the Environment Agency and is contained within the FRA (Appendix 11.1).

3.2 Assessment of effects

3.2.1 An appropriate way to link a planning permission to proposals that have been subject to EIA is through the plans that are included as part of the planning application. The plans define the development that is subject to EIA, and upon which the planning decision is based. The building will be delivered in 2 phases: Phase 1 due to become operational in 2024 and, Phase 2 due to become operational in 2030, subject to projected demand.

3.2.2 The temporal scope considers the construction phase, and thereafter when the development is completed and occupied (often referred to as the 'operational' phase). For example, the assessment of landscape and visual effects considers residual effects at a future time when the landscaping within the scheme has had 15 years to mature.

3.2.3 The primary study area for the EIA covers the physical extent of the Site shown on Figure 2.1. Where necessary, each assessment topic defines its wider study area geographically in relation to the assessment of the Proposed Development. The proposed development is designed as a permanent provision i.e., decommissioning is not an aspect considered in the EIA.

3.2.4 In order to determine the scope of the assessment, the EIA process has identified:

- the key characteristics of the Site and the environmental baseline through a series of desk and field studies;
- consideration of the potential sources and nature of environmental impacts; and
- definition of the assessment methodologies to be used.

3.2.5 The framework used to express the predicted significance of the environmental effects identified and assessed is explained in each ES chapter. Effects can either be positive or negative and can be temporary or permanent.

3.2.6 In addition, the following key documents that have been prepared as part of the planning application: Design and Access Statement; Sustainability Statement; Construction Environment Management Plan; Waste Management Strategy; Landscape Environmental Management Plan; Biodiversity Metric Calculation; Lighting Design; and Health Impact Assessment.

3.3 Cumulative assessment

3.3.1 Schedule 4(5)(e) of the 2017 EIA Regulations requires a description of the likely significant effects of the development on environment resulting from '*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'*.

3.3.2 In respect of potential cumulative effects with other development, national planning practice guidance advises that '*Each application (or request for a screening opinion) should be considered on its own merits. There are occasions, however, when other existing or approved development may be relevant in determining whether significant effects are likely as a consequence of a proposed development. The local planning authorities should always have*

regard to the possible cumulative effects arising from any existing or approved development.' (ID 4-024-20170728).

3.3.3 A list of approved development and relevant planning policy allocations as set out in the EIA scoping request to CDC is shown in the table below, with their location in relation to the Application Site shown on Figure 3.1.

Table 3.2 Cumulative schemes (Figure 3.1)

Development	**Map ref.**	**Description**
CDC Planning Ref 19/02550/F	14	Redevelopment to provide a new leisure resort incorporating a waterpark, a family entertainment centre, a hotel, conferencing facilities and restaurants with associated access, parking and landscaping.
Development of Local Plan Policy Allocations		**Description**
Policy Bicester 1: North West Bicester Eco-Town	1	Mixed use development including 6,000 homes.
Policy Bicester 2: Graven Hill	2	Mixed use development of 2,100 dwellings, employment land, facilities and other infrastructure including the potential for the incorporation of a rail freight interchange.
Policy Bicester 3: South West Bicester Phase 2	3	726 homes with associated services, facilities and other infrastructure.
Policy Bicester 4: Bicester Business Park	4	South west of Bicester, high quality B1 office scheme.
Policy Bicester 7: Meeting the Need for Open Space, Sport and Recreation	n/a	• Protecting the existing network of green spaces and securing new open space and linear route provision linked with public footpaths/cycleways, to create a circular route with connections to the town centre and the countryside beyond. • Seek to establish a community woodland between the South West Bicester link road and Chesterton.
Policy Bicester 10: Bicester Gateway	10	Knowledge economy employment development to the south of the existing retail area (Wyvale Garden Centre), adjacent to the A41.
Policy Bicester 11: Employment Land at North East Bicester	11	Employment development for approximately 1,000 jobs.
Policy Bicester 12: South East Bicester	12	A mixed use site for employment and residential development
Policy Bicester 13: Gavray Drive (re-adopted)	13	A housing site to the east of Bicester town centre for approximately 300 dwellings.

3.3.4 Each of the assessment chapters considers which other developments have the potential for cumulative effects when the construction and/or operational phases could be concurrent, and where there are sensitive receptors common to both developments within the Area of Influence.

3.3.5 CDC's scoping opinion (22.09.2021) also advised that within the EIA, reference should also be made to the Strategic Rail Freight Interchange between Ardley and Upper Heyford for which the Planning Inspectorate has received a request for an EIA scoping opinion (Table 3.3).

Table 3.3 Oxfordshire Strategic Rail Freight Interchange

EIA Scoping	Map ref.	Description
National Infrastructure Planning Scoping Opinion 15th July 2021	15	Oxfordshire Strategic Rail Freight Interchange - A new rail terminal and associated infrastructure, warehouses up to 675,000 sq.m and highways works.

3.3.6 Subsequently, early in October, CDC advised that it had received planning applications by Albion Land for the proposed development of logistics and office space either side of the A43, to the north of M40 J10, and requested that the project is also considered for potential cumulative effects.

Table 3.4 Land at Junction 10, M40

Planning applications	Map ref.	Description
21/03267/OUT & 21/03268/OUT	16	Buildings comprising logistics (Use Class B8) and ancillary Office (Use Class E(g)(i)) floorspace and associated infrastructure; access from the B4100.

3.3.7 Given that the proposed Oxfordshire SRFI is located some 5 km to the north of Symmetry Park, the potential for cumulative effects with Oxford North is considered to be unlikely, other than potentially for the analysis of traffic, and economic effects. However, it is at an early stage of the planning process and as such there is not anything in the public domain that outlines the likely traffic implications of this emerging scheme. Consideration of M40 Junction 9 cannot be undertaken as the traffic information for the proposed SRFI is not available.

3.3.8 In respect of the Land at J10, M40 proposals, it is evident from the submitted Transport Assessments that there will not be any cumulative impacts in the study area that has been agreed for the purposes of the Symmetry Park Oxford North transport assessment. The potential for cumulative effects with Oxford North is considered to be unlikely, other than potentially for the economic effects, which is considered in ES chapter 14.

3.4 Climate change

3.4.1 The Climate Change Act (2008) set up a framework for the UK to achieve its long-term goals of reducing greenhouse gases, and develop a climate change adaptation programme. The 2017 EIA Regulations require a description of 'the impact of the project on climate', and 'the vulnerability of the project to climate change' (Schedule 4, paragraph 5(f)).

3.4.2 Chapter 13 provides consideration of climate change mitigation, acknowledging that all greenhouse gas emissions play a part cumulatively in climate change, and identifying ways in which these can be reduced; and climate change resilience, i.e., the measures used to adapt to the manifestations of a changing climate.

3.4.3 For the other assessment topic chapters, these consider whether climate change may alter the predicted effects. The impact of climate change on the development is considered using the UKCP18 climate change projections for a medium emissions scenario for projected global mean warming of +2°C above pre-industrial levels. It is not considered likely that completely new direct impacts will arise as a result of climate change, but the scale of potential impacts might change when considered against the future conditions.

4.0 PLANNING POLICY

4.1 Introduction

4.1.1 This chapter of the ES has been prepared by Framptons Town Planning Ltd, and provides an overview of the national and local planning policy context relevant to the Proposed Development. A more detailed explanation of planning policy relevant to each topic is included in the planning policy section of each chapter of the ES and the Planning Statement accompanying the application.

4.2 Local Plan Policies

4.2.1 Section 38(6) of the Planning and Compulsory Act 2004 (as amended) states that the determination of planning applications should be made in accordance with the development plan unless material considerations indicate otherwise. This section sets out the planning policy framework at local and national level, against which the Proposed Development must be assessed.

4.2.2 The Development Plan comprises the:

- Adopted Cherwell Local Plan 2011-2031 (Part 1)
- 'Saved' policies Local Plan 1996 (November 1996)
- Cherwell Local Plan 2011-2031 (Part 1) Partial Review – Oxford's Unmet Housing Need September 2020
- Oxfordshire Minerals and Waste Plan (Part 1- Core Strategy) September 2017

4.2.3 Although part of the Development Plan, there are no planning policies in the Cherwell Local Plan Partial Review (Part 1) Oxford's Unmet Housing Need, or the Minerals and Waste Plan (Part 1- Core Strategy) September 2017 relevant to this planning application.

4.2.4 The relevant planning policies of Cherwell District's development plan are set out below:

Adopted Cherwell Local Plan 2011-2031 (Part 1) (CLP)

- Policy PSD1 – Presumption in favour of sustainable development
- Policy SLE1 – Employment development
- Policy SLE4 – Improved transport and connections
- Policy BSC2 – Effective and efficient use of land
- Policy ESD1 – Mitigating and adapting to climate change
- Policy ESD2 – Energy hierarchy and allowable solutions
- Policy ESD3 – Sustainable construction
- Policy ESD4 – Decentralised energy systems
- Policy ESD5 – Renewable energy
- Policy ESD6 – Sustainable flood risk management
- Policy ESD7 – Sustainable drainage systems
- Policy ESD8 – Water resources
- Policy ESD10 – Biodiversity and the natural environment

- Policy ESD13 – Local landscape protection and enhancement
- Policy ESD15 – Character of the built environment
- Policy ESD17 – Green infrastructure
- Policy INF1 - Infrastructure

'Saved' policies from the adopted Local Plan 1996 (November 1996)

- Policy C28 – Layout, design, and external appearance of new development
- Policy C31 – Compatibility of proposals
- Policy TR10 – Heavy goods vehicles
- Policy ENV1 – Development likely to cause detrimental levels of pollution

Planning Considerations

4.2.5 Development plans contain broad statements of policy covering a range of topics. It is important when considering the merits of a particular planning application to establish whether there is a 'dominant' policy whose provisions are most relevant to the proposals. Policy SLE1 Employment Development is the most relevant policy consideration for this application. Consideration is also required to be made to the wider economic and social benefits that would arise from the proposed development, Especially the sustainable development objectives, the need for significant weight to be placed on the need to support economic growth and productivity and the specific 'cluster' locational requirements as referenced in the NPPF.

4.2.6 Policy SLE1 of the CLP is the 'dominant' policy consideration for this proposal. Policy SLE1 is set within two parts; protection of existing employment sites and the focus of employment development within the built-up areas of Bicester, Banbury and Kidlington and on strategic allocations included with the CLP; and, the circumstances where 'new employment proposals' on non-allocated rural sites will be supported.

4.2.7 As the application Site is not allocated and is located within the countryside, the Proposed Development falls within the second part of the policy. Fundamental to the support for employment developments on non-allocated rural sites are the following:

i. The need to demonstrate 'exceptional circumstances.
ii. The requirement to demonstrate through a robust site assessment that the proposed development investment cannot be accommodated on land:
    - Committed for employment development,
    - Allocated for employment development,
    - Within or adjoining Category A Villages.

4.2.8 The remaining criteria within the policy that addresses employment proposals on non-allocated rural sites are set out in the second half of the policy, as follows:

- They will be outside the Green Belt, unless very special circumstances can be demonstrated.
- Sufficient justification is provided to demonstrate why the development should be allocated in the rural area on a non-allocated site.

- They will be designed to a very high-quality standards using sustainable construction, and be of an appropriate scale and respect the character of the villages and the surroundings.
- They will be small scale unless it can be demonstrated that there will be no significant adverse impact on the character of a village or surrounding environment.
- The proposal and any associated employment activities can be carried out without undue detriment to residential amenity, the highway network, village character and its setting, the appearance and character of the landscape and the environment generally including on any designated buildings or features (or on non-designated buildings or features of local importance).
- The proposal will not give rise to excessive or inappropriate traffic and will wherever possible contribute to the general aim of reducing the need to travel by private car.
- There are no suitable available plots or premises within existing nearby employment sites in the rural area.

4.2.9 The overall assessment of the Proposed Development against the Development Plan as a whole, can be found in the Planning Statement that accompanies the application.

4.3 Other Material Considerations

4.3.1 This section sets out other material considerations relevant to this planning application.

National Planning Policy Framework (NPPF)

4.3.2 The National Planning Policy Framework (NPPF) (2021) sets out the Government's planning policies for England and how they should be applied.

4.3.3 Paragraphs 81 and 82 (Section 6 Building a strong, competitive economy) are the most significant in the determination of this planning application. Paragraph 81 states that '*Planning policies and decision should help create the conditions in which business can invest, expand and adapt'* and further states that *'Significant weight should be placed on the need to support* economic *growth and productivity, taking into account both local business needs and wider opportunities for development'.*

4.3.4 Paragraphs 82 goes on to state that local planning policies are required to:

- *"Set out a clear economic vision and strategy which positively and proactively encourages sustainable economic growth;*
- *Set criteria, or identify strategic sites, for local and inward investment;*
- *Seek to address potential barriers to investment, such as inadequate infrastructure, services, or housing; and*
- *Be flexible enough to accommodate needs not anticipated in the plan".*

4.3.5 Paragraph 83 requires *"planning policies and decisions to recognise and address the specific locational requirements of different sectors. This includes making provision for clusters or networks of knowledge and data-driven, creative or high technology industries".*

4.3.6 Paragraph 7 states that the purpose of the planning system is to contribute to the achievement of sustainable development. Paragraph 8 explains that there are three objectives associated with sustainable development; economic, social and environmental. These three objectives are 'interdependent' and to be pursued in 'mutually supportive ways'.

4.3.7 Paragraph 10 states that the presumption in favour of sustainable development is *"at the heart of the Framework".* For decision-taking, Paragraph 11 explains that this means approving proposals, without delay, that accord with the Development Plan. Where the Development Plan is absent, silent or where relevant policies are out of date, permission should be granted unless:

> *'any adverse impacts of doing so would significantly and demonstrably outweigh the benefits' or 'the application of policies in this Framework that protect areas or assets of particular importance provides a clear reason for refusing the development proposed.'*

4.3.8 Paragraph 15 reaffirms that the planning system should be genuinely plan-led. Succinct and up-to-date plans should provide a positive vision for the future, and those strategic policies should set out an overall strategy for the pattern, scale and quality of development and make sufficient provision for housing (including affordable), employment, retail, leisure and other commercial developments.

4.3.9 In the context of policy guidance relating to 'decision-taking', Paragraph 38 of the NPPF reinforces the Government's desire for the presumption in favour of development to be applied positively. It states that:

> *'Local planning authorities should approach decision-taking in a positive and creative way…. Decision-makers at every level should seek to approve applications for sustainable development where possible'.*

4.3.10 The NPPF is structured around a series of numbered thematic sections which provide policy on a range of planning and land-use related issues. The following paragraphs provide a summary of the contents of the NPPF in each of the key sections of relevance to the project.

4.3.11 Section 8 (Promoting Health and safe communities) seek to achieve healthy and safe places which promote social integration. Developments should create safe and accessible places, so that crime and disorder, and the fear of crime does not undermine the quality of life or community cohesion. Developments should enable healthy lifestyles.

4.3.12 Section 9 (Promoting sustainable transport) states at paragraph 104 that transport issues should be considered at the earliest stage of planning so that the potential impacts of the development can be assessed, improvements to the local highway made where required, and opportunities to promote walking, cycling and the use of public transport can be identified. It requires decisions to take account of:

- The opportunity for sustainable transport modes;
- The need for a safe and suitable access; and
- Improvements to the transport networks that cost effectively limit significant impacts.

4.3.13 Paragraph 111 states that development should "*only be prevented or refused on highway grounds if there would be an unacceptable impact on highway safety, or the residual cumulative impacts on the road network would be severe".*

4.3.14 Paragraph 113 further states that a Transport Statement or Transport Assessment and Travel Plan should support all developments that generate significant amounts of vehicle movements.

4.3.15 Section 12 (Achieving well-designed places) states that the creation of high quality, beautiful and sustainable buildings and places is fundamental to what the planning and development process should achieve, and that '*Good design is a key aspect of sustainable development, creates better places in which to live and work, and helps make development acceptable to communities'*.

4.3.16 Paragraph 130 states that policies and decisions should ensure that development*:*

- *(a) will function well and add to the overall quality of the area, not just for the short term but over the lifetime of the development;*
- *(b) are visually attractive as a result of good architecture, layout and appropriate and effective landscaping;*
- *(c) are sympathetic to local character and history, including the surrounding built environment and landscape setting, while not preventing or discouraging appropriate innovation or change (such as increased densities);*
- *(d) establish or maintain a strong sense of place, using the arrangement of streets, spaces, building types and materials to create attractive, welcoming and distinctive places to live, work and visit;*
- *(e) optimise the potential of the site to accommodate and sustain an appropriate amount and mix of development (including green and other public space) and support local facilities and transport networks; and*
- *(f) create places that are safe, inclusive and accessible and which promote health and well-being, with a high standard of amenity for existing and future users; and where crime and disorder, and the fear of crime, do not undermine the quality of life or community cohesion and resilience.*

4.3.17 Paragraph 134 states that development that is not well designed should be refused. Significant weight should be given to outstanding or innovative design which promotes high levels of sustainability, or helps to raise the standards of design more generally in an area.

4.3.18 Section 14 (Meeting the challenge of climate change, flooding and coastal change) requires the planning system to support the transitions to a low carbon future in a changing climate, taking full account of flood risk. Paragraph 152 further states that developments should assist in shaping places in ways that will make developments resistant to climate change, and encourage the reuse of resources.

4.3.19 Paragraph 154 states that new developments should be planned in a way that avoids increased vulnerability to the range of impacts arising from climate change, and that risks should be managed through suitable adaptation measures. Location, orientation of buildings and their design should assist in reducing greenhouse gases.

4.3.20 Paragraph 159 states that *"inappropriate development in areas at risk of flooding should be avoided by directing development away from areas of high risk, to areas of low flood risk."*

4.3.21 Section 15 (Conserving and enhancing the natural environment) states that planning policies and decisions should contribute to, and enhance the natural environment. Paragraph 174 goes on to state that decisions and policies should recognise the intrinsic character and beauty of the countryside.

4.3.22 Paragraph 174 states that new developments should not contribute to, or put itself at unacceptable risk from soil, water or noise pollution, or land instability. Developments should, wherever possible, help to improve local environmental conditions, such as air and water quality.

4.3.23 Developments should minimise the impacts on biodiversity by providing net biodiversity gains that include establishing coherent ecological networks that are more resilient to current and future land pressures. Where a development causes significant harm to the biodiversity of the site, and where the harm cannot be mitigated, or as a last resort, compensated for, then planning permission should be refused (Paragraph 180).

4.3.24 Paragraph 185 requires planning policies and decisions to ensure that developments are appropriate to their locations. Potential effects of pollution on health, living conditions and the natural environment should be taken into account in the design process. Pollutants include noise and light generated by a development and its impact on the local surroundings. Developments should include mitigation to reduce any potential adverse noise or light pollution.

4.3.25 Paragraph 186 refers to air quality and the need for developments to identify opportunities to improve or to mitigate air quality impacts. Such impacts could include Traffic and Travel management proposals and provision and/or enhancement of green infrastructure.

4.3.26 Paragraph 188 reaffirms the focus on the acceptability of the land use, rather than the control of processes or emissions, (where these are subject to separate pollution control regimes) and that, planning decisions should assume that these regimes will operate efficiently.

4.3.27 Section 16 (Conserving and enhancing the historic environment) state that heritage assets are an irreplaceable resource, and should be conserved in a manner appropriate to their significance. Paragraph 194 requires the applicant to describe the significance of any heritage asset affected by a development, including that made by its setting. The extent and nature of the assessment required is directly related to the likely importance of the assets affected, and the likely impact upon those assets.

4.3.28 Paragraph 197 requires the local planning authority to take into account, when determining a planning application,

- *(a) the desirability of sustaining and enhancing the significance of heritage assets and putting them to viable uses consistent with their conservation;*
- *(b) the positive contribution that conservation of heritage assets can make to sustainable communities including their economic vitality; and*
- *(c) the desirability of new development making a positive contribution to local character and distinctiveness."*

The National Planning Practice Guidance (NPPG)

4.3.29 The National Planning Practice Guidance (NPPG) is online based government guidance. The NPPG provides supplementary and supporting context for the NPPF and should therefore be read in conjunction with the NPPF.

4.3.30 The NPPG provides general procedural guidance on matters including the use of planning conditions and obligations as well as on planning appeals. The document provides guidance on issues of prejudice and prematurity alongside providing detailed technical guidance for both authorities and applicants on the production of planning studies, such as housing and economic land availability assessments.

4.3.31 The NPPG includes guidance across a range of planning issues which are referred to in the NPPF. This includes the importance of good design, general guidance regarding the 'natural environment', and further information about issues such as flood-risk and transport, and refers to issues on which local planning policies are usually expected to provide more specific guidance where relevant to the location and/or site involved.

Oxford-Cambridge Arc Prospectus

4.3.32 The application site lies within the Oxford-Cambridge Arc, a national economic priority area set by the Government and covers an area between Oxford, Milton Keynes and Cambridge. The Arc is formed of five administrative counties: Oxfordshire, Bedfordshire, Buckinghamshire, Northamptonshire and Cambridgeshire, and already support over two million jobs, adds over £110 billion to the economy every year and houses one of the fastest growing economies in England.

4.3.33 The Oxford-Cambridge Arc creates a transformational opportunity, that would see economic output growing by between £80.4 billion and £163 billion per annum, with between 476,500 and 1.1 million additional jobs[1] by 2050.

4.3.34 The Arc has the potential to become a world-leading and globally renowned centre for business, innovation and investment in a variety of industries, including AI (Artificial Intelligence), advanced manufacturing and life sciences. Furthermore, the Economic Vision for the Oxford Cambridge Arc described Oxfordshire as the 'global leader in cryogenics, with the most powerful concentration of cryogenics experts in the world'.

4.3.35 The objectives of the arc are three-fold:

- Support long-run sustainable economic growth across the area;
- Help to make the area a brilliant place to live, work and travel in – for existing residents and future communities alike;
- Support lasting improvements to the environment, green infrastructure and biodiversity.

[1] Planning for Sustainable growth in the Oxford- Cambridge Arc (February 2021)

4.4 Conclusion

4.4.1 It is in the context of these policy considerations that the impacts of the proposal are assessed in this ES. Consideration of the policy position relating to each topic will continue within each chapter of this ES and within the planning statement accompanying the planning application.

5 Transport

5.1 Introduction

5.1.1 This ES chapter, which has been prepared by Vectos, assesses the effect of the Proposed Development from a traffic, transport and access perspective. In particular, it considers the potential effects of transport both in the immediate vicinity of the Oxford North site and also on the wider network and incorporates a summary of the Transport Assessment (TA) which is included as Appendix 5.1.

5.1.2 This ES chapter describes: 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.

5.1.3 Traffic and transport are key considerations in the delivery of any development. In this regard, consideration is given to the trips that will be made to and from the Oxford North site, during both demolition and construction and once the Oxford North Development is operational. The likely origins/destinations of the forecast trips are considered, as well as the modes of travel (walk, cycle, bus and car) that will be used.

5.1.4 This ES chapter (and its associated appendices) is not intended to be read as a stand-alone assessment and reference should be made to Chapters 1-4 of this ES, as well as the TA (see Appendix 5.1) that has been prepared in support of the application. In addition to this, it should be noted that the traffic flows provided in this ES chapter have informed the Air Quality and Noise and Vibration assessments**,** Chapters 6 and Chapter 7 respectively**.**

5.2 Legislative and Policy Framework

5.2.1 Further to the Planning Policy Considerations outlined in Chapter 4 of this ES, the below list identifies the legislation, policies and guidance that have influenced the approach to the TA and the methodology developed for identification of potentially significant effects:-

- National Planning Policy Framework (NPPF);
- National Planning Practice Guidance;
- Department for Transport Circular – The Strategic Road Network and the Delivery of Sustainable Development, 2013;
- Saved Policies of the Adopted Cherwell Local Plan, November 1996;
- Adopted Cherwell Local Plan 2011-2031, Re-adopted December 2016.

5.2.2 A full detailed overview of these policies is provided within the TA (see Appendix 5.1).

5.3 Assessment Methodology

Approach and Method

5.3.1 As described in Chapter 3 of this ES, the scope of the assessment has been determined by the scoping process undertaken with Cherwell District Council (CDC), Oxfordshire County Council (OCC) and National Highways (NH) through an ongoing process spanning several months.

5.3.2 Assessment of potential development impacts on Transport has been undertaken through a combination of desk-based analysis and traffic surveys and consideration of potential impact

mitigation requirements.

5.3.3 Potential development effects have been defined by reference to baseline assessment parameters and detailed development design proposals. Where necessary, mitigation measures have been defined for any effects considered to be significant with the aim of reducing any residual risk to an acceptable level.

Defining the Baseline

5.3.4 The existing baseline conditions on the highways and transport networks associated with and surrounding the Site have been informed by Desktop research and review of relevant published information including:

- National Rail timetables;
- Local bus timetables;
- Google Maps;
- Discussions with OCC - the relevant Highway Authority;
- Discussions with National Highways (NH);
- Traffic surveys; and
- Accident Data (of the most recent five-year period up to 31st July 2021).

Surveys

5.3.5 The following junctions have been agreed with OCC and NH at pre-application for assessment within this TA:

Junction 1: Proposed signalised access junction;

Junction 2: Vendee Drive roundabout;

Junction 3: M40 J9.

5.3.6 The study area for junction capacity assessment is shown below at Figure 5.1.

Figure 5.1 Scope of Junction Capacity Assessment

5.3.7 Information extracted from the Bicester Traffic Model (provided by OCC) was used to inform

the assessment undertaken for Junctions 1 and 2, whilst 2018 survey data (currently latest available data) was used to inform the assessment at Junction 3.

5.3.8 For the purposes of this assessment, the following hours have been assessed 08:00-09:00 and 17:00-18:00.

Likely Evolution of the Baseline at Junction 1 and 2

5.3.9 2024 and 2031 traffic flows that inform the Bicester Transport Model (BTM) have been used to inform the highway impact assessment at Junctions 1 and 2. It should be noted that the traffic data provided by Tetra Tech is predicated on a baseline situation that has been suitably validated through reference to observed turning counts at the Vendee Drive roundabout. Accordingly, the flows used extracted from the BTM have been used for the Local Network assessment. It is important to note that background growth and committed developments are included within the model flows and therefore no additional growth has been applied for the purposes of the local highway network assessment.

5.3.10 This is not the case for M40 J9 and as such an alternative approach has been adopted for the Strategic Road Network assessment presented below.

Likely Evolution of the Baseline at Junction 3

5.3.11 As outlined in the TA, J9 does not appear to have been validated against any empirical data. As a result, it would appear that the BTM is not as accurate as other parts of the network that has been developed in conjunction with NH when evaluating the performance of the local highway network.

5.3.12 As set out in the TA, 2018 classified turning counts at this location have been used as the baseline and factored up using NH growth factors and relevant committed developments.

5.3.13 In order to understand the current and expected level of build out of committed developments in the area, a comparison of current build out rates from committed developments against the Annual Monitoring Report (AMR) produced by CDC has been undertaken. A review of predicted build out rate against current build out rates has been undertaken, and a conclusion drawn on the level of development that should be assessed has been made. For reference, the committed developments included are set out in the table below, with further information provided at Appendix M of the TA (see Appendix 5.1).

Table 5.1 List of Committed Developments

Strategic Policy	Description	Planning Permission
BIC 1	North West Bicester Eco Town – 393 dwellings	10/01780/Hybrid
	Phase 2 – 150 dwellings	17/00455/Hybrid
	1,700 dwellings	14/02121/OUT
BIC 2	Graven Hill – 1,900 dwellings	11/01494/OUT
BIC3	South West Bicester Phase 1 (Kingsmere) – 1,585 dwellings	06/00967/OUT
	South West Bicester Phase 1 (Kingsmere) - 46 dwellings	14/010207/OUT
	South West Bicester Phase 2 – 727 dwellings	13/00847/OUT
Villages 5	RAF Upper Heyford – 1,075 dwellings	10/01642/OUT
-	Great Wolf Lodge – Waterpark, family entertainment centre, 498-bedroom hotel and restaurants	19/02550/F

Opening Year

5.3.14 An assessment has been undertaken to evaluate the effects of the Proposed Development in 2024 (i.e. under a future baseline which accounts for an element of background growth and committed developments).

5.3.15 For the purposes of this test, Junctions 1 and 2 have been informed by the outputs of the current Bicester Traffic Model (BTM). It is important to note that background growth and committed developments are included within the model flows and therefore no additional growth has been applied for the purposes of the local highway network assessment.

5.3.16 It is noted that the traffic data provided by Tetra Tech is predicated on a baseline situation that has been suitably validated through reference to observed turning counts at the Vendee Drive roundabout. Accordingly, the flows used extracted from the BTM have been used for the Local Network assessment. This is not the case for M40 J9 (Junction 3) and as such an alternative approach has been adopted for the assessment of this junction. Further details on this assessment are provided within the TA.

Future Year

5.3.17 A sensitivity test has been undertaken to evaluate the effects of the Proposed Development in 2031 (i.e. under a future baseline which accounts for an element of background growth). The current Bicester Traffic Model has also informed this assessment for Junctions 1 and 2. Junction 3 has been subject to a different assessment as provided within the TA.

Study Areas

5.3.18 The study area that informs the analyses presented within this chapter includes the following links:

- Link 1 A34 south of M40 J9;
- Link 2 A41 north of M40 J9;
- Link 3 A41 south of Vendee Drive roundabout;
- Link 4 A41 north of Vendee Drive Roundabout;
- Link 5 Vendee Drive.

Figure 5.2 Study Area

Assessment Scenarios

5.3.19 For the purposes of this assessment, the following scenarios have been included:

- 2024 Base;
- 2024 Base plus Development flows;
- 2031 Base;
- 2031 Base plus Development flows.

5.4 Impact Assessment Methodology

5.4.1 The 'Guidelines for the Environmental Assessment of Road Traffic' sets out a number of potential effects relating to highways and transport considerations, which potentially require assessment. Those which relate to this assessment are:

- Severance;
- Delay (Driver, Pedestrian, Cycle);
- Amenity;
- Fear and Intimidation; and
- Accidents and Safety.

5.4.2 It is considered unlikely that the construction, or operation, of the Site will generate or attract hazardous loads; therefore, on this basis, it is anticipated that there would be no significant effects relating to hazardous loads. An assessment of hazardous loads was therefore scoped out of the assessment and has not been considered any further in this ES chapter.

5.4.3 Severance is defined by the guidance in paragraph 4.27 of the Institute of Environmental Management Assessment (IEMA) guidelines:

"*Severance is the perceived division that can occur within a community when it becomes separated by a major traffic artery. The term is used to describe a complex series of factors that separate people from places and other people. Severance may result from the difficulty of crossing a heavily trafficked road or a physical barrier created by the road itself. It can also relate to quite minor traffic flows if they impede pedestrian access to essential facilities*".

5.4.4 The guidance refers to potential delays to drivers and to pedestrians. Users of other modes can also experience delays, such as cyclists and those travelling by bus and rail. Drawing upon the IEMA Guidelines and professional experience, driver delay and delay to bus users may change where:

- Traffic flows change at junctions;
- New junctions are introduced;
- Existing junctions are changed;
- Speeds on existing links are changed;
- Existing links are closed;
- New links are opened;
- Frequency of use of controlled pedestrian or cycle crossings change; and
- New controlled pedestrian or cycle crossings are introduced.

5.4.5 The IEMA Guidelines note that the Department for Transport (DfT) has assumed 30%, 60% and 90% changes in traffic levels should be considered as "slight", "moderate", and "substantial" impacts respectively. The IEMA Guidelines also note that increases in traffic of

as little as 5% may be significant in terms of the capacity criteria of a highway but not its environmental effects, and the criteria set out within the guidance make the higher thresholds more relevant to the assessment of the environmental effects of traffic increases.

5.4.6 Pedestrian and cyclist delay may change where:

- Pedestrians and cyclists cross existing roads where traffic flows are projected to change;
- Pedestrians and cyclists cross new roads;
- Existing roads which pedestrians and cyclists would have crossed are removed;
- Road speeds change;
- Pedestrian and cycle volumes change;
- New crossing facilities are provided; and
- Existing pedestrian crossing facilities change.

5.4.7 Delay to bus users may also change where bus routes or bus stops are proposed to be changed or where demand for a bus exceeds capacity.

5.4.8 Rail delay may change where:

- Passenger areas within stations become congested; and
- Demand for a train exceeds capacity.

5.4.9 Amenity is defined by the guidance in paragraph 4.39:

"*It is broadly defined as the relative pleasantness of a journey, and is considered to be affected by traffic flow, traffic composition, and pavement width/separation from traffic. This definition also includes pedestrian fear and intimidation and, can be considered to be a much broader category including consideration of the exposure to noise and pollution, and the overall relationship between pedestrians and traffic*."

5.4.10 Fear and intimidation is defined by the guidance in paragraph 4.40:

"*The impact of this is dependent on the volume of traffic, its HGV composition, its proximity to people or the lack of protection caused by such factors as narrow pavement widths*."

5.4.11 Amenity, fear and intimidation may be considered for pedestrians, cyclists, bus passengers and rail passengers. Amenity, fear and intimidation can be considered together as they are strongly interrelated.

5.4.12 The key issue in assessing accidents and safety is in understanding the potential for change. There can be some small changes in prevailing road safety conditions arising simply due to having a greater number of journeys being made on a network; hence, the more people that are travelling, the more people that are liable to become involved in an accident. By far the more important issue to consider is how travel and the design of the transport networks interrelate to affect prevailing road safety.

5.4.13 In that context, prevailing road safety may change where:

- Material changes are proposed to the form of nature of a transport network such as changes to the geometry of a junction or changing the form of a junction; and
- Material changes are proposed to prevailing travel patterns on transport networks not designed to cater for them such as introducing a pedestrian demand on a rural road without footways or introducing a pedestrian demand across a heavily trafficked and high-speed road without a suitable crossing provision.

Construction Phase

5.4.14 An outline of the construction of the Site will be presented in a Construction Traffic Management Plan, which will be secured by Condition. This document will include an indicative construction programme, predicted construction traffic flows, vehicle routing and access gate locations.

5.4.15 The traffic generation as set out in the Construction Traffic Management Plan, are anticipated to arise as a result of the construction of the Site and have been calculated based upon a number of assumptions such as construction material quantities, number of construction workers, and the construction programme.

5.4.16 The effects of the traffic anticipated to be generated by the construction of the Site has been determined by comparing the estimated construction traffic against the existing baseline (2019).

Severance

5.4.17 Severance is broadly defined as the separation of residents from facilities and services they use within their community caused by new or improved roads or by changes in traffic flows.

5.4.18 Several factors are considered in determining the existing level of severance. These include road width, traffic flow and composition, traffic speeds and the availability of pedestrian crossing facilities.

Delay

5.4.19 IEMA guidelines note that changes in the volume, composition and/or speed of traffic may affect the ability of people to cross roads. Typically, increases in traffic levels result in increased pedestrian delay, although increased pedestrian activity itself also contributes. The guidelines do not set any thresholds, recommending instead that assessors use their professional judgement to determine the potential impact and likely effect.

5.4.20 The increased number of HGVs will be considered in comparison to the overall change in traffic compared to the baseline position to understand the estimated level of delay.

Amenity, Fear and Intimidation

5.4.21 IEMA guidelines define pedestrian amenity as the relative pleasantness of a journey and can include considerations of pedestrian fear and intimidation if they are relevant.

5.4.22 Thresholds for HGV increases that will heighten peoples fear and intimidation are ‘Extreme’ when a link road has a composition of 3000+ average 18-hour flow, ‘Great’ for a 2,000-3,000 18-hour flow and Moderate for a ‘1,000-2,000’ 18-hour flow. The number of HGVs and HGV increase as a result of the construction phase will be taken into account within the assessment. If the resultant increase in HGVs causes an increase into the next bracket then further assessment on how to mitigate this will be undertaken.

Accidents and Safety

5.4.23 The IEMA guidelines do not include a definition in relation to accidents and safety, suggesting that professional judgement is required to assess the implications of local circumstance, or factors which may increase or decrease the risk of accidents.

Operational Phase

5.4.24 The assessment of potential highways and transport related effects, which may occur as a result of the Proposed Development, has been based on the number of trips anticipated to be generated by the completed and operational Site. The traffic expected to be generated by the

completed Site was based on a first principles approach using data from the Siemens Healthineers existing facility.

5.4.25 The effects of the traffic anticipated to be generated by the completed and operational Site has been determined by comparing the estimated operational traffic against the respective baseline positions outlined above.

Severance

5.4.26 Severance is broadly defined as the separation of residents from facilities and services they use within their community caused by new or improved roads or by changes in traffic flows.

5.4.27 Several factors are considered in determining the existing level of severance. These include road width, traffic flow and composition, traffic speeds and the availability of pedestrian crossing facilities.

5.4.28 Table 5.2 outlines the thresholds of community severance that are typically referred to when evaluating the effects of a Proposed Development.

Table 5.2 Threshold of Severance Levels

Severance Level	Traffic Flow (AADT)	Length of Diversion
Slight	<8,000	<250m
Moderate	8-16,000	250-500m

Delay

5.4.29 IEMA guidelines note that changes in the volume, composition and/or speed of traffic may affect the ability of people to cross roads. Typically, increases in traffic levels result in increased pedestrian delay, although increased pedestrian activity itself also contributes. The guidelines do not set any thresholds, recommending instead that assessors use their professional judgement to determine the potential impact and likely effect.

5.4.30 The IEMA guidelines refer to a report published by the Transport Research Laboratory (TRL) as providing a useful approximation for determining pedestrian delay. The TRL research identified that mean pedestrian delay was found to be 8 seconds at flows of 1,000 vehicles per hour and below 20 seconds at 2,000 vehicles per hour for various types of crossing condition.

5.4.31 A two-way flow of 1,400 vehicles per hour has been adopted as a lower threshold for assessment (equating to a mean 10 second delay for a link with no pedestrian facilities) in the TRL report. Below this flow pedestrian delay is unlikely to be a significant factor. This is deemed a robust starting point for narrowing down the modelled routes within the Study Area and enabling identification of the rates which exceed the assessment threshold. It is assumed that for controlled forms of pedestrian crossing, the pedestrian delays are likely to be less.

Amenity, Fear and Intimidation

5.4.32 IEMA guidelines define pedestrian amenity as the relative pleasantness of a journey and can include considerations of pedestrian fear and intimidation if they are relevant.

5.4.33 As with pedestrian delay, pedestrian amenity is affected by traffic volumes and composition along with pavement width and pedestrian activity. The guidelines suggest tentative thresholds for determining the potential impact, including where the traffic flow is halved or doubled relative to the existing scenario.

5.4.34 Thresholds for vehicle increases that will heighten peoples fear and intimidation are ‘Extreme’ when a link road has a composition of 1,800+ average 18-hour flow, ‘Great’ for a 1,200-1,800 18-hour flow and ‘Moderate’ for a 600-1,200 18-hour flow. The number of vehicles and vehicle

increase as a result of the Proposed Development will be taken into account within the assessment. If the resultant increase in vehicles causes an increase into the next bracket, then further assessment on how to mitigate this will be undertaken.

Accidents and Safety

5.4.35 The IEMA guidelines do not include a definition in relation to accidents and safety, suggesting that professional judgement is required to assess the implications of local circumstance, or factors which may increase or decrease the risk of accidents.

Type of Assessment: Summary

5.4.36 Table 5.3 summarises the type of assessments that have been undertaken for each potential environmental (traffic and transport related) effect.

5.4.37 Qualitative assessments have been undertaken through the application of professional judgement to consider anticipated changes in the prevailing baseline conditions as defined in this chapter.

5.4.38 Quantitative assessments have been undertaken, with consideration of the sensitivity of the receptor that has been assigned based on that presented in Table 5.4. The magnitude of impact has been defined by reference to the IEMA Guidance as set out in Table 5.5.

Table 5.3 Type of Assessment: Summary

Potential Environmental Effect	Demolition and Construction	Completed Development
Severance	Quantitative	Quantitative
Driver Delay	Quantitative	Qualitative & Quantitative
Pedestrian / Cycle Delay	Qualitative & Quantitative	Qualitative & Quantitative
Public Transport Delay	Qualitative	Qualitative
Amenity, Fear and Intimidation	Qualitative & Quantitative	Qualitative & Quantitative
Accidents and Safety	Qualitative	Qualitative
Potential Environmental Effect	Demolition and Construction	Completed Development
Severance	Quantitative	Quantitative

5.4.39 The criteria defining the sensitivity of the receptors are presented in Table 5.4.

Table 5.4 Description of the Sensitivity of Receptors

Receptor Sensitivity	Receptor Type
High	The receptor/resource has little ability to absorb change without fundamentally altering its present character, Receptors of greatest sensitivity to traffic flow: schools, colleges, playgrounds, accident clusters, retirement homes, roads without footways that are used by pedestrians.
Moderate	The receptor/resource has moderate capacity to absorb change without significantly altering its present character. Traffic flow sensitive receptors: congested junctions, doctors' surgeries, hospitals, shopping areas with roadside frontage, roads with narrow footways, recreation facilities
Low	The receptor/resource is tolerant of change without detriment to its character. Receptors with low sensitivity to traffic flow: places of worship, public open space, tourist attractions and residential areas with adequate footway provision.
Negligible	Receptors with low sensitivity to traffic flows and those sufficiently distant from road affected roads and junctions.

Magnitude of Impact

5.4.40 Table 5.5 summarises the criteria that has been used to determine magnitude of impacts. However, consideration of the absolute level of an impact is also important e.g. the total flow of traffic or HGVs on a link. This is because an increase of, say, 100% in the traffic flow on a road is likely to still lead to negligible or minor effect if the existing flows are low.

Table 5.5 Magnitude of Impact

Effect	Very Low	Low	Medium	High
Severance	Change in total traffic or HGV flows of less than 30%	Change in total traffic or HGV flows of 30-60%	Change in total traffic or HGV flows of 60-90%	Change in total traffic or HGV flows over 90%
Pedestrian and Cyclist Delay	Two way traffic flow < 1,400 vehicles per hour	Professional judgement based on the road links with two way traffic flow exceeding 1,400 vehicles per hour in context of the individual characteristics		
Pedestrian Amenity	Change in total traffic or HGV flows < 100%	Professional judgement based on the routes with >100% change in context of their individual characteristics		
Driver Delay	Professional judgement based on the results of junction capacity assessments undertaken at the Junctions shown on Figure 7.2			
Fear and Intimidation	-	Moderate-Average flow over 18 hour day 600-1200 for vehicle and 1000-2000 for HGV	Great-Average flow over 18 hour day 1200-1800 for vehicle and 2000-3000 for HGV	Extreme-Average flow over 18 hour day 1800+ for vehicle and 3000+ for HGV
Accidents & Safety	Professional judgement based on qualitative analysis			
Public Transport	Professional judgement based on quantitative analysis presented in the TA and TAA (ES Volume 3, Appendix: Traffic and Transport - Annex 1)			

Magnitude of Impact - Screening Methodology

5.4.41 To assist with the judgement of magnitude of impact, reference has been made to the IEMA guidelines. This guidance sets out the effects considered, as well as thresholds, in respect to potential changes in the volume and composition of traffic, in order to facilitate a subjective judgement of the potential highways and transport effect. The thresholds described are guidance only and provide a starting point by which a detailed analysis will inform a qualitative assessment.

Potential Effect of Traffic Flows on the Local Highway Network

5.4.42 In relation to the potential effect of traffic flows generated by the Site on the local highway network, prior to determining the sensitive receptors and their associated sensitivity, and the magnitude of impact, an initial screening process is undertaken (as set out below).

5.4.43 The IEMA guidance identifies two broad rules which can be used as a screening process to ascertain the scale and extent of the assessment:

- *"Rule 1: include highway links where traffic flows will increase by more than 30% (or the number of heavy goods vehicles will increase by more than 30%); and*
- *Rule 2: include any other specifically sensitive areas where traffic flows have increased by 10% or more".*

5.4.44 Where the predicted increase in traffic flows (as a result of a Proposed Development) is lower than the above thresholds, the IEMA guidelines suggest the significance of the effects can be stated to be negligible and further detailed assessments are not warranted. Increases in traffic flows below 10% are generally considered to be insignificant in environmental terms given that daily variations in background traffic flow may vary by this amount.

Scale and Nature of Effect

5.4.45 The scale of the resulting effect is judged on the relationship of the magnitude of impact against the sensitivity and / or importance of the receptor. The predicted scale of effects is summarised in Table 5.6.

Table 5.6 Scale of Effects

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

5.4.46 It should be noted that when evaluating effects such as Pedestrian and Cyclist Delay and Driver Delay, the above table is supplemented by professional judgements that takes into account actual changes over and above a baseline position. For example, a small reduction in junction capacity on a receptor of high sensitivity can still be classified as having a negligible effect on delays being incurred to road users.

5.4.47 The nature of effects is described as either:

- Beneficial – meaning that there is an overall positive impact;
- Adverse – meaning that there is an overall negative impact; or
- Negligible – meaning that there is an insignificant impact.

Significance of Effects

5.4.48 In accordance with the methodology set out within ES Chapter 3, the following criteria is applied in relation to the significance of effects:

- 'Moderate' or 'Major' effects are deemed to be 'significant' (see Table 5.6).
- 'Minor' effects are considered to be 'not significant', although they may be a matter of local concern; and
- 'Negligible' effects are considered to be 'not significant'.

Geographic Extent of Effect

5.4.49 The geographic extent of the effects is identified at a spatial level, 'Site' or 'local' effects are those affecting the Site and neighbouring receptors, while effects upon receptors beyond the vicinity of the Site and its neighbours are at a 'district' level. Effects affecting Cherwell are at a 'regional' level, whilst those which affect different parts of the country, or England, are considered being at a 'national' level. Given the scale of the development, its effects will be limited to the 'local' level.

Effect Duration

5.4.50 The temporal scope of the effect identified is described as either short, medium, long term or permanent as described below.

5.4.51 For the operational assessment the likely effects are deemed permanent whereas for

construction effects they are likely to be medium term:

- Short term – < 12 months;
- Medium term – 1 to 5 years;
- Long term – + 5 years; and
- Permanent – effects that are considered to be 'irreversible' or extremely long-lasting.

Direct and Indirect Effects

5.4.52 The below assessment will also identify whether the effect is 'direct' (i.e. resulting without any intervening factors) or 'indirect' or 'secondary' (i.e. not directly caused or resulting from something else)

5.5 Assumptions and Limitations

5.5.1 The main limitation to presenting the baseline traffic data on the network is that extracted strategic traffic model flows cannot be validated at M40 J9 and as such flows obtained from the most recent 2018 classified turning count survey have had to be used.

5.5.2 As presented within the Transport Assessment, separate assessments have been undertaken for the local highway network (including the proposed signalised access and Vendee Drive Roundabout) and for the strategic highway network (including M40 J9).

5.5.3 With regard to committed developments, it has been assumed that committed developments used for the Junction 3 assessment will come forward in line with current build out rates against the Annual Monitoring Report (AMR) produced by CDC. With regard to Junctions 1 and 2, the BTM used includes relevant committed development growth.

5.5.4 There are two future year tests presented below; 2024 and 2031. It should be noted that two different datasets have been used to inform these assessments and as a result there are some anomalous differences in the overall impact of the Proposed Development across the respective future year assessments. For example, the impact of the proposed development is higher on some links in 2031 than 2024, which is contrary to what would ordinarily/historically be expected when taking into account there would potentially be more increases in background traffic between 2024 and 2031. Notwithstanding this, it does not change the overall conclusions that the Proposed Development will result in a negligible impact, as the absolute increases in vehicle trips is relatively modest at approximately one additional vehicle per minute at peak times.

5.5.5 When estimating the traffic expected to be generated by the construction of the Site assumptions have been made in relation to material quantities, the number of construction workers, and anticipated programme of works, and the routing of vehicles. As these assumptions are informed by an experienced organisation, it is considered that these provide a realistic overview of the construction phase.

5.5.6 In addition, it is expected that any planning consent would include a condition that would require a Construction Traffic Management Plan (CTMP) to be agreed with CDC and that the Construction Traffic Management Plan would define a number of measures that would be implemented to manage construction related road traffic. In this respect, any effects can be suitably managed. A CTMP will be secured by a suitably worded condition.

5.6 Baseline Conditions

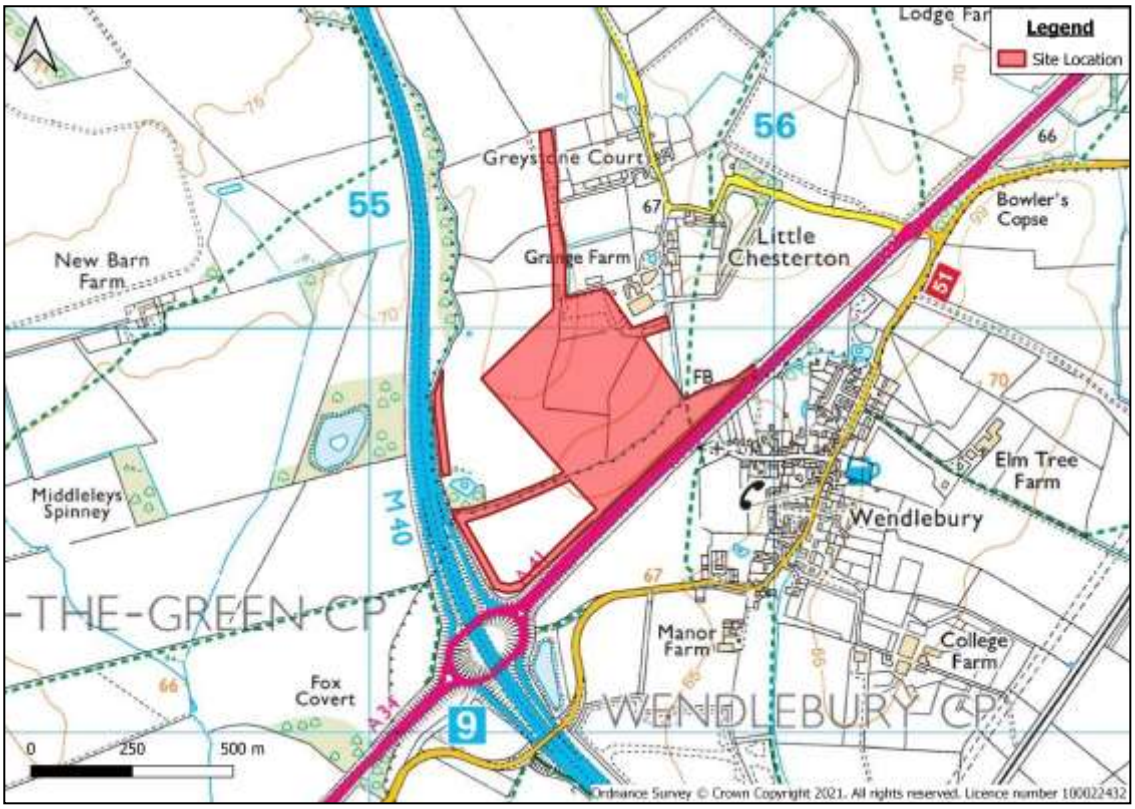
Site Location and Access Points

5.6.1 The Site is located to the north east of Junction 9 of the M40 and to the north of Wendlebury, approximately 4km south west of Bicester and 18km north east of Oxford.

5.6.2 The land is adjacent to Grange Lane Farm industrial estate, which is accessed via Green Lane to the north and the A41 to the south.

5.6.3 The Site location in relation to the local area is shown below in Figure 5.3.

Figure 5.3 Local Site Location



Local Highway Network

5.6.4 The Site can be accessed via Green Lane, an unclassified road to the north of the Site, as well as the A41, a dual-carriageway and trunk road which runs in an east/west alignment from J9 of the M40 to J20 of the M25.

5.6.5 The A41 provides access to Bicester to the north east, Oxford to the south west (via the A34) and Aylesbury to the west as well as Junction 9 of the M40 to the south west of the Site. The M40 connects London to Birmingham, providing a strategic connection throughout the country.

5.6.6 The strategic context of the Site is shown below.

Figure 5.4 Strategic Site Location

South Eastern Perimeter Road (SEPR)

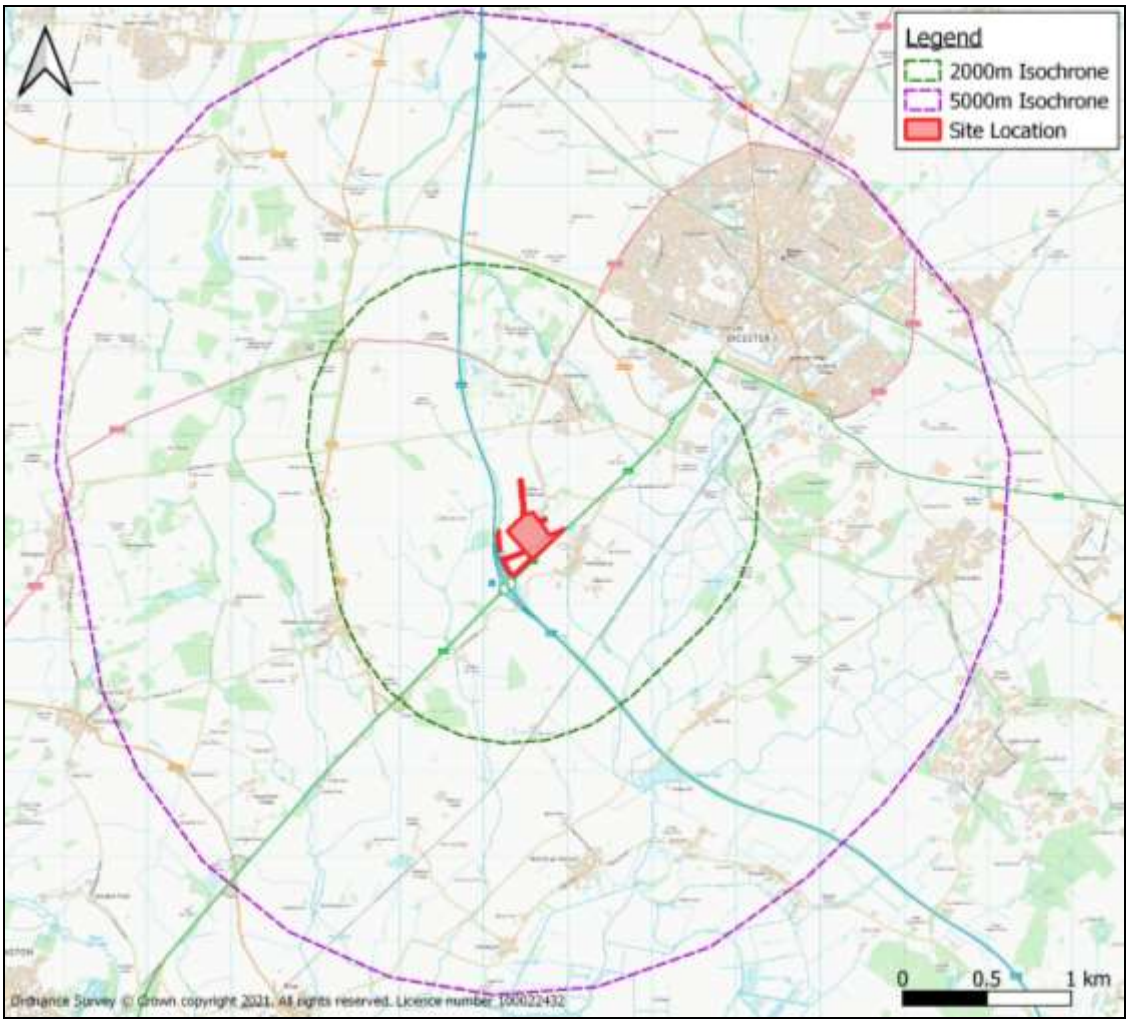
5.6.7 It is also understood that there is a long-standing aspiration to develop the South Eastern Perimeter Road (SEPR). We note from the most recent OCC consultation process that the western end of the SEPR is expected to include the construction of a new roundabout on the A41, which would replace the current A41/Wendlebury Road left-in/left-out junction.

5.6.8 Whilst it is understood that OCC is currently undertaking a wider review of the A41, it is currently unknown if, or when, the SEPR will be implemented. As such this report considers the effects of the Proposed Development without the SEPR in place. However, it should be noted that the access strategy for the Site has been designed to ensure that it does not preclude the delivery of the SEPR at a later date.

Pedestrian and Cycle Network

5.6.9 Walking is a convenient mode of transport for most people for trips up to around 2km in length, which equates to an approximate 20 minute walk time. This walking catchment for the Site is shown below.

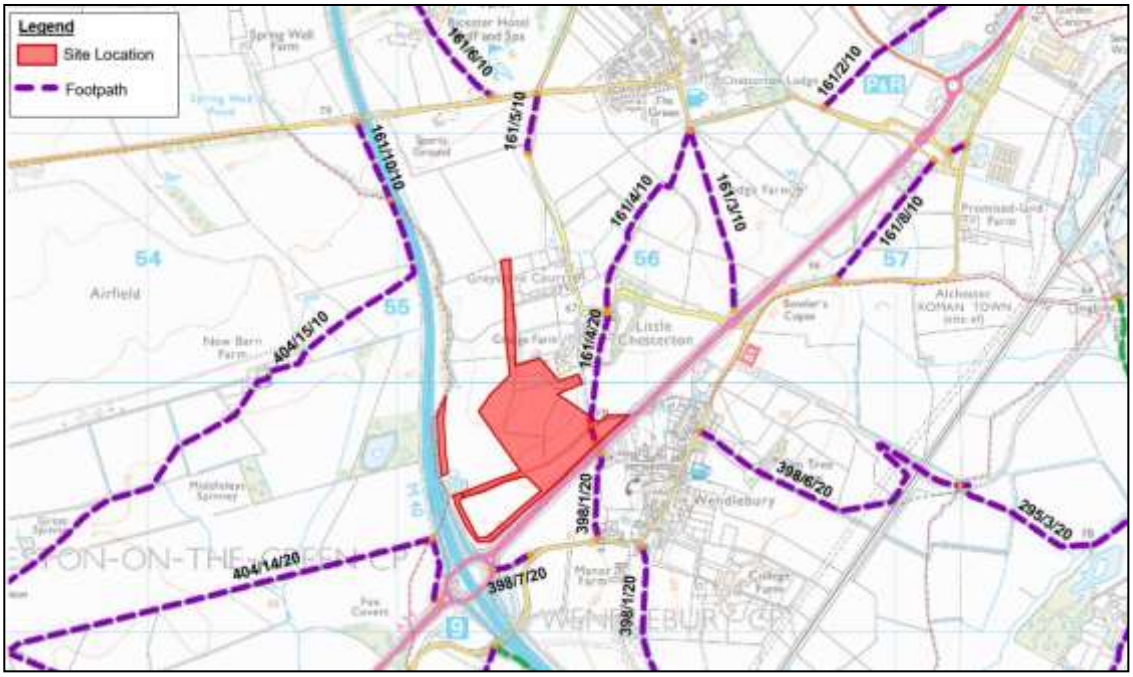
Figure 5.5 Walking and Cycling Isochrones



5.6.10 Whilst it is noted pedestrian accessibility to the Site is currently fairly limited, there is a section of footway located approximately 200m to the north of the Site from the junction of Green Lane with the A41. This footway becomes public right of way across open land to the village of Chesterton, 1km to the north.

5.6.11 Footpath 161/4/20 traverses the Site and crosses the A41 into the village of Wendlebury as shown below at Figure 5.6. At present there are no formal crossing points, but there is a pedestrian refuge area provided in the central reserve.

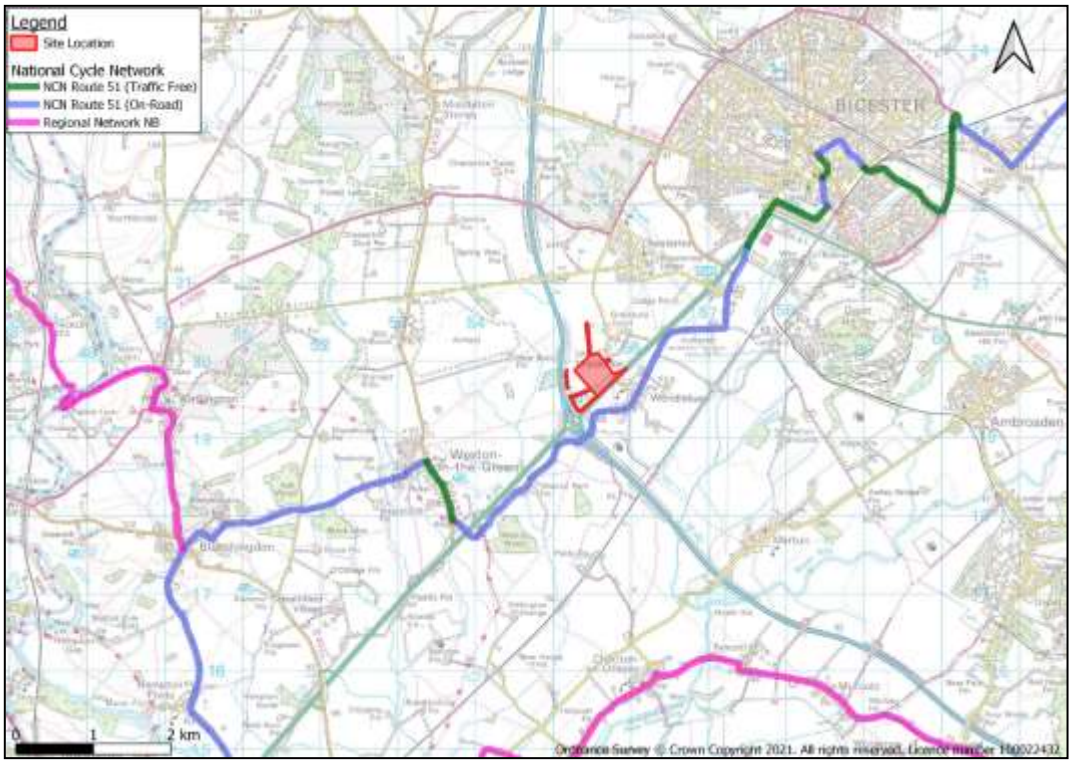
Figure 5.6 Extract from OCCH PRoW Map



5.6.12 With regard to cycling, it is considered that this mode of transport is an option for trips up to around 5km in length, which equates to a 20 minute journey time in an urban environment. The 5km distance is shown in Figure 5.5 above and shows that the built up area of Bicester and many of the surrounding villages are within an accessible distance by bike.

5.6.13 In addition, National Cycle Network (NCN) Route 51 is located to the south of the A41. NCN Route 51 provides a connection to Bicester to the north east of the Site and on to Milton Keynes, Bury St Edmunds and Ipswich. A map showing cycling routes in the vicinity of the Site is shown below.

Figure 5.7 Local Cycle Network



5.6.14 Furthermore, the Bicester Local Cycling and Walking Infrastructure Plan (LCWIP) was adopted in September 2020 and sets out a vision and plan to increase cycling and walking for the town of Bicester. With regard to cycling, the plan states that there is a target to increase cycle journeys in Bicester by 200%. As such, it is anticipated that cycling will become a more accessible mode of transport in the future as development is built out in Bicester.

Bus Services

5.6.15 The closest bus stop to the Site is located along the A41 ('Wendlebury Turn'), on the southern boundary of the Site. One service is provided from this bus stop, namely the S5 Gold. This route provides services between Bicester and Oxford. A breakdown of the service and the frequency provided is set out in Table 5.7, and a bus route map is provided at Figure 5.8.

Table 5.7 Bus Services and Approximate Frequencies

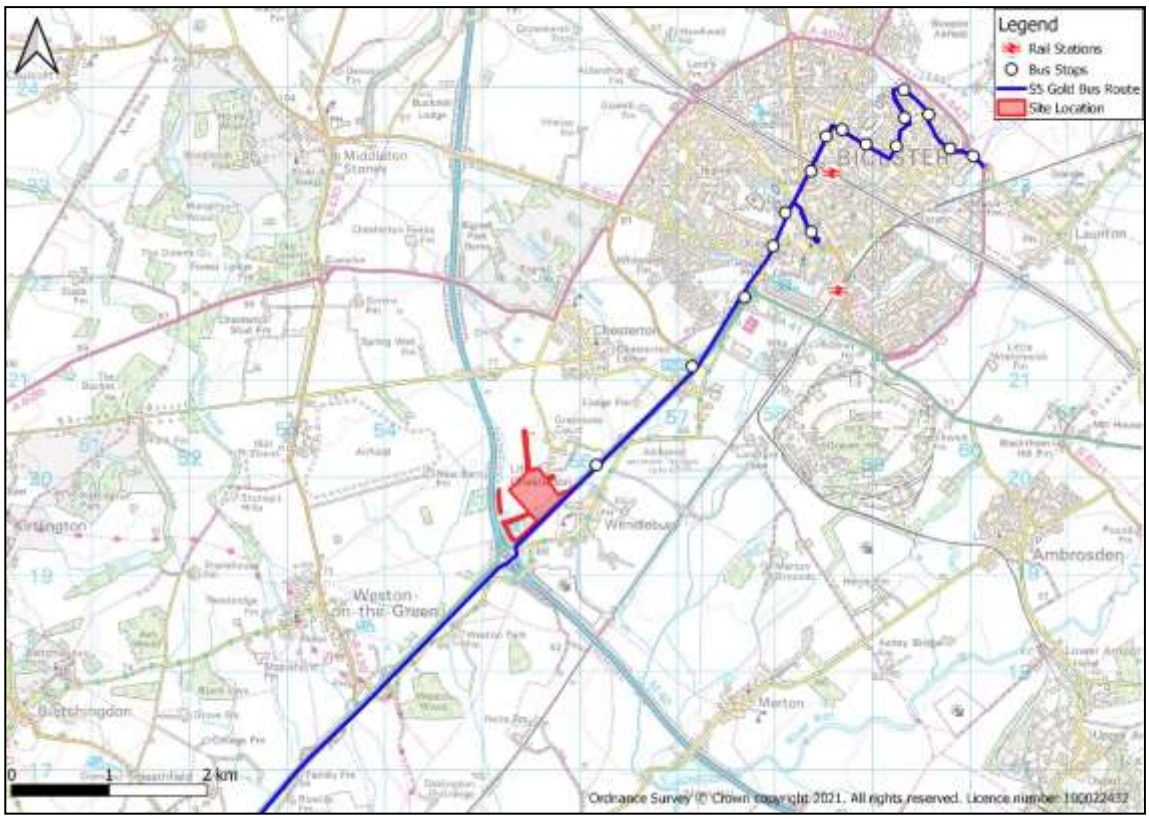
Bus Service	Locations	Frequency		
		Monday-Friday	Saturday	Sunday & Bank Holidays
S5 Gold	Oxford - Kidlington - Bicester		4 per hour	4 per hour

5.6.16 A more detailed analysis of bus times arriving/departing the bus stops adjacent to the Site has been undertaken using timetable information provided in the TA. This review demonstrates buses serve the bus stops located opposite Wendlebury throughout the day, which correspond with shift times that would be associated with the Siemens operation at the Site. As such, travel by bus to and from the Site is a viable option.

5.6.17 The average journey time from the bus stops located nearest to the Site to the centre of Oxford is approximately 25 minutes on the S5 Gold service. The journey time to Bicester town centre is approximately 9 minutes.

5.6.18 In addition to the above, there is a night bus service (NS5) which runs one service a day Monday-Thursdays after midnight and on Fridays there are four services running from midnight to 3am.

Figure 5.8 Bus Route Map



Rail Services

5.6.19 Bicester North Railway Station is situated approximately 4km to the north east of the Site and is accessible using the S5 Gold bus service. From Bicester North Railway Station, services are provided to Birmingham Snow Hill, Banbury and London Marylebone.

5.6.20 Bicester North Railway Station provides disabled and step-free access along with 673 car parking spaces and 6 Blue Badge spaces. A total of 65 cycle parking spaces are available in covered and sheltered locations.

5.6.21 A breakdown of the services available from Bicester North Railway Station and their frequency are provided in Table 5.8.

Table 5.8 Rail Services from Bicester North Railway Station

Service	Notable Stops	Frequency		
		Monday-Friday	Saturday	Sunday & Bank Holidays
London Marylebone	London Marylebone	Twice per hour	Twice per hour	Once every 45 minutes
Birmingham Snow Hill	Banbury, Warwick, Solihull, Birmingham Moor Street, Birmingham Snow Hill	Once per hour	Once per hour	Once per hour

5.6.22 As shown above, the S5 bus service provides a route to/from Bicester North Railway Station. The S5 is a frequent service with four buses an hour and runs throughout the day, which is

beneficial for future employees at the Site.

Personal Injury Accidents

5.6.23 Personal Injury Accident Information has been obtained from OCCH on the collisions occurring within the 5 year period from 1st January 2016 to 31st July 2021. There were 95 accidents which occurred during this period, of which 5 were fatal, 11 serious and 79 were slight.

5.6.24 The TA includes a detailed review of all the accidents recorded in the assessment period. On the basis of the information provided by OCC it is apparent that the overriding factors associated with all accidents is driver/pedestrian/cyclist error rather than any problems related to highway geometry. It is therefore concluded that the number and severity of the accidents recorded in this study is not in excess of that for an area of highway in a location of this type over the study period assessed.

5.6.25 It is also noteworthy that as part of the development proposals at the site, a new traffic signal-controlled site access junction will be provided on the A41. Further details regarding the proposed site access are provided within the TA (see Appendix 5.1).

5.6.26 It is anticipated that the proposed signal access junction will improve road safety in the vicinity of the site as it will:

- act as a natural speed restraint given vehicles will be required to stop for red lights.
- provide a safer crossing point for pedestrians and cyclists, including those that are seeking to use the PRoW network and access the existing bus stops opposite Wendlebury.

Baseline Travel Statistics

Travel Behaviour

5.6.27 The 2011 Census Data results associated with output area Cherwell 016 has been interrogated in order to establish current travel patterns of people that commute into this area for work purposes. The results are provided below at Table 5.9.

Table 5.9 Census Journey to Work data (Cherwell 016)

Method of Travel to Work	Percentage of Method to Work
Underground, metro, light rail or tram	0%
Train	1%
Bus, minibus or coach	4%
Taxi	0%
Motorcycle, scooter or moped	1%
Driving a car or van	80%
Passenger in a car or van	8%
Bicycle	2%
On foot	4%
Total	100%

5.6.28 Table 5.9 indicates that circa 11% of people travel to workplaces located in the relevant output area via sustainable modes of transport (i.e. public transport, walking and cycling) and as such it is considered that the sustainable transportation options provide future employees with the potential to travel by modes other than the private car. The Proposed Development will also seek to enhance sustainable transport options to the Site, which will provide additional scope

for employees to travel to/from the Site by sustainable modes.

Baseline Traffic Flows

5.6.29 The existing baseline 24 hour two-way Annual Average Daily Traffic (AADT) flows for vehicles and heavy goods vehicles (HGVs) are provided in Table 5.10; the existing baseline AM peak hour (i.e. 08:00-09:00) traffic flows for vehicles and HGVs are provided in Table 5.11; the existing baseline PM peak hour (i.e. 17:00-18:00) traffic flows for vehicles and HGVs are provided in Table 5.12.

5.6.30 As outlined above, baseline data has been collated from a range of different data sources for the purposes of this assessment. This includes:

- Empirical peak hour traffic surveys;
- Data extracted from the BTM for peak hours;
- Annual Average Daily Traffic (AADT) recorded by the DfT;
- Automatic Traffic Count Data recorded by OCC;
- AADT data recorded by NH.

5.6.31 Full details of the traffic flows for the assessment links is provided at Appendix 5.1 together with an overview of calculations that have been undertaken to predict traffic flows where there are gaps in the various data sources referred to above. It should be noted that the calculations referred to in Appendix 5.1 are consistent with industry best practice methodologies and have been subject to a validation exercise that uses the traffic engineering GEH statistic.

Table 5.10 Baseline Traffic Flows 24 Hour Annual Average Daily Traffic

Reference	Road Link	Vehicles		
		Total Vehicles	HGV	HGV %
1	A34 South of M40 J9	68889	8055	11.7%
2	A41 North of M40 J9	34814	2116	6.1%
3	A41 South of Vendee Drive Roundabout	36200	2159	6.0%
4	A41 North of Vendee Drive Roundabout	35230	1726	4.9%
5	Vendee Drive	7400	360	4.9%

Table 5.11 Baseline Traffic Flows AM Peak Hour

Reference	Road Link	Vehicles		
		Total Vehicles	HGV	HGV %
1	A34 South of M40 J9	3857	541	14.0%
2	A41 North of M40 J9	1949	142	7.3%
3	A41 South of Vendee Drive Roundabout	2655	217	8.2%
4	A41 North of Vendee Drive Roundabout	2355	212	9.0%
5	Vendee Drive	800	38	4.7%

Table 5.12 Baseline Traffic Flows PM Peak Hour

Reference	Road Link	Vehicles		
		Total Vehicles	HGV	HGV %
1	A34 South of M40 J9	5365	668	12.5%
2	A41 North of M40 J9	2711	176	6.5%
3	A41 South of Vendee Drive Roundabout	2779	107	3.9%
4	A41 North of Vendee Drive Roundabout	2932	47	1.6%
5	Vendee Drive	871	16	1.8%

5.7 Receptors and Receptor Sensitivity

Existing

5.7.1 Tables 5.13 and 5.14 present the receptors likely to be affected by the development, and their sensitivity. This takes into account the location of the receptor in question and its relationship with the Site.

Road Links

5.7.2 The sensitivity of a road being considered can be defined by the vulnerability of the user groups who may use it, such as elderly people or children, e.g. a road where pedestrian activity is high in the vicinity of a school, or where there is already an existing accident issue may be highly sensitive. It also takes account of the existing nature of the road e.g. an existing "A" road is likely to have a lower sensitivity than a minor residential road.

Table 5.13 Sensitivity of Road Links in Study Area

Reference	Road Link	Sensitivity
1	A34 South of M40 J9	Moderate
2	A41 North of M40 J9	Moderate
3	A41 South of Vendee Drive Roundabout	Moderate
4	A41 North of Vendee Drive Roundabout	Moderate
5	Vendee Drive	Moderate

Other Sensitive Receptors

5.7.3 Based on a review of the baseline conditions, the following additional receptors and their sensitivity have been identified.

Table 5.14 Additional Receptors in the Study Area

Resource / Receptor	Sensitivity
Pedestrian Network	Low
Cycle Network	Low
Bus Services	Low
Rail Services	Low

5.7.4 The IEMA guidelines highlight that sensitive receptors can include congested junctions, hospitals, community centres, conservation areas, schools, colleges, churches and accident black hot spots. The Proposed Development will not affect any sensitive receptors.

5.8 Assessment of Proposed Development Impacts and Evaluation

Mitigation

5.8.1 The way that potential environmental impacts have been or will be avoided, prevented, reduced or off-set through design and / or management of the Site are outlined below and will be taken into account as part of the assessment of the potential transport effects. Proposed environmental enhancements are also described where relevant. These are essentially measures committed to reduce the potential for residual significant effects.

5.8.2 The measures accounted for in the construction phase and once the development is complete and occupied are outlined below.

Construction

Construction Traffic Management Plan (CTMP)

5.8.3 A CTMP will set out measures to control the potential impacts of the construction process. A summary of these is provided below as follows:

- Temporary traffic control measures (if required);
- Timing controls (e.g. limiting peak period vehicle movements);
- Temporary and permanent access to the works for personnel/vehicles;
- Traffic management procedures for waste disposal vehicles;
- Personnel and vehicle segregation;
- Traffic Management Equipment, e.g. road cones, temporary fencing and signage etc.;
- Provision would be made to ensure that vehicles can be loaded and unloaded off the public highway where possible;
- The Site labour force would be encouraged to use public transport to travel to and from the Site where possible. There would only be limited vehicle parking permitted on-Site for visitors;
- HGV wheels will be washed prior to vehicles leaving the Site;
- Road sweepers will be used on adjacent roads at an appropriate frequency depending on the stage of construction to keep the roads clean and free from mud etc. (if necessary);
- Traffic management plans would be implemented to minimise the potential effect of the works. This would include ensuring that any lane closures (following approval) are undertaken outside of peak hours where considered necessary and appropriate; and
- Pedestrian and cycleways would be temporarily diverted during the public highway works where necessary (following approval).

5.8.4 The provision of a CTMP would ensure that a strategy for planning the construction access routes will be implemented, to take into account current legislation, and the feedback from consultation with relevant stakeholders.

Operation

Improvements

5.8.5 The inclusion of shared pedestrian/cycle routes within the Site that will connect the Site with the off-site infrastructure that will be provided adjacent to the A41. White lining will facilitate access to the staff car park and cycle parking spaces provided in front of the facility.

5.8.6 The inclusion of dedicated pedestrian/cycle crossing points within the signalised access will provide links to improved bus stops and also provide safety benefits for pedestrians and cyclists.

Management Plans

5.8.7 As is set out in the TA, the Proposed Development will:

- Encourage use of modes of transport other than the private car to be used by employees and visitors.
- Outline the measures that will be adopted to ensure the efficient use of the service yard.

5.8.8 It is expected that these will be secured by a suitably worded condition with the content agreed with OCC and NH prior to the Proposed Development becoming operational.

5.9 Construction Phase Impacts

Impact 1: Construction Traffic on Environment/Receptors

5.9.1 As the trip generation from the construction works would fluctuate through the implementation of the development, a reasonable assessment has been undertaken of the highest daily construction trip two-way flows. This has been completed in advance of appointing a contractor or defining the detailed construction activities and programme.

5.9.2 A first-principles approach has been applied to assess the highest likely daily construction trip generation from the proposed development. It has been assumed that the activities that would generate the greatest construction vehicle movements are:

- construction workers travelling to and from the Site;
- on-site earthworks and landscaping; although there is an expectation that a cut and fill materials balance will be achieved on-site;
- construction of the proposed development access roads;
- utilities work; and
- construction and fit out of the new buildings.

5.9.3 In order to provide a comparison, daily two-way construction vehicle movements have been extracted from the approved Symmetry Park scheme at South East Bicester (planning reference: 16/00861/HYBRID) for the construction of circa 63,000sqm of logistics floor space. Whilst it is acknowledged that the use class is not the same as what is being proposed at the Oxford North site, the construction vehicle activity will be similar. As such, the construction traffic has been factored to reflect the proposed circa 54,000sqm B2 development at the site.

5.9.4 Using this approved methodology to inform the assessment at Oxford North, Table 5.15 shows a daily total of 90 two-way HGV movements and 52 two-way light vehicle movements, or a total of 142 two-way vehicle movements. However, it should be noted that multiple stages of construction activity could occur simultaneously; therefore, the potential combined trip generation from these activities should be considered individually, as two-way trips. It has also been assumed that there would be 1.5 employees per light vehicle 'car sharing' to get to the Site. The stage where the highest total movements could occur in parallel was determined to be the construction of the access, earthworks and utilities whilst the on-site highway is constructed.

Table 5.15 Potential Highest Daily Construction Flows

Activity	Maximum Two-Way Movements Per Day		
	Light Vehicles	HGVs	Total Vehicles
Construction of Access	18	76	94
Utilities works	29	13	42
On-site earthworks	4	2	6
Total	52	90	142

5.9.5 The trip generation shown in Table 5.15 is considered a worst-case scenario that would only occur if activities on-site occurred simultaneously, and consequently would only occur over a short time frame. Therefore, for most of the construction period, the volume of construction traffic is expected to be less than presented in Table 5.15. The building would be constructed once the earthworks and development platforms have been established.

5.9.6 Of the flows summarised above, only a limited number of light vehicle and HGV movements would typically occur during the peak hours. Working patterns for construction workers are unlikely to coincide with the network peak, and construction processes would be programmed to avoid reliance on deliveries of large loads, such as concrete and bituminous materials during peak times.

5.9.7 For the purposes of this assessment, it has been assumed that all construction traffic would route along the A41 to/ from the M40, which provides the most direct access to the strategic road network.

5.9.8 On the basis of the maximum number of construction activities occurring on-site at the same time, a worst case assessment of the likely impact on daily traffic flows is provided in Table 5.16.

Table 5.16 Worst Case Construction Traffic Impacts (Daily)

	2019 Base Year Flows (Two-way)		Estimated Construction Traffic (Two-way)		% Increase	
Road Affected	**All Vehicles**	**HGVs**	**All Vehicles**	**HGVs**	**All Vehicles**	**HGVs**
A41 (north of M40 J9)	34814	34814	142	90	0.4%	4.3%

5.9.9 With regard to construction, the maximum impact is on the A41 west of the proposed Site access with daily flows increasing by less than one per cent if used by all vehicles, and HGVs increasing by approximately five per cent.

5.9.10 Again, this assessment assumes a worst case scenario that would only occur for a short amount of time should all operatives associated with the maximum construction activities onsite at the same time; therefore, the significance of effect from construction activities is negligible.

5.9.11 On this basis, it is considered that the effect of the construction traffic upon the receiving environment/receptors will be temporary and Negligible (Not Significant):

- Pedestrian severance - as the effects will be temporary and it has been shown that the increases in traffic and HGV activity on all links will not exceed Rule 1 of the IEMA thresholds;
- Pedestrian delay - as the effects will be temporary and it has been shown that the increases in traffic and HGV activity will not materially change on the links assessed
- Pedestrian amenity - as the effects will be temporary and it has been shown that the increases in traffic and HGV activity will not double on the links across the construction period;
- Driver delay - as the effects will be temporary and it has been shown that the level of vehicular activity will be modest on the local highway network, particularly when compared to that associated with the operational phase of the Proposed Development;
- Fear and intimidation - as the increases in vehicular and HGV activity is modest and will

not lead to any links to transfer into another bracket of the thresholds outlined in Table 5.5;

- Road safety - as the increases in temporary activity will not increase the likelihood of accidents occurring, on a network that has been found not to have any underlying safety issues that lead to an abnormally high accident rate.

5.9.12 There is the potential that mud and debris could be deposited on the surrounding roads by construction vehicles transporting waste away from the Site. It is generally accepted that there are no simple formulae to predict the level of dust and dirt which might arise from vehicle movements. However, given the scale of the development it is considered, based on our professional judgement, that the potential effects of this from a road safety perspective will be temporary and Negligible (Not Significant). Indeed, it should be noted that the CTMP that will be operated will include construction management measures such as the use of wheel washing facilities and keeping fine materials damp to minimise the amount of material that is deposited on the surrounding road network including the A41 that provides access into the Site.

Impact 1: Mitigation

5.9.13 No further mitigation is required.

Impact 1: Residual Effect

As no further mitigation is proposed the residual effect remains Negligible and Not Significant.

5.10 Operational Phase Impacts

Impact 2: Operational Traffic - Opening Year 2024 and Future Year 2031

Opening Year 2024

5.10.1 In relation to the opening year assessment, there will be change on the highway network in the absence of the Proposed Development. These changes are due to the vehicle movements arising from other committed developments (i.e. cumulative schemes) and general growth in traffic in the area. The opening year traffic flows for 2024 take into account expected traffic growth in the area from both background traffic growth and additional growth from committed developments. Full details are provided in the TA.

5.10.2 The assessment year for the opening year traffic flows is 2024 and these traffic flows are based on the specific data relating to the effects of committed development within the study area and background growth in the area.

5.10.3 Opening year baseline conditions for the assessment year of 2024 are summarised in Table 5.17 (24-hour AADT), 5.18 (AM Peak Hour), 5.19 (PM Peak Hour).

Table 5.17 2024 Traffic Flows 24 Hour Annual Average Daily Traffic

Reference	Road Link	Vehicles		
		Total Vehicles	HGV	HGV %
1	A34 South of M40 J9	71923	8305	11.5%
2	A41 North of M40 J9	41851	2116	5.1%
3	A41 South of Vendee Drive Roundabout	31270	2993	9.6%
4	A41 North of Vendee Drive Roundabout	34723	2115	6.1%
5	Vendee Drive	13279	1098	8.3%

Table 5.18 2024 Traffic Flows AM Peak

Reference	Road Link	Vehicles		
		Total Vehicles	HGV	HGV %
1	A34 South of M40 J9	4135	542	13.1%
2	A41 North of M40 J9	2316	142	6.1%
3	A41 South of Vendee Drive Roundabout	2283	313	13.7%
4	A41 North of Vendee Drive Roundabout	2457	207	8.4%
5	Vendee Drive	932	117	12.5%

Table 5.19 2024 Traffic Flows PM Peak

Reference	Road Link	Vehicles		
		Total Vehicles	HGV	HGV %
1	A34 South of M40 J9	5773	681	11.8%
2	A41 North of M40 J9	3166	179	5.7%
3	A41 South of Vendee Drive Roundabout	2409	136	5.6%
4	A41 North of Vendee Drive Roundabout	2753	110	4.0%
5	Vendee Drive	1061	48	4.5%

Future Year 2031

5.10.4 In relation to the future baseline, there will be change on the highway network in the absence of the Proposed Development. These changes are due to the vehicle movements arising from other committed developments (i.e. cumulative schemes) and general growth in traffic in the area. The future baseline traffic flows for 2031 take into account expected traffic growth in the area from both background traffic growth and additional growth from committed developments. These flows have been derived as follows.

5.10.5 The assessment year for the future baseline traffic flows is 2031 and these traffic flows are based on the specific data relating to the BTM provided by Tetra Tech. It is noted that this is a sensitivity test.

5.10.6 Future baseline conditions for the assessment year of 2031 are summarised in Table 5.20 (24-hour AADT), 5.21 (AM Peak Hour), 5.22 (PM Peak Hour).

Table 5.20 2031 Traffic Flows 24 Hour Annual Average Daily Traffic

Reference	Road Link	Vehicles		
		Total Vehicles	HGV	HGV %
1	A34 South of M40 J9	92604	12168	13.1%
2	A41 North of M40 J9	30396	3321	10.9%
3	A41 South of Vendee Drive Roundabout	32303	3217	10.0%
4	A41 North of Vendee Drive Roundabout	37709	2276	6.0%
5	Vendee Drive	17386	1188	6.8%

Table 5.21 2031 Traffic Flows AM Peak Hour

Reference	Road Link	Vehicles		
		Total Vehicles	HGV	HGV %
1	A34 South of M40 J9	6455	1028	15.9%
2	A41 North of M40 J9	2171	349	16.1%
3	A41 South of Vendee Drive Roundabout	2299	335	14.6%
4	A41 North of Vendee Drive Roundabout	2667	221	8.3%
5	Vendee Drive	1271	127	10.0%

Table 5.22 2031 Traffic Flows PM Peak Hour

Reference	Road Link	Vehicles		
		Total Vehicles	HGV	HGV %
1	A34 South of M40 J9	7441	797	10.7%
2	A41 North of M40 J9	2390	149	6.2%
3	A41 South of Vendee Drive Roundabout	2548	147	5.8%
4	A41 North of Vendee Drive Roundabout	2991	120	4.0%
5	Vendee Drive	1338	52	3.9%

5.11 Assessment of Effects

5.11.1 The total traffic generated by the Proposed Development once completed, operational and fully occupied (2024 and 2031) across the weekday AM, PM and 24 hour period is presented in Table 5.23, the number of HGVs is presented in brackets.

Table 5.23 Forecast AM, PM and Daily Proposed Vehicle Movements to and from the Site

Period	Total Vehicle (Two-way)
AM Peak Hour (08:00-09:00)	74 (0)
PM Peak Hour (17:00-18:00)	66 (0)
24 hour	1888 (54)

5.11.2 It should be noted that the methodology followed to identify the development related traffic was the subject of detailed discussions with both OCC and NH. Full details of this, together with correspondence confirming the approach to be appropriate for the purposes of this assessment, is provided in the TA (ES Appendix 5.1).

5.11.3 When establishing the distribution of development traffic presented above, reference has been made to:

- Existing staff relocating from the existing facility in Eynsham would distribute onto the local highway network in accordance with the locations where current employees live.
- Proposed increases in staff over and above that currently employed at the existing facility

in Eynsham would distribute onto the local highway network in accordance with Census data extracted from the Nomis website.

5.11.4 Having regard to the information provided above, Tables 5.24 to 5.26 present the percentage increase in total vehicle flows and HGVs by link in 2024 as a result of the Proposed Development for the daily 24-hour AADT, AM and PM peak periods. Tables 5.27-5.29 present similar information for the 2031 assessment year

Table 5.24 Summary of Impact as a Result of the Proposed Development (2024 AADT)

Reference	Road Link	Vehicles	
		Total Vehicles	HGV
1	A34 South of M40 J9	1.7%	0.7%
2	A41 North of M40 J9	3.8%	2.6%
3	A41 South of Vendee Drive Roundabout	1.0%	0.0%
4	A41 North of Vendee Drive Roundabout	0.7%	0.0%
5	Vendee Drive	0.4%	0.0%

Table 5.25 Summary of Impact as a Result of the Proposed Development (2024 AM)

Reference	Road Link	Vehicles	
		Total Vehicles	HGV
1	A34 South of M40 J9	1.2%	0.0%
2	A41 North of M40 J9	2.4%	0.0%
3	A41 South of Vendee Drive Roundabout	0.5%	0.0%
4	A41 North of Vendee Drive Roundabout	0.4%	0.0%
5	Vendee Drive	0.1%	0.0%

Table 5.26 Summary of Impact as a Result of the Proposed Development (2024 PM)

Reference	Road Link	Vehicles	
		Total Vehicles	HGV
1	A34 South of M40 J9	0.8%	0.0%
2	A41 North of M40 J9	1.8%	0.0%
3	A41 South of Vendee Drive Roundabout	0.4%	0.0%
4	A41 North of Vendee Drive Roundabout	0.3%	0.0%
5	Vendee Drive	0.1%	0.0%

Table 5.27 Summary of Impact as a Result of the Proposed Development (2031 AADT)

Reference	Road Link	Vehicles	
		Total Vehicles	HGV
1	A34 South of M40 J9	1.3%	0.4%
2	A41 North of M40 J9	5.2%	1.6%
3	A41 South of Vendee Drive	0.9%	0.0%

	Roundabout		
4	A41 North of Vendee Drive Roundabout	0.7%	0.0%
5	Vendee Drive	0.3%	0.0%

Table 5.28 Summary of Impact as a Result of the Proposed Development (2031 AM)

Reference	**Road Link**	**Vehicles**	
		Total Vehicles	**HGV**
1	A34 South of M40 J9	0.8%	0.0%
2	A41 North of M40 J9	2.5%	0.0%
3	A41 South of Vendee Drive Roundabout	0.5%	0.0%
4	A41 North of Vendee Drive Roundabout	0.4%	0.0%
5	Vendee Drive	0.1%	0.0%

Table 5.29 Summary of Impact as a Result of the Proposed Development (2031 PM)

Reference	**Road Link**	**Vehicles**	
		Total Vehicles	**HGV**
1	A34 South of M40 J9	0.6%	0.0%
2	A41 North of M40 J9	2.3%	0.0%
3	A41 South of Vendee Drive Roundabout	0.4%	0.0%
4	A41 North of Vendee Drive Roundabout	0.3%	0.0%
5	Vendee Drive	0.1%	0.0%

5.11.5 The results of the predicted traffic flows arising from the development indicate that the potential impact on all of the links, range from 0% to 3.8% increase in 2024 and 0% to 5.2% in 2031. In addition to this, HGV flows are expected to increase by between 0% and 2.4% in 2024 and 0% to 1.6% in 2031.

5.11.6 It is noted that the 2031 sensitivity test experiences a larger percentage impact. The reason for this is the different data sources used (i.e. surveys against BTM data) and therefore flows are lower on certain arms, particularly the A41 approach of the M40 J9. As previously stated, the BTM data has not been validated at M40 J9, and therefore the 2031 sensitivity test should be treated with caution. Notwithstanding the above, it does not change the conclusions, namely the effect of the Proposed Development will be negligible.

5.11.7 On the basis of the evidence presented above it is evident that the increases in traffic associated with the Proposed Development do not exceed either of the tests that are referred to in the IEMA guidance. As a result, there is not a requirement to undertake any detailed assessment of the transport effects of the Proposed Development.

5.11.8 Notwithstanding this, it is accordingly concluded that the Proposed Development will have an overall permanent, beneficial effect of minor significance upon:

- Pedestrian Severance and Amenity, when considered against the criteria set out in Table 5.5 and taking into account the access for the Site incorporates dedicated crossing facilities that will enhance access to/from Wendlebury for existing residents wishing to

access the PRoW network and bus stops located on the A41

- Pedestrian and Cyclist Delay, for the same reasons outlined above with respect to severance, and ongoing discussions with OCC about how best to provide a cycle connection to the Site.
- Accidents and Safety, as the proposed access will:
  i. act as a natural speed restraint given vehicles will be required to stop for red lights of the traffic signalling control sequencing.
  ii. will significantly enhance pedestrian safety when compared to the existing informal crossing point, through the inclusion of dedicated pedestrian crossing stages in the traffic signalling control sequencing.

5.11.9 It is also concluded that the Proposed Development will have a permanent and negligible effect upon:

- Driver Delay, as the increases in traffic are comfortably within accepted daily fluctuations in traffic flows (i.e. +/- 10%) and the detailed junction modelling results presented in the TA show the Proposed Development is expected to result in relatively modest reductions in residual capacity at the assessment junctions shown at Figure 5.2.
- Fear and Intimidation, as the increases in traffic on the assessment links do not result in the links shifting into a higher threshold category as set out in Table 5.5.

Impact 2: Mitigation

5.11.10 On the basis of the above, no further mitigation to those linked to the design interventions is required.

Impact 2: Residual Effect

5.11.11 As no further mitigation is proposed the residual effect remains as follows in Table 5.30 overleaf.

Table 5.30 Residual Effects

Receptor	Description of the Residual Effect	Scale and Nature	Beneficial/ Adverse	Geo	DI	PT	St Mt Lt
Construction							
All of the options listed in Table 5.4	Pedestrian severance	Negligible	N/A	L	D	T	St
	Pedestrian delay						
	Pedestrian amenity						
	Driver delay						
	Fear and Intimidation						
	Road Safety						
Completed Development							
All of the options listed in Table 5.4	Pedestrian severance	Minor	Beneficial	L	D	P	Lt
	Pedestrian delay						
	Pedestrian amenity						
	Road Safety		N/A	L	D	P	Lt
	Fear and Intimidation	Negligible					
	Driver delay						

Notes:
Residual Effect, Scale = Negligible / Minor / Moderate / Major; Nature = Beneficial or Adverse; Geo (Geographic Extent) = Local (L), Borough (B), Regional (R), National (N); D = Direct / I = Indirect ;P = Permanent / T = Temporary; St = Short Term / Mt = Medium Term / Lt = Long Term N/A = not applicable / not assessed.

5.12 Cumulative Effects

Inter-topic Relationship Effects

5.12.1 The cumulative increases in traffic associated with the construction and operational phases will have an effect on Air Quality and Noise in the local area. These effects are evaluated in Chapters 6 and 7 and confirm that the Proposed Development will have a:

- Negligible effect from an Air Quality perspective once construction control interventions are taken into account.
- Negligible residual effect from a Noise perspective during construction, and a negligible to low residual effect as a result of operational noise.

Third Party Development Cumulative Effects

5.12.2 This section of the chapter assesses the Transport effects of the Proposed Development in combination with other Transport effects of committed developments Table 5.1. For the purposes of this assessment, consideration is given to both the construction and operational phases.

Construction Phase

5.12.3 The location of the Committed Developments to the Site is such that the potential for any overlap of construction vehicles associated with the committed developments and that of the Proposed Development will be focused on J9 of the M40.

5.12.4 Given the increases in construction traffic associated with the Proposed Development are comfortably within the increases in traffic associated with its operational phase (i.e. 1,888 vehicles per day), which have been established to have, at worse, a negligible effect upon the surrounding transport networks, it is considered that the cumulative construction effects of these schemes would be Negligible and temporary in nature. This is particularly evident given that:

- the Proposed Development and committed schemes will be expected to operate CTMPs that minimise the effects of construction traffic.
- the scale and planning status of the respective schemes are such that the likelihood of the construction programmes overlapping being low.

Operational Phase

5.12.5 The location of the Proposed Development with respect to the committed developments is such that it will not lead to a significant overlap in the origin and destination profiles of people that will travel to and from these developments once they are operational. This is particularly evident when considering the distribution profiles of development set out in the TA, which shows 85% of all traffic will have an origin to the south west of Bicester.

5.12.6 Moreover, on-site observations have established the study area is characterised by relatively low pedestrian/cyclist activity and as such it is considered that there are no inherent capacity constraints that will be exacerbated by the committed developments. Similarly, safety records do not suggest that there is any particular safety concern with respect to pedestrians and cyclists.

5.12.7 In this regard, it is considered that the cumulative effects of the major developments identified

are likely to have a permanent and negligible (Not Significant) effect on the pedestrian and cycle networks in environmental terms. This is particularly evident given that it has been established that the Proposed Development will deliver a comprehensive package of improvements to the existing network that will benefit future users of the Site and the existing residents of Wendlebury through enhanced access to the PRoW and public transport networks.

5.12.8 When considering the cumulative impact of the Proposed Development upon public transport, it should be noted that on-site observations suggest that the bus services that operate within the vicinity of the Site do not currently operate at capacity. As such, the cumulative effects of the Proposed Development will result in a permanent and negligible (Not Significant) effect on the local bus services in environmental terms.

5.12.9 The cumulative effects of the committed developments upon the adjacent highway network has already been taken into account in the analyses presented above. The cumulative effects of the Proposed Development is thus considered to be permanent and Negligible (Not Significant) given the conclusions reached with respect to 'Driver Delay' and 'Accidents and Safety'.

5.13 Implications of Climate Change

5.13.1 As part of the proposals at the Site, a Travel Plan will be in operation. This will seek to encourage future employees at the Site to travel by sustainable methods and away from the private car. In addition, there are a number of EV parking spaces proposed at the Site, which aligns with government policy. Furthermore, there are bus stops located adjacent to the Site and as such there are opportunities to facilitate travel by bus to and from the Site. As bus fleets across England become electrified, this will assist with further reducing greenhouse gas emissions associated with bus travel.

5.13.2 It is noted that there will be unavoidable greenhouse gas emissions resulting from the construction of the Proposed Development. It is expected that the CTMP will encourage construction workers to travel to the Site using sustainable modes of travel where feasible to do so.

5.14 Summary

5.14.1 None of the residual effects of the Siemens Healthineers operation at the Site are considered to be significant.

6 Air quality

6.1 Introduction

6.1.1 This chapter of the ES considers the potential air quality effects associated with the construction and operation of the Proposed Development (see Chapter 2 for a detailed description of the Proposed Development).

6.1.2 The chapter describes the scope, relevant legislation and planning policy, assessment methodology and the baseline conditions currently existing at the Site and the surrounding area. It then considers any potentially significant environmental effects that the Proposed Development would have on this baseline environment and the mitigation measures required to prevent, reduce, or offset any significant adverse effects; and the likely residual impacts after those measures have been employed.

6.1.3 The chapter is supported by Appendices 6.1 to 6.5.

Assessment Scope

6.1.4 The assessment scope has been developed on the basis of the Scoping Opinion prepared by Cherwell District Council (CDC) and further consultation with the CDC Environmental Health department. The scope comprises:

- Baseline evaluation – assessment of existing air quality in the local area;
- Construction phase assessment – identification and assessment of potential air quality impacts and effects associated with the construction phase of the Proposed Development;
- Operational phase assessment – identification and assessment of potential impacts and effects of pollutant emissions from the traffic associated with the operational phase of the Proposed Development; and
- Mitigation Measures – Identification of appropriate mitigation measures.

Legislation and Local Policy

Legislative Context

Air Quality Strategy

6.1.5 The 'Air Quality Strategy for England, Scotland, Wales and Northern Ireland' (AQS) 2007, contains air quality objectives based on the protection of both human health and vegetation (ecosystems).

6.1.6 The AQS provides the over-arching strategic framework for air quality management in the UK and contains statutory national air quality Objectives established by the UK Government and Devolved Administrations for the protection of public health and the environment.

6.1.7 The AQS objectives apply at locations outside buildings or other natural or man-made structures above or below ground, where members of the public are regularly present and might reasonably be expected to be exposed to pollutant concentrations over the relevant averaging period – herein referred to as relevant exposure. Table 6.2 provides an indication of those locations.

6.1.8 The ambient air quality standards of relevance to human receptors in this assessment (collectively termed Air Quality Assessment Levels (AQALs) throughout this report) are provided in Table 6.1.

Table 6.1 AQALs of relevance to this assessment

Pollutant	Standard (µg/m^3)	Measured As	
Nitrogen Dioxide (NO_2)	40	Annual Mean	-
	200	1-hour Mean	Not to be exceeded more than 18 times a calendar year
Particles (PM_{10})	40	Annual Mean	-
	50	24-hour mean	Not to be exceeded more than 35 times a calendar year
Particles ($PM_{2.5}$)	25	Annual Mean	-

Table 6.2 Human health relevant exposure

AQAL Averaging Period	AQALs should apply at	AQALs should not apply at
Annual Mean	Building facades of residential properties, schools, hospitals etc.	Facades of offices Hotels Gardens of residences Kerbside sites
24-hour Mean	As above together with hotels and gardens of residential properties	Kerbside sites where public exposure is expected to be short term
1-hour Mean	As above together with kerbside sites of regular access, car parks, bus stations etc.	Kerbside sites where public would not be expected to have regular access

Local Air Quality Management

6.1.9 Part IV of the Environment Act 1995 places a statutory duty on local authorities to undergo a process of Local Air Quality Management (LAQM). This requires local authorities to Review and Assess air quality within their boundaries to determine the likeliness of compliance, regularly and systematically.

6.1.10 Where any of the prescribed AQS objectives are not likely to be achieved, the authority must designate an Air Quality Management Area (AQMA). For each AQMA, the local authority is required to prepare an Air Quality Action Plan (AQAP), which details measures the authority intends to introduce to deliver improvements in local air quality in pursuit of the objective. AQMAs can give rise to potential constraints to development, or at least a higher degree of scrutiny to air quality assessment work. Local authorities therefore have formal powers to control air quality through a combination of LAQM and through application of wider planning policies.

Clean Air Strategy

6.1.11 The Clean Air Strategy (CAS), published in 2019, sets out the Government's proposals aimed at delivering cleaner air in England, and indicates how devolved administrations intend to make emissions reductions. It sets out the comprehensive action that is required from across all parts of government and society to deliver clean air.

General Nuisance Legislation

6.1.12 Part III of the Environmental Protection Act (EPA) 1990 (as amended) contains the main legislation on Statutory Nuisance and allows Local Authorities and individuals to take action to prevent a statutory nuisance. Section 79 of the EPA defines dust as a potential Statutory Nuisance amongst other things emitted from industrial, premises so as to be prejudicial to health or a nuisance. It also defines as a nuisance, accumulation or deposit, which is prejudicial to health.

6.1.13 In contrast to suspended particulate matter, there are no UK or European statutory standards

that define the point at which deposited dust causes annoyance or affects amenity. Nuisance is a subjective concept and its perception is highly dependent upon the existing conditions and the change which has occurred.

Planning Policy

6.1.14 The following policies have been considered within this assessment.

National Policy

6.1.15 The 2021 update to the National Planning Policy Framework (NPPF) describes the policy context in relation to air pollutants:

'Para 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 […] air […] pollution […]. Development should, wherever possible, help to improve local environmental conditions such as air […] quality […]'

'Para 185: 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.'

6.1.16 Specifically, in terms of development with regards to air quality:

'Para 186: 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.'

6.1.17 The NPPF is accompanied by web based supporting Planning Practice Guidance (PPG) which includes guiding principles on how planning can take account of the impacts of new development on air quality. In regard to air quality, the PPG states:

'Defra carries out an annual national assessment of air quality using modelling and monitoring to determine compliance with EU Limit Values […] It is important that the potential impact of new development on air quality is taken into account […] where the national assessment indicates that relevant limits have been exceeded or are near the limit.'

'Whether or not air quality is relevant to a planning decision will depend on the proposed development and its location. Concerns could arise if the development is likely to generate air quality impacts in an area where air quality is known to be poor. They could also arise where the development is likely to adversely impact upon the implementation of air quality strategies and action plans and/or, in particular, lead to a breach of the EU legislation (including that applicable to wildlife).'

6.1.18 The PPG sets out the information that may be required within the context of a supporting air quality assessment, stating that "*assessments should be proportional to the nature and scale of development proposed and the level of concern about air quality* […] *mitigation options where necessary, will depend on the proposed development and should be proportionate to the likely impact."*

6.1.19 The policies within the NPPF and accompanying PPG in relation to air pollution are considered within this air quality assessment.

Local Policy

6.1.20 The Cherwell Local Plan 2011 - 2031 was re-adopted by CDC incorporating policy Bicester 13 on 19th December 2016. The following policy relates to air quality:

Policy ESD10: Protection and Enhancement of Biodiversity and the Natural Environment Air Quality:

'Protection and enhancement of biodiversity and the natural environment will be achieved by the following:

[…]

Air quality assessments will also be required for development proposals that would be likely to have a significant adverse impact on biodiversity by generating an increase in air pollution.'

6.1.21 The above policy is addressed by this assessment.

6.2 Assessment methodology

Key Assessment Guidance

6.2.1 This assessment has been carried out in accordance with the principles contained within the guidance documents below:

- Department of Environment Food and Rural Affairs (Defra): LAQM Technical Guidance (2016) (LAQM.TG(16));
- Defra: COVID-19: Supplementary Guidance. Local Air Quality Management Reporting in 2021;
- Environmental Protection UK (EPUK) and Institute of Air Quality Management (IAQM): Land-use Planning & Development Control: Planning and Development Control: Planning for Air Quality (2017); and
- Highways England: LA 105; and
- IAQM: Guidance on the Assessment of Dust from Demolition and Construction (2016).

Construction Phase

6.2.2 The assessment of impacts associated with the generation of dust as a result of the construction phase has been undertaken with reference to the IAQM guidance. The assessment of risk is determined by considering the risk of dust effects arising from four activities, initially in the absence of mitigation:

- demolition;
- earthworks;
- construction; and
- trackout.

6.2.3 The assessment methodology considers three separate dust impacts with account being taken of the sensitivity of the area that may experience these effects;

- annoyance due to dust soiling;
- the risk of health effects due to an increase in exposure to PM_{10}; and
- harm to ecological receptors.

6.2.4 The first stage of the assessment involves a screening to determine if there are sensitive receptors within threshold distances of site activities associated with the construction phase of the scheme. A detailed assessment is required where a:

- human receptor is located within 350m of the Site, and/or within 50m of routes used by construction vehicles, up to 500m from the Site entrance(s); and/or
- ecological receptor is located within 50m of the Site, and/or within 50m of routes used by construction vehicles, up to 500m from the Site entrance(s).

6.2.5 The dust emission class (or magnitude) for each activity is determined based on the guidance, indicative thresholds and expert judgement. The risk of dust effects arising is based upon the relationship between the dust emission magnitude and the sensitivity of the area. The risk of impact is then used to determine the appropriate mitigation requirements, whereby through effective application, residual effects are considered to be 'not significant'.

6.2.6 Heavy Duty Vehicle (HDV = vehicles >3.5t gross weight) movements on the A41 are predicted to be less than 100 Annual Average Daily Trips (AADT). Therefore, according to EPUK-IAQM screening guidance the requirement for a detailed assessment can be screened out.

Construction Phase Assessment of Significance

6.2.7 The potential for significant construction dust effects has been assessed using the IAQM guidance. The risk of dust effects arising is based upon the relationship between the dust emission magnitude and the sensitivity of the area, and is classified as negligible risk, low risk, medium risk, or high risk. The risk of impact is then used to determine the appropriate mitigation requirements, whereby through effective application, residual effects are considered to be 'not significant'.

Operational Phase

6.2.8 In order to assess the effects from road traffic emissions associated with the operational phase of the Proposed Development, a screening for 'affected' roads has first been undertaken to inform the spatial extent of the assessment. Affected roads have been identified by reference to EPUK-IAQM screening criteria for 'significant changes' in traffic, i.e.:

- a change of Light Duty Vehicles (LDV = vehicles <3.5t gross weight) flows of more than 500 AADT (outside an AQMA);
- a change of HDV flows of more than 100 AADT (outside an AQMA);
- a change of LDV flows of more than 100 AADT (within or adjacent to an AQMA); and/or
- a change of HDV flows of more than 25 AADT (within or adjacent an AQMA).

6.2.9 The extent of the affected road network was limited to the A41 and A34. Consideration was given to nearby AQMAs (including the AQMA No.4 located within the centre of Bicester), however road traffic flows screened below the relevant thresholds.

6.2.10 Receptors within 200m of the affected roads have been considered, as per LA 105. No ecological designation is located within 200m of an affected road, so an assessment on sensitive ecological habitats has been scoped out.

6.2.11 The impact at receptors in proximity to 'affected' roads, has been assessed using detailed dispersion modelling undertaken using the Cambridge Environmental Research Consultants (CERC) ADMS-Roads version v5.0.0.1, focussing on concentrations of NO_2, PM_{10} and $PM_{2.5}$ for the following scenarios:

- 2019 Baseline / model verification (2019 BC) – Base flows for the year 2019;
- 2024 Do Minimum (2024 DM) – Without development flows for the assumed year of opening (2024), inclusive of any relevant committed development flows; and
- 2024 Do Something (2024 DS) – With development flows for the proposed year of opening (2024), inclusive of any relevant committed development flows.

6.2.12 For the 2024 future year scenario, 2024 projected emission factors and background pollutant concentrations have been applied. The assessment of road traffic emissions addresses cumulative effect, in that the future scenarios (DM and DS) take account of committed developments (and associated traffic flows) within the study area.

6.2.13 Further details of the road traffic emissions assessment methodology applied are provided in Appendix 6.1, whilst the modelled roads in relation to the Site are presented in Appendix 6.4.

Assessment of Significance

6.2.14 Significance criteria as provided within EPUK-IAQM guidance has been used for the purpose of informing effects arising from road traffic emissions on human receptors.

6.2.15 The guidance provides a method for identifying impacts at a specific receptor, taking into account the resultant total concentration as well as the magnitude of change in relation to the respective AQAL (see Table 6.3).

Table 6.3 EPUK-IAQM impact descriptors for receptors

Long Term Average Concentration at Receptor in Assessment Year	Change in Concentration Relative to AQAL			
	1% (A)	2-5%	6-10%	>10%
75% or less of AQAL	Negligible	Negligible	Slight	Moderate
76-94% of AQAL	Negligible	Slight	Moderate	Moderate
95-102% of AQAL	Slight	Moderate	Moderate	Substantial
103-109% of AQAL	Moderate	Moderate	Substantial	Substantial
110% or more of AQAL	Moderate	Substantial	Substantial	Substantial

Table note:
(A) Changes of 0%, i.e. less than 0.5% will be described as Negligible.

6.2.16 Following derivation of impacts at all receptor locations assessed, the overall significance of the 'effect' is determined based upon consideration, as necessary, of the following factors:

- the existing and future air quality in the absence of the development;
- the extent of current and future population exposure to the impacts;
- the worst-case assumptions adopted when undertaking the prediction of impacts; and
- the extent to which the Proposed Development has adopted best practice to eliminate and minimise emissions.

Consultation

6.2.17 In addition to the EIA scoping exercise, consultation has been undertaken directly with the Environmental Health Officer (EHO) at CDC to agree on the scope and methodology of the assessment (Appendix 6.5).

Assumptions and Limitations

Construction Phase Assessment

6.2.18 The construction dust assessment is primarily a tool to identify the proportionate level of

mitigation required for anticipated construction activities.

6.2.19 Resultant effects ultimately depend on the effective application of this mitigation. Therefore, there can be uncertainty on the representativity of the assessment procedure and associated post-mitigated outcomes if mitigation is not implemented. In response to this limitation, construction dust mitigation is typically secured by a planning condition and/or included within a Construction Environmental Management Plan (CEMP) (or similar).

6.2.20 It is acknowledged that there may be current uncertainties surrounding the proposed construction activities which may affect the validity or representativity of the assessment and associated outcomes. Where Site specific information is not known, a worst-case approach has been adopted with regards anticipated construction activities. Furthermore, the Site boundary has been used for the purposes of defining the distance to potential dust sources (i.e. decreasing the separation distance(s) to nearby sensitive receptors applied in the assessment). As such, potential risks calculated are intended to be precautionary (worst case), which may result in a higher level of mitigation being recommended than would realistically be required, providing greater confidence in the representativity of the assessment outcomes.

Operational Phase Assessment

6.2.21 Dispersion modelling is principally reliant on the accuracy and representativity of its inputs. In acknowledgement of this, the ADMS-Roads dispersion model has been verified with the latest representative publicly available local monitoring data, as collected by CDC – to ensure consistency.

6.2.22 In addition, there is a widely acknowledged disparity between emission factors and ambient monitoring data. To help minimise any associated uncertainty when forming conclusions from the results, this assessment has utilised the latest Emissions Factors Toolkit (EFT) version 10.1 utilising COPERT 5.3 emission factors, and associated tools/datasets published by Defra.

6.2.23 In addition, from review of local monitoring data presented, NO_2 concentrations are broadly reducing, correlating to national projections and assumptions embedded within the tools and datasets employed within this assessment. This provides a greater confidence and certainty in the use of these national datasets within the local setting.

6.3 Baseline conditions

6.3.1 Monitoring data collected prior to the COVID-19 pandemic (i.e. pre-2020) has been used to characterise the baseline environment, as pollutant concentrations monitored during 2020 and 2021 are expected to be atypical, and not representative of the local environment and have therefore not been considered.

LAQM Review and Assessment

6.3.2 CDC, in fulfilment of statutory requirements, has conducted an on-going exercise to review and assess air quality within their administrative area. The latest publicly available LAQM report for CDC (not impacted by the COVID-19 pandemic) at the time of writing is the 2020 Annual Status Report (ASR).

6.3.3 CDC has designated four AQMAs due to elevated annual mean concentrations of NO_2 at locations of relevant exposure. The Proposed Development is located 3.1km south-west of the nearest AQMA (AQMA No.4) located within Bicester. The increase in traffic flows into or adjacent to the AQMA are below the applied EPUK-IAQM criteria (i.e. changes in traffic can be

concluded to have 'insignificant effects') and therefore the AQMA falls outside the Study Area.

6.3.4 The Site is outside of an AQMA.

Review of Air Quality Monitoring

Automatic Monitoring

6.3.5 Following a review of both national and local monitoring networks, the nearest continuous monitor is located >10km from the Site. Given the separation distance, and anticipated differences in local environments, no automatic monitoring locations have been considered.

Non-Automatic Monitoring

6.3.6 Passive NO_2 diffusion tube monitoring is currently undertaken by CDC within the development locale, although most are situated within Bicester and not within the spatial extent of the model domain.

6.3.7 The details and results of the monitoring locations of relevance to the Site (i.e. within 6km of the Site and adjacent to the affected road network) are presented in Table 6.4 and Table 6.5 respectively, whilst their locations are illustrated in Appendix 6.4.

6.3.8 All monitoring data presented has been ratified by CDC.

Table 6.4 Local diffusion tube monitoring sites: details

Site ID	Site Name	Site Type	NGR (m)		Height (m)	Within AQMA?	Distance to Site (km)
			X	Y			
DT18	Villiers Road	Urban Background	457619	222535	2	No	3.1
DT19	A41, Oxford Rd (Premier Inn)	Kerbside	458419	222334	2	No	3.5
DT20	Kings End South	Roadside	458006	222404	2	Yes	3.3
DT22	Field Street	Kerbside	458214	222836	2	Yes	3.7
DT23	North Street	Kerbside	458274	222935	2	Yes	3.8
DT24	Queens Avenue	Kerbside	458028	222471	2	Yes	3.3
DT28	Aylesbury Rd 2014	Roadside	459100	221190	2	No	3.6
DT29	London Road 2016	Roadside	458721	222115	2	No	3.6

Table 6.5 Local diffusion tube monitoring sites: results

Site ID	2019 Data Capture %	Annual Mean NO_2 Concentration ($\mu g/m^3$)				
		2015	2016	2017	2018	2019
DT18	100.0	16.9	18.2	17.9	17.2	17.0
DT19	100.0	-	-	-	-	25.5
DT20	100.0	**46.0**	**46.0**	**41.7**	**41.9**	**41.5**
DT22	100.0	36.5	34.3	33.5	31.6	32.1
DT23	100.0	41.8	37.9	36.5	37.6	35.6
DT24	100.0	**40.6**	**40.5**	39.5	35.0	35.6
DT28	100.0	30.5	30.0	28.8	29.5	26.7
DT29	92.0	-	29.1	26.3	25.7	23.6

Site ID	2019 Data Capture %	Annual Mean NO_2 Concentration (µg/m^3)				
		2015	2016	2017	2018	2019
Table note: Exceedances of the NO_2 annual mean AQAL (40µg/m^3) are displayed in **bold**.						

6.3.9 Exceedances of the AQAL have occurred at DT20 and DT24 relative to the period assessed (2015-2019). These monitoring locations are located within the AQMA No.4, roadside of the Kings End – a key arterial route within an urban environment contributing to stop/start conditions exacerbated by the presence of urban canyons limiting dispersion. These conditions are not comparable to those experienced on road links surrounding the Site (i.e. the affected road network). Concentrations recorded at DT24 achieved compliance with the AQAL from 2017 onwards – demonstrating local improvements in NO_2 concentrations at key roadside locations.

6.3.10 Annual mean NO_2 concentrations at the majority of sites have reduced over the period assessed, correlating somewhat to national projections, placing greater confidence in the applied assessment inputs and projections.

6.3.11 The empirical relationship given in LAQM.TG(16) states that exceedences of the 1-hour mean AQAL for NO_2 is unlikely to occur where annual mean concentrations are <60µg/m^3. This indicates that an exceedence of the 1-hour mean AQAL was unlikely to have occurred at the above locations for the period assessed.

Defra Mapped Background Concentrations

6.3.12 Defra maintains a nationwide model of existing and future background air quality concentrations at a 1km grid square resolution.

6.3.13 The Defra mapped background concentrations of NO_2, PM_{10} and $PM_{2.5}$ for the baseline year of 2019 and the predicted opening year of the development (2024) are presented in the Table 6.6 for those grid square of relevance to the assessment.

6.3.14 All of the mapped background concentrations presented are well below the respective annual mean AQALs.

Table 6.6 Defra mapped background pollutant concentrations

Grid Square (X, Y)	Year	Annual Mean Background Concentration (µg/m^3)			
		NOx	NO_2	PM_{10}	$PM_{2.5}$
456500, 219500	2019	15.1	11.4	15.1	9.6
	2024	11.7	9.0	14.2	8.9
455500, 219500	2019	26.3	18.9	17.2	10.6
	2024	18.9	14.0	16.2	9.8
454500, 218500	2019	18.0	13.4	16.9	10.4
	2024	13.6	10.4	16.0	9.7
453500, 217500	2019	18.4	13.7	17.8	10.7
	2024	13.9	10.6	16.9	9.9

Future Baseline

6.3.15 Baseline air quality conditions are expected to evolve during the interim period, prior to construction and operation commencing.

6.3.16 As discussed above, NO_2 concentrations monitored in proximity to the Site remain stable, with

a long-term downward trend between the year 2015 and 2019 observed at key roadside locations.

6.3.17 Air quality is expected to improve in future years, with the introduction of electric vehicles and more stringent emission standards, as well as the recent enforcement of local and national policy and initiatives (CAS). With the introduction of these initiatives and cleaner technologies, pollutant concentrations reported locally are expected to reduce further, or at least remain comparable to those presented.

6.3.18 Local background future year projections provided by Defra (based upon semi-empirical evidence) are provided in Table 6.6. These data demonstrate the anticipated improvement in background pollutant concentrations for the local area, particularly for NO_2; given current emphasis, such as the Air Quality Plan for NO_2 in UK (Defra and DfT 2017).

6.4 Assessment of Likely Significant Effects

Construction Phase Dust Assessment

6.4.1 Where figures relating to area of the site, volume of the site, approximate number of construction vehicles or distances to receptors are given, these relate to thresholds as defined in the IAQM guidance to guide the assessor to define the dust emissions magnitude and sensitivity of the area.

Assessment Screening

6.4.2 There are 'human receptors' within 350m of the Site and an ecological designation (ancient woodland) within 50m of the Site boundary.

Potential Dust Emissions Magnitude

6.4.3 The potential dust emission magnitude for each activity has been assessed and assigned on the basis of the criteria presented in the IAQM guidance and is presented in Table 6.7.

Table 6.7 Potential dust emission magnitude

Activity	Considerations	Magnitude
Demolition	At the north-eastern extent of the Site boundary there are 7 agricultural barns which will require demolition. These are assumed to be approximately 20,000m^3 – 50,000m^3 in building volume, and constructed with materials of low dust generation potential (i.e. steel and metal cladding), and require demolition activities less than 10m above ground level.	Small
Earthworks	The majority of the Site is agricultural land. Site earthworks are required over an area >10,000m^2. A bund is proposed along the northern and north-eastern arm of the Site boundary. >10 heavy earth moving vehicles may be active at any one time	Large
Construction	The total building volume associated with the Proposed Development is predicted to be >100,000m^3, i.e. 'Large'. However, construction materials largely consist of a steel frame and metal cladding of lower dust potential.	Medium
Trackout	Given the scale and nature of works required, it is considered that there could be >10 HDV outward movements on a worst-case day. However, access roads will be paved following initial construction phases and therefore HDVs will travel over minimal unpaved areas for the majority of the construction phase period.	Medium

Sensitivity of the Area

Dust Soiling Impacts

6.4.4 There are no sensitive receptors within 20m of the Site. There are 1-10 existing residential

properties (highly sensitive receptors) within 100m of the Site. There are also 1-10 residential receptors (highly sensitive receptors) less than 50m from the access routes within 200m of the Site entrance (commensurate of a medium site).

6.4.5 The sensitivity of the area with respect to dust soiling effects on people and property in relation to demolition, earthworks construction and trackout is therefore considered to be 'low'.

Human Health Impacts

6.4.6 The maximum 2019 mapped background PM_{10} concentration (2018 reference year) for the $1km^2$ grid squares centred on the Site is estimated to be $17.2\mu g/m^3$ (i.e. falls into the $<24\mu g/m^3$ class).

6.4.7 Given the above information regarding the number of residential receptors within 100m of the Site and within 50m of the identified trackout routes, the sensitivity of the area with respect to human health impacts for all activities is therefore considered to be 'low'.

Ecological Impacts

6.4.8 There is one ecological designation within 20m of the Site boundary. This relates to an AW designation, situated on the western extent of the Site. No ecological designations are within 50m of the identified trackout routes.

6.4.9 The sensitivity of the area with respect to ecological impacts for all non-trackout activities is therefore considered to be 'low'.

Summary

6.4.10 A summary of the sensitivity of the surrounding area is detailed in Table 6.8, whilst the spatial density of nearby receptors is provided in Appendix 6.4.

Table 6.8 Sensitivity of the area

Potential Impact	Demolition	Earthworks	Construction	Trackout
Dust Soiling	Low	Low	Low	Low
Human Health	Low	Low	Low	Low
Ecological Receptor	Low	Low	Low	-

Risk of Impacts (Unmitigated)

6.4.11 Table 6.9 presents the risk of impacts which is used to inform the selection of appropriate mitigation.

Table 6.9 Risk of Dust Impacts

Potential Impact	Demolition	Earthworks	Construction	Trackout
Dust Soiling	Negligible	Low Risk	Low Risk	Low Risk
Human Health	Negligible	Low Risk	Low Risk	Low Risk
Ecological Receptor	Negligible	Low Risk	Low Risk	-

6.4.12 The construction phase is found to be 'Low Risk' in relation to dust soiling effects on people and property, human health impacts and ecological impacts. Potential dust effects during the construction phase are considered to be temporary in nature and may only arise at particular times (i.e. certain activities and/or meteorological conditions).

6.5 Operational Phase Assessment

6.5.1 This section presents the potential air quality impacts and effects associated with the operation of the Proposed Development.

NO_2 Modelling Results

6.5.2 Table 6.10 presents the annual mean NO_2 concentrations predicted at all assessed receptor locations for the 2019 BC, 2024 DM and 2024 DS scenarios.

Table 6.10 Predicted annual mean NO_2 concentrations

Receptor	Predicted Annual Mean NO_2 Concentration (µg/m^3)			% Change of AQAL	% of 2024 DS Relative to AQAL	Impact Descriptor
	2019 BC	2024 DM	2024 DS			
R1	18.6	13.9	14.0	0.2	35.0	Negligible (A)
R2	30.0	21.8	22.5	1.6	56.3	Negligible (A)
R3	17.4	13.1	13.2	0.2	33.0	Negligible (A)
R4	28.9	21.0	21.5	1.4	53.8	Negligible (A)
R5	26.7	18.5	18.6	0.4	46.5	Negligible (A)
R6	26.7	18.6	18.7	0.3	46.8	Negligible (A)
R7	18.5	13.8	13.9	0.2	34.8	Negligible (A)
R8	25.2	18.4	18.6	0.6	46.5	Negligible (A)
R9	32.3	23.4	24.3	N/A - Short Term Exposure Only		

6.5.3 The maximum predicted annual mean NO_2 concentration at the existing receptors of relevant exposure during the 2019 BC scenario was at Receptor R2 with a predicted concentration of 30.0µg/m^3; this represents 75% of the AQAL. Receptor R2 is located at a façade of a residential property off Church Lane, nearest to the A41.

6.5.4 The maximum predicted annual mean NO_2 concentration at existing receptors of relevant exposure with the development in place (2024 DS) was at Receptor R2 with a predicted concentration of 22.5µg/m^3; this represents 56.3% of the AQAL. The greatest predicted increase in annual mean NO_2 concentrations relative to the AQAL due to the Proposed Development (2024 DM vs. 2024 DS) at relevant receptor locations was 1.6% at Receptor R2.

6.5.5 In accordance with EPUK-IAQM guidance, the impact of the development on annual mean NO_2 concentrations at all assessed existing receptors is considered to be 'negligible'. Given the marginal increase in annual mean NO_2 concentrations associated with the Proposed Development, and that there are no predicted exceedances of the annual mean NO_2 AQAL, unmitigated effects associated with annual mean NO_2 concentrations at all assessed receptor locations are therefore considered to be 'not significant'.

6.5.6 The empirical relationship given in LAQM.TG(16) states that exceedences of the 1-hour mean NO_2 AQAL are unlikely to occur where annual mean concentrations are <60µg/m^3. Annual mean NO_2 concentrations predicted at all receptor locations are well below this limit. Therefore, it is unlikely that an exceedance of the 1-hour mean objective will occur. Effects associated with likely 1-hour mean NO_2 concentrations at all assessed receptor locations are therefore considered to be 'not significant'.

PM_{10} Modelling Results

6.5.7 Table 6.11 presents the annual mean PM_{10} concentrations predicted at all assessed receptor locations for the 2019 BC, 2024 DM and 2024 DS scenarios.

Table 6.11 Predicted annual mean PM_{10} concentrations

Receptor	Predicted Annual Mean PM_{10} Concentration (µg/m^3)			% Change of AQAL	% of 2024 DS Relative to AQAL	Impact Descriptor
	2019 BC	2024 DM	2024 DS			
R1	16.3	15.5	15.5	<0.1	38.8	Negligible (A)
R2	19.3	18.5	18.6	0.2	46.5	Negligible (A)
R3	16.1	15.3	15.3	<0.1	38.3	Negligible (A)
R4	19.1	18.3	18.3	0.2	45.8	Negligible (A)
R5	19.3	18.4	18.4	<0.1	46.0	Negligible (A)
R6	20.2	19.3	19.3	<0.1	48.3	Negligible (A)
R7	16.3	15.4	15.5	<0.1	38.8	Negligible (A)
R8	18.5	17.6	17.6	<0.1	44.0	Negligible (A)
R9	19.7	19.0	19.1	N/A - Short Term Exposure Only		

6.5.8 The maximum predicted annual mean PM_{10} concentration at the existing receptors of relevant exposure during the 2019 BC scenario was at Receptor R6 with a predicted concentration of 20.2µg/m^3; this represents 50.5% of the AQAL (i.e. 'well-below'). Receptor R6 is located at a façade of a residential property off the B430 Northampton Road, nearest to the A44.

6.5.9 The maximum predicted annual mean PM_{10} concentration at existing receptors of relevant exposure with the development in place (2024 DS) was at Receptor R6 with a predicted concentration of 19.3µg/m^3; this represents 48.3% of the AQAL (i.e. 'well-below'). The greatest predicted increase in annual mean PM_{10} concentrations relative to the AQAL due to the Proposed Development (2024 DM vs. 2024 DS) at relevant receptor locations was 0.2% at Receptors R2 and R4.

6.5.10 In accordance with EPUK-IAQM guidance, the impact of the development on annual mean PM_{10} concentrations at all assessed existing receptors is considered to be 'negligible'. Given the marginal increase in annual mean PM_{10} concentrations associated with the Proposed Development, and that there are no predicted exceedences of the annual mean PM_{10} AQAL, unmitigated effects associated with annual mean PM_{10} concentrations at all assessed receptor locations are therefore considered to be 'not significant'.

6.5.11 Based upon the maximum predicted annual mean PM_{10} concentration of 19.3µg/m^3 (predicted at Receptor R6 – 2024 DS), this equates to less than 3 days where 24-hour mean PM_{10} concentrations are predicted to be greater than 50µg/m^3. This is well below the 35 permitted exceedences, and therefore the number of maximum exceedences is in compliance with the 24-hour mean AQAL. Effects associated with likely 24-hour mean PM_{10} concentrations at all assessed receptor locations are therefore considered to be 'not significant'.

$PM_{2.5}$ Modelling Results

6.5.12 Table 6.12 presents the annual mean $PM_{2.5}$ concentrations predicted at all assessed receptor locations for the 2019 BC, 2024 DM and 2024 DS scenarios.

Table 6.12 Predicted annual mean $PM_{2.5}$ concentrations

Receptor	Predicted Annual Mean $PM_{2.5}$ Concentration (µg/m^3)			% Change of AQAL	% of 2024 DS Relative to AQAL	Impact Descriptor
	2019 BC	2024 DM	2024 DS			
R1	10.3	9.6	9.6	<0.1	38.4	Negligible (A)
R2	11.9	11.1	11.2	0.2	44.8	Negligible (A)
R3	10.2	9.5	9.5	<0.1	38.0	Negligible (A)
R4	11.7	11.0	11.0	0.2	44.0	Negligible (A)
R5	11.9	11.0	11.0	<0.1	44.0	Negligible (A)
R6	12.1	11.2	11.2	<0.1	44.8	Negligible (A)
R7	10.3	9.6	9.6	<0.1	38.4	Negligible (A)
R8	11.4	10.6	10.6	<0.1	42.4	Negligible (A)
R9	N/A - Short Term Exposure Only					

6.5.13 The maximum predicted annual mean $PM_{2.5}$ concentration at the existing receptors of relevant exposure during the 2019 BC scenario was at Receptor R6 with a predicted concentration of 12.1µg/m^3; this represents 48.4% of the AQAL (i.e. 'well-below').

6.5.14 The maximum predicted annual mean $PM_{2.5}$ concentration at existing receptors of relevant exposure with the development in place (2024 DS) was at Receptor R6 with a predicted concentration of 11.2µg/m^3; this represents 44.8% of the AQAL (i.e. 'well-below'). The greatest predicted increase in annual mean $PM_{2.5}$ concentrations relative to the AQAL due to the Proposed Development (2024 DM vs. 2024 DS) at relevant receptor locations was 0.2% at Receptors R2 and R4.

6.5.15 In accordance with EPUK-IAQM guidance, the impact of the development on annual mean $PM_{2.5}$concentrations at all assessed existing receptors is considered to be 'negligible'. Given the marginal increase in annual mean $PM_{2.5}$ concentrations associated with the Proposed Development, and that there are no predicted exceedences of the annual mean $PM_{2.5}$ AQAL, unmitigated effects associated with annual mean $PM_{2.5}$ concentrations at all assessed receptor locations are therefore considered to be 'not significant'.

6.6 Mitigation

Construction Phase

6.6.1 Commensurate with the calculated dust risk (i.e. low risk), mitigation measures, as described in IAQM guidance as representing best practice, have been identified to ensure that any potential impacts arising from the construction phase of the Proposed Development are reduced, and removed where possible.

6.6.2 These mitigation measures are presented in Appendix 6.3.

Operational Phase

6.6.3 In accordance with EPUK-IAQM guidance, the overall effect of the development on NO_2, PM_{10} and $PM_{2.5}$ concentrations at all assessed receptor locations is considered to be 'not significant'. As such, additional long-term scheme-specific mitigation measures are therefore not considered to be necessary.

6.6.4 Notwithstanding the above, a Travel Plan has been prepared to reduce single occupancy private

car trips to/from the Site in favour of more sustainable modes of transport. This measure is likely to have a benefit to local air quality, further to what has been assessed.

6.7 Residual effects

Construction Phase

6.7.1 With the effective application of the dust mitigation measures, as recommended in Appendix 6.3, it is considered that the overall effect at all receptors will be 'not significant'.

Operational Phase

6.7.2 Given the outcomes of the assessment, long-term scheme-specific mitigation measures in relation to operational effects arising from road traffic emissions are therefore not considered to be necessary. No mitigation is therefore proposed, and residual effects are not applicable in this instance, but can otherwise be assumed to be 'not significant' in the absence of mitigation.

6.8 Implications of Climate Change

6.8.1 The impact of climate change in respect of the UKCP18 climate change projections for central England is broadly described as resulting in '*greater chance of hotter, drier summers and warmer, wetter winters' by year 2070*. Hotter drier summers would potentially influence the dust mitigation requirements during construction operations, however given the short timescale with opening by 2024 the long-term climate change predictions are not considered to be of relevance to the assessment and will not affect the overall conclusions regards the significance of effects.

6.9 Cumulative effects

Construction Phase

6.9.1 Cumulative construction dust effects from neighbouring schemes may potentially occur where the zone of influence of concurrent activities overlap at an affected receptor. Based on the IAQM approach of applying a 350m screening distance for the zone of influence, a neighbouring construction site would need to be within 700m. None of the consented developments identified for the assessment of cumulative effects lie within 700m and as such cumulative effects during the construction phase can be considered 'not significant'.

Operational Phase

6.9.2 In considering the likely changes in road traffic flows that may occur on the local highway network as a result of the Proposed Development, consideration has been given to the potential maximum traffic flows that are likely to occur in the future assessment year (i.e. 2024) should the Proposed Development become fully operational. This has included vehicle movements associated with relevant committed developments in the assessment area.

6.9.3 As such, the dispersion modelling results presented are inherently cumulative in nature. The cumulative operational effect of the Proposed Development is therefore considered to be 'not significant'.

6.10 Summary

6.10.1 A summary of the assessment is set out in Table 6.13.

Construction Phase

6.10.2 A qualitative assessment of the potential dust impacts during the construction phase of the Proposed Development has been undertaken following the IAQM guidance.

6.10.3 Following the construction dust assessment, in the absence of mitigation the Site is found to have a 'Low Risk' in relation to dust soiling effects on people and property, human health and ecological impacts.

6.10.4 Providing mitigation measures are implemented, such as those outlined in Appendix 6.3, residual effects from dust emissions arising during the construction phase are considered to be 'not significant'.

6.10.5 Given the short-term nature of the construction phase, there is predicted to be an insignificant effect on air quality from construction-generated vehicle emissions.

Operational Phase

6.10.6 The assessment of operational phase effects considered impacts on all relevant existing receptors from road traffic emissions associated with the Proposed Development.

6.10.7 The ADMS-Roads dispersion model (version 5.0.0.1) was used to determine the likely NO_2, PM_{10} and $PM_{2.5}$ concentrations at all assessed receptor locations for a series of scenarios, in accordance with technical guidance presented in LAQM.TG(16).

6.10.8 Predicted pollutant concentration changes at existing receptor locations as a result of the Proposed Development were assessed using the EPUK-IAQM significance criteria.

6.10.9 In accordance with EPUK-IAQM guidance, the impacts of the Proposed Development on NO_2, PM_{10} and $PM_{2.5}$ concentrations at all assessed existing receptor locations are considered to be 'negligible'. Unmitigated effects associated with NO_2, PM_{10} and $PM_{2.5}$ concentrations at all assessed receptor locations are therefore considered 'not significant'.

6.11 References

CDC (2020). 2020 Annual Status Report.
Defra (2007). UK Air Quality Strategy.
Defra (2021). Local Air Quality Management Technical Guidance (TG16), April 2021.
Defra (2019). Clean Air Strategy.
Defra (2020). Defra Supplied Background Maps https://uk-air.defra.gov.uk/data/laqm-background-maps?year=2018
Defra and DfT (2017). Air Quality Plan for Nitrogen Dioxide in UK.
Highways England, Transport Scotland, Welsh Government and Department for Infrastructure (2019). Design Manual for Roads and Bridges LA105 Air Quality.
IAQM (2016). Guidance on the Assessment of Dust from Demolition and Construction.
IAQM and EPUK (2017). Land-Use Planning & Development Control: Planning for Air Quality.

Table 6.13 Summary of effects

Receptor	Sensitivity of Receptor	Nature of potential impact	Proposed mitigation	Residual effect	Significant / not significant
Construction phase					
Human receptors	High	Temporary / direct	Construction dust mitigation measures (Appendix 6.3)	Negligible	Not significant
Ecological receptors	Low	Temporary / direct	Construction dust mitigation measures (Appendix 6.3)	Negligible	Not significant
Operational phase					
Human receptors located adjacent to the affected road network.	High	Permanent / direct	Not required.	Negligible	Not significant

Mitigation commitments Summary

Table 6.14 Summary for Securing Mitigation

Identified receptor	Type and purpose of additional mitigation measure (prevent, reduce, offset, enhance)	Means by which mitigation may be secured (e.g. planning condition / legal agreement)	To be delivered by	Auditable by
Construction phase				
Human receptors	Reduce	Planning Condition	Construction contractor	CDC
Ecological receptors	Reduce	Planning Condition	Construction contractor	CDC
Operational phase				
N/A	N/A	N/A	N/A	N/A

7 Noise and vibration

7.1 Introduction

7.1.1 The study area encompasses the Site itself and extends to include the following sensitive receptor locations around the Site:

- Church Lane;
- Grange Farmhouse; and
- Half Mile House.

7.1.2 It is considered that the following assessments are required:

- The noise impact of construction.
- The noise impact of on-site traffic movements and fixed plant associated with the Development.
- The noise impact of increased traffic movements associated with the Development.

7.1.3 The likely significant effects of each identified potential impact above have been determined and are clearly detailed within this ES Chapter. Where necessary, suitable mitigation has been proposed and the likely residual impacts considered.

7.1.4 The assessments have been completed in accordance with the legislation and best practice methodologies detailed in the methodology section of this Report.

7.1.5 The assessment has been completed by a member of SLR's Acoustics Team who is a Corporate Member of the Institute of Acoustics (MIOA).

7.1.6 To assist the reader a Glossary of Terminology has been included in Appendix 07/01.

7.2 Guidance

7.2.1 This section of the Report references relevant National Planning Policy, and Local Planning Policy. British Standards and Guidance documents that the Application Site will be assessed against are then discussed.

National Planning Policy Framework (2021

7.2.2 The NPPF does not specify any noise limits to be applied to new development, rather at Paragraph 174 it states:

7.2.3 *"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…"*.

7.2.4 At Paragraph 185 the NPPF states:

"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:

- *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;

- *Identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason." (Paragraph 185)."*

Planning Practice Guidance

7.2.5 On 6 March 2014, the Department for Communities and Local Government (DCLG) launched the Planning Practice Guidance (PPG) web-based resource.

7.2.6 The section on noise includes a table that summarises "the noise exposure hierarchy" which offers "examples of outcomes" relevant to the 'No Observed Effect Level' (NOEL), 'Lowest Observed Adverse Effect Level' (LOAEL) and 'Significant Observed Adverse Effect Level' (SOAEL) effect levels described in the NPSE and discussed below. These outcomes are in descriptive form, there is still no numerical definition of the NOEL, LOAEL and SOAEL and no reference to the further research that was identified as necessary in the NPSE in 2010.

British Standards and Guidance Documents

7.2.7 The National and Local Policies detailed above have been informed by a number of British Standards and Guidance documents. Those British Standards and Guidance Documents that will be referenced in each assessment are detailed in Table 7.1.

Table 7.1 British Standards and Guidance Documents

Assessment	British Standards	Guidance Documents
1: Noise arising from construction activities, including construction traffic.	BS5228:2009+A1:2014 *Code of practice for noise and vibration control on construction and open sites – Part 1: Noise.*	-
2: Proposed commercial/industrial noise incident upon existing off-Site receptors	BS4142:2014:+A1:2019 *Methods for rating and assessing industrial and commercial sound*	-
3: The noise impact of development related traffic movements on transport existing sensitive receptors adjacent to links to and from the Site	-	Design Manual for Roads and Bridges Volume (DMRB) LAN 111 7 *Noise and Vibration*

7.2.8 The British Standards and Guidance documents referenced in Table 7.1 and to be used in each Assessment are discussed below.

Assessment One: Construction Noise

7.2.9 An assessment of construction will be undertaken at the nearest noise sensitive receptors to the Site. The levels would be predicted using the guidance contained in British Standard 5228:2009+A1:2014 *Code of practice for noise and vibration control on construction and open sites – Part 1: Noise*. This standard sets out a methodology for predicting noise levels arising from a wide variety of construction and related activities and contains tables of sound power levels generated by a wide variety of mobile and fixed plant equipment.

7.2.10 Compliance with BS5228-1:2009+A1:2014 is expected as a minimum standard when assessing

the impact of construction noise upon the existing noise environment at nearby sensitive receptors.

7.2.11 BS5228-1:2009+A1:2014 gives several examples of acceptable noise limits for construction or demolition noise. For this assessment as baseline noise data will be available, it is proposed that the ABC method will be used to determine the threshold value at the receptor locations.

7.2.12 Under the ABC method, a threshold value noise level is determined by establishing the existing ambient noise level at each location. This measured ambient noise level is then rounded to the nearest whole 5dB(A) and the threshold noise value for each receptor is then established from Table E.1 of BS5228-1:2009+A1:2014. This threshold value is the $L_{Aeq,T}$ noise level that should not be exceeded at the receptor location by operations at the site. In accordance with this method the threshold noise levels for a potentially significant effect are as detailed in Table 7.2.

Table 7.2 Construction Noise Residential Receptors – Example Threshold Values

Assessment category and threshold value period (L_{Aeq})	**Threshold value, in decibels (dB)**		
	Category A [A)]	**Category B [B)]**	**Category C [C)]**
Night-time (23.00-07.00)	45	50	55
Evenings and weekends D)	55	60	65
Daytime (07.00-19.00) and Saturdays (07.00-13.00)	65	70	75
NOTE1 A significant effect has been deemed to occur if the total LAeq noise level, including construction, exceeds the threshold level for the Category appropriate to the ambient noise level. NOTE 2 If the ambient noise level exceeds the threshold values given in the table (i.e. the ambient noise level is higher than the above values), then a significant effect is deemed to occur if the total LAeq noise level for the period increases by more than 3 dB due to construction activity. NOTE 3 Applied to residential receptors only.			
A) Category A: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are less than these values. B) Category B: threshold values to use when the ambient noise levels (when rounded to the nearest 5 dB) are the same as category A values. C) Category C: threshold values to use when the ambient noise levels (when rounded to the nearest 5 dB) are higher than category A values. D) 19.01-23.00 weekdays, 13.01-23.00 Saturdays and 07.01-23.00 Sundays.			

7.2.13 If the threshold value is exceeded, then the effect of construction noise upon nearby receptors may be significant. BS5228-1:2009+A1:2014 states that the significance of the effect will depend upon “other project-specific factors, such as the number of receptors affected and the duration and character of the impact” (Paragraph E.3.2). Whereby professional judgement will be used to determine whether an effect is considered to be significant, and commentary explaining the reasons for this judgement will be provided.

Assessment Two: Operational Noise

7.2.14 An assessment of operational noise will be undertaken at the nearest noise sensitive receptors to the Site. British Standard 4142:2014+A1:2019 Methods for rating and assessing industrial and commercial sound is intended to be used to assess the potential adverse impact of sound, of an industrial and/or commercial nature, at nearby noise-sensitive receptor locations within

the context of the existing sound environment.

7.2.15 Where the specific sound contains tonality, impulsivity and/or other sound characteristics, penalties should be applied depending on the perceptibility. For tonality a correction of either 0, 2, 4 or 6dB should be added and for impulsivity a correction of either 0, 3, 6 or 9dB should be added. If the sound contains specific sound features which are neither tonal nor impulsive, a penalty of 3dB should be added.

7.2.16 In addition, if the sound contains identifiable operational and non-operational periods, that are readily distinguishable against the existing sound environment, a further penalty of 3dB may be applied.

7.2.17 The assessment of impact contained in BS4142:2014+A1:2019 is undertaken by comparing the sound rating level, i.e. the specific sound level of the source plus any penalties, to the measured representative background sound level immediately outside the noise-sensitive receptor location. Consideration is then given to the context of the existing sound environment at the noise-sensitive receptor location to assess the potential impact.

7.2.18 Once an initial estimate of the impact is determined, by subtracting the measured background sound level from the rating sound level, BS4142:2014+A1:2019 states that the following should be considered:

- typically, the greater the difference, the greater the magnitude of the impact;
- a difference of around +10dB 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 an adverse impact, depending on the context; and
- the lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. It is an indication that the specific sound source has a low impact, depending on the context.

7.2.19 BS4142:2014+A1:2019 notes that, *"Adverse impacts include, but are not limited to, annoyance and sleep disturbance. Not all adverse impacts will lead to complaints and not every complaint is proof of an adverse impact."*

7.2.20 BS4142:2014+A1:2019 outlines guidance for the consideration of the context of the potential impact including consideration of the existing residual sound levels, location and/or absolute sound levels.

7.2.21 To account for the acoustic character of proposed sound sources, BS4142:2014+A1:2019 provides the following with respect to the application of penalties to account for "the subjective prominence of the character of the specific sound at the noise-sensitive locations and the extent to which such acoustically distinguishing characteristics will attract attention".

- Tonality – "*For sound ranging from not tonal to predominantly tonal the Joint Nordic Method gives a correction of between 0dB and +6dB for tonality. Subjectively, this can be converted to a penalty of 2dB for a tone which is just perceptible at the noise receptor, 4dB where it is clearly perceptible and 6dB where it is highly perceptible;*
- Impulsivity – *A correction of up to +9dB 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 3dB for*

impulsivity which is just perceptible at the noise receptor, 6dB where it is clearly perceptible, and 9dB where it is highly perceptible;

- Intermittency – *When the specific sound has identifiable on/off conditions, the specific sound level ought to be representative of the time period of length equal to the reference time interval which contains the greatest total amount of on time. If the intermittency is readily distinctive against the residual acoustic environment, a penalty of 3dB can be applied; and*
- Other Sound Characteristics – *Where the specific sound features characteristics that are neither tonal nor impulsive, though otherwise are readily distinctive against the residual acoustic environment, a penalty of 3dB can be applied."*
- Finally, BS4142:2014+A1:2019 outlines guidance for the consideration of the context of the potential impact including consideration of the existing residual sound levels, location and/or absolute sound levels.

Assessment Three: Road Traffic Noise

7.2.22 The proposals are likely to alter traffic flows and therefore noise levels near to the affected road network. In accordance with the Design Manual for Roads and Bridges LAN 111 Noise and Vibration, SLR would undertake an assessment to include all roads where it is anticipated that noise from traffic may change.

7.2.23 For each link the Basic Noise Level (BNL) will be established for the "With Scheme" and "Without Scheme" Scenarios for the opening year 2034. The BNL is the $L_{A10,T}$ dB noise level at 10m from the kerb of the road assessed.

7.2.24 The BNL results for each link will be tabulated and the impact and significance would be determined.

7.3 Assessment Methodology

Predicting effects

7.3.1 In this section the Sensitivity Criteria, the Impact Magnitude, and the Level of Effect will be discussed.

7.3.2 The sensitivity of the receiving environment is shown in Table 7.3.

Table 7.3 Sensitivity Criteria for Acoustic Receptors

Sensitivity	Receptor Type
High	Residential properties (night-time), Schools and healthcare building (daytime)
Medium	Residential properties (daytime), SAC, SPA, SSSI (or similar areas of special interest)
Low	Offices and other non-noise producing employment areas
Negligible	Industrial areas

Impact Magnitude

7.3.3 The Guidelines for Environmental Noise Impact Assessment published by IEMA list the following generic noise impacts:

- Negligible Impact: *"Noise impacts can be heard, but do not cause any change in behaviour or attitude, e.g. turning up volume on television; speaking more loudly; closing windows. Can slightly affect the character of the area but not such that there*

is perceived change in the quality of life";

- Minor Impact: "*Noise impact can be heard and causes small changes in behaviour and/ or attitude, e.g. turning up volume of television; speaking more loudly; closing windows. Potential for non-awakening sleep disturbance. Affects the character of the area such that there is a perceived change in the quality of life";*
- Moderate Impact: *"Causes a material change in behaviour and/or attitude, e.g. voiding certain activities during periods of intrusion. Potential for sleep disturbance resulting in difficulty getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in character of the area";* and
- High Impact "*Significant changes in behaviour and/or inability to mitigate effect of noise leading to psychological stress or physiological effects e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory".*

Assessment One Impact Definition

7.3.4 The impact of construction noise upon existing residential receptors, assessed in accordance with the ABC method presented in BS5228-1:2009+A1:2014, is as detailed in Table 7.4.

Table 7.4 Construction Noise – Noise Impact Magnitude

Magnitude	**Increase in the $L_{Aeq,T}$ Noise Level**
High	Threshold value exceeded by more than 5dB
Medium	Threshold value exceeded between 3.0 and 4.9dB
Low	Threshold value exceeded between 0.1 and 2.9dB
Negligible	Threshold value not exceeded

Assessment Two Impact Definition

7.3.5 The impact of operational noise upon existing receptors will be calculated in accordance with BS4142:2014+A1:2019. Based on the guidance presented in BS4142:2014+A1:2019 the impact of commercial/industrial noise upon NSRs will be determined, and a limit set, with reference to Table 7.5.

Table 7.5 Commercial/Industrial Noise Upon Residential Receptors – Noise Impact Magnitude

Magnitude	**Description**
High	A Rating level is 10dB(A) or more above the background
Medium	A Rating level is between 6 and 9dB(A) above the background
Low	A Rating level is between 1 and 5dB(A) above the background
Negligible	A Rating level below the background

Assessment Three Impact Definition

7.3.6 The sound levels generated by development- related traffic noise upon existing receptors will be calculated in accordance with the Calculation of Road Traffic Noise 1988 (CRTN).

7.3.7 For each link the Basic Noise Level (BNL) will be established for the "With Scheme" and "Without Scheme" scenarios for the opening year 2024. The BNL is the $L_{A10,T}$ dB noise level at 10m from

the kerb of the road assessed. The BNL results for each link will be tabulated and the impact and significance would be determined.

7.3.8 The proposals may alter noise levels near the affected network. In accordance with the Design Manual for Roads and Bridges (DMRB) LA111 Noise and Vibration an assessment will be undertaken to include all roads where it is anticipated that noise from traffic may change.

7.3.9 The impact of development related traffic noise upon existing receptors in the short-term is detailed in Table 7.6.

Table 7.6 Development Related Traffic – Short-Term Magnitude of Change (Impact)

Magnitude	**Noise Change $L_{A10,18hr}$ dB**
High	5.0+
Medium	3.0 – 4.9
Low	1.0 – 2.9
Negligible	0.1 – 0.9

Level of Effect

7.3.10 The sensitivity of the receiving environment together with the magnitude of impact defines the level of effect as shown in Table 7.7.

Table 7.7 Level of Effect

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

7.3.11 Where an effect is classified as Major, this is considered to represent a 'significant effect' in terms of the EIA Regulations. Where an effect is classified as Moderate, this may be considered to represent a 'significant effect' but should always be subject to professional judgement and interpretation, particularly where the sensitivity or impact magnitude levels are not clear or are borderline between categories or the impact is temporary or intermittent.

7.3.12 The Level of Effect Matrix provided within Table 7.7 therefore provides a guide to decision making but is not a substitute for professional judgement.

7.3.13 Impacts and effects can be beneficial, neutral or adverse and these would be specified where applicable. Effects can also be temporary, intermittent or permanent in nature. It should be noted that significant effects need not be unacceptable or irreversible.

Consultation

7.3.14 In addition to the EIA scoping exercise the following Scope was agreed with the Environmental Health Officer at Cherwell District Council in email correspondence dated 7th July 2021 (see Appendix 7.2).

7.3.15 A baseline survey would be conducted over an extended period to include a weekend. The survey would utilise unmanned monitoring locations. The unmanned locations would be representative of the following locations.

- Park Farm
- Church Lane
- Grange Farm House
- Grange Farm Cottages
- Half Mile House

At the Cricket Pavilion, as the receptor is likely to only be sensitive during the daytime, an attended short term weekday daytime survey would be completed.

7.3.16 The survey would inform the following assessments:

- Construction noise levels would be predicted using the guidance contained in British Standard 5228:2009+A1:2014 *Code of practice for noise and vibration control on construction and open sites – Part 1: Noise*.
- Fixed plant associated with Phase 1 would be assessed in accordance with the guidance contained in British Standard 4142:2014+A1:2019 *Methods for rating and assessing industrial and commercial sound*.
- Off Site traffic noise emissions would be assessed in accordance with the DMRB *LA 111 Noise and Vibration.*

Assumption and Limitations

7.3.17 To ensure transparency within the EIA process, the following limitations and assumptions have been identified.

- Baseline noise levels were measured at four locations. The noise monitoring locations were agreed with CDC. At the location where attended monitoring had to be completed, the survey period covered is considered the most sensitive (i.e. only daytime measurements were completed at the Cricket Pavilion).

7.4 Baseline conditions

Current Baseline

Survey Date

7.4.1 To determine baseline sound levels in the vicinity of the Southern Quarter a noise survey was undertaken between Friday 9th July 2021 and Monday 13th July 2021.

Weather Conditions

7.4.2 During the survey weather conditions were generally suitable for noise monitoring, with dry and calm conditions. Wind speeds were below 5m/s.

Equipment

7.4.3 The noise survey equipment used during the survey is detailed in Table 7.8. All measurement instrumentation was calibrated before and after the measurements. No significant drift was observed. The calibration chain is traceable via the United Kingdom Accreditation Service to National Standards held at the National Physical Laboratory.

Table 7.8 Survey Equipment

Location	Equipment	Serial Number
Location 1	Cirrus CR:171B Type 1 Sound Level Meter	G080759
	Cirrus CR:515 Acoustic Calibrator	85061
Location 2	Cirrus CR:171B Type 1 Sound Level Meter	G061094
	Cirrus CR:515 Acoustic Calibrator	72210
Location 3	Cirrus CR:171B Type 1 Sound Level Meter	G080759
	Cirrus CR:515 Acoustic Calibrator	85061
Location 4	Cirrus CR:171B Type 1 Sound Level Meter	G080288
	Cirrus CR:515 Acoustic Calibrator	83349

Survey Location

7.4.4 Sound levels were measured at four locations, representative of the nearest residential receptors to the site, as follows:

- Location 1: Bicester and North Oxford Cricket Club. Set near the corner of the building closest to the M40/Green Lane.
- Location 2: Half Mile House. Set back from the property towards the fence at the rear of the property.
- Location 3: Set in the rear garden of a property called ‘Saxon’ at Green Farm Cottages.
- Location 4: Rear garden of property on Church Lane, closest house to the church.

7.4.5 The survey locations, (and the nearest sensitive receptor locations), are shown in Figure 7.1.

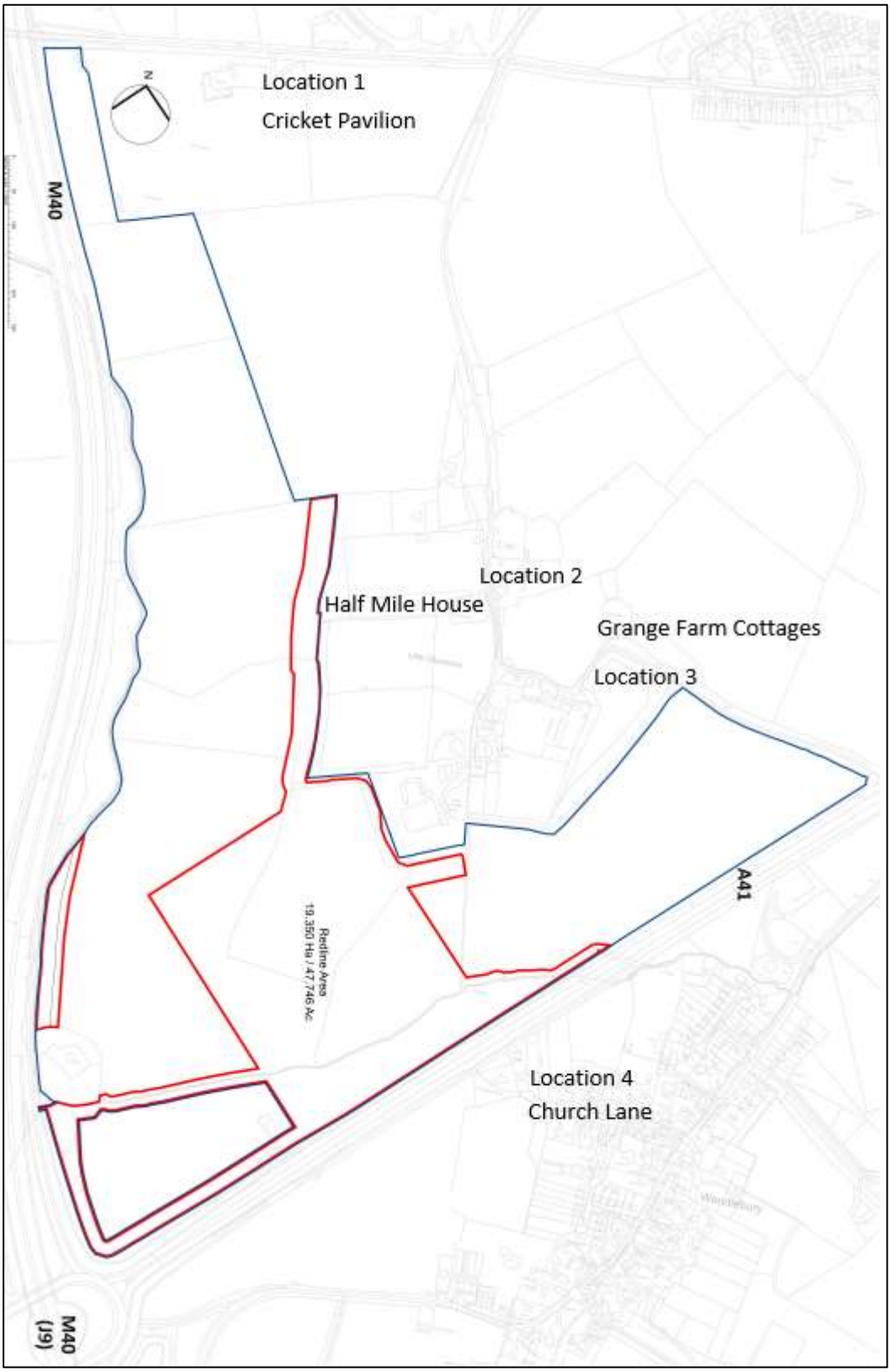


Figure 7.1 Survey Locations

7.4.6 At the survey locations the microphone was placed 1.5m above the local ground level in free-field conditions, i.e. at least 3.5m from the nearest vertical, reflecting surface. The following noise level indices were recorded:

- $L_{Aeq,T}$: The A-weighted equivalent continuous noise level over the measurement period.
- L_{A90}: The A-weighted noise level exceeded for 90% of the measurement period. This parameter is often used to describe background noise.
- L_{A10}: The A-weighted noise level exceeded for 10% of the measurement period. This parameter is often used to describe road traffic noise.
- L_{Amax}: The maximum A-weighted noise level during the measurement period.

Baseline Sound Level Results

7.4.7 A summary of the survey results at each monitoring location are shown in Tables 7.9 to 7.12. The full survey results are available in Appendix 7.1.

Table 7.9 Location 1 - Summary of Measured Sound Levels, free-field, dB

Date	Period	$L_{Aeq,T}$	Median L_{A90}	Median L_{A10}	L_{Amax}
Friday 9th July 2021	Daytime	56.9	52.8	59.3	72.1
	Night-Time	Attended daytime survey only.			
Saturday 10th July 2021	Daytime				
	Night-Time				
Sunday 11th July 2021	Daytime				
	Night-Time				
Monday 12th July 2021	Daytime	51.5	48.4	53.9	63.6
	Night-Time	Attended daytime survey only			

Table 7.10 Location 2 - Summary of Measured Sound Levels, free-field, dB

Date	Period	$L_{Aeq,T}$	Median L_{A90}	Median L_{A10}	L_{Amax}
Friday 9th July 2021	Daytime	59	55	59	77
	Night-Time	55	51	56	72
Saturday 10th July 2021	Daytime	59	54	59	92
	Night-Time	53	46	56	69
Sunday 11th July 2021	Daytime	57	55	59	75
	Night-Time	46	42	46	69

Table 7.11 Location 3 - Summary of Measured Sound Levels, free-field, dB

Date	Period	$L_{Aeq,T}$	Median L_{A90}	Median L_{A10}	L_{Amax}
Friday 9th July 2021	Daytime	58	54	59	77
	Night-Time	54	51	56	70
Saturday 10th July 2021	Daytime	58	55	58	93
	Night-Time	54	48	56	74
Sunday 11th July 2021	Daytime	58	56	60	74
	Night-Time	49	46	50	71

Table 7.12 Location 4 - Summary of Measured Sound Levels, free-field, dB

Date	Period	$L_{Aeq,T}$	Median L_{A90}	Median L_{A10}	L_{Amax}
Friday 9th July 2021	Daytime	63	57	66	83
	Night-Time	56	44	58	75

Saturday 10th July 2021	Daytime	63	58	66	81
	Night-Time	55	42	58	80
Sunday 11th July 2021	Daytime	62	56	65	87
	Night-Time	58	41	60	77

Future Baseline

7.4.8 The soundscape is dominated by road traffic noise. It is considered that the future baseline is unlikely to be notably different to that which exists today. Paragraph 5.11.5 of the Transport ES chapter states that:

The results of the predicted traffic flows arising from the development indicate that the potential impact on all of the links, range from 0% to 3.8% increase in 2024 and 0% to 5.2% in 2031. In addition to this, HGV flows are expected to increase by between 0% and 2.4% in 2024 and 0% to 1.6% in 2031.

7.4.9 Therefore, it is not expected that the future baseline would alter the noise environment on the Site.

7.5 Mitigation

Construction Phase

7.5.1 No Primary mitigation has been included in the assessment. Tertiary measures will include a Construction Environmental Management Plan (CEMP). The adoption of Best Practicable Means, as defined in the Control of Pollution Act 1974, is usually the most effective means of controlling noise from sites. Within the constraints of efficient site operations and the requirements of the relevant British Standards, the following is advisable:

- limit the use of particularly noisy plant, i.e. do not use particularly noisy plant early in the morning;
- limit the number of plant items in use at any one time;
- plant maintenance operations should be undertaken as far away from noise-sensitive receptors as possible;
- phasing the works to maximise the benefit from perimeter structures;
- any compressors brought on to site should be silenced or sound reduced models fitted with acoustic enclosures;
- reduce the speed of vehicle movements;
- all pneumatic tools should be fitted with silencers or mufflers;
- ensure that operations are designed to be undertaken with any directional noise emissions pointing away from noise-sensitive receptors where practicable;
- when replacing older plant, ensure that the quietest plant available is considered wherever possible; any deliveries/spoil removal vehicles should be programmed to arrive and depart during daytime hours only;
- drop heights must be minimised when loading vehicles with rubble;
- care should be taken when loading vehicles to minimise disturbance to local residents. Vehicles should be prohibited from waiting within the site with their engines running;
- all plant items should be properly maintained and operated according to the manufacturers' recommendations in such a manner as to avoid causing excessive

noise. All plant should be sited so that the noise impact at nearby noise-sensitive properties is minimised;
- local hoarding, screens or barriers should be erected as necessary to shield particularly noisy activities; and
- any problems concerning noise from construction works can sometimes be avoided by taking a considerate and neighbourly approach to relations with local residents. Works should not be undertaken outside of the hours agreed with the local authority.

Operational Phase

7.5.2 No Primary mitigation has been included in the assessment. Tertiary measures will include the specification of a sound reduction for both the façade of the Development, and the setting of a noise limit from all fixed plant at the Site. This is detailed further below.

7.6 Operational Effects

Assessment One: Construction

7.6.1 An assessment of construction noise has been completed with reference to BS5228-1:2009+A1:2014 *Code of practice for noise and vibration control on construction and open sites*.

Noise Sensitive Receptors

7.6.2 This assessment will consider the impact of construction noise upon the following receptors:

- Residents at Half Mile House.
- Residents at Grange Farm Cottages.
- Residents at Church Lane.

7.6.3 The construction noise limit at each receptor is detailed in Table 7.13. The limit has been determined using the ABC method detailed in of BS5228-1:2009+A1:2014.

Table 7.13 Threshold Construction Noise Limits dB(A)

Receptor	Baseline lowest daytime Ambient Noise Level	Threshold Noise Limit
Half Mile House	57	65
Grange Farm Cottages	58	65
Church Lane	62	65

Construction Phases and Plant

7.6.4 For the purposes of this construction noise assessment, SLR has determined the noise level during three typical construction phases detailed below. The following Tables outline the items of plant which would typically be utilised during each activity, and the equipment sound power levels (determined from BS5228:2009+A1:2014), and the percentage on-time off each item of plant.

- Phase 1: Site Clearance and Enabling Works.
- Phase 2: Substructure Works.
- Phase 3: Superstructure Works.

7.6.5 For the purposes of the noise assessment, it is assumed in the first instance that the construction of each element will be in isolation.

7.6.6 It is accepted that the construction activities may vary from the activities presented, but as it

would not be feasible to assess all construction configurations, the assessments undertaken in this Assessment are considered a robust representation of anticipated construction noise levels.

Phase 1 - Site Clearance and enabling works

7.6.7 Site clearance and enabling works typically include:

- Site working area establishment / securement.
- Service relocation and/or stopping up.
- Soft strip of retained features.
- Demolition (where applicable) and site clearance.
- Site investigation works / remedial activities (where required).

7.6.8 Table 7.14 details plant that is typically utilised during site clearance and enabling works.

Table 7.14 Site Clearance and Enabling Works - Plant List

Type of Machinery	Quantity on Site	Sound Power Level, dB	Percentage Use
Large Excavator Mounted Breaker	1	110	20%
Tracked Excavator	2	107	80%
Handheld Circular Saw	2	109	15%
Spreading Fill (Dozer)	2	109	25%
Vibratory Roller	1	102	30%
Lorry (Unloading Tipper Truck)	2	108	40%
Concrete Truck Mixer	1	103	5%
Concrete Crusher	2	110	40%
Road Sweeper	1	104	5%

Phase 2 - Substructure Works

7.6.9 Substructure works typically include:

- Creation of foundations, excavation or earthworks to form finished floor levels; and
- Laying out/down of services.

7.6.10 Table 7.15 details the plant utilised during this phase.

Table 7.15 Substructure Works - Plant List

Type of Machinery	Quantity on Site	Sound Power Level, dB	Percentage Use
Concrete Truck Mixer	2	103	25%
Small Breaker	2	110	20%
Compressor	2	106	70%
Lorry (Unloading)	2	108	40%
Petrol Saw	2	109	40%
Tracked Excavator (Rubber Tracks)	2	107	80%

Dumper Trucks	2	106	25%
Vibratory Roller	2	102	30%
Poker Vibrator	2	97	40%
Mobile Crane	1	103	100%
Telescopic Forklift (17m) JCB 540	2	107	80%
Hand Tools (Hammers)	8	98	80%

Phase 3 - Superstructure Works

7.6.11 Substructure works typically include:

- Creation and installation of new concrete / steel superstructure (i.e. concrete boxes, steel frames etc.).
- Application of façades and finishes to newly construction-built form.
- Internal fit outs and plant/machinery installations.

7.6.12 It is envisaged that this phase would include the erection of buildings. Table 7.16 details the plant utilised during this phase.

Table 7.16 Superstructure Works - Plant List

Type of Machinery	Quantity on Site	Sound Power Level, dB	Percentage Use
Concrete Truck Mixer	2	103	25%
Mewp-Cherry Picker Genie	2	95	60%
Lorry (unloading)	3	108	20%
Petrol Saw	2	109	40%
Tracked Excavator (rubber tracks)	2	107	70%
Dumper Trucks	2	106	25%
Poker Vibrator	2	97	40%
Mobile Crane Operation	2	103	90%
Telescopic Forklift (17m) JCB 540	1	107	80%
Hand Tools (hammers)	8	98	40%
Concrete Pump (pumping)	2	112	70%

7.6.13 At this stage it is envisaged that all activities will take place within normal daytime working hours (07:30 to 18:00 hours, Monday to Friday and 08:00 to 13:00 on a Saturday).

Noise Prediction Methodology

7.6.14 Using the sound power levels and associated percentage on-times shown in Tables 7.14 to 7.16, noise levels from each construction activity have been predicted at the nearest noise sensitive receptors to the Site.

7.6.15 The predictions have been undertaken using the proprietary noise modelling software CadnaA which incorporates the methodology outlined in BS5228:2009+A1:2014. The model assumes hard ground and applies the screening effect of barriers from Figure F.3 of

BS5228:2009+A1:2014 at 500Hz.

7.6.16 During Phase 1 and 2 it has been assumed that most of the plant will be operating at ground level. A height of 2m above ground level of each item of plant has been assumed.

7.6.17 During Phase 3, superstructure works, some plant will be operating at increased heights. A height of 12m above ground level of each item of plant (that will operate at height) has been assumed.

7.6.18 The location of each item of plant during each phase of construction has been positioned across the Site. At times plant would be closer and further away from the receptor.

Predicted Noise Levels and Assessment

7.6.19 With reference to the methodology above, the predicted noise levels for each Activity of the construction works at each of the nearest noise-sensitive receptors are shown in Table 7.17 to 7.19 below.

7.6.20 The Tables also compare the predicted noise levels with the threshold value adopted for the assessment.

7.6.21 Noise levels have been predicted at a height of 1.5m which is representative of a ground-floor window for each receptor.

Table 7.17 Phase 1 Predicted Noise levels and Assessment, L_{Aeq} dB(A)

Receptor	Predicted Noise Level	Thres. Value	Difference
Half Mile House	38.0	65.0	-27.0
Grange Farm Cottages	42.8	65.0	-22.2
Church Lane	47.5	65.0	-17.5

Table 7.18 Phase 2 Predicted Noise levels and Assessment, L_{Aeq} dB(A)

Receptor	Predicted Noise Level	Thres. Value	Difference
Half Mile House	41.1	65.0	-23.9
Grange Farm Cottages	44.9	65.0	-20.1
Church Lane	49.4	65.0	-15.6

Table 7.19 Phase 3 Predicted Noise levels and Assessment, L_{Aeq} dB(A)

Receptor	Predicted Noise Level	Thres. Value	Difference
Half Mile House	43.4	65.0	-21.6
Grange Farm Cottages	46.8	65.0	-18.2
Church Lane	52.0	65.0	-13.0

7.6.22 It can be seen from Tables 7.17 to 7.19 that the noise limit for construction noise during all phases will be met at the nearest NSR's assessed. At all assessed receptors the impact is Negligible with a Negligible effect. Construction noise effects will therefore not be Significant.

Assessment Two: Operation

Noise Model Assumptions

7.6.23 The sound predictions in this assessment have been undertaken using a proprietary software-based noise model, CadnaA, which implements the full range of UK calculation methods. The calculation algorithms set out in ISO 9613-2:1996 Acoustics – Attenuation of sound during propagation outdoors – Part 2 General method of calculation have been used and the model assumes:

- A ground absorption factor of 0.
- A reflection factor of 2.
- A daytime receiver height of 1.5m.
- A night-time receiver height of 4m.

Noise Sources

7.6.24 At this stage it is understand that the Facility will be similar to the SIEMENS Facility at Wharf Road, Oxford. Therefore, SLR undertook an operational noise survey at this Facility on Friday 25th June 2021.

7.6.25 The equipment used during the survey is detailed in Table 7.20.

Table 7.20 Monitoring Equipment

Equipment	Serial Number
Cirrus CR:171B Type 1 Sound Level Meter	G301839
Cirrus CR:515 Acoustic Calibrator	93674
Cirrus CR:171B Type 1 Sound Level Meter	G0302667
Cirrus CR:515 Acoustic Calibrator	94806

7.6.26 During this survey, the surveyor measured internal reverberant noise levels in the following areas of the Facility:

- Location 1
- Location 2
- Location 3
- Location 4
- Location 5: HGV Unloading Area

7.6.27 The internal monitoring positions are shown on Figure 7.2.

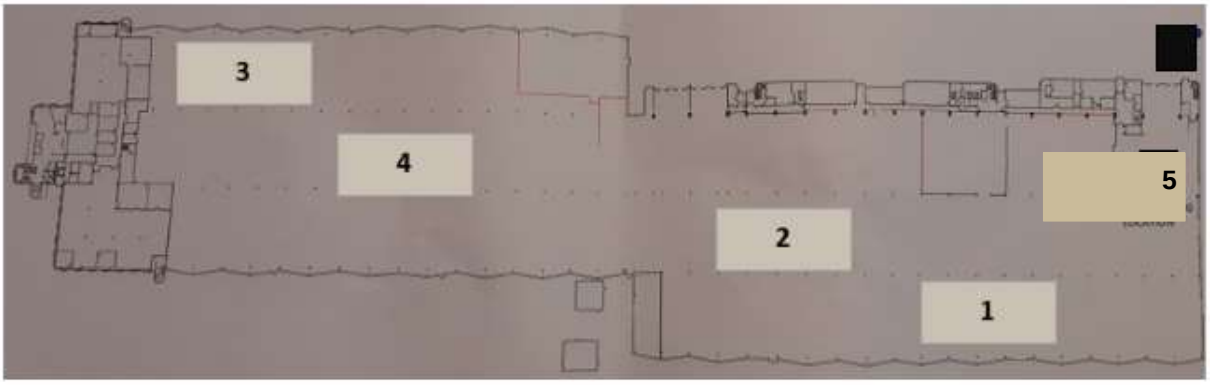


Figure 7.2 Internal Measurement Positions

7.6.28 An image of the sound level meter at Location 1 can be seen in Figure 7.3. A picture of the sound level meter at Location 2 can be seen in Figure 7.4. A picture of the sound level meter in the HGV Unloading Area can be seen in Figure 7.5.

Figure 7.3 Monitoring Location 1

Figure 7.4 Monitoring Location 2

Figure 7.5 Monitoring Location 5

7.6.29 From the measurements completed the internal reverberant noise level to the building can be seen in Table 7.21.

Table 7.21 Internal Reverberant – Sound Power dB

Area	L_w dB(A)	31.5Hz	63Hz	125Hz	250Hz	500Hz	1KHz	2KHz	4KHz	8KHz
Location 1	71	68.2	70	68.5	69.1	69.3	66	62.8	57.7	51.6
Location 2	71.6	69.1	65.7	66.5	66.9	69	66.6	64.5	60.6	53.8
Location 3	72.9	65.9	65.2	64.5	69.5	71.2	69.2	62.9	57.9	49.4
Location 4	71.5	64.6	66.6	65.1	65.2	65.9	64.9	65.3	64.4	61
HGV Unloading Area	79.7	74.7	80.4	76	77.9	78	73.9	72.6	68.3	52.8

7.6.30 External to the Facility noise measurements of the following items of plant were completed:

- HGV Arrival Departure.
- HGV Reversing with Beeper.
- HGV Off-Loading.
- Compressor Room.
- Fan.
- Cooling Tower.
- Liquid Nitrogen Tank.
- Temperature Control Unit.
- Liquid Nitrogen Extractor.

7.6.31 From the measurements completed the internal reverberant noise level to the building, and the sound power level of each item of plant measured can be seen in Table 7.22.

Table 7.22 Fixed Plant Noise Sources – Sound Power dB

Plant	**L_w dB(A)**	**31.5Hz**	**63Hz**	**125Hz**	**250Hz**	**500Hz**	**1KHz**	**2KHz**	**4KHz**	**8KHz**
HGV Arrival / Departure	93.7	98.9	89.1	89.5	92.0	91.2	88.9	86.5	80.3	71.1
HGV Reversing with Beeper	80.5	79.7	75.9	70.0	72.9	72.7	73.1	71.9	76.8	56.6
Compressor Room	85.4	82.1	90.0	86.3	83.3	85.5	80.2	74.8	66.4	60.2
Fan	84.9	84.2	89.9	94.1	87.4	80.5	77.5	74.4	69.2	64.5
Cooling Tower	81.4	78.5	79.4	83.0	82.1	78.8	75.5	72.9	68.8	64.6
Liquid Nitrogen Tank	80.8	80.3	85.3	83.5	79.7	82.3	73.8	69.5	63.5	56.5
Temperature Control Unit	75.9	76.5	78.4	78.8	75.6	73.1	70.9	68.4	61.3	56.4
Liquid Nitrogen Extractor	98.8	106.3	93.8	100.0	91.0	94.4	95.5	91.6	87.7	83.7

Noise Levels to Be Used in the Assessment

7.6.32 Based on the data presented in Section 7.6.24 onwards the noise levels detailed in Table 7.23 will be used in the assessment. Where the data is not presented above, the source of the data is indicated.

Table 7.23 Noise Levels of Proposed Site

Area / Plant	Number / Attribute	Location	L_w dB(A)	31.5Hz	63Hz	125Hz	250Hz	500Hz	1KHz	2KHz	4KHz	8KHz
Warehouse[1]	1 /Vertical and Area Sources	Warehouse	72.9	65.9	65.2	64.5	69.5	71.2	69.2	62.9	57.9	49.4
HGV Arrival / Departure	48 per hour (12 every 15 minutes) / Moving Point Source	Access Road to Docking/Parking Bays	93.7	98.9	89.1	89.5	92.0	91.2	88.9	86.5	80.3	71.1
Car Arrival / Departure[2]	501 per hour (125 every 15 minutes)/ Moving Point Source	Access Road to Car Park	80.2	88.5	91.0	82.4	77.2	74.9	74.6	74.5	67.7	60.6
HGV Reversing with Beeper	17 / Point Source[3]	Reversing in Bays	80.5	79.7	75.9	70.0	72.9	72.7	73.1	71.9	76.8	56.6
Transformers[4]	4	South of Waste Compound	80.7	44.0	52.2	67.3	73.8	79.2	76.4	72.6	67.4	58.3
Liquid Nitrogen Tank	1	South of Waste Compound	80.8	80.3	85.3	83.5	79.7	82.3	73.8	69.5	63.5	56.5
Temperature Control Unit	1	South of Waste Compound	75.9	76.5	78.4	78.8	75.6	73.1	70.9	68.4	61.3	56.4
Liquid Nitrogen Extractor	1	South of Waste Compound	98.8	106.3	93.8	100.0	91.0	94.4	95.5	91.6	87.7	83.7

[1] The higher of the internal measurements at the existing has been taken forward as the internal reverberant sound level.
[2] Measured by SLR
[3] 1 minute on time over reference period
[4] SLR Library Data

Specific Sound Level

7.6.33 The predicted sound levels of the noise sources associated with the proposals are shown in Table 7.24 below.

7.6.34 Daytime sound levels have been predicted at 1.5m above local ground level, which is the approximate height of a ground floor window. Night-time sound levels have been predicted at 4m above local ground level, which is the approximate height of a first-floor window.

Table 7.24 Predicted Specific Sound Levels

Location	Period	Predicted Sound Level, $L_{Aeq,T}$
Cricket Club	Daytime	21.1
	Night-Time	No Receptor at Night.
Half Mile House	Daytime	31.8
	Night-Time	35.8
Green Farm Cottages	Daytime	38.0
	Night-Time	38.3
Church Lane	Daytime	38.3
	Night-Time	38.5

7.6.35 A graphical image of the predicted specific sound level during the daytime can be seen in Figure 7.6. A graphical image of the predicted specific sound level during the night-time can be seen in Figure 7.7.

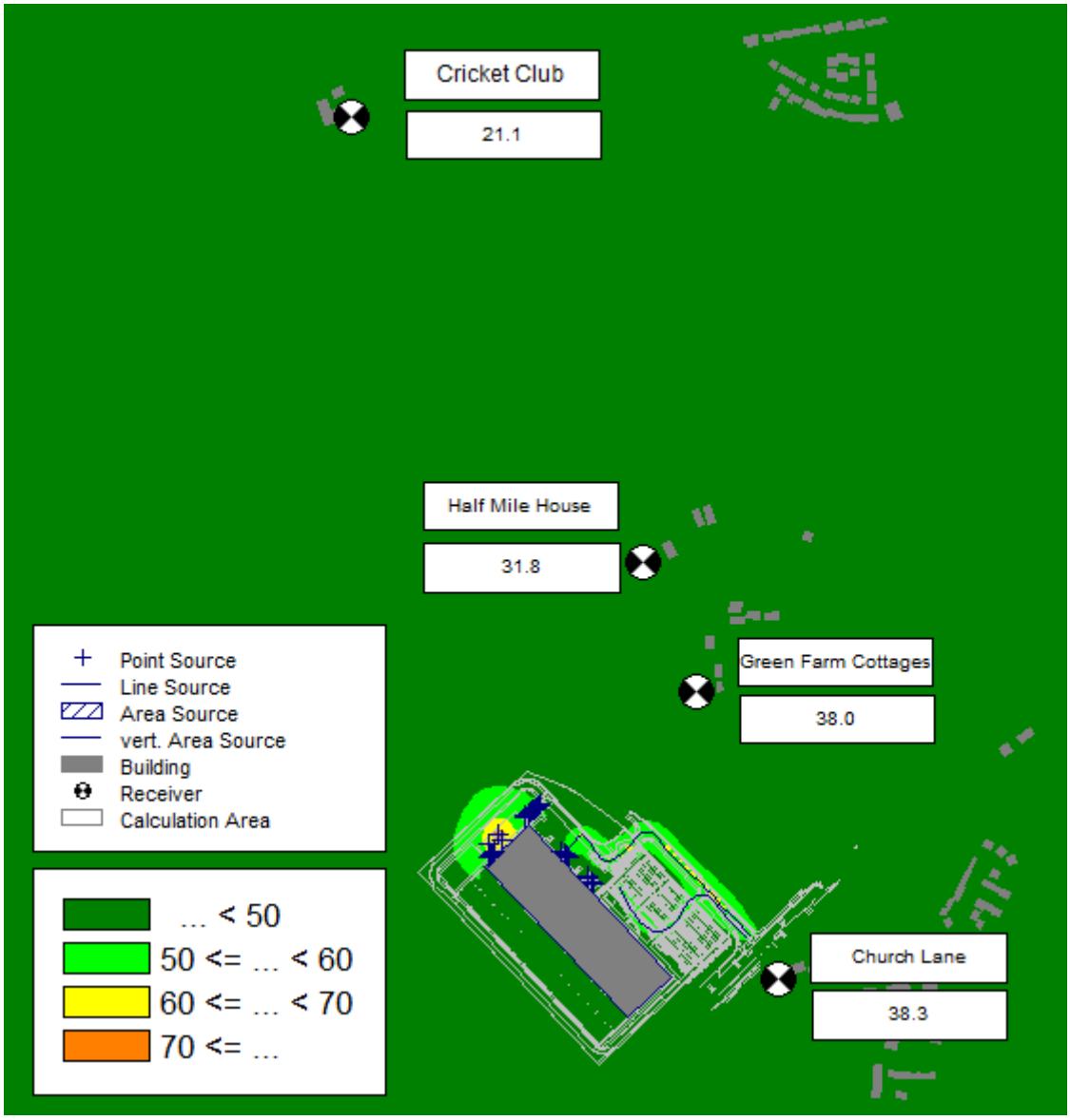


Figure 7.6 Daytime Specific Sound Level at a Grid Height of 1.5m – dB(A)

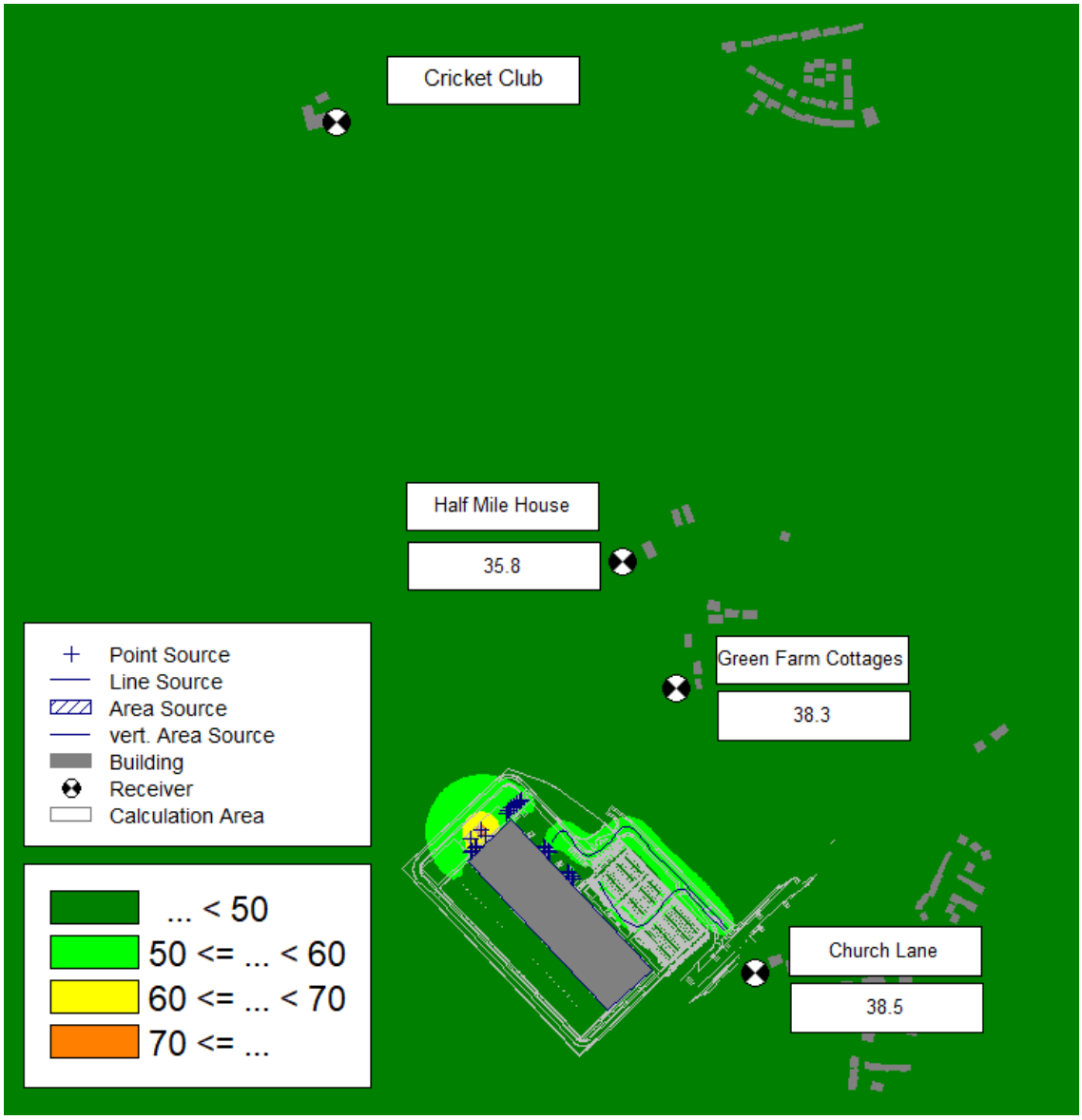


Figure 7.7 Night-Time $L_{Aeq,T}$ Specific Sound Level at a Height of 4m – dB(A)

Character Correction

7.6.36 The character of each noise source, and the correction that will be applied in the BS4142:2014+A1:2019 assessment are as follows:

- Tonality: SLR has not undertaken the BS4142:2014+A1:2019 Objective method for assessing the audibility of tones in south: one third octave method. However, it is not expected that any sound from the Site would be tonal. Therefore, no tonal correction is required.
- Impulsivity: It is not anticipated that any of the noise sources would be impulsive provided it is well maintained.
- Other sound characteristics: It is not anticipated that the identified noise sources would have any other identifiable sound characteristics that differ to those associated with the surrounding area, for example vehicle movements.
- Intermittentness: As noise sources at the site would be intermittent a 3dB correction will be included in the assessment.

7.6.37 In total a 3dB character correction will be added to the calculated specific sound level at each receptor.

Assessment

7.6.38 The character corrections described in Section 7.6.36 have been added to the predicted sound levels shown in Table 7-24 to derive the rating levels at each of the nearest noise-sensitive receptors.

7.6.39 The results of the BS4142:2014 +A1:2019 assessment are shown in Table 7.25. In accordance with the standard, the rating levels and the representative background sound levels have been rounded to the nearest decibel.

7.6.40 Based on the accuracy of the prediction methodology, i.e. ISO9613-2, the uncertainty of the CadnaA model accuracy, i.e. barrier corrections for buildings, etc., it is considered that the results of the assessment are as accurate as reasonably practicable and considered to be within +/-3dB.

Table 7.25 BS4142:2014+A1:2019 Assessment

Receptor	Assessment	Predicted Specific Sound Level, $L_{Aeq,T}$	Predicted Rating Level, $L_{Ar,T}$	Derived Background Sound Level L_{A90}	Difference between Background Sound Level and Rating Level
Cricket Club	Daytime	21	24	48	-24
	Night-Time	No Receptor at Night.			
Half Mile House	Daytime	32	35	54	-19
	Night-Time	36	39	42	-3
Green Farm Cottages	Daytime	38	41	54	-13
	Night-Time	38	41	46	-5
Church Lane	Daytime	38	41	56	-15
	Night-Time	39	42	41	+1

7.6.41 It can be seen from Table 7.25 that:

- During the daytime, the rating level of the proposals would be below the background sound level at all receptors assessed. The impact and associated effect is Negligible, which is not Significant.
- During the night-time the rating level of the proposals would be below the background sound level at Half Mile House and Green Farm Cottages. The impact and associated effect is Negligible, which is not Significant. At Church Lane the impact is Low with a Moderate effect. As the rating level is only 1dB(A) above the background sound level it is considered that the effect is not Significant.

7.6.42 Mitigation of operational noise upon existing receptor locations is therefore not considered necessary.

Assessment Three Development Related Traffic

7.6.43 Traffic from the proposals may alter noise levels near the affected network. In accordance with the DMRB LA111, SLR has undertaken an assessment to include the following four road links for which traffic flow data has been provided:

- Link 1. A41 Northbound.
- Link 2. A41 Southbound.
- Link 3. A34 Northbound.
- Link 4: A34 Southbound.

7.6.44 For each link the BNL has been established for the “With” and “Without Scheme” Scenarios for the opening

year 2024 (including committed developments). The BNL is the $L_{A10,\ 18\text{-}hr}$ dB noise level at 10m from the kerb of the road assessed.

7.6.45 The results of the assessment are provided in Table 7.26 below.

Table 7.26 Road Traffic Assessment

Link	Without Scheme (& Committed Developments)				With Scheme (& Committed Developments)				Change in BNL	Impact	Effect
	AAWT	% HGV	Average Speed	BNL	AAWT	% HGV	Average Speed	BNL			
A41 Northbound	21774	5	70	77	22307	5	50	74.3	-2.7	Negligible	Negligible
A41 Southbound	17873	6	70	76.3	18641	6	50	73.5	-2.8	Negligible	Negligible
A34 Northbound	35658	12	70	80.1	36083	12	70	80.2	+0.1	Negligible	Negligible
A34 Southbound	36937	11	70	80.1	37515	11	70	80.2	+0.1	Negligible	Negligible

7.6.46 It can be seen from Table 7.26 that:

- Due to the reduction in traffic speed on the A41 the noise level from traffic will reduce at 10m from the carriageway edge of the A41.
- At 10m from the A34 the increase in road traffic will result in a 0.1dB(A) increase in the $L_{A10\text{-}18hr}$ noise level. Both the impact and associated effects will be Negligible. Noise effects are not Significant.

7.6.47 Mitigation of road traffic noise upon existing receptor locations is therefore not considered necessary.

7.7 Residual effects

7.7.1 As the Assessments have concluded that noise effects are Not Significant there are not any residual effects to assess.

7.8 Implications of Climate Change

7.8.1 The implications of climate change have been considered and none have been identified.

7.9 Cumulative effects

7.9.1 The road traffic flows used in the assessment take account of committed developments (and associated traffic flows), these are listed in Table 5.1 within the Transport chapter. In addition, the potential for cumulative effects with the following planning applications has been considered:

- 21/03266/F Planning application: 21/03266/F: Site clearance, construction of new site access from the B4100, permanent and temporary internal roads, an internal roundabout and a foul drainage station, diversion of an existing overhead power cable and public right of way, and soft landscaping.
- 21/03267/OUT (Eastern Parcel) Planning application: 21/03267/OUT: Outline planning permission (all matters reserved except for access) for the erection of buildings comprising logistics (Use Class B8) and ancillary Office (Use Class E(g)(i)) floorspace and associated infrastructure; construction of new site access from the B4100; creation of internal roads and access routes; and hard and soft landscaping.
- 21/03268/OUT (Western Parcel) Planning application: 21/03268/OUT: Outline planning permission (all matters reserved except for access) for the erection of buildings comprising logistics (Use Class B8) and ancillary Office (Use Class E(g)(i)) floorspace; construction of new site access from the B4100; creation of internal roads and access routes; hard and soft landscaping including noise attenuation measures; and other associated infrastructure.

7.9.2 SLR has reviewed the combined Environmental Statement submitted for all three applications. Chapter 10 of the ES addressed noise and from a review of the assessments completed, the proposals are sufficiently distant from the Application Site addressed in this ES not to require cumulative assessment.

7.10 Summary

7.10.1 A summary of the assessment is set out in Table 7.27.

Table 7.27 Summary of effects

Receptor	Sensitivity of Receptor	Nature of potential impact	Proposed mitigation	Residual effect	Significant / not significant
Construction phase					
Half Mile House	Medium to High	Construction noise	CEMP	Negligible	Not significant
Grange Farm Cottages	Medium to High	Construction noise	CEMP	Negligible	Not significant
Church Lane	Medium to High	Construction noise	CEMP	Negligible	Not significant
Operational phase					
Cricket Club	Medium	Operational noise	None	Negligible	Not significant
Half Mile House	Medium to High	Operational noise	None	Negligible	Not significant
Grange Farm Cottages	Medium to High	Operational noise	None	Negligible	Not significant
Church Lane	Medium to High	Operational noise	None	Negligible to Low	Not significant

7.11 References

BS5228:2009+A1:2014 *Code of practice for noise and vibration control on construction and open sites – Part 1: Noise.*

BS4142:2014:+A1:2019 Methods for rating and assessing industrial and commercial sound
Design Manual for Roads and Bridges Volume (DMRB) LAN 111 *Noise and Vibration*

8 Biodiversity

8.1 Introduction

8.1.1 This chapter of the ES has been produced by the Environmental Dimension Partnership Ltd (EDP).

8.1.2 This chapter should be read in conjunction with Technical Appendix 8.1 (Ecological Baseline) which sets out full details of the baseline surveys and other work undertaken to identify and evaluate relevant Important Ecological Features within the Site's zone of influence.

Purpose of Assessment

8.1.3 This chapter considers the existing biodiversity and ecological context of the Study Area and the potential effects of the Proposed Development on Important Ecological Features (IEFs) as required by Cherwell District Council (CDC) in the Scoping Opinion where biodiversity matters have been requested to be included within the EIA.

Legislative Framework

8.1.4 Planning policy is set out in detail in Chapter 4 of this ES. The following is a summary of legislation and planning policies relevant to biodiversity and ecological issues both at national and local levels and should be read in conjunction with Chapter 4.

Legislative Context

The Conservation of Habitats and Species Regulations 2017 (as amended)

8.1.5 The Conservation of Habitats and Species Regulations 2017 (as amended) provide for the designation and protection of statutorily designated wildlife sites of European importance ('European sites'), and the protection of a number of rare and vulnerable species in a European context ('European Protected Species' (EPS)). European sites, including Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and Ramsar sites are recommended for designation in the UK by the Joint Nature Conservation Committee (JNCC).

The Wildlife and Countryside Act 1981

8.1.6 The Wildlife and Countryside Act 1981 (as amended) enshrines the protection of statutory designated wildlife sites of national importance (Sites of Special Scientific Interest (SSSIs) and National Nature Reserves (NNRs)) in England and Wales. The Act also sets out varying degrees of protection and offences with regards to native species and their habitats that are rare and vulnerable in a national context. The Act also provides for the control, management and offences in respect of invasive non-native species. Sites of national importance (SSSIs and NNRs) are designated by Natural England under the Act and are protected from any development that may destroy or negatively affect them, either directly or indirectly.

Protection of Badgers Act 1992

8.1.7 The Protection of Badgers Act 1992 (as amended) affords protection specifically to badgers (*Meles meles*) and their setts.

Natural Environment and Rural Communities (NERC) Act 2006

8.1.8 Section 40 of the Natural Environment and Rural Communities (NERC) Act 2006 places a statutory duty on Local Planning Authorities (LPAs) to consider the effects upon biodiversity when exercising their functions in England and Wales. In addition, Section 41 of the Act makes for the provision of a list of habitats and species of principal importance for the conservation of

biodiversity.

Biodiversity 2020

8.1.9 In 2013, the UKBAP Priority Habitats and Priority Species, and the Section 41 Species and Habitats of Principal Importance for Conservation under the NERC Act 2006, were rationalised. This rationalisation occurred under the 'Post-2010 Biodiversity Framework'. As a result, a new list of Priority Species and Priority Habitats is now in operation at the UK level. These new lists supersede the former UKBAP; they are the new 'Biodiversity Indicators' that are used to monitor the status of biodiversity at the UK level. Each of the four devolved countries of the UK also has a similar list. Within England, the new rationalised lists of 24 Priority Habitats and 213 Priority Species are provided in Biodiversity 2020 which is the national biodiversity policy for England.

Planning Policy Context
National Planning Policy Framework (NPPF)

8.1.10 The Government published a revised version of the National Planning Policy Framework (NPPF) in July 2021. Paragraph 174 of the NPPF states that:

'*planning policies and decisions should contribute to and enhance the natural and local environment by:*

a) Protecting and enhancing valued landscapes, sites of biodiversity or geological value and soils (in a manner commensurate with their statutory status or identified quality in the development plan);

b) Recognising the intrinsic character and beauty of the countryside, and the wider benefits from natural capital and ecosystem services – including the economic and other benefits of the best and most versatile agricultural land, and of trees and woodland.'

8.1.11 Paragraph 174 of the NPPF states that planning policies and decisions should contribute to and enhance the natural and local environment by:

d) Minimising impacts on and providing net gains for biodiversity, including by establishing coherent ecological networks that are more resilient to current and future pressures.'

8.1.12 With regard to planning applications and biodiversity, Paragraph 180 of the NPPF states that:

'When determining planning applications, local planning authorities should apply the following principles:

a) If significant harm to biodiversity resulting from a development cannot be avoided (through locating on an alternative site with less harmful impacts), adequately mitigated, or, as a last resort, compensated for, then planning permission should be refused;

b) Development on land within or outside a Site of Special Scientific Interest, and which is likely to have an adverse effect on it (either individually or in combination with other developments), should not normally be permitted. The only exception is where the benefits of the development in the location proposed clearly outweigh both its likely impact on the features of the Application Site that make it of special scientific interest, and any broader impacts on the national network of Sites of Special Scientific Interests;

c) Development resulting in the loss or deterioration of irreplaceable habitats (such as ancient woodland and ancient or veteran trees) should be refused, unless there are wholly exceptional reasons and a suitable compensation strategy exists; and

d) Development whose primary objective is to conserve or enhance biodiversity should be supported; while opportunities to incorporate biodiversity improvements in and around

developments should be encourages especially where this can secure measurable net gains for biodiversity.'

National Planning Practice Guidance (NPPG)

8.1.13 Further guidance on the NPPF with respect to ecology is described within the Planning Practice Guidance on the Natural Environment under 'Biodiversity, geodiversity and ecosystems.

Local Planning Policy

8.1.14 Relevant development management policies within the Cherwell Local Plan 2011 – 2031 are: Policy ESD10, which aims to protect and enhance biodiversity and the natural environment; and Policy ESD17, relating to the maintenance and enhancement of the District's Green Infrastructure.

8.2 Survey

8.2.1 All survey methodologies used within the assessment followed the published guidelines as accepted by the statutory and non-statutory agencies, including Natural England (NE) and the Chartered Institute for Ecology and Environmental Management (CIEEM). This EcIA follows the standard current guidance in place at the time of writing in 2021, as set out by the CIEEM and recommended by NE.

8.2.2 For the purposes of this chapter the term 'Site' refers to all land within the Application Site red line boundary as shown in Figure 2.1. The term 'Study Area' relates to the areas covered by the ecological surveys and desk-based survey which varies as appropriate for the ecological feature being considered, due to its sensitivity, size of home range etc., as well as the nature of predicted impacts. The study areas used for the desk study are defined below.

Survey Methodology

Desk Study

8.2.3 An ecological desk study was completed to collate current baseline data from statutory and non-statutory sources. The following data were gathered:

- Records of statutorily designated sites of international importance (Special Areas of Conservation (SAC), Special Protection Areas (SPA) and Ramsar sites), national/regional (Sites of Special Scientific Interest (SSSI)), or local importance (Local Nature Reserves (LNR)) within 15km, 5km and 2km of the Site respectively.
- Records of non-statutorily designated sites for nature conservation (Local Wildlife Sites (LWS) within 2km of the Site
- Habitats of importance for nature conservation including ancient woodlands and Habitats for Principal Importance (HPI) under the Natural Resources and Environment Act (NERC) Act 2006 within or adjacent to the Site.
- Records of legally protected and notable species (including Species of Principal Importance (SPI)) under the NERC Act within 2km of the Site.

8.2.4 Information was sourced from Thames Valley Environmental Records Centre (TVERC) in June 2021. Online resources, including data available through the Multi-Agency Geographic Information for the Countryside website (www.magic.gov.uk) were used to supplement the baseline data and reviewed in order to gain an overview and identify features of interest in the wider landscape.

Field Survey

8.2.5 An Extended Phase 1 Habitat Survey of the Site was carried out in accordance with the standard Joint Nature Conservation Committee (JNCC) methodology in April 2018, which was updated in June 2021. Hedgerows were assessed against the Wildlife and Landscape criteria of the Hedgerow Regulations 1997 in June 2018 and the results checked in February 2021. Details of these methodologies are presented within Technical Appendix 8.1.

8.2.6 Detailed faunal surveys were carried out in accordance with the relevant survey methodology for that species as recommended by CIEEM and NE. The faunal surveys undertaken include wintering and breeding birds, roosting and foraging bats, otter, water vole, badger, great crested newt (GCN), reptiles and butterflies. Methodologies used are presented within Technical Appendix 8.1.

8.3 Assessment methodology

8.3.1 Assessment and evaluation has been made in accordance with the CIEEM guidance for EcIA, which recognises that evaluation is a complex process and that a range of factors need to be considered in attributing value to ecological features. Various characteristics can be used to identify features that are likely to be important in terms of biodiversity, including:

- Naturalness;
- Animal or plant species that are rare or uncommon, either internationally, nationally or more locally;
- Ecosystems and their component parts which provide the habitats required by the above species, populations and/or assemblages;
- Endemic species or locally distinct sub-populations of a species;
- Habitat diversity, connectivity and/or synergistic associations (e.g. Networks of hedgerows and areas of species-rich pasture that provide important feeding habitat for a rare species, such as greater horseshoe bat);
- Plant communities (and their associated animals) that are considered to be typical valued natural/semi-natural vegetation types – these will include examples of naturally species poor communities;
- Species on the edge of their range, particularly where their distribution is changing as a result of global trends and climate change;
- Species rich assemblages of plants and animals;
- Typical faunal assemblages that are characteristic of homogenous habitats.

8.3.2 The ecological features that may be affected by the Development have been evaluated within a geographical framework based on the ecological status of the features, but which also reflects a wide range of legislation and governmental guidance as indicated in Table 8.4. The guidance stresses there are many geographic contexts in which the importance of 'Important Ecological Features' (IEFs) can be assessed and the importance is in how these are defined). The significance of impacts is also then subsequently assessed based on this frame of reference.

8.3.3 Features with a value of Local or above were considered to represent IEFs. Those features not meeting the criteria for IEFs were classified as having below local (that is, not considered to appreciably enrich the habitat resource at the local level, although they may provide some habitat diversity within the immediate context of the Site itself), or Negligible ecological importance. These features are excluded from further assessment given that impacts on such features are considered insignificant regardless of the nature or magnitude of the potential impact, the exception to this being where a feature (typically individuals or populations of a

species) is legally protected.

8.3.4 The likelihood that a change/activity will occur as predicted has a degree of confidence assigned. The categories of confidence used are provided in Table 8.1.

Table 8.1 Level of Confidence in Predictions

Level of Confidence	Estimated Probability
Certain/Near Certain	Probability estimated at 95% chance or higher
Probable	Probability estimated below 95% but above 50%
Unlikely	Probability estimated below 50% but above 5%
Extremely Unlikely	Probability estimated at less than 5%

8.3.5 The impacts of the Development have been predicted, taking into account different stages and activities within the development process. Impacts have been considered both individually and cumulatively. When describing impacts on an ecosystem, structure or function, reference is made to the terms as described in Table 8.2.

Table 8.2 Terms used to Describe Impacts

Parameter	Definition of parameter
Positive or Negative	Whether the impact has a positive or negative effect
Extent	The area of which the impact occurs
Magnitude	The size or amount of an impact
Duration	The time for which the impact is predicted to last prior to recovery or replacement of the resource or feature
Reversibility	Whether the impact is permanent (i.e. irreversible) or temporary (i.e. reversible)
Timing and Frequency	How often the impact occurs (e.g. repeated noise from piling work) and when it occurs (e.g. vegetation clearance undertaken outside of the bird breeding season.

8.3.6 The Town and Country Planning (Environmental Impact Assessment) Regulations 2017 (as amended) require that attention be paid to all likely forms of effects. These may be:

- Direct or indirect;
- Short or long-term;
- Intermittent, periodic or permanent; and
- Cumulative.

8.3.7 Potential effects prior to mitigation include:

- Direct loss of habitats and associated flora and fauna within the Site boundary, interruption of wildlife corridors, decrease in value to wildlife through reduction in species and/or habitats;
- Indirect effects on retained vegetation within and bordering the Site, through increase disturbance and through local changes in soils, drainage and hydrology;
- Potential effects upon protected and scarce species through disturbance;
- Operational effects such as pollution incidents from chemical spills, pollution of streams and fragile habitats from runoff and incorrect storage of materials; and
- Long-term effects arising as a result of the favourable restoration of the Site to beneficial after-use.

Magnitude

8.3.8 Magnitude of effects has been determined based on the scales described in Table 8.3:

Table 8.3 Methodology for Assessing Magnitude

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

Significance

8.3.9 The ecological significance of any impact has been assessed, based upon the likely effect on the structure, function or conservation status of the feature. The assessment of impact significance is undertaken both to identify the need for mitigation and also to assess residual effects.

8.3.10 The significance of likely effects was determined by identifying those ecological features likely to be affected. The features were evaluated to identify the important ones, i.e. those which, if their level of importance reduced, national or local policies (or in some cases legislation) would be triggered. The nature of the individual and combined impacts (positive or negative) were characterised on each important feature, to determine the longevity, reversibility and consequences for the feature in terms of ecological structure and function and/or the conservation status of a habitat or species. As part of the process of determining whether there is likely to be an effect on the integrity of a site or ecosystem, the following questions are considered:

- Will any site/ecosystem processes be removed or changed?
- What will be the effect on the nature, extent, structure and function of component habitats?
- What will be the effect on the average population size and viability of the component species?

8.3.11 Once an impact is considered to be significant then the scale of impact is assessed on a geographical scale (i.e. international, national, regional, county etc.) as above. For example, the impact may not be significant at a county scale but is significant at a more local scale. For the purposes of this Chapter, likely significant effects on IEFs are those identified as being of significance at a local scale or above.

Mitigation, Compensation or Enhancement

8.3.12 For the purposes of the EcIA, impacts on IEFs are assessed without mitigation in place. Mitigation or compensation is identified for significant impacts on features of nature conservation importance. In line with current CIEEM guidelines, the mitigation proposals for the Development

should aim to:

- Avoid negative ecological impacts – especially those that could be significant;
- Reduce negative impacts that cannot be avoided; and
- Compensate for any remaining significant ecological impacts.

8.3.13 Priority is given to avoidance of impacts, where possible, through design and/ or regulation of the Development through aspects such as timing, storage of materials etc. Where this is not possible opportunities are sought to reduce the impacts as much as is feasible. If significant impacts cannot be avoided through mitigation, then compensation that is considered appropriate to offset the negative impacts of the Development should be outlined. Where it is known to exist, evidence is supplied for the effectiveness of proposed mitigation or compensation.

8.3.14 Development should be sustainable, and projects should seek to provide a net gain for biodiversity, as promoted through national and local policies. Enhancement should therefore be an objective of all projects, and refers to gains, such as from improved management or habitat creation, which are unrelated to an identified negative impact or, are over and above that required for mitigation or compensation of an identified effect, and will therefore deliver a net biodiversity gain or benefit.

Assumptions and Limitations

8.3.15 Limitations relating to field surveys are general limited or absent, as described in further detail with Technical Appendix 8.1.

Consultation

8.3.16 The views of: the Local Planning Authority (LPA) Ecologist for Cherwell District Council (CDC); Natural England (NE); and Berkshire, Buckinghamshire and Oxfordshire Wildlife Trust (BBOWT) were sought in respect of likely ecological sensitivities pertaining to the Application Site during the formal screening/scoping stage of the EcIA.

8.3.17 Natural England provided general advice on the EcIA process, and noted that the Site lies within the Impact Risk Zone (IRZ) of the Wendlebury Meads and Mansmoor Closes SSSI. An assessment of this SSSI, as well as the Weston Fen SSSI, is set out at paragraph 3.6-3.9 at Technical Appendix 8.1.

8.3.18 The LPA Ecologist requested that: impacts on the area of ancient woodland be assessed and that the ancient woodland be accommodated within any areas of green infrastructure; that any surveys scoped out will need to be justified; and that Biodiversity Impact Assessment (BIA) calculations be included with the where a net gain of at least 10% is sought (in addition to other enhancements on site, such as provision of bird and bat boxes). A BIA has been undertaken accordingly and is provided in Technical Appendix 8.2.

8.3.19 BBOWT has suggested that a minimum 50m buffer be maintained between the ancient woodland and any development, and that hedgerows should be retained and enhanced, with a 15m buffer between any development and the hedgerows, which should also serve as a dark corridor for nocturnal species. BBOWT has set out that dependent on the findings of breeding and wintering bird surveys, mitigation may be required for any priority species that are to be impacted. It has also been recommended that a lighting assessment be carried out to avoid impacts on nocturnal species, in particular bats. BBOWT has referenced the NPPF with regards to biodiversity net gain and noted that a net gain will need to be demonstrated for the Site, and

has recommended that DEFRA's Biodiversity Metric be used to calculate biodiversity net gain. BBOWT has recommended that a variety of new habitats be created within the Site, including species-rich grassland within the built development and along any roadside swales, which should be protected through management plans. Finally, BBOWT provide general advice on the survey scope. As set out above, a BIA has been undertaken, which is provided in Technical Appendix 8.2. The methodology and results of the suite of surveys undertaken, as well as an assessment of impacts and mitigation, are set out in this ES chapter and accompanying Technical Appendix 8.1.

8.4 Baseline conditions

Current Baseline

8.4.1 The baseline conditions within the Site and surrounding Study Area (where relevant), which have informed the subsequent evaluation and ecological assessment, are detailed in full within Technical Appendix 8.1 and are summarised below.

Designated Sites

8.4.2 The Application Site is not covered by any statutory designations, nor are there any international designations (European Sites) within 10km. No European Sites are judged to be at risk of adverse impacts resulting from the Proposed Development and therefore an Appropriate Assessment of the proposals, in line with The Conservation of Habitats and Species Regulations 2017, is not required.

8.4.3 Initial review and impact screening with regard to designated sites, as described within Technical Appendix 8.1, ruled out adverse impacts on all but one designated site, namely Bowlers Copse Cherwell District Wildlife Site (CDWS). This designation measures 0.4ha, comprises semi-natural coppiced woodland and is located approximately 500m to the east of the Site, on the opposite side of the A41 (Figure 8.3). This designation, of District-level ecological importance, has been scoped into the assessment because of potential hydrological linkages between a watercourse (drainage ditch) running through this woodland and the Wendlebury Brook within the Site, which lies upstream.

Habitats and Vegetation

8.4.4 The current distribution of habitats within the Site and surrounding Study Area is illustrated on Figure 8.1 and further details/evaluation of habitats are provided in Technical Appendix 8.1. Those habitats and flora of sufficient value for inclusion as IEFs in the assessment are summarised in Table 8.4 below.

Table 8.4 Important Habitats and Flora

IEF	Summary	Level of Ecological Importance
Broad-leaved Semi-natural woodland	Area of semi-natural woodland in the surrounding a pond, the southern part of which comprises ASNW (directly adjacent to the Site).	Local-County
Species-poor hedgerow and trees	Following the wet ditch across the southern portion of the Site. Low distinctiveness although forms part of notable habitat corridor.	Local
Semi-improved grassland	A field of semi-improved grassland in the south of the Site, south of the wet ditch.	Local
Wet ditches	Wet ditches run along the western boundary of the Site and through the southern part of the Site. Only very low water levels.	Local

Fauna

8.4.5 A detailed account of the protected and notable species present within and around the Site is provided in Technical Appendix 8.1. Those species or species assemblages of sufficient value for inclusion as IEFs in the assessment are summarised in Table 8.5 below.

Table 8.5 Important Species/Species Assemblages

IEF	Summary	Level of Ecological Importance
Birds	No significant breeding or wintering populations on Site, although the hedgerows, trees and woodland offer suitable nesting habitat. Barn owl recorded foraging but no breeding confirmed.	Local
Bats	Potential roosting in several mature trees and confirmed roost in two trees. Foraging and commuting by mostly common and widespread bat species with low numbers of uncommon species including barbastelle.	Local
Otter	Limited evidence of presence suggests occasional dispersal along the wet ditch within the Site.	Site
Badger	No evidence recorded within the Site, but setts and other evidence recorded in the wider area such that future presence in the Site cannot be ruled out.	Site
Common Toad	Small population recorded using terrestrial habitats within the Site.	Site
Reptiles	Low population of grass snake within tall ruderal vegetation and western boundary margins	Site
Butterflies	Non-significant breeding population of brown hairstreak and black hairstreak butterflies on site.	Local

Future Baseline

8.4.6 In the absence of development it is predicted that the existing agricultural use of the land would continue, as would the management of existing habitats such as hedgerows, trees and watercourses. The current management is not undertaken with the objective of maintaining or enhancing the ecological and biodiversity value of the Site and does not, for example, include repairing or replanting of hedgerows or planting trees to replace those which have died. Therefore, in the long-term, it is predicted that the ecological and biodiversity value would gradually decline below existing levels, in the absence of any significant intervention or farming subsidies which would incentivise habitat enhancement and restoration.

8.5 Potential Effects

8.5.1 An assessment of likely significant effects of the Proposed Development on those IEFs identified above has been undertaken based on the application plans (paragraph 2.1.2). The quantum and layout of the Proposed Development incorporate inherent or embedded ecological mitigation as a result of an iterative assessment and design process. In particular green corridors have been incorporated into the design on the southern, western and eastern site boundaries in which existing habitats can be retained and new habitat created and the proposed landscaped bunds in the north east of the Site (the primary objective of which is landscape mitigation) also provide opportunities for new habitat creation.

8.5.2 The likely effects are assessed with the inherent mitigation included, but in the absence of the additional mitigation measures required to address potentially significant effects. Anticipated effects during the construction and operation/post-completion stage of the Proposed

Development are discussed in turn below.

Construction Phase

8.5.3 Generalised effects which could arise as a result of the construction of the Proposed Development in the absence of mitigation include the following:

- Effects of direct habitat loss, damage and degradation due to land take upon habitats and species;
- Impacts of noise, light and human disturbance to species; and
- Pollution of groundwater and surface water flows, as described further in Chapter 11 of the ES (Hydrology, flood risk and drainage).

Designated Sites

8.5.4 Wetland habitats within Bowlers Copse CDWS are judged to be at risk of downstream hydrological impacts, via adverse changes in water quality and/or flow caused by construction work within or near the watercourses onsite, in particular the proposed realignment of the wet ditch running west-east across the southern portion of the Site.

8.5.5 The following construction activities could potentially alter water quality within the Site and therefore in Bowlers Copse CDWS:

- Construction plant movement and enabling ground works areas could result in the mobilisation and generation of contaminated run-off, comprising soil, sediment, and/or other construction materials;
- Accidental spillage of fuels or other contaminating substances could cause polluted run-off;
- Discharge of groundwater from any necessary dewatering of excavations could be contaminated with soil, sediment, and/or other construction materials; and
- Owing to the agricultural use of land within the Site, the soil may be rich in nutrients such as phosphorus and nitrogen. Construction plant movement, enabling ground works, and groundwater dewatering activities could therefore mobilise any 'residual' organic pollutants.

8.5.6 Whilst changes to the wet ditch within the Site will be substantial, Bowlers Copse lies approximately 500m downstream which would ameliorate negative effects. Furthermore, the drainage ditch running through Bowlers Copse is a minor water course and is likely to receive pollutants from the A41 and Wendlebury Road which are in very close proximity on either side. Potential hydrological effects are therefore judged to be minor adverse, temporary, reversible, not certain and significant at a Local level.

Habitats and Vegetation

Broad-leaved Semi-natural woodland

8.5.7 All existing woodland within or near to the Site is to be retained within the development layout and buffered from the construction zone by at least 160m, although some groundworks in close proximity to the area of ASNW will be required as part of the wet ditch realignment. There is therefore a risk of damage or deterioration of habitats in close proximity to the construction zone, including physical damage from machinery or personnel, pollution from dust, fuels/chemicals and waste materials. This potential effect is judged to be minor adverse (due to limited interface between development footprint and sensitive habitats), temporary, reversible, not certain,

significant at a District level.

Species-poor hedgerow and trees

8.5.8 Approximately 1,231m (62%) of the existing hedgerow with trees following the wet ditch will be lost either to make way for built development or as part of the wet ditch realignment on the southern edge of the Site. This direct loss is judged to be major adverse, permanent, partially reversible, certain and significant at a Local level.

8.5.9 Where retained hedgerow is present in close proximity to the construction zone, it is at risk of damage or deterioration as described above in respect of the woodland habitat. Such effects would be moderate adverse, temporary, reversible, not certain, and significant at a Local level.

Semi-improved grassland

8.5.10 Approximately 3.8ha (100%) of the existing semi-improved grassland within the Site boundary will be lost either to make way for built development or for proposed new tree planting and the wet ditch realignment on the southern edge of the Site. This direct loss is judged to be major adverse, permanent, partially reversible, certain and significant at a Local level.

8.5.11 Where retained grassland is present in close proximity to the construction zone, it is at risk of damage or deterioration as described above in respect of the woodland habitat. Such effects would be moderate adverse, temporary, reversible, not certain, and significant at a Local level.

Wet ditches

8.5.12 The existing wet ditch S2 and small section of adjoining wet ditch S1 with the Site will be diverted/realigned as part of the Proposed Development, thus resulting in the total loss of the existing habitat. The effect would be major adverse, permanent, irreversible, certain and significant at a Local level.

Fauna

Birds

8.5.13 Land take associated with the built development and other groundworks will result in the reduction in habitat available for breeding, overwintering and foraging by a range of bird species, albeit the majority of habitats affected are of limited importance. This direct habitat loss is judged to be moderate adverse, permanent, partially reversible, certain and significant at a Local level.

8.5.14 Removal of breeding habitat at inappropriate times of year could result in the injuring or killing of individual birds, their eggs or young. However, such actions would also be an offence under the Wildlife and Countryside Act 1981 (as amended), compliance with which is assumed as being inherent to the Proposed Development. Therefore, no significant effect is anticipated.

8.5.15 Birds using retained habitats in close proximity to the construction zone are likely to be disturbed temporarily during construction by noise and movement from machinery and personnel. This disturbance could affect breeding success albeit only a small proportion of the population would be affected. Such effects would be minor adverse, temporary, reversible, not certain, and significant at a Local level.

Bats

8.5.16 Out of eight trees with bat roost potential identified within the Site (as shown on Figure 8.2), five require removal to facilitate the construction of the Proposed Development, including two trees with confirmed roosts (T30 and T18), two trees with high potential (T19 and T20), one with

medium potential (T17), and one tree with negligible to low potential. This includes T18 and T30 (as labelled on Figure 8.2), from which individual noctule (*Nyctalus noctula)* bats were observed emerging during the activity transect survey in May 2021. The loss of known (minor) roosts, and loss of potential roosting opportunities within the other affected trees, is judged to be major adverse, permanent, irreversible, certain/uncertain and significant at a Local level.

8.5.17 Removal of a confirmed bat roost could result in the injuring or killing of individual bats. However, such actions would also be an offence under the Conservation of Habitats and Species Regulations 2017 (as amended), compliance with which is assumed as being inherent to the Proposed Development. Therefore, no significant effect is anticipated.

8.5.18 Of the remaining two trees within the Site with bat roost potential, seven are sufficient close to the development footprint to be at risk of disturbance from construction noise and lighting (T11-T16 and T24). Given that this effect applies to potential, rather than actual, bat roosting and affects a small minority of suitable trees, it is judged to be insignificant.

8.5.19 With respect to effects on bat foraging and commuting habitats, the highest quality bat habitats within the Site are the woodland on the western boundary (which is to be retained) and the wooded wet ditch corridor in the south (which is to be lost as part of the realignment works). The area of direct habitat loss represents a small proportion of the total resource is judged to be insignificant.

8.5.20 Potential disturbance of retained bat foraging habitats by artificial lighting during construction has been ruled out on the basis that standard hours of operation will be imposed, thereby avoiding works after dark during the main bat activity season.

Otter

8.5.21 No actual or potential otter breeding or resting places have been recorded along the wet ditch within the Site, and therefore no impacts on such features would occur during construction. Foraging otter could be disturbed, or experience temporary disruption of their foraging routes, during the wet ditch realignment works. However, use of the existing wet ditch by otter appears to be limited and infrequent, which is consistent with the poor quality of foraging habitat (e.g. low water levels), such that these potential (temporary) effects are considered to be insignificant.

Badger

8.5.22 No badger setts have been recorded within the Site, however, evidence of badgers was recorded in the wider area. Furthermore, scrub and hedgerow habitats offer suitable locations for badgers to potentially establish new (likely outlier) setts in future and the grasslands provide foraging habitat. Direct loss or disturbance of such habitats during construction will be limited as proportion of the existing habitat, such that the effect on any badger population (if present) would be insignificant.

8.5.23 Removal of vegetation and groundworks within and around an active badger sett could result in the disturbance of the sett or the injuring or killing of individual badgers. However, such actions would also be an offence under the Protection of Badgers Act 1992 (as amended), compliance with which is assumed as being inherent to the Proposed Development. Therefore, no significant effect is anticipated.

Common Toad

8.5.24 Common toad was not recorded within the one pond onsite but was recorded in nearby off-site ponds and individuals were regularly recorded under reptile refugia during the 2021 survey, in

particular within an area of tall ruderal vegetation south of the farm buildings. No aquatic/breeding habitat is to be lost as a result of the Proposed Development, however the tall ruderal and other potentially suitable terrestrial habitats for common toad will be lost, and individuals could be killed or injured during clearance works.

8.5.25 The population present is assessed as being of less than Local ecological importance, such that these effects are not significant in EIA terms, however such impacts will be addressed as part of the mitigation strategy to meet planning policy requirements in respect of biodiversity net gain and to enable the Local Planning Authority to fulfil its duty under the NERC Act 2006.

Reptiles

8.5.26 The majority of habitat in which reptiles were recorded, or would be expected to occur, will be retained and buffered from development. However, a proportion of actual/potential habitat will lost either to make way for built development or for proposed new tree planting and bunding. The population present is assessed as being of less than Local ecological importance, such that these permanent habitat losses are not significant in EIA terms, however such impacts will be addressed as part of the mitigation strategy to meet planning policy requirements in respect of biodiversity net gain and to enable the Local Planning Authority to fulfil its duty under the NERC Act 2006.

8.5.27 Clearance of suitable habitat in the development footprint could result in the injuring or killing of individual reptiles. However, such actions would also be an offence under the Wildlife and Countryside Act 1981 (as amended), compliance with which is assumed as being inherent to the Proposed Development. Therefore, no significant effect is anticipated.

Butterflies

8.5.28 Only a minority of the hedgerows within the Site were found to support, or have potential to support, black and brown hairstreak butterflies owing to the frequency with which the hedgerows are flailed (both species lay their eggs on the previous season's blackthorn growth). A small proportion of the suitable habitat is to be lost to create the landscaped bunds and/or as part of the wet ditch alignment works. The area of direct habitat loss represents a small proportion of the total resource is judged to be insignificant.

Operational Phase

8.5.29 Generalised effects which could arise as a result of the operation of the Proposed Development, in the absence of mitigation, include the following:

- Effects of light and noise/visual/human disturbance to habitats and species;
- Increased risk of collision to species arising from increased traffic movements;
- Increased levels of airborne pollutants due to emissions of nitrogen dioxide (NO2), particulate matter (PM10 and PM2.5) and dust (see Chapter 6 – Air Quality); and
- Alteration of surface water and groundwater flow quality and quantity (see Chapter 11 -Hydrology, flood risk and drainage).

Designated Sites

8.5.30 Wetland habitats within Bowlers Copse CDWS are judged to be at risk of downstream hydrological impacts, via adverse changes in water quality and/or flow within the Site during operation of the Proposed Development.

8.5.31 Operation of the Proposed Development will result in currently undeveloped permeable land

being developed with the construction of buildings, highways and other hard surfaces. Accordingly, this could increase the rate and volume of surface water run-off entering the (realigned) onsite watercourse and connected habitats downstream. However, a surface water drainage system is to be installed as part of the Proposed Development, which is treated as 'embedded mitigation'. This will intercept, manage and release rainfall run-off from the Site at a controlled rate, to ensure post-development peak run-off rates are not increased compared to the baseline situation and hence that additional flows are not discharged to the downstream catchments. On this basis the effect would be negligible.

8.5.32 The following operations could potentially alter water quality within the Site and therefore in Bowlers Copse CDWS:

- Surface water run-off from highways and other hard surfaces could result in the generation of contaminated run-off, comprising soil, sediment, salt or other particles; and
- The accidental spillage of fuels or other contaminating substances could cause polluted run-off.

8.5.33 The proposed surface water drainage system, will include the use of SuDS features, catch pits, and trapped gullies, the details of which will be subject to further approval via discharge of planning condition, prior to water being discharged to the downstream catchment. Such measures will remove hydrocarbon pollutants and suspended solids (via settlement), and thereby ensure a high-quality discharge from the Site to the downstream catchment. On this basis the effect would be negligible.

Habitats and Vegetation

8.5.34 Negative effects on retained habitats during operation of the Proposed Development (beyond the habitat losses experienced during construction) are predicted to be limited, however some deterioration of features could occur as a result of poor management/neglect. Such effects are not predicted to be significant in EIA terms, however this will be addressed as part of the mitigation strategy to meet planning policy requirements in respect of biodiversity net gain and to maintain locally important species populations.

Fauna

8.5.35 Negative effects on fauna during operation of the Proposed Development (beyond the habitat losses experienced during construction) are predicted to be limited, however certain species could suffer from the habitat deterioration/neglect described above. As above, such effects are not predicted to be significant in EIA terms, however this will be addressed as part of the mitigation strategy to meet planning policy requirements in respect of biodiversity net gain and to maintain locally important species populations.

8.5.36 In addition to the above, nocturnal fauna, in particular barn owl, bats, otter and badger could be deterred from using, or accessing, their breeding or foraging habitats by light spill from the Proposed Development. This is only likely to affect species using habitats in close proximity to the development and associated highways infrastructure, such that this effect is judged to be a minor-moderate adverse, permanent, irreversible, uncertain and significant at a Local level.

8.6 Mitigation

Introduction

8.6.1 Wherever possible, negative effects have been avoided or reduced through inherent mitigation. However, not all potential negative effects can be avoided or reduced in severity through inherent mitigation alone. This section identifies any additional mitigation measures required to avoid, reduce, or offset the potential for such significant negative impacts. The key mechanisms described include measures to:

- Conform with relevant and pertinent legislative requirements, particularly those associated with legally protected species; and
- Deliver and, where possible, maximise opportunities for biodiversity enhancement and gain through the Proposed Development.

8.6.2 The key mitigation delivery mechanisms to be implemented are summarised below.

Detailed Design Measures

8.6.3 Aspects of the detailed design which are especially relevant are as follows:

- Street lighting – to be designed to avoid impacts on nocturnal wildlife where in close proximity to retained habitats. This detail is not provided as part of the planning application but can be secured through a suitably worded planning condition;
- Surface water drainage system – designed to maintain/improve water quality, maintain existing run-off rates and provide additional wetland habitat. This detail is not provided as part of the planning application and will be subject to further approval via discharge of condition; and
- Soft landscape scheme – designed to include new habitats of ecological value within the public open space and other green infrastructure. A detailed landscape design is provided as part of the planning application.

Construction Environmental Management Plan

8.6.4 A framework Construction Environmental Management Plan (CEMP) is submitted with the planning application. Further detail in the CEMP will be prepared and implemented during the entirety of the construction stage to ensure appropriate management and operational systems are in place to avoid or minimise adverse pollution effects. Further details on the measures to be included in the CEMP are provided within Chapters 6, 7 and 11 of the ES (covering Air Quality, Noise and Hydrology respectively).

8.6.5 The CEMP can be secured by way of a suitably worded pre-commencement planning condition attached to the planning permission.

Ecological Construction Method Statement

8.6.6 An Ecological Construction Method Statement (ECMS) will be prepared which will set out in detail the measures to be implemented to protect IEFs during the construction phase of the Proposed Development. It is proposed that the implementation of the ECMS will be overseen by an appointed Ecological Clerk of Works (ECoW), whose scope and remit will be set out within the ECMS. This document will cross reference with the CEMP, where relevant, and a detailed Arboricultural Method Statement (AMS) which will set out measures to protect trees and hedgerows during the construction phase.

8.6.7 The ECMS (and AMS) and appointment of the ECoW can be secured by way of a suitably worded pre-commencement planning condition attached to the planning permission.

Landscape and Ecological Management Plan

8.6.8 A Landscape and Ecological Management Plan (LEMP) will be prepared. This will set out in the detail the measures to be implemented to ensure the successful establishment/installation of new habitats/features and the long-term maintenance and management of both existing and new habitats/features proposed as part of the soft landscape scheme.

8.6.9 The LEMP can be secured by way of a suitably worded pre-commencement planning condition attached to the planning permission.

Construction Phase

8.6.10 All necessary surveys are considered to be sufficiently up to date at the time of submission to determine the planning application. However, where relevant and depending on development timescales, certain detailed species surveys may require updating prior to commencement of development. The findings will be used to inform the measures set out below.

Designated Sites

8.6.11 Potential adverse hydrological effects on Bowlers Copse CDWS during construction will be avoided or reduced to insignificant levels by a range of measures to be included in the CEMP, as set out in Section 5 of Chapter 11 – Hydrology, flood risk and draining.

Habitats and Vegetation

8.6.12 The effects of habitat loss during construction will be mitigated or compensated through new habitat creation post-construction. This is described further under the Operation Phase mitigation section below.

8.6.13 Potential adverse effects on retained habitats relating to damage, deterioration or disturbance, will be avoided or reduced to insignificant levels by the following:

- CEMP – including pollution prevention and control of hours of operation; and
- ECMS and AMS – including establishment of Ecological Protection Zones (EPZs) around retained habitats, clearly delineated by protective fencing (or other barriers) and signage, where construction activities (including incursion by vehicles or personnel, fires and stockpiling of materials) are excluded.

Fauna

8.6.14 Protection of species during construction will be ensured through the provisions of the ECMS. As a general measure aimed at protecting species, “tool box talks” will be provided by a suitably qualified ecologist to the principal contractor appointed by the Developer, for distribution to all employees involved in any enabling works/vegetation clearance, to ensure that identification and protection of the relevant species, their habitats is understood.

8.6.15 In addition to the habitat protection measures described above, which will deliver much of the necessary species protection, further measures to be included in the ECMS for each relevant species group are summarised below.

Birds

- Retained nesting and foraging habitats will be included within EPZs;
- Removal of potential nesting habitat will be undertaken outside the bird breeding season (namely March-August) unless a detailed survey by a suitably experienced ecologist has confirmed that no active nests are present in the affected area immediately prior to works commencing; and

- Pre-commencement check of mature trees for nesting barn owls prior to felling and appropriate mitigation (timing of works and provision of nest box) if any barn owl nests are found.

Bats

- Retained trees with bat roost potential will be included within EPZs;
- Construction activities will be restricted to daylight hours as far as possible to mitigate effects of increased visual and noise disturbance, with the use of temporary, artificial lighting avoided during the hours between dusk and dawn, with directional and low-level lighting used away from sensitive habitat corridors to mitigate effects relating to increased use of artificial lighting;
- Update survey of trees with confirmed bat roosting or bat roost potential prior to felling or pruning of trees;
- Works to trees containing bat roost will require a Natural England (NE) EPS licence to derogate from the legal protection afforded to bats. In order to obtain a licence it must be demonstrated that there will be no detriment to the maintenance of the favourable conservation status of the local bat population; and
- Provision of replacement roosting habitat to mitigate losses of confirmed roosts.

Otter

- Construction activities will be restricted to daylight hours as far as possible to mitigate effects of increased visual and noise disturbance, with the use of temporary, artificial lighting avoided during the hours between dusk and dawn, with directional and low-level lighting used away from sensitive habitat corridors to mitigate effects relating to increased use of artificial lighting;
- Update survey of the section of wet ditch and any other affected watercourses prior to construction; and
- In unlikely event that holts/burrows are recorded, exclusion of animals from the affected area and provision of alternative habitat (under NE EPS licence) prior to works.

Badger

- Update check of development footprint and 30m buffer for badger setts prior to works commencing;
- In unlikely event that setts are recorded, aim to avoid impacts by micro-siting of development or, if impacts cannot be avoided, exclusion of animals from the affected area (under NE licence and potentially requiring provision of alternative setts) prior to works; and
- Use of ramps or sloping sides in open excavations to allow for wildlife to escape.

Common Toad and Reptiles

- Sensitive two-stage clearance of vegetation suitable for common toad and reptiles, under supervision of ECoW, with individuals allowed to disperse naturally, or captured by hand and relocated, out of the construction footprint; and
- Construction footprint subsequent maintained as bare ground/short vegetation to deter common toad and reptiles from entering.

Butterflies

- Retained hedgerows and woodland/scrub edge left uncut during the year of vegetation clearance and construction, to minimise brown and black hairstreak egg mortality rates in these habitats.

Operational Phase

Designated Sites

8.6.16 Potential adverse hydrological effects on Bowlers Copse CDWS during operation of the Proposed Development will be avoided or reduced to insignificant levels by implementation of the surface water drainage system as described above.

Habitats and Vegetation

8.6.17 Potential adverse effects on retained habitats as a result of poor management/neglect will be avoided by implementation of the LEMP as described above. Furthermore the LEMP will include measures to restore and enhance the ecological value of existing woodland, hedgerow and grassland habitats through a combination of initial interventions (e.g. gap planting) and sensitive long-term management (e.g. less frequent flailing of hedgerows and infrequent cutting of grassland).

8.6.18 The effects of habitat loss during construction will be mitigated or compensated through new habitat creation post-construction. New habitats to be delivered as part of the Soft Landscape Scheme (SLS) include the following:

- New native tree and shrubs;
- New native hedgerow and hedgerow grassland planting;
- New species-rich and tussock grassland (at base of landscaped bunds);
- Realigned wet ditch corridor with native swathe planting; and
- New wetland grassland in SuDS basins.

8.6.19 The establishment and long-term management of these habitats, as secured through the LEMP, will offset the losses to development and result in an overall net gain in habitat of biodiversity value. Details of the biodiversity metric can be seen at Technical Appendix 8.2. Furthermore, the proposed new planting will enhance the connectivity between existing important habitats, in particular the woodland habitats on the western edge of the Site, thereby strengthening the integrity of the local ecological network.

Fauna

8.6.20 The habitat enhancement and creation measures described above (delivered via the LEMP and LS) will offset any impacts of habitat loss and fragmentation on the important species and species groups present within the Site.

8.6.21 Additional species-specific measures proposed to minimise post-development effects, and provide enhanced opportunities for species breeding, forage and refuge, are detailed below.

Birds

- Landscape planting to include a range of fruit and seed-bearing plants to enhance foraging resource for birds; and
- Bird nesting features (bird boxes or bricks) to be installed on retained trees and/or incorporated into selected new buildings in the development;

Bats

- Bat roosting features (bat boxes or bricks) to be installed on retained trees and/or incorporated into selected new buildings in the development; and
- Sensitive design of streetlighting to avoid impacts on bats where in close proximity to retained habitats.

Badger

- Landscape planting to include a range of fruit bearing shrubs and trees to enhance foraging resource for badgers; and
- Sensitive design of streetlighting to avoid impacts on badgers where in close proximity to retained habitats.

Common Toad and Reptiles

- Amphibian and reptile refugia/hibernacula (log and rubble piles) to be created in secluded locations.

Butterflies

- Landscape planting to include a high proportion of blackthorn to provide additional breeding habitat for black and brown hairstreak.

8.7 Residual effects

Construction Phase

8.7.1 Subject to the mitigation measures outlined above, residual effects anticipated upon IEFs during the construction phase have been reduced to levels that are not considered to be significant.

Operational Phase

8.7.2 In light of the mitigation proposed, all potential effects upon those IEFs identified within the assessment are not considered to be significant. Furthermore, habitat creation, restoration and long-term management to be delivered via the LEMP and SLS will result in minor beneficial (Local level) effects on the local woodland habitat resource.

8.8 Implications of Climate Change

8.8.1 Changes to future climate including higher winter and summer temperatures and a decrease in summer rainfall could negatively affect habitats and species on site, and/or result in a shift in the geographical range of plants and animals (generally northward or towards higher altitudes).

8.8.2 The proposed protection and enhancement of existing habitats, and creation of new habitats composed of native climate tolerant species, will increase the resilience of the Site's ecological features to the future effects of climate change. In addition, the increased habitat connectivity that would be achieved by the landscaping proposals would facilitate the long-term migration/shift in geographical range by plants and animals in response to the changing climate.

8.9 Cumulative effects

8.9.1 The schemes to be considered in the cumulative assessment include the Proposed Development along with other committed developments (i.e. those that have not been commenced but have a valid planning permission and those schemes which are in the planning

process). The assessment of cumulative effects repeats the assessment process set out above, but considers the potential change caused by all schemes identified for cumulative assessment.

8.9.2 The schemes listed in ES Section 3.3 have been included within the assessment of cumulative effects.

8.9.3 Subject to the implementation of the proposed ecological avoidance, mitigation and enhancement measures, the residual effects of the Proposed Development alone will be either negligible or beneficial. Thus, the likelihood of cumulative effects on ecological features arising in combination with the schemes listed above is judged to be negligible.

8.10 Summary

8.10.1 This chapter assesses the impacts and consequential ecological effects that may occur to Important Ecological Features from the Proposed Development. Important Ecological Features includes designations, habitats, protected and Priority Species of plants and animals (terrestrial and aquatic).

8.10.2 The assessment includes a summary of the current baseline and predicted future ecological conditions and identifies measures to avoid, mitigate and/or compensate, where appropriate, for significant effects that may arise as part of the Proposed Development.

8.10.3 The assessment has been informed by baseline investigations (desk studies and a series of detailed ecological surveys) by EDP. The assessment has been undertaken using professional judgement and experience, and in accordance with industry standard guidance.

8.10.4 The majority of the Site comprises improved grassland fields, with smaller areas of bare ground, tall ruderal vegetation, buildings and hardstanding that are of negligible intrinsic ecological importance. However, the Site also includes a semi-improved grassland field, a pond, broad-leaved semi-natural woodland (part of which comprises ancient semi-natural woodland), hedgerows and trees, and wet ditches that are of Local ecological importance.

8.10.5 The Important Ecological Features taken forward for detailed assessment are set out below:

- Bowlers Copse CDWS (Local-level);
- Broad-leaved semi-natural woodland (Local/County-level);
- Species-poor hedgerow and trees (Local-level);
- Semi-improved grassland (Local-level);
- Wet ditches (Local-level);
- Birds (Local-level);
- Bats (Local-level);
- Otter (Site-level);
- Badger (Site-level);
- Common Toad (Site-level);
- Reptiles (Site-level); and
- Butterflies (Local-level).

8.10.6 A range of industry standard measures describing key working methods and timings to avoid/minimise ecological effects during construction will be delivered through an Ecological Construction Method Statement (ECMS), and protected species licenses where required, overseen by an ECoW. These licenses would be obtained in advance of construction, and mitigation measures would be further refined and agreed during the licensing process.

8.10.7 The design and layout of the Proposed Development has been refined through various iterations to ensure that potentially significant ecological effects are avoided or minimised, and to deliver biodiversity gains in accordance with local and national planning policy. To achieve this, the Proposed Development incorporates approximately 6.7ha of greenspace to biodiversity, approximately 35% of the total Site area, which will be managed specifically for biodiversity. The establishment, maintenance and long-term management of the retained and created habitats will be delivered via a Landscape and Ecological Management Plan (LEMP).

8.10.8 Overall, it is predicted that a net biodiversity gain will be delivered by the development proposals, thereby meeting both local and national policy requirements regarding biodiversity.

8.10.9 In summary, with appropriate mitigation and design built into the Proposed Development, **no significant**, adverse construction nor operation effects are predicted to the Important Ecological Features assessed. Furthermore, the Proposed Development can potentially deliver a long-term **beneficia**l effect at a **Local level** with respect to native scrub and grassland habitats.

8.10.10 A summary of the assessment is set out in Table 8.6 overleaf.

8.11 References

- Department for Communities and Local Government, 2021, *"National Policy Planning Framework"*
- www.gov.uk/guidance/natural-environment
- Cherwell Local Plan 2011–2031 Part 1 (adopted July 2015)
- Chartered Institute of Ecology and Environmental Management (September 2018) *Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine* (2nd Edition)

Table 8.6 Summary of effects

Feature(s)	Potential effect	Nature of effect	Significance (pre-mitigation)	Mitigation measure	Significance of residual effect
Construction Phase					
Designated sites					
Bowlers Copse CDWS	Changes in river flow and flood characteristics	Minor adverse, temporary, reversible, not certain.	Significant (Local level)	CEMP (sensitive construction methods, pollution prevention measures)	Negligible
	Changes in water quality from on-site pollution				Negligible
Habitats and Vegetation					
Broad-leaved Semi-natural woodland	Damage or deterioration	Minor adverse, temporary, reversible, not certain.	Significant (District level)	CEMP, ECMS and AMS (protection of retained habitats); LEMP (enhancement of retained habitat); and SLS (new habitat creation)	Significant beneficial (Local-level)
Species-poor hedgerows and trees	Direct loss (62%)	Major adverse, permanent, irreversible, certain.	Significant (Local level)	LEMP (enhancement of retained habitat); and SLS (new habitat creation/planting)	Negligible
	Damage or deterioration	Moderate adverse, temporary, reversible, not certain.	Significant (Local level)	CEMP, ECMS and AMS (protection of retained habitats); LEMP (enhancement of retained habitat); and SLS (new habitat creation)	Negligible
Semi-improved grassland	Direct loss (100%)	Major adverse, permanent, partially reversible, certain.	Significant (Local level)	LEMP (enhancement of retained habitat); and SLS (new habitat creation)	Negligible
	Damage or deterioration	Moderate adverse, temporary, reversible, not certain.	Significant (Local level)	CEMP and ECMS (protection of retained habitats); LEMP (enhancement of retained habitat); and SLS (new habitat creation)	Negligible
Wet ditches	Direct loss (100%)	Major adverse, permanent, irreversible, certain.	Significant (Local level)	SLS and LEMP (new habitat creation and management)	Negligible
Fauna					
Birds	Loss of nesting and foraging habitat	Moderate adverse, permanent, partially reversible, certain	Significant (Local level)	LEMP (enhancement of retained habitat); and SLS (new habitat creation/planting)	Negligible
	Direct killing and injuring of nesting birds, young and eggs	Not significant (based on inherent mitigation – legal compliance)		ECMS (sensitive timing and method of vegetation clearance)	Negligible
	Disturbance	Minor adverse, temporary, reversible, not certain.	Significant (Local level)	CEMP and ECMS (protection of retained habitats)	Negligible
Bats	Loss of actual and potential roosting habitat in trees	Major adverse, permanent, irreversible, certain/uncertain.	Significant (Local level)	LEMP (bat boxes)	Negligible
	Direct killing and injuring of roosting bats	Not significant (based on inherent mitigation – legal compliance)		ECMS and EPS Licence (sensitive timing and method of tree removal, provision of replacement roost habitat)	Negligible
	Disturbance of potential roosting habitat	Insignificant		CEMP and ECMS (protection of retained habitats)	Negligible

Feature(s)	Potential effect	Nature of effect	Significance (pre-mitigation)	Mitigation measure	Significance of residual effect
	Loss of foraging habitat (small proportion)	Insignificant		LEMP (enhancement of retained habitat); and SLS (new habitat creation/planting)	Negligible
Otter	Disturbance of foraging habitat	Insignificant		CEMP and ECMS (sensitive timing and method of works)	Negligible
Badger	Loss of foraging habitat (small proportion)	Insignificant		LEMP (enhancement of retained habitat); and SLS (new habitat creation/planting)	Negligible
	Direct killing and injuring of badgers in setts	Not significant (based on inherent mitigation – legal compliance)		ECMS and NE Licence (sensitive timing and method of works)	Negligible
Common Toad	Loss of terrestrial habitat and direct killing and injury	Moderate adverse, permanent, irreversible, certain/uncertain	Insignificant	LEMP (enhancement of retained habitat); SLS (new habitat creation); and ECMS (sensitive timing and method of vegetation clearance)	Negligible
Reptiles	Loss of breeding, refuge and foraging habitat	Moderate adverse, permanent, irreversible, certain	Insignificant	LEMP (new pond creation and enhancement of retained habitat); and SLS (new habitat creation/planting)	Negligible
	Direct killing and injuring	Not significant (based on inherent mitigation – legal compliance)		ECMS (sensitive timing and method of vegetation clearance)	Negligible
Butterflies	Loss of breeding habitat (small proportion)	Minor adverse, permanent, irreversible, certain	Insignificant	LEMP (enhancement of retained habitat); and SLS (new habitat creation/planting)	Negligible
Operational Phase					
Designated sites					
Bowlers Copse CDWS	Changes in river flow and flood characteristics	Negligible (based on inherent mitigation – surface water drainage system)		Surface water drainage system (SuDS features)	Negligible
	Changes in water quality from on-site pollution				Negligible
Habitats and Vegetation					
Retained habitats	Poor management/neglect	Insignificant		LEMP (enhancement of retained habitat); and SLS (new habitat creation/planting)	Negligible
Fauna					
All species	Poor management/neglect of retained habitats	Insignificant		LEMP (enhancement of retained habitat); and SLS (new habitat creation/planting)	Negligible
Nocturnal species (barn owl, bats, otter and badger)	Disturbance of habitat by lighting	Minor-moderate adverse, permanent, irreversible, not certain	Significant (Local level)	Sensitive lighting design	Negligible

9 Landscape and visual effects

9.1 Introduction

9.1.1 This chapter of the ES has been produced by the Environmental Dimension Partnership Ltd (EDP). This chapter has been prepared with reference to the Technical Appendices and contributors, as set out below:

- Technical Appendix 9.1: Landscape and Visual Impact Assessment (LVIA) baseline assessment - EDP;
- Technical Appendix 9.2: Table of Effects: Visual Amenity;
- Technical Appendix 9.3: Cumulative Assessment;
- Technical Appendix 9.4: Detailed Landscape Proposals;
- Technical Appendix 9.5: Photomontages;
- Technical Appendix 9.6: Arboricultural Impact Assessment;
- Technical Appendix 9.7: Landscape Strategy; and
- Technical Appendix 9.8: Dunwoody Lighting

Purpose of Assessment

9.1.2 This chapter considers the existing landscape and visual context of the Study Area and the potential effects of the Proposed Development on landscape and visual receptors as required by Cherwell District Council (CDC) in the Scoping Opinion where landscape and visual matters have been requested to be included within the EIA (refer to correspondence in Appendix 9.1).

Legislative Framework

9.1.3 Planning policy is set out in detail in Chapter 4 of this ES. The following is a summary of planning policies relevant to landscape and visual issues both at national and local levels and should be read in conjunction with Chapter 4.

Legislative Context

9.1.4 With regard to Landscape and Visual matters the European Landscape Convention (ELC), to which the UK is a signatory, defines landscape thus:

"Landscape is an area, as perceived by people, whose character is the result of the action and interaction of natural and/or human factors."

9.1.5 The Guidelines for Landscape and Visual Impact Assessment Third Edition (LI/IEMA, 2013) (GLVIA), para 2.4, reminds us that the importance of the ELC definition is that it *"…moves beyond the idea that landscape is only a matter of aesthetics and visual amenity".* Landscape assessment requires that proposed changes are assessed holistically in terms of all dimensions of the landscape resource. Those other dimensions include whether the Application Site has historical or cultural relevance, its habitats, its landscape fabric and its long term management. Frequently we find that loss of openness and change to visual character are counterbalanced by neutral or even positive impacts on other dimensions of the landscape resource.

9.1.6 The GLVIA also states, in reference to the European Union Directive 2011/92/EU:

"The Directive is clear that the emphasis is on the identification of likely significant environmental effects. This should embrace all types of effect and includes, for example, those that are positive/beneficial and negative/adverse, direct and indirect, and long and short term, as well

as cumulative effects. Identifying significant effects stresses the need for an approach that is in proportion to the scale of the project that is being assessed and the nature of its likely effects. Judgement needs to be exercised at all stages in terms of the scale of investigation that is appropriate and proportional. This does not mean that effects should be ignored or their importance minimised but that the assessment should be tailored to the particular circumstances in each case."

9.1.7 This landscape and visual assessment has been prepared in accordance with best practice guidance, as set out in the GLVIA which *"takes into account recognition of the European Landscape Convention by the United Kingdom government"* including with regard to: definition of landscape; value of landscape; and the assessment of the effects of the development on landscape, as set out above. This assessment has, therefore, been prepared with regard to the European Landscape Convention in these regards.

National Planning Policy Framework (NPPF)

9.1.8 At the heart of the National Planning Policy Framework (NPPF, Updated July 2021) is a presumption in favour of sustainable development. For landscape, this means recognising the intrinsic character and beauty of the countryside (paragraph 174 (b)) and balancing any harm to the landscape resource with the benefits of the scheme in other respects. This balancing exercise is to be undertaken by the decision taker (in this case the Local Planning Authority (LPA)) and falls outside the remit of this report. The benefits of the scheme are to be weighed against the effects on the landscape character and visual amenity as set out in this report, as detailed in the Planning Statement accompanying this application. The policy framework is supported by the National Planning Practice Guidance (NPPG) where relevant.

National Planning Practice Guidance (NPPG)

9.1.9 Those categories within the NPPG that are of relevance to landscape and visual matters in relation to this site are set out below.

9.1.10 The NPPG states that well-designed places can be achieved by taking a pro-active and collaborative approach at all stages of the planning process. The guidance sets out processes and tools that can be used through the planning system. The guidance is to be read alongside the National Design Guide.

National Design Guide

9.1.11 The importance of design is a key focus within the guide as is the local and wider context and character of the Application Site.

Green Infrastructure

9.1.12 The NPPG highlights the multifaceted benefits delivered through Green Infrastructure and recognises how it can be used to reinforce and enhance local landscape character and contribute to a sense of place.

Landscape

9.1.13 Finally, the NPPG refers to the NPPF and the recognition of the intrinsic character and beauty of the countryside and the provision of strategic policies to provide the conservation and enhancement of landscapes. Adverse landscape impacts are to be avoided and mitigation measures employed where necessary.

Local Planning Policy

9.1.14 The statutory development plans which are relevant to the Application Site comprise:

- Cherwell Local Plan 2011–2031 Part 1 (adopted July 2015); and
- Saved Policies of the Adopted Cherwell Local Plan 1996.

9.1.15 Part 2 of the Local Plan 2011–2031 is under preparation, which will contain detailed development management policies and non-strategic site allocations. While this is under preparation the saved policies of the Cherwell Local Plan 1996 remain part of the current development plan.

Cherwell Local Plan 1996 Saved Policies

9.1.16 The Local Plan Proposals Map shows no specific policies applying to the Application Site.

9.1.17 The following saved policies to be retained under the new 2011–2031 Local Plan are considered relevant in the context of this assessment:

- Saved policy C7 Landscape conservation, requires development to take into account the surrounding topography and landscape character so as not to detract from important views; and
- Saved Policy C28 Layout, design and external appearance of new development, which relates to the design of development (including siting, layout, size, scale, architectural style, building materials, means of enclosure and landscaping), and which should be sympathetic to the character of its landscape context.

9.1.18 The Application Site lies in close proximity to the village of Wendlebury, outside the northern boundary of the 'Green Buffer' identified within the evidence base to the Local Plan 2011–2031, namely the Bicester: Green Buffer Report (September 2013). Given the Application Site's location to the north of the village, being divorced from it by the A41 dual carriageway, it is considered that development within the site would not materially change the separate identity of Wendlebury and, as such, would not offend Saved Policy C15 which relates to the coalescence of settlements is not applicable.

Cherwell Local Plan 2011–2031: Part 1 (Adopted July 2015)

9.1.19 The over-arching policies contained within the Cherwell Local Plan 2011–2031 that are considered relevant are described in detail within Technical Appendix 9.1 and listed below:

- Policy SLE 1: Employment Development;
- Policy ESD 10 Protection and Enhancement of Biodiversity and the Natural Environment;
- Policy ESD 13 Local Landscape Protection and Enhancement;
- Policy ESD 15 The Character of the Built and Historic Environment;
- Policy ESD 17 Green Infrastructure.

Other Documents of Relevance to Landscape Matters

9.1.20 The following evidence base documents have been considered as part of this appraisal:

- ENV06 Bicester Environmental Baseline Report (September 2013); and
- ENV07 Bicester 'Green Buffers' Report (September 2013).

9.2 Assessment methodology

9.2.1 A general EIA methodology is presented in Chapter 3. Provided within this section is an abridged methodology for the LVIA. An unabridged version can be found at Annex EDP 2 of Technical Appendix 9.1, with terms clearly defined within the Glossary at Annex EDP 3.

9.2.2 A three-stage assessment process will be adopted for the LVIA in accordance with best practice as set out in the GLVIA as relevant to EIA schemes, comprising: 1) Description of the proposed development and the existing landscape and visual context in which it will be assessed (set out at, Technical Appendix 9.1, with reference to ES Chapter 2, and summarised in this Chapter); 2) Prediction of the likely changes to the landscape and visual context resulting from the proposed development; and 3) Assessment of the significance and nature (positive or negative/ adverse) of the effects resulting from the likely changes.

9.2.3 The likely effects of the proposed development on the landscape resource and visual amenity will be assessed through the combination of an assessment of a number of representative viewpoints and desk research and fieldwork, through which a more precise understanding of the study area can be gained.

9.2.4 In order to assess the likely effects, the assessment will draw on the baseline to identify receptors, which, for the Proposed Development may include, but not be limited to, those listed below.

9.2.5 Landscape receptors may include:

- Landscape designations on a national, regional or local level (where relevant);
- The landscape fabric of the development site;
- The 'host' landscape character area which contains the proposed development;
- 'Non-host' landscape character areas surrounding the host character area which have the potential to be affected by the Application Proposals (where relevant); and
- Specific landscape features of value as identified through the ecology and arboriculture surveys.

9.2.6 Visual receptors may include:

- Users of National Cycle Routes and National Trails;
- Users of local/regional cycle and walking routes;
- Those using local rights of way – walkers, horse riders, cyclists;
- Users of open spaces with public access;
- Settlements and private residences;
- People using major (A and B) roads;
- People using minor roads; and
- People using local railways.

9.2.7 The tables within Technical Appendix 9.1 Annex EDP 2 - Methodology, reproduced below for ease of reference, offer templates for assessing overall sensitivity of any landscape or visual receptor, and magnitude of change.

9.2.8 Assessment of the overall sensitivity of any landscape or visual receptor is determined by combining judgements of their susceptibility to the type of change or development proposed and the value attached to the landscape or view as set out at paragraph 5.38 of GLVIA. However, the narrative in this report may demonstrate that assessment of overall sensitivity can

change on a case-by-case basis. For example, a high susceptibility to change and a low value may result in a medium overall sensitivity, unless it can be demonstrated that the receptor is unusually susceptible or is in some particular way more valuable. A degree of professional judgement is applied in arriving at the overall sensitivity for both landscape and visual receptors.

9.2.9 Table 9.1 below provides an indication of the criteria by which the overall sensitivity of a landscape receptor is judged within this assessment and considers both value and susceptibility independently.

Table 9.1 Landscape Sensitivity Criteria (see Technical Appendix 9.1 Annex EDP 2, Table EDP A2.1)

Category	Landscape Receptor Value Criteria	Landscape Susceptibility to Change Criteria
Very High	Nationally/internationally designated/valued countryside and landscape features; strong/distinctive landscape characteristics; absence of landscape detractors.	Strong/distinctive landscape elements/-aesthetic/perceptual aspects; absence of landscape detractors; landscape receptors in excellent condition. Landscapes with clear and widely recognised cultural value. Landscapes with a high level of tranquillity.
High	Locally designated/valued countryside (e.g. Areas of High Landscape Value, Regional Scenic Areas) and landscape features; many distinctive landscape characteristics; very few landscape detractors.	Many distinctive landscape elements/-aesthetic/perceptual aspects; very few landscape detractors; landscape receptors in good condition. The landscape has a low capacity for change as a result of potential changes to defining character.
Medium	Undesignated countryside and landscape features; some distinctive landscape characteristics; few landscape detractors.	Some distinctive landscape elements/-aesthetic/perceptual aspects; few landscape detractors; landscape receptors in fair condition. Landscape is able to accommodate some change as a result.
Low	Undesignated countryside and landscape features; few distinctive landscape characteristics; presence of landscape detractors.	Few distinctive landscape elements/-aesthetic/perceptual aspects; presence of landscape detractors; landscape receptors in poor condition. Landscape is able to accommodate large amounts of change without changing these characteristics fundamentally.
Very Low	Undesignated countryside and landscape features; absence of distinctive landscape characteristics; despoiled/- degraded by the presence of many landscape detractors.	Absence of distinctive landscape elements/-aesthetic/perceptual aspects; presence of many landscape detractors; landscape receptors in very poor condition. As such landscape is able to accommodate considerable change.

9.2.10 For visual receptors, judgements of susceptibility and value are closely interlinked considerations. For example, the most valued views are those which people go and visit because of the available view – and it is at those viewpoints that their expectations will be highest and thus most susceptible to change.

9.2.11 Table 9.2 below provides an indication of the criteria by which the overall sensitivity of a visual receptor is judged within this assessment, and considers both value and susceptibility together.

Table 9.2 Visual Receptor Sensitivity Criteria (see Technical Appendix 9.1 Annex EDP 2, Table EDP A2.2)

Category	Visual Receptor Criteria
Very High	Designed view (which may be to or from a recognised heritage asset or other important viewpoint), or where views of the surroundings are an important contributor to the experience. Key promoted viewpoint e.g. interpretative signs. References in literature and art and/or guidebooks tourist maps. Protected view recognised in planning policy designation. Examples may include views from residential properties, especially from rooms normally occupied in waking or daylight hours; national Public Rights of Way (PRoW) e.g. National Trails and nationally designated countryside/landscape features with public access which people might visit purely to experience the view; and visitors to heritage assets of national importance.
High	View of clear value but may not be formally recognised e.g. framed view of high scenic value, or destination hill summits. It may also be inferred that the view is likely to have value e.g. to local residents. Examples may include views from recreational receptors where there is some appreciation of the landscape e.g. golf and fishing; local PRoW, access land and National Trust land, also panoramic viewpoints marked on maps; road routes promoted in tourist guides for their scenic value.
Medium	View is not promoted or recorded in any published sources and may be typical of the views experienced from a given receptor. Examples may include people engaged in outdoor sport other than appreciation of the landscape e.g. football and rugby or road users on minor routes passing through rural or scenic areas.
Low	View of clearly lesser value than similar views experienced from nearby visual receptors that may be more accessible. Examples may include road users on main road routes (motorways/A roads) and users of rail routes or people at their place of work (where the place of work may be in a sensitive location). Also views from commercial buildings where views of the surrounding landscape may have some limited importance.
Very Low	View affected by many landscape detractors and unlikely to be valued. Examples may include people at their place of work, indoor recreational or leisure facilities or other locations where views of the wider landscape have little or no importance.

9.2.12 Table 9.3 below provides an indication of the criteria by which the size/scale of change at a landscape or visual receptor is judged within this assessment (Note that the assessment of visual effects has considered seasonality, with professional judgement considering the likely worst-case scenario of effects).

Table 9.3 Scale of Change Criteria (see Technical Appendix 9.1 Annex EDP 2, Table EDP A2.3)

Category	Landscape Receptor Criteria	Visual Receptor Criteria
Very High	Total loss of or major alteration to key elements/features/characteristics of the baseline condition. Addition of elements which strongly conflict with the key characteristics of the existing landscape.	There would be a substantial change to the baseline, with the proposed development creating a new focus and having a defining influence on the view.
High	Notable loss or alteration to one or more key elements/features/characteristics of the baseline condition. Addition of elements that are prominent and may conflict with the key characteristics of the existing landscape.	The proposed development will be clearly noticeable, and the view would be fundamentally altered by its presence.
Medium	Partial loss or alteration to one or more key elements/features/characteristics of the baseline condition. Addition of elements that may be evident but do not necessarily conflict with the key characteristics of the existing landscape.	The proposed development will form a new and recognisable element within the view which is likely to be recognised by the receptor.
Low	Minor loss or alteration to one or more key elements/features/characteristics of the baseline landscape. Addition of elements that may not be uncharacteristic within the existing landscape.	The proposed development will form a minor constituent of the view being partially visible or at sufficient distance to be a small component.
Very Low	Barely discernible loss or alteration to key elements/features/characteristics of the baseline landscape. Addition of elements not uncharacteristic within the existing landscape.	The proposed development will form a barely noticeable component of the view, and the view whilst slightly altered would be similar to the baseline situation.
Negligible	No appreciable change	No appreciable change

9.2.13 Table 9.4 below provides an indication of the criteria by which the geographical extent of the area affected is judged within this assessment.

Table 9.4 Geographical Extent Criteria (see Technical Appendix 9.1 Annex EDP 2, Table EDP A2.4)

	Landscape Receptors	Visual Receptor Criteria
Largest ↕ Smallest	Large scale effects influencing several landscape types or character areas.	Direct views at close range with changes over a wide horizontal and vertical extent.
	Effects at the scale of the landscape type or character areas within which the proposal lies.	Direct or oblique views at close range with changes over a notable horizontal and/or vertical extent.
	Effects within the immediate landscape setting of the Application Site.	Direct or oblique views at medium range with a moderate horizontal and/or vertical extent of the view affected.
	Effects at the site level (within the Application Site itself).	Oblique views at medium or long range with a small horizontal/vertical extent of the view affected.
	Effects only experienced on parts of the Application Site at a very localised level.	Long range views with a negligible part of the view affected.

Significance of Effect

9.2.14 The purpose of the EIA process is to identify the likely significant environmental effects (both beneficial and adverse) arising from Application Proposals.

9.2.15 In order to consider the likely level of any effect, the sensitivity of each receptor is combined with the predicted magnitude of change (as set out above), with reference also made to the geographical extent, duration and reversibility of the effect within the assessment. The level of effect can be derived by combining the sensitivity and magnitude in accordance with the matrix in Table 9.5.

Table 9.5 Level of Effects Matrix

	Overall Magnitude of Change				
Overall Sensitivity	**Very High**	**High**	**Medium**	**Low**	**Very Low**
Very High	**Substantial**	**Major**	**Major/ Moderate**	**Moderate**	*Moderate/ Minor*
High	**Major**	**Major/ Moderate**	**Moderate**	Moderate/ Minor	Minor
Medium	**Major/ Moderate**	**Moderate**	Moderate/ Minor	Minor	Minor/ Negligible
Low	**Moderate**	Moderate/ Minor	Minor	Minor/ Negligible	Negligible
Very Low	Moderate/ Minor	Minor	Minor/ Negligible	Negligible	Negligible/ None

9.2.16 Each effect is described and evaluated individually through the integration of all of the relevant factors and assessed as either significant or not significant. For landscape and visual effects,

those effects identified at a substantial, major, major/ moderate or moderate level (emboldened in the table above) are generally considered to be significant and those effects assessed at a moderate/minor, minor, minor/ negligible or negligible level are considered to be not significant.

9.2.17 In certain cases, where additional factors may arise, a further degree of professional judgement may be applied when determining the level of overall change. For example, in cases where a moderate/minor effect is experienced by a high or very high sensitivity receptor, this may be considered to be significant. Where this occurs, further explanation is given.

9.2.18 Effects will be described and evaluated during construction, at Year 1 (completion of construction activities) and Year 15 (following maturation of the landscape proposals).

Study Area

9.2.19 In order to establish the baseline and the potential limit of notable effects, a broad study area was adopted as the initial search area. This enabled the geographical scope of the assessment to be defined and provided the wider geographical context of the study. Within this area, the search focused on identifying the local planning policy context, national and local landscape designations and other relevant designations, and providing a general geographical understanding of the Application Site and its broader context (for example, in relation to landform, transport routes and the distribution and nature of settlement).

9.2.20 Following this initial analysis and subsequent field work, and having an appreciation of the development proposed, the study area has been refined to focus on those areas and features that are assessed to be likely to be affected by the proposals. The extent of this study area is 3km from the site boundary, largely due to local topography being relatively flat. Occasional reference may be made to features beyond this 3km area where appropriate. The study area is illustrated on **Figure 9.1**.

Surveys

9.2.21 A number of field assessments of local site circumstances, including photographic survey of the character and visual context of the Application Site and its surroundings were undertaken in during April 2021, and again in September 2021 in order to gather robust baseline information. Field assessments were undertaken in clear, dry weather and have, therefore, been undertaken, as far as is practicable, in accordance with best practice guidance which states that such assessments should be undertaken across the seasons when the leaves are absent from the majority of trees/vegetation and visibility is at its greatest.

9.2.22 These field-based assessments were undertaken by a Chartered Landscape Architect, with appropriate experience of the relevant guidance.

Arboricultural Matters

9.2.23 There are no known TPO trees within or adjacent the Application Site. As illustrated at Technical Appendix 9.1: Figure 9.2, a small block of woodland adjacent to the western boundary of the Application Site is designated as an Ancient Woodland.

Public Rights of Way

9.2.24 The locations of Public Rights of Way (PRoW) within the Zone of Theoretical Visibility of the Proposed Development are discussed in detail in Technical Appendix 9.1. They have been taken from Ordnance Survey Explorer Mapping (at a scale of 1:25,000) and PRoW route codes from the online Oxfordshire Countryside Access Map.

9.2.25 Chesterton PROW (161/4/20) crosses through the Application Site connecting Little Chesterton to Wendlebury. Potential views of the Application Site from the above routes and others within the wider countryside are considered in Technical Appendix 9.1.

Consultation

9.2.26 Consultation with the Local Planning Authority (LPA) was undertaken as part of an EIA Scoping Request, which principally involved the inclusion of a selection of representative viewpoints, or photoviewpoints (PVPs), of the site and proposals, as set out in Technical Appendix 9.1, with regard to the visual baseline. The selection of PVP were based on best practise and professional experience.

9.2.27 The LPA organised a meeting between EDP and Land Use Consultants (LUC) who were appointed by the Council to review the application material. EDP presented a total of 14 photoviewpoints to LUC to inform the assessment of effects. Following discussions, the following was agreed:

- It was agreed that nine of the photoviewpoints were to be presented as illustrative views and would not be formally assessed (Presented as **Photoviewpoints EDP A to I**). However, although not assessed, these views would aid the assessment of effects within the wider study area;
- LUC requested the following additional viewpoint locations be recorded:
    - Short-distance views from the east and north-east where both residents and PRoW users may experience views of the proposed development;
    - Short-distance views from the junction between the M40 and A41 where transient views are experienced road users travelling at speed; and
    - Medium distance views from a bridge over the M40, approximately 1km to the north.

9.2.28 Following this initial consultation, EDP proposed that the assessment of landscape and visual effects be supported by the following:

- 7 Photoviewpoints to be presented as illustrative views (not formally assessed);
- 15 Photoviewpoints to be formally assessed (this included the additional locations requested by LUC);
- 12 locations where wireline images are to be produced, predominantly from locations where views of the proposed development would be limited, but may be an identifiable component of the view;
- 3 locations where photomontages are to be produced where the proposed development would be considered an obvious addition to the view.

9.2.29 With regard to EDP's methodology, LUC questioned EDP's Level of Effects Matrix. However, EDP acknowledged that different landscape practices use different assessment methods. The methodology employed by EDP, who are corporate members of the Institute of Environmental Management and Assessment (IEMA), has never been questioned at Public Inquiry where landscape witnesses have good cause to query assessment methodology. Furthermore, GLVIA3 does state that (Para 3.35) (with EDP emphasis) *"In reporting on the significance of the identified effects the main aim should be to draw out the key issues and ensure that the significance of the effects and the scope for reducing any negative/adverse effects are properly understood by the public and the competent authority before it makes its decision. This requires clear and accessible explanations. The potential pitfalls are:*

- *over-reliance on matrices or tabular summaries of effects which may not be accompanied by clear narrative descriptions;*
- *failure to distinguish between the significant effects that are likely to influence the eventual decision and those of lesser concern;*
- *losing sight of the most glaringly obvious significant effects because of the complexity of the assessment."*

9.2.30 With the above in mind, EDP proposed to retain the existing tried and tested methodology, ensuring that the assessment of any effects is supported by 'clear narrative descriptions'.

9.2.31 In order to agree the scope of the landscape and visual assessment, the above was presented to the LPA on 8th of September 2021, with supporting imagery following on 9th September 2021.

Assumption and Limitations

9.2.32 Baseline conditions have been established using published documents and field assessment; it is important to note that this information may change before, or during, the construction and operation of the Application Proposals.

9.2.33 The assessment is undertaken in consideration of the 'worst case' scenario for the Application Proposals, i.e. those potential outcomes, situations or locations which would result in the most profound effect on landscape and visual receptors, unless stated to the contrary. It therefore identifies the greatest degree of change likely to accrue and may be subject to mitigating factors or alternative conditions which might reduce those effects.

9.2.34 As defined above, the assessment of likely significant effects applies a pre-determined methodology to arrive at its conclusions. This procedure brings a degree of objective, procedural rigour into what otherwise might be judged to be 'personal opinion'. Certainly, professional judgement still plays its part, but the purpose of adopting a methodology is to make the process as clear and logical as possible.

9.3 Baseline conditions

Current Baseline

9.3.1 Landscape and visual assessment is comprised of a study of two separate but inter-linked issues; landscape character and visual amenity. A detailed description of the landscape and visual baseline at and around the Application Site is set out in Technical Appendix 9.1, with a summary provided below.

Landscape Character

National Landscape Character

9.3.2 The landscape of England has been subject to a nationwide Landscape Character Assessment, The Character of England: Landscape, Wildlife and Natural Features (Natural England). The Application Site falls within National Character Area (NCA) Profile 108 Upper Thames Clay Vales.

9.3.3 While the descriptions of NCA 108 are useful in that it provides a context for the Application Site, and a broad framework for more detailed landscape character assessments, it is too generic to provide specific site level characterisation. For the scale of the development

proposed, it is considered that the description of landscape character undertaken at the sub-regional level is more relevant in establishing the landscape resource baseline.

Local Landscape Character

9.3.4 Of more relevance, is the landscape character outlined within local publications. There are three published documents relating to the landscape character which are relevant to the Application Site and its context:

- Oxfordshire Wildlife and Landscape Study (2004);
- Countryside Design Summary (1998); and
- Cherwell District Landscape Assessment (1995).

9.3.5 The Countryside Design Summary (June 1998) is Supplementary Planning Guidance (SPG) adopted in 1998. This document was informed by the Cherwell District Landscape Assessment by Cobham Resource Consultants (November 1995), which describes the landscape character of the District. Development proposals should reference the information and advice contained in this SPG, as well as the more recent landscape assessment within the Oxfordshire Wildlife and Landscape Study. The intention of the SPG document is that it will *"encourage creative and imaginative approaches to new development, which reflects the existing distinctive character of the villages and countryside of Cherwell District"* rather than being prescriptive.

Oxfordshire Wildlife and Landscape Study

9.3.6 The Application Site lies within 'Clay Vale' Landscape Character Type (LCT), and within that, the Weston-on-the-Green Local Character Area (LCA).

9.3.7 As defined by the Oxfordshire wildlife and landscape study (OWLS), the Clay Vale LCT covers land from the northern part of the river Cherwell to the Upper Thames area south of Bicester. It is described as *"a low-lying vale landscape associated with small pasture fields, many watercourses and hedgerow trees and well-defined nucleated villages."*

9.3.8 Key characteristics of the Clay Vale LCT relevant to the Application Site and its context include:

- *"A flat, low-lying landform;*
- *Mixed land uses, dominated by pastureland, with small to medium-sized hedged fields; and*
- *Many mature oak, ash and willow hedgerow trees; and*
- *Dense, tree lined streams and ditches dominated by pollarded willows and poplars."*

9.3.9 The 'Forces for Change' for this LCT include *"industrial, commercial and residential development on the fringes of larger settlements",* which can be *"visually intrusive."*

9.3.10 The landscape strategy for the LCT is to *"Conserve the intimate, tranquil and small-scale pastoral character of the landscape. Conserve and enhance the well-defined pattern of hedgerows, hedgerow trees and tree-lined watercourses."*

9.3.11 The 'Key Recommendations' for the landscape strategy include: *"Conserve the intimate, tranquil and small-scale pastoral character of the landscape. Conserve and enhance the well-defined pattern of hedgerows, hedgerow trees and tree-lined watercourses."*

9.3.12 Guidelines for this LCT which are considered relevant to the Proposed Development include:

- *Strengthen the small-scale field pattern by planting up gappy hedges using locally characteristic species such as hawthorn, and hedgerow trees such as oak and ash particularly within roadside hedges; and*

- *Promote environmentally-sensitive maintenance of hedgerows, including coppicing and layering when necessary, to maintain a height and width appropriate to the landscape type; and*
- *Promote small-scale planting of deciduous woodland blocks using locally characteristic species such as oak and ash; and*
- *"Minimise the visual impact of intrusive land uses at the fringes of towns, villages and farms with the judicious planting of tree and shrub species characteristic to the area. This would help to screen the development and integrate it more successfully with its surrounding countryside."*

9.3.13 The wooded estate lands LCT covers a larger swathe of land between Junction 9 of the M40 and Middelton Stoney. It is described as *"A wooded estate landscape characterised by arable farming and small villages with a strong vernacular character".* The landscape strategy for the LT is to *"Safeguard and enhance the characteristic landscape of parklands, estates, woodlands, hedgerows and unspoilt villages."*

EDP's Site Specific Landscape Character Assessment

9.3.14 EDP conducted a desk based and field assessment of the Application Site's characteristics during which the individual elements of the Application Site were noted, as were the differences in the composition and the character of the Application Site's physical components to the published assessment, and their value and ability to accommodate change.

9.3.15 The landscape within the context of the Application Site includes a mix of rural features and urban uses, including major vehicular corridors located at the Application Site's western and southern boundaries. The Application Site does contain a number of areas of established vegetation, including a small block of woodland at the western boundary, which is located immediately adjacent to the site boundary and is partly designated as an ancient woodland, and a number of mature trees along field boundaries and a watercourse.

9.3.16 The Application Site is perceived as being flat with little variation in topography. Ground levels have been altered locally following the construction of the A41 and M40 road junction, which is elevated above the Application Site's south-western corner. For the most part, the A41 sits on an embankment and, owing to limited tree cover on the Application Site's south-western boundary, enables direct views into the Application Site. However, where the A41 becomes 'at grade' with the Application Site, views are then terminated by mature tree cover on the Application Site's south-eastern boundary.

9.3.17 The Application Site's hydrological character is largely defined by a small watercourse which runs through the southern areas of it in a west to east direction. Other hydrological features adjacent to the Application Site include a pond within located within a small block of woodland.

9.3.18 The location of the Application Site, within a relatively flat landscape, results in limited visibility from the surrounding context, with most ground level views being filtered by intervening hedgerows and other vegetation. Views back to the Application Site from publicly accessible locations are generally limited by mature field boundary vegetation within the Application Site's local context, characteristic of the surrounding LCA. Short-distance transient views are possible from the road network adjacent to the Application Site, with the more open views being experienced from sections of the A41 dual carriageway.

9.3.19 The Application Site's general character is illustrated at Technical Appendix 9.1: Figure 9.4. The character of the Application Site is influenced by the prominent road infrastructure of the A41

and M40 corridors, both exerting an audible and visual influence on local tranquillity. In addition, where views of the Application Site can be obtained from the local context, a small industrial estate to the northwest of the Application Site, along with isolated residential dwellings, introduces an urban influence on this agricultural context.

9.3.20 The landscape fabric of the Application Site is relatively simple, comprised largely of several medium-sized agricultural fields. The key characteristics of the Application Site are consistent with the current agricultural land use prevalent in the wider area. With the exception of mature landscape features at the Application Site boundaries, internal field boundaries are considered to be in poor declining condition and contain few hedgerow trees.

9.3.21 With regard to landscape character, there are no heritage assets within the Application Site illustrated at Technical Appendix 9.1: Figure 9.2. The closest assets to the Application Site include a number of listed buildings within Wendlebury, which is separated from the Application Site by the A41, and a number of listed buildings within the Conservation Area of Chesterton, which has limited intervisibility with the Application Site due to mature tree and hedgerows within the local context.

Value of the Landscape Receptors

9.3.22 The following paragraphs describe the value of the landscape receptors as assessed by EDP and within published documents. Value and susceptibility to change are considered independently in the assessment of overall 'sensitivity' of landscape receptors, with susceptibility being in accordance with best practice guidance.

Value: Landscape Character of the Site and Context

9.3.23 Published landscape character assessments provide some contextual understanding of the defining characteristics of the wider landscape and, in some respects, the Application Site itself. As set out above, the Application Site and its surrounding context correlates with many of the key characteristics of the Clay Vale LCT and, more specifically, the Weston-on-the-Green LCA. The Application Site lies within the Clay Vale LCT and Weston-on-the-Green LCA and its characteristics are typical of the rural landscape. However, the description of the local landscape includes detracting urban elements, including the influence of the M40 which *"has had an impact on the otherwise tranquil pastoral landscape"* according to the Forces for Change of the LCT. Therefore, on balance, the value of the local landscape character is considered to be medium.

9.3.24 The Application Site does not lie within, or contain, any nationally or locally designated landscapes and it does not represent, in a perceptual or physical sense, a landscape of any great importance or distinct character. Furthermore, there is no evidence to suggest that the local community place special weight on the Application Site, meaning overall the Application Site is considered to be of no more than local landscape value.

9.3.25 The Application Site is adversely affected, in a sensory manner, by its proximity to both the M40, the A41 which is openly visible in short-distance views, and also a small industrial Application Site to the northeast. It is therefore considered of compatible value to the majority of the local landscape, i.e., there is nothing to suggest the local landscape is worthy of any particular sensitivity or protection, apart from as an area of functioning agricultural land with good field boundary features. This results in the susceptibility of the Application Site and its context, including the village of Little Chesterton, being assessed as medium resulting in an overall **medium** sensitivity.

Value: On Site Landscape Features

9.3.26 The guidelines for the Clay Vale LCT include to *"conserve and enhance the well-defined pattern of hedgerows and hedgerow trees."* The Application Site features consist of native hawthorn or hawthorn and blackthorn, field boundary hedgerows with trees including predominantly mature oak trees. These have intrinsic value in defining the pattern, scale and enclosure within the landscape, but are not rare or unique features.

9.3.27 The landscape elements with the potential to be adversely impacted by the development of the Application Site would include hedgerow boundaries, mature trees, particularly those aligning the existing watercourse, and existing agricultural field parcels (refer to EDP's Arboricultural Impact Assessment (included at **Technical Appendix 9.6**)). These landscape elements have been shown to be characteristic of published character assessments and are present within the Application Site or local context. The on-site landscape features are therefore considered to be of **medium** sensitivity.

Visual Context

9.3.28 EDP has conducted the assessment of the views available to and from the Application Site by walking and driving (as appropriate) local roads and rights of way. Before doing so, a broad area of search was defined using a Geographical Information System (GIS) based computer programme that predicts the Zone of Theoretical Visibility (ZTV), as detailed below.

Visibility to the Application Site

9.3.29 Using landform data within a Geographical Information System (GIS), EDP has prepared a broad Zone of Theoretical Visibility (ZTV) using digital surface modelling (DSM) data. This data includes height data on landform and surface features and therefore accounts for the screening effects of intervening landform, buildings, structures and vegetation. The ZTV was then visited by walking and driving (as appropriate) local roads, rights of way and other publicly accessible viewpoints. Through this exercise the main visual receptors predicted to have actual visibility to the Proposal, and constituent areas, were identified and the Zone of Primary Visibility (ZPV) of the Application Site was established (refer to Technical Appendix 9.1: Figure 9.5).

9.3.30 As set out at Technical Appendix 9.1, the ZPV is based on professional judgement and is considered to be where the proposed development would be visible to the casual observer on foot, cycling, driving or travelling by train where the views would normally be close-ranging and open; the proposal would be an obvious element of the view. Beyond this area, there is a zone of visibility that is less open, being either partly-screened or filtered. Views from within this wider zone may include the proposal, it may not be immediately noticeable, but once recognised any new development may be a perceptible addition to the view. The extent of the proposal within such views would vary and, in some cases, it would be almost indistinguishable as a consequence of both increasing distance and intervening visual screening.

9.3.31 The visual appraisal identified that the relatively flat landform of the study area means that landform, settlement, structures and vegetation provide effective screening for the Application Site. It shows that visual containment is provided by:

- To the north – agricultural land extends to the north alongside the M40 corridor. As this is private land, public views are only obtained from Green Lane which is at grade with the Application Site. However, as Green Lane crosses the M40, a bridge enables open views looking south with views of the Application Site largely being screened by mature woodland (refer to Technical Appendix 9.1: Photoviewpoints EDP 4, 5 and E);

- To the east – Built form and mature tree cover immediately to the north-east of the Application Site serves to limit views to and from Chesterton. Similarly, although there are views towards the Application Site from the neighbouring agricultural land, tree cover aligning a minor roads serves to limit views to within approximately 500m (refer to Technical Appendix 9.1: Photoviewpoints EDP 7, 9, 10 and H);
- To the south – as set out above, land in close proximity to the south of the Application Site is also largely flat. As such, views back to the Application Site from publicly accessible locations are generally filtered by intervening hedgerows and other vegetation, particularly those aligning the A41 corridor (refer to Technical Appendix 9.1: Photoviewpoints EDP 12, 13 and I); and
- To the west – the landscape is more open, particularly due to the presence of an airfield which enables views from the B430 and Weston-on-the-Green, looking east. Furthermore, limited built form on the eastern side of the B430 enables views looking east from the Weston-on-the-Green Conservation Area, although the Application Site itself is barely perceptible due to the maturity of field boundary hedgerows within the flat landscape context (refer to Technical Appendix 9.1: Photoviewpoints EDP 1, 2, 3 and A).

9.3.32 As set out above, following consultation with CDC, 15 of the locations are to be used for the production of visualisations (12 are to be AVR Level 1 (wirelines) and 3 are to be AVR level 3 (Photomontages)). This imagery is contained at Technical Appendix 9.5.

Extent of Visibility

9.3.33 As set out in paragraph 9.2.26, based on fieldwork observations, and the findings of the data trawl and consultation, a number of representative viewpoints, or PVPs, have been selected to be assessed. The locations are shown at Technical Appendix 9.1: Figure 9.5 and the views themselves are shown on **Technical Appendix 9.1: Figure 9.7**.

9.3.34 Within the zone of primary visibility, there are different groups of 'receptors', i.e. people in cars, walking, at work, or with views from their homes. The following paragraphs summarise the main 'receptor groups' which do obtain views towards or into the Site:

- Road Users: There are limited close-distance views (i.e. less than 500m from the Site boundary) towards the Site from sections of the local road network. Minor roads are considered to have medium sensitivity:
- Road Users: There are limited close-distance views (i.e. less than 500m from the Site boundary) towards the Site from sections of the main road network, including the M40 and A41. Major roads are considered to have low sensitivity:
- PRoW Users: Aside from PRoW running through the Application Site and immediately adjacent to it, there are few PRoW within the Study Area that afford clear views of the Application Site. Views from PRoW are limited to a few PRoW within close proximity, or immediately adjacent to the Application Site, largely where breaks in tree cover occur. PRoW users are considered to have a high sensitivity.
- Users of the wider Public Rights of Way (PRoW) Network: There are a number of PRoWs within 3km of the Site. PRoWs receptors are considered to have a high sensitivity;

9.3.35 This assessment has focused on the assessment of views from publicly accessible locations. As the Site is bounded by some residential and commercial development, it follows that neighbouring dwellings have views into the Site, but these tend to be from first floor level above the domestic curtilage treatment and surrounding mature landscape features. Notwithstanding, any proposed development would need to be sensitive to the residential visual amenity of these

dwellings.

9.3.36 Views from private residential properties are not protected by national planning guidance or local planning policy. However, nearby residential receptors with close-quarter views of the Site are broadly limited to dwellings immediately to the northeast of the site within Little Chesterton. These properties are located within a partly rural context, albeit with some small commercial and residential built form being seen in local views. The visual amenity of residential receptors is considered to be of high sensitivity with a reduced susceptibility to change due to commercial built form within the immediate context. However, given the rural character of the wider context, residents beyond 1km are considered to be of very high sensitivity.

9.3.37 Details of each view, and the reason for its selection as a 'representative viewpoint', are provided in **Table 9.6** below.

Table 9.6 Representative Viewpoints, or PVP

No.	Viewpoint Location	Grid Ref	Distance and Direction from Application Site	Receptor Sensitivity
PVP 1	View from Northampton Road, looking east	453676, 218086	2.1km to the south-west of the Application Site boundary.	**Low**
PVP 2	View from PRoW 404/15/10, looking east	453326, 219139	1.9km to the west of the Application Site boundary.	**High**
PVP 3	View from B430, looking west	453059, 220115	2.1km	**Low**
PVP 4	View from a B-road (Green Lane) to the north of the site, looking south-east	453563, 220874	1.85km	**Low**
PVP 5	View from a motorway bridge on Green Lane to the north of the site, looking south-east	454835, 221063	800m	**Low**
PVP 6	View from a minor road to the north of the site, looking south	455538, 220876	400m to the north of the Application Site boundary.	**Medium**
PVP 7	View from PRoW 161/4/10, looking south-west	455743, 220270	400m	**High**
PVP 8	View from a minor road Grange Farm, looking east	455743, 220270	250m	**Medium**
PVP 9	View from PRoW 161/14/20, looking west	455819, 220171	120m	**High**
PVP 10	View from PRoW 161/14/20 and a minor road, looking west	455854, 220074	100m	**Medium/High**

No.	Viewpoint Location	Grid Ref	Distance and Direction from Application Site	Receptor Sensitivity
PVP 11	View from Langford Lane, on a bridge of the railway, looking west	457097, 219672	1.25km to the east of the Application Site boundary.	**Medium**
PVP 12	View from PRoW 398/1/20, adjacent to Oxford Road, looking north-west	455809, 219400	275m to the south of the Application Site boundary.	**High**
PVP 13	View from the A41 to the south of the site, looking north	455373, 219333	30m	**Low**
PVP 14	View from PRoW No. 161/4/10, adjacent to a minor road, looking south-west	456191, 220980	900m	**High**
PVP 15	View from PRoW 398/1/20, looking north-west	455803, 219656	50m	**High**

Visual Receptors

9.3.38 Users of the following locations and routes, and residents of the following properties, have been identified as potentially able to perceive a change because of the Application Proposals that could result in a notable effect. These receptor locations are shown on Figure 9.5 and described in more detail within Technical Appendix 9.1:

- PRoW
    - Green Lane;
    - PRoW 161/4/10;
    - PRoW 398/1/20;
    - PRoW 404/16/10; and
    - PRoW 404/15/10.
- Transport Routes – Roads and Railway
    - M40;
    - A41;
    - Kirtlington Road (A4095);
    - Wendlebury Road;
    - Northampton Road; and
    - Langford Lane.
- Residents within Little Chesterton.

Site Context After Dark

10.1.1 In agreement with CDC, this assessment also considers landscape character after dark.

10.1.2 A total of seven locations were visit between the hours of 19:00 and 21:00 on the 28th of October 2021, with photography being recorded in line with best practice guidance published by the Landscape Institute. It should be noted that, as some photography was recorded at 21:00hrs, it is possible that some residential receptors are no longer active within their home and therefore,

fewer internal and external lighting sources may have been recorded that at other times of the day or night.

10.1.3 It was found that lighting sources around the Site are limited due to its largely agricultural nature. However, there are some light sources associated with properties in Little Chesterton and the neighbouring rural industrial units. As expected, the dominant light sources within the local context are associated with the M40 and A41, including vehicle movements, which can be seen in Night View EDP 5, 6 and 12.

10.1.4 In medium distance views from the north, illustrated by Night View EDP 6, the view is more rural, with glimpsed views of lighting sources within Little Chesterton. However, due to proximity, lighting and vehicle movements on the M40 reduce tranquillity after dark here. Notably, within the Inspectors decision for the recently approved development at the Bicester Sports Association (see Cumulative Site 17), it was found that *"the introduction of 18 lighting columns would result in a change to the character of the night sky when in use. There would also be illumination from the car park lighting, the clubhouse and its outdoor terrace and events space, although this could be mitigated by additional landscaping"* (Para 62). As such, the immediate context of the view would become less rural.

10.1.5 In views from the west, illustrated by Night View EDP 1 and 3, although views of vehicle movements on the M40 would be possible during winter months, views during summer when trees are in leaf are likely to be filtered by mature tree cover within the wider context. Notably, there is little sense of any lighting beyond the M40, largely due to a combination of mature tree cover and flat topography.

10.1.6 In short-distance views from the north-east, illustrated in Night Views EDP 8 and G, a number of individual lighting sources associated with dwellings in Little Chesterton can be seen. However, mature tree cover within the immediate context reduces light spill to the wider field parcels. The more defining lighting sources, as shown in Night View EDP G, are those associated with the A41 which extend along the southern boundary of the site.

10.1.7 EDP agrees that the lighting proposals within the scheme should address the existing landscape setting after dark and acknowledge that, while lighting sources are apparent within the Site's immediate context, lighting to the north and east is currently of a low level and considered to be contained to the immediate setting. Lighting sources associated with the M40 and A41 are defining features of character after dark and, therefore, would be considered to reduce the susceptibility to change of the immediate landscape. Receptors that would be likely to experience a change to character after dark would largely be limited to those within Little Chesterton, those travelling along minor rural vehicular corridors to the north and vehicle users on the A41 itself. Overall, it is considered that the sensitivity of landscape character after dark would be medium.

Summary of Visual Amenity Matters

9.3.39 As a complement to the appreciation of the character and evolution of the landscape EDP has assessed the nature and distribution of views within, from and towards the Application Site.

9.3.40 EDP's analysis focuses on the assessment of visual impacts of the development of the Application Site from the surrounding landscape, concentrating on the views towards the Application Site from surrounding public locations. Such analysis provides an understanding of the location and sensitivity of surrounding areas with views towards the Application Site and therefore forms the basis of an assessment of the significance of any visual impacts arising from

the Application Site proposals.

9.3.41 It is clear from EDP's field appraisal and a review of the visual context that:

- Views from close quarters are generally only available from short sections of busy road corridors (approximately 500m of both the A41 and M40, and from very short sections of the local PRoW network immediately surrounding the Application Site;
- From most roads and footpaths, views towards the Application Site are filtered by intervening vegetation within a relatively flat landscape;
- Views experienced by residential receptors in close proximity to the Application Site are generally screened by mature tree cover within the agricultural context. Any middle distance to distant views of the Application Site are gained across largely flat agricultural landscape and tend to be heavily filtered or fragmented by intervening vegetation; and
- Much of the wider study lies outside the visual envelope from where no views of the entire Application Site are possible.

9.4 Potential Effects

9.4.1 With reference to the contents of the previous sections, this section provides EDP's assessment of the potential landscape and visual effects arising from the proposed development.

9.4.2 For convenience, the assessment can be considered under three different categories.

1. The potential effects on the character of the landscape (including the character of the Application Site itself and the surrounding area), including:
- The character of the Application Site; and
- The Clay Vale LCT.

2. The potential effects at the selected viewpoint locations, which examines the effects on the visual receptors at each location and enables a 'calibration' of the general assessment. The viewpoint assessment is provided in Technical Appendix 9.2.

3. The potential effects on visual amenity (having regard to the conclusions of the representative viewpoints), including assessments of the following receptors:
- Close Proximity Views from Roads and PRoW; and
- Distant Views towards the Application Site.

Construction Phase

9.4.3 The construction activities that can potentially cause landscape and visual impacts include:

- Demolition and clearance of vegetation within the construction zone, where appropriate;
- Earthworks and temporary storage of topsoil;
- Removal of unwanted waste from the site;
- Erection of site hoarding and fencing around vegetation (tree protection scheme);
- Erection of temporary structures within the main contractor's construction compound, plus materials stockpiling and lay-down areas;
- Potential lighting of the works (during winter);
- Erection of scaffold structures;
- Movement of construction vehicles;
- Partially completed built form;
- Works associated with the implementation of the landscape scheme; and
- Removal of temporary construction facilities.

Operational Phase

9.4.4 This section describes the likely effects of the proposed development on the landscape and visual resource following overall completion at operation year 1 and without landscape mitigation measures having matured. The main potential landscape and visual impacts of the proposed development once completed, irrespective of any mitigation measures, are summarised below:

- Potential adverse landscape impacts caused by the operational development would be localised in scale and restricted to the Application Site itself and immediate environs, including the A41, due to the relatively enclosed nature of the Application Site in the wider landscape and its immediate surroundings. There will be some internal tree and hedgerow loss resulting from the proposed development, however the proposals have been designed to limit vegetation loss as far as possible with the majority of boundary vegetation retained;
- Change to the character of the landscape of the Application Site, through alteration of land use and introduction of new temporary and permanent features, the latter including beneficial effects such as the creation of new habitats within the Application Site boundary;
- A permanent, long-term adverse impact on landscape character would occur due to physical impact on landscape within the Application Site, introduction of new built form and ground remodelling within existing agricultural land, movement of vehicles and people within the Application Site, and increase in the volume of light pollution from both street lighting and internal lighting of built form.
- There would be adverse physical impact on landscape elements and features within the Application Site caused by the localised removal of existing landscape features; and
- There would be adverse visual impacts on nearby visual receptors, such as users of public footpaths and bridleways, road users and visitors to local facilities, due to visibility of the completed scheme (including built development, traffic and lighting).

9.4.5 Alteration to existing night-time views, from additional lighting that would form part of the proposed development, is considered within the Dunwoody Lighting Design (refer to Technical Appendix 9.8). Importantly, as set out within the Dunwoody Report 005.01, *"All luminaires will be selected to have a zero upward light output ratio with shielding to limit light spill to surrounding areas and have a photometric distribution to control illumination of vertical surfaces and secondary reflected lighting pollution."* As such, the conclusion of the lighting assessment found that "*there is no significant environmental spillage or impact to residential amenity or other environmental concerns as a result of the lighting installation either during construction or in operational phases."*

9.5 Mitigation

9.5.1 An understanding of the mitigation measures embedded in the proposal is fundamental to an assessment of the potential landscape and visual effects. The design in terms of layout, built form height, orientation, Green Infrastructure strategy and biodiversity enhancements has been informed by the LVIA in order to mitigate potential impacts. A key principle of landscape assessment is that the assessment should take account of the effect of any proposed mitigation (GLVIA3, para 6.45).

9.5.2 The hierarchical approach toward mitigation (prevent, reduce, offset) has been (1) first to avoid

where possible, any effects through the overall design and layout of the Proposed Development and disposition of its elements; this constitutes primary mitigation by preventing effects occurring through sensitive design and layout; (2) subsequently reducing effects arising through the careful siting of strategic landscape mitigation measures and careful consideration of the siting of each of the different elements of the Proposed Development; (3) Tertiary mitigation is achieved through the compensation of potential losses.

9.5.3 Those mitigation measures pertinent to landscape and visual matters are detailed with reference to the different stages of the Proposed Development below and are illustrated on Figure 9.6: Illustrative Landscape Strategy Plan.

Construction Phase

9.5.4 This assessment has assumed a scenario based on conventional best practice approaches. The following construction control measures should be implemented and adhered to, secured by a suitably worded planning condition, during the temporary construction phase:

- The adoption of an approved framework Construction Environmental Management Plan (CEMP) including an Ecological Construction Method Statement designed to avoid significant ecological effects, including those on key landscape features, and incorporating the measures listed below as appropriate;
- The adoption of an approved Arboricultural Method Statement (AMS) incorporating best practice guidance set out in British Standard 5837: '2012 Trees in Relation to Design, Demolition and Construction' which would ensure retained trees and other vegetation are not adversely affected during the construction process;
- The adoption of an approved topsoil and earthworks management plan (Soil Management Plan) including dust control measures;
- The use of visual screening, such as hoardings for more sensitive visual receptors in proximity to the Application Site, including residential receptors that have the greatest potential to be affected by the Proposed Development;
- Existing residents that live adjacent to the Application Site would be more sensitive to construction lighting due to the proximity, direction and type of receptor. Mitigation measures for construction lighting are likely to include directional fittings and restricted hours of operation; and
- Construction works which create dust should be kept to a minimum within proximity to existing pedestrian routes and residential properties, and dust prevention measures, such as damping. For reasons of public safety, any informal use of the Application Site for dog walking, etc. would need to be prevented during the construction phase of the Proposed Development. This would be achieved using protective fencing.

Operational Phase

9.5.5 The landscape and visual mitigation strategy is a key, and fully-integrated, component of the Application Proposals which has been informed by the LVIA process and is illustrated on the Illustrative Landscape Strategy Plan (Figure 9.6). A number of general landscape design principles have been developed as part of the landscape strategy in order to reduce or offset the effects of the proposed development that is described within the Design and Access Statement accompanying this application. These principles, which are summarised below, would guide the implementation of a suitable landscape scheme for the proposed development.

9.5.6 At a broad scale, the landscape strategy for the site (refer to Technical Appendix 9.7) aims to

strengthen key strategic landscape corridors around the site, which also contribute to the well treed character of the local landscape and serve to reduce adverse effects arising from the proposed development. At a more detailed site level, the design of external spaces, particularly species selection within the planting palette, has drawn on the local landscape character of the Oxfordshire countryside.

9.5.7 In relation to the Detailed Landscape Proposals prepared by EDP (included at Technical Appendix 9.3) drawing reference edp2425_d017 the landscape design principles include:

- Existing boundary hedgerows and trees would be retained where possible (with buffers to the proposed development), reinforced and brought into regular, long-term management. This would protect visual amenity and landscape character as well as continuing to offer commuting and foraging opportunities for protected species;
- Creation of a landscaped buffer from proposed development zones to protect and enhance retained boundary features of landscape and ecological interest;
- Provision of structural landscaping, native trees and shrubs that reflect the local context throughout the scheme to maintain a buffer to the wider setting. Particularly within the northern areas of the Application Site, existing landscape features would be reinforced with additional planting measures in order to maintain the 'green' setting to the wider rural setting;
- Provision of landscape screening, in the form of landscaped bunds and native tree planting, to properties and PRoW in close proximity to the site;
- Native heavy standard tree planting is proposed within landscape buffers to fragment views of the proposed development, particularly for receptors in close proximity to the north-eastern and eastern boundaries;
- Additional structural landscaping proposed to the western boundary, enhancing the landscape corridor that aligns the M40 and providing visual screening to the proposed development from the M40 and the wider context to the west;
- New scrub planting to comprise density of blackthorn to provide new egg-laying opportunities for brown hairstreak butterflies, and shelter for small mammals, birds and other wildlife;
- Species-rich wildflower grassland to be created within areas of green open space to provide nectar-rich habitats for pollinating insects such as bees, butterflies and moths;
- The proposals should complement the existing landscape features of the Application Site and character of adjacent uses and rural areas; and
- The landscape strategy should take into consideration the long-term vision for the Application Site, using tree planting to filter into the proposed development from adjacent green corridors and to frame and buffer the proposed built form.

Proposed Tree Planting

9.5.8 Structural tree planting and earth bunding within the Application Site boundaries would buffer the proposed development and assimilate it into the existing landscape and should include a suitable palette of locally native trees that are found across the surrounding landscape, giving rise to beneficial effects. Refer to Technical Appendix 9.3 for the quantity and location of tree planting across the Application Site within the landscape proposals.

9.5.9 Proposed tree planting, in line with local guidance and policy, should seek to reinforce the existing trees on the Application Site and around the perimeter of the Application Site, and would be strategically placed to enhance views into and out from the Application Site, and define

proposed public routes.

9.6 Residual effects

9.6.1 This section describes the residual landscape and visual effects (following implementation of the design mitigation measures). The assessment of magnitude of effect and the overall significance of effect is provided for the relevant landscape and visual receptors.

Construction

9.6.2 This section describes the likely significant effects of the proposed development on landscape and visual receptors during the construction phase, and would involve Application Site clearance, groundworks, and construction of buildings, vehicle and pedestrian accesses, tree and shrub planting and grass seeding, as described in detail within Chapter 2 of this ES. The effects described take account of both embedded mitigation and additional measures.

Landscape Character of the Site and its Context

9.6.3 Clearly, in terms of the Site itself, the construction of industrial built form would constitute a notable alteration to the existing agricultural character of the Application Site. The diversion of the watercourse would require the removal of a number of mature trees and scrub however, the existing mature landscape framework on the boundaries of the Application Site would be retained, including existing trees and hedgerow trees.

9.6.4 The proposed development construction activity would result in a very high magnitude of change on the immediate rural character of the Application Site and its surrounding context, including Little Chesterton, extending only a short distance due to the containment of the existing main road network (i.e. M40 and A41). The overall **medium** sensitivity of the character of the Application Site and its context would therefore yield a **major/moderate**, short-term, adverse and temporary level of effect, which is significant.

On-site Landscape Features

9.6.5 During construction, trees and hedgerows to be retained would be protected in accordance with those measures outlined in the Arboricultural Impact Assessment (Report Reference edp_2425_r011). However, as set out in the Arboricultural Impact Assessment, as a result of the proposed development and site access, there would be some tree and hedgerow removal. In particular, the diversion of the existing watercourse would require the removal of a number of mature trees and scrub.

9.6.6 EDP's Arboricultural Impact Assessment (included at Technical Appendix 9.6) identified 43 individual trees, 21 groups of trees, 7 hedgerows and 1 woodland, totalling 72 items. Of these 72 items, 17 have been categorised as A, of high quality, 34 items have been categorised as B of moderate quality; and 20 have been categorised as C and are of low quality. Of those surveyed, the proposed development would require the loss of 11 trees (3no. Category A, 6no Category B, 3no Category C and 1no. Category U. The proposed development would also affect 1 Category B tree that, although can be retained, would require some works within the Root Protection Area.

9.6.7 The magnitude of change to the landscape fabric of the site would be very high, giving rise to a **major/moderate**, short-term, adverse and temporary effect, which is significant.

Local Landscape Character

9.6.8 It is inevitable that there would be some temporary effects during the short-term temporary

construction period upon the landscape character of the Clay Vale LCT. However, in local transient views, it is considered that construction activities would be in the context of existing urbanising elements of the urban fringe of Bicester and proximity to the major road corridors to the west of Bicester, influencing the character of the Clay Vale LCT. There would be localised excavation of land, ground remodelling and the storage of topsoil, and partial loss to local features of the Application Site, largely through the removal of mature tree and scrub through due to the need to divert the existing watercourse. Additionally, movement and machinery associated with Application Site operations would introduce additional localised activity. In the wider context, higher-level construction activities may be visible in medium-distance in views from the surrounding context. Together, these operations would lead to an incremental increase in effects on the Clay Vale LCT as construction draws to completion. Geographically, these changes would be experienced at the site level and the construction period would be short-term and temporary.

9.6.9 It is considered that during the construction phase, there would be high, adverse, short-term and temporary magnitude of change on the Clay Vale LCT, giving rise to a **moderate**, short-term, adverse and temporary level of effect, which is significant.

9.6.10 For health and safety reasons, construction activity after dark would be limited/none. However, there may be some elements of security lighting present around construction compounds and, therefore, the proposed development would result in additional lighting within the local context. New lighting would be considered an addition of elements that would be evident but not necessarily conflicting with the characteristics of the existing landscape. The magnitude of change to character after dark would be medium which, when compared with a medium sensitivity, would give rise to a **moderate/minor** adverse and temporary level of effect which is not significant.

Close Proximity Views from Roads and PRoW

9.6.11 All construction effects would be adverse in nature, direct and temporary. The majority of receptors would only experience localised views of the Application Site and the vast majority of construction effects on individual receptor groups would be short-term.

9.6.12 Visual receptors travelling directly past the Application Site on the A41 (**Technical Appendix 9.1: Figure 9.7**: **Photoviewpoint EDP 13**), would experience close ranging views of all construction activities within the Application Site. These visual receptors (road users) would be subject to a high magnitude of change, giving rise to a **moderate/minor** adverse overall effect which is significant.

9.6.13 Owing to mature field boundaries within the surrounding context, views of low-level construction activities would largely be screened from surrounding PRoW (**Technical Appendix 9.1: Figure 9.7**: **Photoviewpoints EDP 2**). However, higher level activities would be visible, albeit seen in the context of existing lighting columns and road signs on the A41 and agricultural outbuildings in close proximity to the Application Site.

9.6.14 Visual receptors shown on **Technical Appendix 9.1: Figure 9.7**: **Photoviewpoints EDP 9**, **10** and **12** in close proximity to the Application Site would experience short-distance views of higher-level construction activities and glimpsed views of low-level activities where breaks in vegetation occur during winter months. Residents within Little Chesterton would also experience similar views. It is considered that PRoW receptors in relatively close proximity to the Site would be subject to a high magnitude of change, giving rise to a **major/moderate** short-term, adverse and temporary level of effect, which is significant.

Private Viewpoint Receptors

9.6.15 During construction, private viewpoint receptors would be limited to those in close proximity to the Site, largely limited to those within Little Chesterton. Here, views of all construction activity would be possible, although partly screened by mature landscape features within the foreground of the view. Although not illustrated by a supporting Photoviewpoint, it is predicted that receptors here would be subject to high magnitude of change, giving rise to a **major/moderate**, short-term and temporary adverse effect which is significant.

9.6.16 In the wider context, beyond 1km, views become heavily filtered by mature vegetation and woodland cover, such that all low-level activities will be entirely screened with any taller construction activities being barely perceptible, if seen at all from private property. The magnitude of change in private views beyond Little Chesterton is considered to be very low which, when combined with an assumed very high sensitivity given the wider rural context to the west, gives rise to a **moderate/minor**, short-term and temporary adverse effect which is not significant due to distance.

Distant Views towards the Site

9.6.17 In the wider context, for road users, including pedestrians, views of the Application Site in the wider context are largely screened by mature vegetation. There would be limited visibility of the construction works throughout the study area comprising of taller machinery, largely relating to cranes. Views from roads are predominantly contained by existing mature field boundary or roadside vegetation, as shown in **Technical Appendix 9.1: Figure 9.7**: **Photoviewpoint EDP 1**, **3**, **4**, and **5**. High level construction activity would be barely visible in medium distance views, and receptors would be subject to a worst-case medium magnitude of change, giving rise to a **moderate/minor** overall effect which is not significant due to distance.

Operational Phase Year 1

Landscape Character of the Site and its Context

9.6.18 The proposed development would result in a permanent change of use within the Application Site from agricultural land to built form. The localised landscape character of the Application Site and its immediate surroundings would be altered by the proposed development, retaining existing landscape features where possible and appropriate, and enhancing existing landscape corridors. The integration of a well-designed landscape scheme with the built form would assimilate the proposals into the immediate setting. The proposed development would introduce a variety of native, valuable soft landscape elements and features which would positively contribute to the new character of the area. However, at year 1, it is unlikely that the landscape scheme would provide a notable addition to the character of the Application Site or provide sufficient visual screening to proposed built form. The proposed development would be seen in the context of the existing infrastructure on the A41 and agricultural outbuildings that appear in many views within the surrounding context. The proposed development would result in a high magnitude of change at operation year 1, giving rise to a **moderate**, medium-term, adverse and temporary effect, which is significant.

On-site Landscape Features

9.6.19 The Arboricultural Impact Assessment confirms that the proposed development would result in some tree and hedgerow loss in order to facilitate the proposed development and access road, particularly where tree loss is required as part of the diversion of a watercourse. The Landscape Strategy Plan (refer to **Figure 9.6**) shows how boundary trees and hedgerows would be retained across the Application Site and the overall tree cover would be increased significantly through

buffer planting at the Application Site boundaries and the proposed landscaped bund. This would give rise to some beneficial effects.

9.6.20 New tree and scrub planting would improve the species and age diversity of the tree stock, whist also enhancing the setting of the new development within the landscape. The magnitude of change to the landscape fabric of the site would be high, giving rise to a **moderate** adverse and temporary effect, which is significant.

Local Landscape Character

9.6.21 The proposed development would result in the introduction of commercial built form into the Clay Vale LCT. Although many of the characteristics of the LCT relate to agricultural uses, including many mature trees, the rural character of the Application Site and its surrounding context is degraded in part by the visual intrusion of urban elements including the M40 and A41. The proposed development would retain existing landscape features within the Application Site, therefore reducing the visual impact of the proposals on the local landscape character. At operation year 1, it is considered that the proposed development would result in a low magnitude of change upon the Clay Vale LCT, giving rise to a **minor**, medium-term, adverse and temporary effect, which is not significant.

9.6.22 On completion, as set out within the Dunwoody Lighting assessment, all luminaires will be selected to have a zero upward light output ratio with shielding to limit light spill to surrounding areas and have a photometric distribution to control illumination of vertical surfaces and secondary reflected lighting pollution. However, in local views, there is likely to be some appreciation of additional lighting sources present, although in views from the north-east, where fewer light sources are present, any new lighting would be seen with the backdrop of tall lighting columns associated with major highways. The proposed development, and any new lighting associated within it, would be considered an addition of elements that would be evident but not necessarily conflicting with the characteristics of the existing landscape after dark. The magnitude of change to character after dark would be medium which, when compared with a medium sensitivity, would give rise to a **moderate/minor** adverse and temporary level of effect which is not significant.

Close Proximity Views from Roads and PRoW

9.6.23 Visual receptors travelling directly past the Site on the A41 following completion of the proposed development would have close ranging direct views of proposed built form as shown in **Technical Appendix 9.1: Figure 9.7**: **Photoviewpoint EDP 13**. Existing mature landscape features would provide little to no visual screening due to the proximity of the receptor and the height of low field boundary hedgerows. Planting within the proposed development would not have established to increase the filtering of views at this stage. At operation year 1, excluding the consideration of mitigation measures, these receptors would be subject to a high magnitude of change to this low sensitivity receptor, giving rise to a **moderate/minor**, medium-term, adverse and temporary effect, which is significant.

9.6.24 For road users and pedestrians in the wider context, the existing landscape framework is useful in limiting adverse effects. Views from roads are predominantly contained by mature roadside vegetation as shown in **Technical Appendix 9.1: Figure 9.7**: **Photoviewpoint EDP 1**, **3**, **4** and **5**. However, where roadside vegetation has been maintained to a low-level medium distance views of the proposed built form would be possible. Due to distance and the filtering of some views of the proposed development, these visual receptors would be subject to a low magnitude of change at operation year 1, giving rise to worst-case **minor/negligible**, medium-term,

adverse and temporary effect, which is not significant.

9.6.25 Where PRoW are in close proximity to the Application Site (such as route 161/14/20), or there are views across existing agricultural in winter months, filtered views of the upper sections of the proposed development will be seen (refer to **Technical Appendix 9.1: Figure 9.7**: **Photoviewpoint EDP 10** and **12**). Receptors using PRoW, in close proximity to the Application Site would be subject to a worst case high magnitude of change at operation year 1, giving rise to a **major/moderate**, medium-term, adverse and temporary effect, which is significant.

Distant Views towards the Site

9.6.26 Owing to the mature landscape framework within the surrounding context, the proposed development would be partially screened in views from PRoW in the wider context (**Technical Appendix 9.1: Figure 9.7**: **Photoviewpoint EDP 2**). Receptors using PRoW in the wider context, or where views are restricted by mature landscape features, would be subject to a low magnitude of change at operation year 1, giving rise to a **moderate/minor**, medium-term, adverse and temporary effect, which is not significant. The proposed development will form a minor constituent of the view being partially visible or at sufficient distance to be a small component.

Private Viewpoint Receptors

9.6.27 On completion, private viewpoint receptors would largely be limited to those in close proximity to the Site, largely limited to those within Little Chesterton. Here, although partly screened by mature landscape features, it is unlikely that the landscape scheme would have matured sufficiently to provide a visual screen over and above the existing context. However, the addition of the Proposed Development would not necessarily conflict with the character of the immediate context, which includes a number of smaller commercial units. However, due to the horizontal scale of the proposals, it is possible that the proposed development will form a new and recognisable element within the view, albeit limited in summer months. The magnitude of change to residential visual amenity is considered to be medium, giving rise to a moderate medium-term and temporary adverse effect which is significant.

9.6.28 In the wider context, beyond 1km, views become heavily filtered by mature vegetation and woodland cover, such that views of the proposed development are unlikely. The magnitude of change in private views beyond Little Chesterton is considered to be very low/none which, when combined with an assumed very high sensitivity given the wider rural context to the west, gives rise to a moderate/minor or non-effect, medium-term and temporary adverse effect which is not significant.

Operational Phase Year 15

Landscape Character of the Site and its Context

9.6.29 At year 15, proposed landscape measures within the Application Site, including tree planting, landscaped bunds and a range of proposed new habitat types, would have matured, assimilating the proposals into the wider landscape context. Despite the introduction of commercial built form, the maturation of the proposed landscape framework would give rise to beneficial effects as set out within the Landscape Strategy. The integration, and maturation, of a well-designed landscape scheme, aided by landscaped bunds, with built form would assimilate the proposals into the immediate setting such that it would not necessarily conflict with the characteristics of the Application Site's immediate context, including the village of Little Chesterton.. It is considered that, at year 15, the magnitude of change would reduce to medium,

giving rise to a **moderate/minor**, long-term, both adverse and beneficial and permanent residual effect, which is not significant.

9.6.30 Importantly the landscape of the Application Site and its near surroundings are not designated at either a national or local level, which confirms the general reduced value and sensitivity in landscape terms, as described in detail above. This does not in turn indicate that development is acceptable in landscape terms, but that subject to addressing the appropriate detail of the scheme, there are no 'in principle' landscape constraints to development at the Application Site.

On-site Landscape Features

9.6.31 At year 15, proposed landscape measures within the Site, including tree planting and a range of habitat types, would have matured, assimilating the proposals into the wider landscape context. Despite the introduction of commercial built form, the maturation of the proposed landscape framework would give rise to beneficial effects as set out within the Landscape Strategy.

9.6.32 The integration, and maturation, of a well-designed landscape scheme, aided by landscaped bunds, with commercial built form would assimilate the proposals into the immediate setting such that it would not necessarily conflict with the characteristics of the Site's immediate context. It is considered that, at year 15, the magnitude of change would remain high, although reducing to a neutral effect as proposed planting would offset the loss of existing tree stock aligning the watercourse. This gives rise to a **moderate**, permanent and neutral effect which is significant.

Local Landscape Character

9.6.33 Design mitigation proposals on the Application Site boundaries, including landscaped bunds adjacent to the site boundaries in key locations, would assimilate the proposed development into the surrounding landscape context and minimise the effect on the wider landscape setting, including villages such as Wendlebury and Chesterton. Glimpsed views of the proposed built form within the Application Site may remain, particularly during winter months however, the proposed development would be seen in the context of existing infrastructure and major transport route M40/A41. It is considered that, with the maturation of the proposed landscape framework, the key characteristics of Clay Vale LCT would be subject to a low magnitude of change giving rise to a **minor**, long-term, adverse and permanent residual effect, which is not significant.

9.6.34 In the longer term, new lighting associated with the proposed development would be mitigated in part by the maturation of the landscape scheme. However, light sources would be likely to remain an identifiable component of local views. Beneficial effects would be evident in some views as the landscape strategy proposed within the site would provide some visual screening to lighting and vehicular movements associated with major vehicular corridors. However, overall, due to the proximity of new light sources to Little Chesterton, it would be considered that the overall effect would be adverse. In the long term, with consideration of the maturation of the landscape strategy, lighting within the proposed development would be considered to be the addition of elements that are not uncharacteristic of the existing landscape. The magnitude of change to character after dark would be low which, when compared with a medium sensitivity, would give rise to a **minor** adverse and permanent level of effect which is not significant.

Close Proximity Views from Roads and PRoW

9.6.35 Visual receptors travelling along the A41 will experience views of the proposed development in the context of existing infrastructure along this busy road corridor (**Technical Appendix 9.1: Figure 9.7**: **Photoviewpoint EDP 13**). At year 15, although mitigation planting along the

southern boundary of the site will reduce visibility of the proposed development to an extent, winter views are likely to remain. Proposed planting in the foreground on highways land has the potential to screen the proposals, however as this is outside the applicant's control, therefore the residual magnitude of change resulting from the proposed development is considered to be medium, giving rise to a **minor**, long-term, adverse and permanent effect, which is not significant.

9.6.36 For road users and pedestrians in the wider context, at year 15 the proposed mitigation measure and landscaped bund will contribute toward further screening of the built form, particularly increased filtering of the upper levels. Views of the proposed development experienced by receptors (as represented by **Technical Appendix 9.1: Figure 9.7**: **Photoviewpoint EDP 1**, **3**, **4** and **5**) at year 15 will be heavily screened, but glimpsed views of the roof structure will remain resulting in a worst-case **low** magnitude of change, giving rise to a **minor** long-term, adverse and permanent effect, which is not significant.

9.6.37 Where PRoW are in close proximity to the Application Site (illustrated in **Technical Appendix 9.1: Figure 9.7**: **Photoviewpoint EDP 10** and **12**), at year 15, although mitigation planting along the southern boundary of the Application Site will reduce visibility of the proposed development to an extent, winter views are likely to remain. Proposed planting in the foreground on highways land has the potential to screen the proposals, however as this is outside the applicant's control, the residual magnitude of change resulting from the proposed development is considered to be **medium**, giving rise to a **moderate** long-term, adverse and permanent effect which is significant.

Distant Views towards the Site

9.6.38 Distant views of the Application Site, as shown in **Technical Appendix 9.1: Figure 9.7: Photoviewpoints EDP 2**, at operation year 15 would largely be limited by mature landscape features within a flat landscape. The proposed mitigation measures and landscaped bund would contribute to further screening views from PRoW within the surrounding open agricultural landscape. However, the proposed development would form a minor constituent of the view, although in some cases would be barely perceptible with any views being limited to the immediate agricultural setting. It is considered that receptors experiencing distant views towards the Site would be subject to a very low magnitude of change, giving rise to a worst-case **minor**, long-term, adverse and permanent effect, which is not significant.

Private Viewpoint Receptors

9.6.39 For residential receptors in close proximity to the Site, on completion, the Proposed Development would introduce views of commercial built form, although partly screened by mature landscape features aligning the north-eastern boundary. Although the Proposed Development would introduce built elements already found within the local context, albeit with a larger horizontal extent, there would be a change to views from few properties with views looking south into the Site from upper storey windows. As such, the magnitude of change to the residential amenity of properties in close proximity to the Site would be low, giving rise to a **moderate/minor** and permanent adverse effect, which is significant due to the close proximity of the view.

9.6.40 In the wider context, beyond 1km, views become heavily filtered by mature vegetation and woodland cover, such that views of the proposed development are unlikely. The magnitude of change in private views beyond Little Chesterton is considered to be very low/none which, when combined with an assumed very high sensitivity given the wider rural context to the west, gives

rise to a **moderate/minor** or non-effect which is not significant.

9.7 Implications of Climate Change

9.7.1 The impact of climate change might include certain tree species or grasslands becoming more dominant/prevalent, but given the character of the surrounding landscape, which includes agricultural land with mature trees and hedgerow boundaries, these changes would not have a prominent impact. Changes to the landscape effects predicted is considered appropriate.

9.7.2 For visual effects, the future baseline under a climate change scenario would not lead to any greater, or different, effects to those predicted. Due to the Proposed Development being set within a mature landscape, largely set on lower ground below the M40 and A41, or at grade with the wider landscape, any perception of it with consideration of climate change would remain limited to few locations.

9.8 Cumulative effects

9.8.1 The cumulative landscape and visual impact assessment uses the same assessment methodology as that presented for the main LVIA above, and considers impacts on the same receptor groups. The cumulative assessment considers construction phase impacts, as well as operational phase impacts at year 1 post completion and 15 years after completion. The assumptions with regard to mitigation set out in the main LVIA also apply to the cumulative assessment. Impacts reported below include consideration of residual impacts with the implementation of the mitigation proposed.

9.8.2 The sites to which the Proposed Development may result in a cumulative effect differ for each technical discipline. In the case of landscape and visual matters, of the 13 committed development sites, only 2 are physically and visually proximate to the Site. However, there may also be transient views of committed development sites slightly further afield, particularly on the western edge of Bicester. Those scoped into the assessment of cumulative landscape and visual effects are listed below in Table 9.7 and shown on Figure 3.1 Due to a combination of distance, intervening built form and tree and woodland cover within the local context, Sites Bicester 2, 4 and 8 are unlikely to result in either sequential or in-combination views with the Proposed Development and, as such, have been scoped out of further consideration below.

9.8.3 The schemes listed below have been included within the assessment of cumulative landscape and visual effects due to proximity to the proposed development and likely future intervisibility with the proposed development.

Table 9.7 Cumulative Sites

Development approved	Map Ref.	Description.
CDC Planning Ref 19/02550/F	14	Leisure resort incorporating a waterpark, a family entertainment centre, a hotel, conferencing facilities, restaurants, access, parking and landscaping.
CDC Planning Ref 19/00934/F	n/a	Change of Use of Agricultural land and extension of the existing Bicester Sports Association facilities for enhanced sports facilities including relocation and reorientation of existing pitches and archery zone, 2 No training pitches with floodlighting, 2 No match pitches, new flexible sports pitch, new rugby training grids, new clubhouse with events space, new rifle and shooting range, cricket scorers building, storage and maintenance buildings and provision of associated car parking, amended access, landscaping and other associated works
Planning application		**Description.**
CDC Planning Refs 21/03267/OUT & 21/03268/OUT	16	Buildings comprising logistics (Use Class B8) and ancillary Office (Use Class E(g)(i)) floorspace and associated infrastructure; access from the B4100.
Local Plan Allocation		**Description.**
Policy Bicester 1: Northwest Bicester Eco-Town	1	Mixed use development including 6,000 homes.
Policy Bicester 2: Graven Hill	2	Development of 2,100 dwellings, employment land, facilities and other infrastructure including the potential for the incorporation of a rail freight interchange.
Policy Bicester 3: Southwest Bicester Phase 2	3	726 homes with associated services, facilities, and other infrastructure.
Policy Bicester 4: Bicester Business Park	4	Southwest of Bicester, high quality B1 office scheme.
Policy Bicester 10: Bicester Gateway	10	Knowledge economy employment development to the south of the existing retail area (Wyevale Garden Centre), adjacent to the A41.
Policy Bicester 11: Employment Land at Northeast Bicester	11	Employment development for approximately 1,000 jobs.
Policy Bicester 12: Southeast Bicester	12	A mixed-use site for employment and residential development
Policy Bicester 13: Gavray Drive	13	A housing site to the east of Bicester town centre for approximately 300 dwellings.
Local Plan Policy		**Description.**
Policy Bicester 7: Meeting the Need for Open Space, Sport and Recreation	n/a	Protecting the existing network of green spaces and securing new open space and linear route provision Seek to establish a community woodland between the Southwest Bicester link road and Chesterton.
EIA Scoping		**Description.**
National Infrastructure Planning Scoping Opinion 15th July 2021	15	Oxfordshire Strategic Rail Freight Interchange. A new rail terminal and associated infrastructure, warehouses up to 675,000 sq.m and highways works.

Landscape Character

9.8.4 The Proposed Development is assessed above as having a moderate/minor adverse effect on the character of the Site context and a minor adverse effect on the landscape of the Clay Vale LCT. The Proposed Development adopts the landscape strategy for this LCT by strengthening existing field boundaries, which includes planting of native deciduous woodland blocks to minimise the visual impact of both the proposed development and existing commercial uses to the northeast.

9.8.5 Views of the Proposed Development, including the cumulative sites listed above would be possible from within the host LCT, although the cumulative site in closest proximity to the proposed development, namely Cumulative Site 1, is located within the neighbouring Wooded Estatelands LCT. However, it is not the view that defines the landscape effect, rather it is changes to the physical and wider perceptual qualities (including visual) that lead to the level of effect. Large areas of built development, such as the Sites listed above, would clearly have a notable effect on landscape character. However, assuming the development of all strategic sites, the urban edge of Bicester would extend west and, as a whole, the cumulative sites listed above would result in further urbanisation of the eastern extents of the Clay Vale LCT. The proposed development retains and enhances key landscape features which provide clear value to the local landscape context, including mature boundary vegetation and new woodland planting however, there would be an adverse alteration to a number of key characteristics within the site's immediate context. The Proposed Development would increase the quantity of land developed on the eastern side of the M40 but have a limited cumulative effect with regards to the future urban developed context, largely owing to its location adjacent to the M40 Junction, being divorced from the main urban areas of Bicester and set within a mature landscape such that views of it are limited. It is therefore considered that, while the Proposed Development would form a notable addition to the local context, the Proposed Development would not lead to a significant cumulative landscape effect, especially given the size of the overall strategic developments named above.

Visual Amenity

9.8.6 It is pertinent to note that the cumulative baseline consists of a number of areas of development. Taking into account the size and distribution of cumulative developments as a whole, it is possible that there would be locations within the landscape from which views of more than one development site may be gained either in combination or sequentially, particularly in views from vehicular corridors including the A41 and M40. A detailed assessment of the cumulative impact on each Photoviewpoint is provided in Technical Appendix 9.3.

9.8.7 The cumulative assessment (See Technical Appendix 9.3) has identified that some cumulative effects are predicted, predominantly in views from the north of the site where relatively short-distance views of the proposed development are possible with Cumulative Site 1. However, overall, cumulative effects were not considered to give rise to additional significant effects to those outline within the main assessment above.

9.8.8 In consideration of the cumulative developments, it is assessed that there would be a proportional increase of 'in combination' effects as a result of a change to views to currently undeveloped land. In summary:

- The area to the west of Bicester would be more urbanised in transient views and therefore less susceptible to change and less sensitive to the introduction of built components within the landscape; and
- Generally, as a result of intervening landscape features, combined with undulating topography, although there are predicted to be some in-combination views of taller elements of construction activity, on completion there are likely to be few locations where views of the Site would be seen in combination with the cumulative sites named above. Where in-combination views are possible, due to the distribution of the cumulative sites named above, these views are often heavily filtered or informed by existing urbanising features within the local context.

9.8.9 The cumulative assessment found that:

- For receptors travelling along the M40, dependant on the timings of construction activity, it is possible that the proposed development could be seen in sequential views with Cumulative Site 14 and 17, being seen as a new and recognisable elements within the view and likely to be recognised by the receptor. In the long-term, views would be limited to the taller elements of each scheme only, each being filtered by mature landscape features and with the proposed development benefiting from mitigation planting on the site's western boundary such that views would largely be limited to winter months;
- For receptors travelling on the A41, sequential views of the proposed development with Cumulative Sites 2, 3, and 10 would result in a perceived increase in built form throughout the local context however, it is not considered that this effect would increase the magnitude of change from that arising from the proposed development;
- For receptors travelling on the A4095, depending on construction timescales, sequential views may be possible of the proposed development and Cumulative Sites 3, 14 and 17. However, Cumulative Site 3 is closely related to the western edge of Bicester and visually separate from the Proposed Development and Cumulative Sites 14 and 17. On completion, due to the perception of the horizontal scale of development on the eastern side of the M40 increasing, there is predicted to be an increase in the magnitude of change from that arising from the proposed development alone. However, the cumulative effect is considered to be minor adverse and not significant;
- For PRoW users within and around Chesterton, there were not predicted to be any in-combination views with any of the named cumulative sites and the proposed development; and
- Similarly, or residents within Little Chesterton, there were not predicted to be any in-combination views with any of the named cumulative sites and the proposed development.

9.8.10 While the effect of the Proposed Development at the Site would not differ, the magnitude of change experienced across the wider area will clearly be greater when taking the combined effect of the other schemes into consideration. By the same token, it may be considered that the proportion of the total visual change attributable to the Site would be proportionately less because i) the wider area will be more urbanised and therefore potentially less sensitive to the introduction of urban components within the landscape; and ii) viewpoints that are likely to experience change as a result of the Site may have views blocked or altered by other developments. In this case, due to the physical and visual separation of the site and each of the cumulative development sites named above, being aided by intervening built form and tree and woodland cover within the local context, the assessment of sensitivity and susceptibility to change is considered to remain as set out within the main assessment. Overall, as a result of the implementation of the Proposed Development and the cumulative developments listed above, there would be an increase in massing of built development within the wider context as a whole. However, significant effects would remain as identified within the main assessment above and at no locations would the cumulative level of effect be made significant by the addition of the Proposed Development.

9.9 Summary

9.9.1 An assessment of landscape and visual components of the Application Site and the wider area where there is the potential for likely significant environmental effects was undertaken through desktop and field study and in accordance with accepted guidance. This identified the main landscape and visual receptors likely to be affected by the proposed development and resulted in a baseline appraisal (contained at Technical Appendix 9.1) in the context of which landscape and visual effects could be assessed. The main landscape and visual implications of the proposed development and the potential impacts were identified and mitigation developed in order to minimise these impacts.

9.9.2 The Landscape and Visual Impact Assessment considered the effects of the proposed development on the Clay Vale Landscape Character Type and finds that the proposed development results in limited impacts. The proposed development would not cause any significant residual effects on the overall character of this area.

9.9.3 The Application Site is well contained by mature field boundary trees and hedgerows. Although the Application Site is currently part of an immediate rural context, it is also contained by two major road corridors (M40 and A41) and associated urban infrastructure which is visible in the surrounding context of the Application Site.

9.9.4 The landscape within the study area is predominately flat, low-lying and is well-vegetated and contains a mix of rural features and urban uses, resulting in limited opportunities for views of the Application Site. In consideration of the impacts on the visual amenity of people, views towards the Application Site are often obscured by mature landscape features within a flat landscape. The assessment finds that, due to this visual screening, there would be limited long-term impacts on publicly accessible areas, including highways and PRoW.

9.9.5 Significant residual impacts are predicted for receptors using PRoW 161/14/20 and a minor road at Little Chesterton in close proximity to the Application Site to the east, largely due to proximity to the development.

9.9.6 In the wider context, the low number of significant landscape and visual effects confirm the extent to which strategic planting incorporated into the proposed development would mitigate views, retaining and reinforcing the characteristic landscape fabric and pattern of the Application Site and assimilating the proposed development, as far as possible, into the urban and rural landscape context.

9.9.7 The cumulative assessment identified that some in-combination views of the proposed development and named Cumulative Sites are predicted, predominantly where receptors are in close proximity to both the proposed development and Cumulative Site 14 to the north. However, where the cumulative assessment identified effects that differ from that set out within the main Landscape and Visual Assessment, in all cases, these effects were found to be not significant.

9.10 References

- Department for Communities and Local Government, 2021, *"National Policy Planning Framework".*
- Landscape Institute / Institute of Environmental Management and Assessment, 2013, "Guidelines for Landscape and Visual Impact Assessment, Third Edition"
- Natural England website http://publications.naturalengland.org.uk/publication/12332031 'The Character of England: Landscape, Wildlife and Natural Features'
- Cherwell Local Plan 2011–2031 Part 1 (adopted July 2015) and Saved Policies of the Adopted Cherwell Local Plan 1996
- ENV06 Bicester Environmental Baseline Report (September 2013)
- ENV07 Bicester 'Green Buffers' Report (September 2013)
- Countryside Design Summary (June 1998)
- Cherwell District Landscape Assessment by Cobham Resource Consultants (November 1995)
- Oxfordshire Wildlife and Landscape Study (2004)
- Natural England, 2010, National Character Area (NCA) Profile 108

Glossary

A glossary of clearly defined terms can be found at Annex EDP 3 of Technical Appendix 9.1.

Table 9.8 Summary of effects

Receptor	Sensitivity of Receptor	Nature of potential impact	Proposed mitigation	Residual effect	Significant / not significant
Construction phase					
Landscape Character of the Application Site and Context	Medium	Refer to Para 9.5.1 to 9.5.3	Mitigation considered in all effects at Construction Stage.	Major/Moderate Short-term, Adverse and Temporary	**Significant**
On-site Landscape Features	Medium	Refer to Para 9.5.1 to 9.5.3	Mitigation considered in all effects at Construction Stage.	Major/Moderate Short-term, Adverse and Temporary	**Significant**
Clay Vale LCT	Medium	Refer to Para 9.5.1 to 9.5.3	Mitigation considered in all effects at Construction Stage.	Moderate Short-term, Adverse and Temporary	**Significant**
Landscape Character after Dark	Medium	Refer to Para 9.5.1 to 9.5.3	Mitigation considered in all effects at Construction Stage.	Moderate/Minor Short-term, Adverse and Temporary	Not Significant
Visual receptors travelling directly past the Application Site on the A41	Low	Refer to Para 9.5.1 to 9.5.3	Mitigation considered in all effects at Construction Stage.	Moderate/Minor Short-term, Adverse and Temporary	**Significant**
Road users and pedestrians in the wider context only	Low	Refer to Para 9.5.1 to 9.5.3	Mitigation considered in all effects at Construction Stage.	Minor Short-term, Adverse and Temporary	Not Significant
PRoW users in the wider context only	High	Refer to Para 9.5.1 to 9.5.3	Mitigation considered in all effects at Construction Stage.	Moderate/Minor Short-term, Adverse and Temporary	Not Significant
Visual receptors (PRoW and minor road users) in close proximity to the Application Site	High	Refer to Para 9.5.1 to 9.5.3	Mitigation considered in all effects at Construction Stage.	Major/Moderate Short-term, Adverse and Temporary	**Significant**
Residential receptors in Little Chesterton	Very High	Refer to Para 9.5.1 to 9.5.3	Mitigation considered in all effects at Construction Stage.	Major/Moderate Short-term, Adverse and Temporary	**Significant**
Residential receptors in the wider context	Very High	Refer to Para 9.5.1 to 9.5.3	Mitigation considered in all effects at Construction Stage.	Moderate/Minor Short-term, Adverse and Temporary	Not Significant

Receptor	Sensitivity of Receptor	Nature of potential impact	Proposed mitigation	Residual effect	Significant / not significant
Operational phase (Year 1)					
Receptor					
Landscape Character of the Application Site and Context	Medium	Refer to Para 9.5.1 to 9.5.3	Refer to Para 9.5.6	Moderate Medium-term, Adverse and Temporary	**Significant**
On-site Landscape Features	Medium	Refer to Para 9.5.1 to 9.5.3	Refer to Para 9.5.6	Moderate Medium-term, Adverse and Temporary	**Significant**
Clay Vale LCT	Medium	Refer to Para 9.5.1 to 9.5.3	Refer to Para 9.5.6	Minor Medium-term, Adverse and Temporary	Not Significant
Landscape Character after Dark	Medium	Refer to Para 9.5.1 to 9.5.3	Refer to Para 9.5.6 and Dunwoody Lighting Assessment	Moderate/Minor Medium-term, Adverse and Temporary	Not Significant
Visual receptors travelling directly past the Application Site on the A41	Low	Refer to Para 9.5.1 to 9.5.3	Refer to Para 9.5.6	Moderate/Minor Medium-term, Adverse and Temporary	**Significant**
Road users and pedestrians in the wider context only	Low	Refer to Para 9.5.1 to 9.5.3	Refer to Para 9.5.6	Minor Medium-term, Adverse and Temporary	Not Significant
PRoW users in the wider context only	High	Refer to Para 9.5.1 to 9.5.3	Refer to Para 9.5.6	Moderate/Minor Medium-term, Adverse and Temporary	Not Significant
Visual receptors (PRoW and minor road users) in close proximity to the Application Site	High	Refer to Para 9.5.1 to 9.5.3	Refer to Para 9.5.6	Major/Moderate Medium-term, Adverse and Temporary	**Significant**

Receptor	Sensitivity of Receptor	Nature of potential impact	Proposed mitigation	Residual effect	Significant / not significant
Residential receptors in Little Chesterton	Very High	Refer to Para 9.5.1 to 9.5.3	Refer to Para 9.5.6	Moderate Medium-term, Adverse and Temporary	**Significant**
Residential receptors in the wider context	Very High	Refer to Para 9.5.1 to 9.5.3	Refer to Para 9.5.6	Moderate/Minor Medium-term, Adverse and Temporary	Not Significant
Operational phase (Year 15)					
Landscape Character of the Application Site and Context	Medium	Refer to Para 9.5.1 to 9.5.3	The landscape and GI framework will have established, assimilating the proposed development into the landscape and lessening the magnitude of change.	Moderate/Minor Long term, Adverse and Permanent	Not Significant
On-site Landscape Features	Medium	Refer to Para 9.5.1 to 9.5.3	The landscape and GI framework will have established, assimilating the proposed development into the landscape. The magnitude of change would remain, although reducing to a neutral effect as proposed planting would offset the loss of existing tree stock aligning the watercourse.	Moderate Long term, Neutral and Permanent	**Significant**
Clay Vale LCT	Medium	Refer to Para 9.5.1 to 9.5.3	The landscape and GI framework will have established, assimilating the proposed development into the landscape. However, the magnitude of change would remain.	Minor Long term, Adverse and Permanent	Not Significant
Landscape Character after Dark	Medium		The landscape and GI framework will have established, assimilating the proposed development into the landscape. Lighting would be considered to be characteristic of the baseline context.	Minor Long term, Adverse and Permanent	Not Significant
Visual receptors travelling directly past	Low	Refer to Para 9.5.1 to 9.5.3	The landscape and GI framework, and planting measures close to the	Minor Long term, Adverse	Not Significant

Receptor	Sensitivity of Receptor	Nature of potential impact	Proposed mitigation	Residual effect	Significant / not significant
the Application Site on the A41			viewpoint, will have established, lessening the magnitude of change	and Permanent	
Road users and pedestrians in the wider context only	Low	Refer to Para 9.5.1 to 9.5.3	The landscape and GI framework, and planting measures close to the viewpoint, will have established, lessening the magnitude of change	Minor/Negligible Long term, Adverse and Permanent	Not Significant
PRoW users in the wider context only	High	Refer to Para 9.5.1 to 9.5.3	The landscape and GI framework, and planting measures close to the viewpoint, will have established, lessening the magnitude of change	Minor Long term, Adverse and Permanent	Not Significant
Visual receptors (PRoW and minor road users) in close proximity to the Application Site	High	Refer to Para 9.5.1 to 9.5.3	The landscape and GI framework, and planting measures close to the viewpoint, will have established, lessening the magnitude of change	Moderate Long term, Adverse and Permanent	**Significant**
Residential receptors in Little Chesterton	Very High	Refer to Para 9.5.1 to 9.5.3	The landscape and GI framework, and planting measures close to the viewpoint, will have established, lessening the magnitude of change	Moderate/Minor Long term, Adverse and Permanent	**Significant**
Residential receptors in the wider context	Very High	Refer to Para 9.5.1 to 9.5.3	The landscape and GI framework, and planting measures close to the viewpoint, will have established, lessening the magnitude of change	Moderate/Minor Long term, Adverse and Permanent	Not Significant

10 Heritage

10.1 Introduction

10.1.1 This chapter of the Environmental Statement (ES) has been prepared by The Environmental Dimension Partnership Ltd (EDP) and assesses the potential effects of the proposed development in terms of archaeology and cultural heritage resources (the historic environment). EDP is a Registered Organisation with the Chartered Institute for Archaeologists.

10.1.2 This chapter describes the assessment methodology, the baseline conditions currently existing within the site and surroundings, the likely significant environmental effects during the construction and operation phases of the proposed development, the mitigation measures required to prevent, reduce or offset significant adverse effects and likely residual effects after these measures have been employed. The chapter assesses the development as described in Chapter 2 of this ES.

10.1.3 This chapter is informed by desk-based assessment and site survey work carried out in 2021. The results of these surveys are summarised in this chapter, with more detailed information included in Appendix 10.1, which comprises an Archaeological and Heritage Desk-Based Assessment (EDP, 2021) and geophysical survey report (TigerGeo, 2021). Pre-application consultation responses are reproduced in Appendix 10.2. A report on a trial trench evaluation carried out at the site (Cotswold Archaeology, 2022) is included at Appendix 10.3 along with a Written Scheme of Investigation (WSI) pertaining to that work.

10.2 Assessment methodology

Archaeological and Heritage Desk-Based Assessment

10.2.1 The assessment has been informed by a baseline Archaeological and Heritage Assessment (Appendix 10.1) carried out in line with the Standard and Guidance for Historic Environment Desk-Based Assessment issued by the Chartered Institute for Archaeologists (CIfA, 2020).

10.2.2 The assessment methodology was developed in consultation with Oxfordshire County Council's Lead Archaeologist in July 2021. The methodology was set out in a Written Scheme of Investigation (WSI) (EDP, 2021) approved in advance by the Lead Archaeologist (See Appendix 10.2).

10.2.3 The Archaeological and Heritage Assessment forms the basis of the assessment within the ES. It utilised baseline information derived from the following sources:

- Citations and supporting documentation acquired from Historic England for archaeological and/or heritage designations within the site, or located within the site's wider zone of influence;
- Information held by the Oxfordshire Historic Environment Record (HER) on known archaeological sites, monuments and findspots within the site and within a wider study area;
- Information describing the site's archaeological and historical background, including published and unpublished maps, books and periodicals, drawn from a wide variety of sources including the Oxfordshire History Centre;
- Aerial photographs depicting the site and its environs, which are held by the Historic England Archive in Swindon;
- LiDAR data acquired from the Environment Agency;

- Observations regarding the presence or absence of above ground archaeological sites, features and/or remains within the redline boundary, as well as the likely survival and condition of below ground features in light of past and present land use, made during a site walkover survey carried out in August 2021; and
- The results of the August 2021 Geophysical Survey (TigerGeo, 2021).

10.2.4 In accordance with the National Planning Policy Framework (NPPF), the following designated and non-designated heritage assets have been considered:

- Registered Parks and Gardens;
- Listed Buildings;
- Scheduled Monuments;
- Conservation Areas;
- Previously recorded or hitherto unknown non-designated archaeological remains; and
- Non-designated standing buildings or other extant heritage assets.

10.2.5 The baseline archaeological assessment focused on a study area extending for 1km from the boundary of the site, as that was considered appropriate to understand the historic environment context for a proposed development of this size/scale and in this topographical location.

10.2.6 The available information has been checked and augmented through site walkover/field surveys. These also aimed to determine the contribution made by the settings of designated heritage assets to their significance, in addition to determining the relationship (if any) to the proposed development site.

10.2.7 This aspect of the assessment was carried out in accordance with the Historic England guidance set out in Historic Environment Good Practice Advice in Planning, Note 3 (Second Edition), The Setting of Heritage Assets (HE 2017) and adopted an initial 2km radius study area.

Legislation Planning and Guidance

10.2.8 In terms of effects on the historic environment, the principal legislative instruments and planning policy framework is described in full in Section 2 of the Archaeological and Heritage Assessment at Appendix 10.1.

Guidance

10.2.9 The heritage baseline assessment and this ES chapter follow, where relevant, the heritage-specific guidance documents listed below:

- The baseline review of archaeological and heritage issues has been completed with recourse to the Chartered Institute for Archaeologists' Standard and Guidance for Historic Environment Desk-based Assessment (CIfA 2020);
- The identification and assessment of potential 'setting' effects undertaken with regard to Historic England's Historic Environment Good Practice Advice in Planning Note 3: The Setting of Heritage Assets (Second Edition) (HE 2017); and
- The assessment of the significance of heritage assets references Historic England's Historic Environment Good Practice Advice in Planning Note 2: Managing Significance in Decision-Taking in the Historic Environment: (HE 2015).

Geophysical Survey

10.2.10 Following the preparation of the baseline assessment and following further consultation with Oxfordshire County Council's Lead Archaeologist, the site was subject to a geophysical survey. This entailed a magnetometer survey of all available and suitable areas within the site and an extent of land beyond the site boundary comprising the remaining parts of full fields which contain parts of the site. In this way, all whole fields which the site at least partially occupies were surveyed so as to give complete coverage of the site and adjacent areas. The survey was carried out in line with a methodology set out in a Written Scheme of Investigation (WSI) (TigerGeo, 2021) approved in advance by the Lead Archaeologist (See Appendix 10.2).

10.2.11 The work was undertaken in accordance with the relevant best practice guidance, in this case the main documents being the Geophysical Survey in Archaeological Field Evaluation: Research and Professional Services Guidelines issued by English Heritage (EH 2008) and the Standard and Guidance for archaeological geophysical survey issued by the Chartered Institute for Archaeologists (CIfA 2016).

10.2.12 The aim of the geophysical survey was to provide sufficient information to enable an assessment to be made of the impact of any proposed development on any potential sub-surface archaeological remains, and for further evaluation or mitigation proposals, if appropriate, to be recommended. The general archaeological objectives of the geophysical survey were:

- To provide information about the nature and possible interpretation of any magnetic anomalies identified;
- To therefore model the possible presence/absence and extent of any buried archaeological features: and
- To prepare a report summarising the results of the survey.

Trial trenching

10.2.13 Following the geophysical survey, archaeological trial trenching took place during November and December 2021. The work was undertaken by Cotswold Archaeology in accordance with a WSI (Appendix 10.3) that was agreed in advance with the OCC Lead Archaeologist.

10.2.14 The trenching excavated 95 trenches across the site all measuring 30m by 1.8m. Their locations targeted anomalies identified by the geophysical survey as well other parts of the site, as a means of prospection for remains of a type or period that may not respond to geophysical survey. In this respect a sample was taken across all parts of the site for which trenching was practical.

10.2.15 A meeting was held on site with the Lead Archaeologist on Tuesday 23rd November 2021 to view the trenches. The approach to the possible future mitigation of the loss of archaeology within the site, as identified by the trenching, is set out in the chapter, which was based on verbal advice from that meeting.

10.2.16 The report on the trenching is included at Appendix 10.3 with its results summarised in this Chapter in the Baseline section below. Following a review of the report by the Lead Archaeologist, it is anticipated that further detail on archaeological mitigation will be issued.

ES Assessment Methodology

10.2.17 The evaluation of potentially significant effects on a heritage asset depends on a combination of its designation, the heritage significance or sensitivity of the asset and the magnitude of change that is predicted to result from the development. The assessment of likely significant effects as a result of the development takes into account both the construction phase and the completed occupation phase.

10.2.18 The assessment attributes 'sensitivity' to archaeological and cultural heritage assets, as shown in Table 10.1.

Table 10.1 Sensitivity of Receptor

Receptor	Sensitivity of receptor				
	Very High	High	Medium	Low	Negligible
World Heritage Site					
Scheduled Monument					
Grade I or II* listed building					
Grade I or II* registered park or garden					
Other nationally important archaeological asset					
Grade II listed building					
Grade II registered park or garden					
Conservation Area					
Other asset of regional or county importance					
Locally important asset with cultural or educational value					
Heritage site or feature with very limited values or interests					

10.2.19 The classification of the magnitude of change to heritage assets is based on consistent criteria and takes account of such factors as the physical scale and type of disturbance and whether features or evidence would be lost that are fundamental to their historic character, integrity and therefore, significance.

10.2.20 Both physical and non-physical (e.g. visual) changes to heritage assets are considered. The magnitude of impact is assessed using the criteria in Table 10.2.

Table 10.2 Magnitude of Change

Magnitude of Change	Description
Large	Change to the significance of a heritage asset so that it is completely altered or destroyed.
Medium	Change to the significance of a heritage asset so that it is significantly modified.
Small	Change to the significance of a heritage asset so that it is noticeably different.
Negligible	Change to the significance of a heritage asset that hardly affects it.
None	No change to the significance of an asset.

10.2.21 Following the evaluation of the sensitivity of specific cultural heritage receptors, and the magnitude of the impact upon them, the significance of the effect will be assessed using the criteria outlined in Table 10.3 below.

10.2.22 It should be noted that there are no receptors of 'Very High' sensitivity within the scope of the assessment and therefore, this is not included in the matrix in Table 10.3.

Table 10.3 Significance of Effect

Magnitude of Change	Sensitivity of Receptor			
	High	**Medium**	**Low**	**Negligible**
Large	Severe	Major	Moderate	Minor
Medium	Major	Moderate	Minor	Negligible
Small	Moderate	Minor	Minor	Negligible
Negligible	Minor	Negligible	Negligible	Negligible

10.2.23 The assessment matrix defined in Table 10.3 is not intended to be 'prescriptive', but rather it allows for the employment of professional judgement to determine the most appropriate level of effect for each heritage asset that is identified.

10.2.24 Effects are categorised with regard to their nature (adverse, beneficial or neutral) and their permanence (permanent, temporary or reversible). For all forms of heritage asset (receptor); including archaeological sites and remains; historic buildings, places and areas; and historic landscapes; the sensitivity of the receptor is combined with the predicted magnitude of change to arrive at the significance of effect.

10.2.25 The combination of sensitivity and magnitude of change is undertaken with reference to the matrix in Table 10.3, with those effects defined as severe, major or moderate being deemed significant. All other effects are determined to be not significant in EIA terms.

Consultation

10.2.26 Pre-application consultation responses are reproduced in Appendix 10.2.

10.2.27 A Scoping Response was received on 21st September 2021 from Cherwell District Council. Whilst this did not include comment form the Council's Conservation Officer, an email was received from the Conservation Officer to the Council's Principal Planning Officer on 20th October 2021. In summary this email stated the following:

- That the designated Heritage Assets identified in the Scoping Report should be scoped into the Environmental Statement;
- That the assets lie within the wider area surrounding the site and there are no Heritage Assets within the site itself;
- That no non-designated Heritage Assets are identified within the site but that non-designated Heritage Assets identified within the Conservation Area Appraisals for Chesterton and Weston on the Green should also be considered;
- That the methodology and approach to assessment is broadly agreed with, but that it is important that the impact to Heritage Assets through development within their wider setting is considered which should include views into and out of conservation areas plus views from public footpaths and across the wider landscape; and
- It was noted that St Giles Church, Wendlebury sits close to the application site and the impact to the significance of this asset through development within its setting should be assessed.

10.2.28 The points raised by the Conservation Officer are considered within the Archaeological and heritage baseline and in the assessment presented in the ES Chapter.

10.2.29 Historic England were also consulted for an opinion on the scope of the assessment. An email was received from the Inspector of Ancient Monuments, Berkshire, Buckinghamshire, Oxfordshire on 27th October 2021 which was accompanied by a letter dated 28th October. The Inspector agreed with the scope and study area as set out in this chapter and HE, whilst acknowledging their role as a statutory consultee, declined to participate in any pre-application discussion.

10.2.30 As noted above, regarding the archaeological approach, consultation took place with Oxfordshire County Council's Lead Archaeologist between July and November 2021. Initially a WSI in relation to the Archaeological and Heritage Assessment report was agreed to define the scope of that study. Secondly, a WSI was agreed in relation to the Geophysical Survey which defined the survey's scope and methodology.

10.2.31 The geophysical survey report was issued to the Lead Archaeologist for comment. He responded on 14th September 2021 confirming that the report is acceptable. He also requested that trial trenching would be required for the site.

10.2.32 The Lead Archaeologist issued a Design Brief for Archaeological Field Evaluation on the 4th October 2021 and this was incorporated into a WSI produced by Cotswold Archaeology (CA, MK0583, October 2021: Appendix 10.3) which outlines a 95 trench programme of evaluation trenching. The WSI was submitted to the Lead Archaeologist who confirmed that the WSI is acceptable in an email dated 29th October 2021.

10.2.33 As detailed above, archaeological trial trenching took place in November/December 2021 and a site meeting was held with the Lead Archaeologist on 23rd November to view the trenches and discuss future mitigation.

Assumption and Limitations

10.2.34 The Archaeological and Heritage Baseline Assessment was made with the following assumptions in place, and limitations to the data.

10.2.35 It is assumed that the HER data, as curated by Oxfordshire County Council, and the Historic England data, is up-to-date and robust.

10.3 Baseline conditions

Current Baseline

10.3.1 This section of the ES chapter identifies the relevant archaeological and cultural heritage receptors (heritage assets) within the extents of the site and its wider zone of influence. It draws upon the results of the supporting baseline assessment and further geophysical survey (Appendix 10.1).

10.3.2 A detailed description of the baseline situation at and around the site is set out in the reports at Appendix 10.1. Provided below is a summary of the baseline assessment with regard to archaeology and cultural heritage, with the relevant receptors identified on supporting figures within the assessment reports.

Designated Heritage Assets

10.3.3 No designated heritage assets (world heritage sites, scheduled monuments, listed buildings, conservation areas, registered parks and gardens or registered battlefields) are located within the site.

10.3.4 All designated heritage assets located up to 2km from the site boundary have been assessed in order to understand to what degree their setting contributes to their significance, whether the site forms part of that setting and whether the site makes a contribution to their significance.

10.3.5 The assessment concludes that the site does not form a part of the setting of any designated heritage assets and makes no contribution to the significance of any designated heritage asset.

10.3.6 Nonetheless, on account of the development comprising a modern building, which rises above the site, to have a presence in the landscape, the Archaeological and Heritage Assessment, does assess an impact against the value of a single designated heritage asset comprising the Grade II listed building Church of St Giles (1046559).

10.3.7 The church comprises a restored medieval church rebuilt in the 18th and 19th centuries that primarily derives its heritage value from its architectural and historical interest but also the artistic interest inherent in its decoration and interior and the archaeological interest in its fabric. As a Grade II listed building of partial medieval date and with a range of heritage values, the church is considered to be of **High** sensitivity.

10.3.8 The church's setting also contributes to its value to a lesser degree. The church is situated in a walled churchyard at the edge of the village and is experienced from the adjacent Church Lane in conjunction with nearby houses to the east. From these locations, the church is a prominent building that relates closely to the history of the settlement, and these adjacent spaces contribute to its value to a moderate degree.

10.3.9 To the west and south are fields and to the north a row of trees and hedgerow which bounds the southern side of the A41. In this regard, part of the experience of the church is adjacent to countryside reflecting its history as a rural church set at the edge of the settlement. As such the

adjacent fields and hedge, insomuch as they are experienced with the church, and the countryside character that they embody, contributes to the church's value to a low degree.

10.3.10 Being screened from it and unrelated to it historically or functionally, the site in its current form makes no contribution to the value of the church. The assessment of effects on the heritage asset are discussed in the section on Operational Phase effects below.

Non-Designated Heritage Assets

10.3.11 The Archaeological and Heritage Assessment, geophysical survey and trial trenching identified the following non-designated heritage assets within the Site:

Slight Ridge and Furrow Earthworks

10.3.12 Aerial photographic sources identify the presence of historic ridge and furrow earthworks across most of the Site (see Plan EDP 5 in Appendix 10.1). It is evident that these have been eroded through modern ploughing and in most of the Site are no longer present. Very slight earthworks are identifiable on LiDAR data in the field directly south of Grange Farm and also within the northern corridor however, these are so slight that they could not be identified during the site visit because of the presence of long grass.

10.3.13 With reference to Table 10.1, given their fragmented and denuded state, as a '*heritage site or feature with very limited value or interest*', it is considered that the earthworks comprise a heritage asset of **Negligible** sensitivity.

Historic boundary between the parishes of Chesterton and Wendlebury

10.3.14 Historic map sources identify that a hedgerow boundary that crosses the site from east-west in its southern part marks the historic boundary between the parishes of Chesterton and Wendlebury.

10.3.15 This boundary meets the criteria to be considered 'important' under the 1997 Hedgerow Regulations (Part II – Criteria – Archaeology and Heritage). The parish boundary, marked along much of its length by a hedgerow, bank and ditch, is considered to possess a degree of historic interest through its association with the history of the two parishes and is thus considered, with reference to Table 10.1, as a '*Locally important asset with cultural or educational value'*, and comprises a heritage asset of **Low** sensitivity.

Iron Age and Roman period settlement enclosures and related features within the Site

10.3.16 The geophysical survey identified anomalies that appear to relate to the buried remains of a series of prehistoric period enclosures defined by curved ditches. The anomalies intersect with the western edge of the central part of the site where three groups can be discerned (see Plan 10.1). The geophysical survey report interpreted these as the possible buried remains of individual enclosed farms and, by their form suggests an Iron Age date.

10.3.17 Trial trenching (see report at Appendix 10.3) confirmed that these groups are of archaeological origin, identifying two concentrations of ditches and pits at the north-western (Trenches 8 – 15) and south-western (Trenches 36, 37 and 39) edges of the site. Finds suggest domestic rural settlement of the Mid-Late Iron Age at both foci with some residual Bronze Age pottery also found in Trenches 15 and 36 suggesting nearby activity from that period also. Two trenches also contained cremations (Trenches 13 and 62) which were un-urned and not excavated. Subject to accurate dating it is likely that these represent burials in the countryside most likely

of the Bronze Age as Iron Age cremations are rare.

10.3.18 With reference to Table 10.1, buried remains related to Iron Age or Bronze Age settlement and cremation burials are considered to represent an '*asset of regional or county importance*', and thus a heritage asset of **Medium** sensitivity.

Undated buried linear features within the site (furrows and ditches)

10.3.19 The geophysical survey also identified nondescript linear anomalies that may indicate the presence of buried infilled ditches of unknown date. A linear feature was located to the south of Grange Farm and several others were located at the southern edge of the site within an area previously utilised for a works compound during the construction of the M40 motorway. Trial trenching did not identify any of these as archaeological features, rather, identifying several instances of infilled furrows (probably of medieval or post-medieval date) a post-medieval or modern infilled boundary ditch and modern made ground in the location of the M40 construction compound.

10.3.20 With reference to Table 10.1, the infilled furrows and ditch would be considered to represent '*features with very limited values or interests '* and comprise heritage assets of **Negligible** sensitivity.

Unrecorded Archaeological Remains

10.3.21 The Assessment considered evidence for the site to contain previously unrecorded archaeological remains. Evidence from the study area identified a moderate potential for remains dating from the later prehistoric (Bronze Age/Iron Age) and Roman periods, which has been backed up by the anomalies identified by the geophysical survey. Insomuch as there is also potential for buried remains of these periods elsewhere within the application site the trial trenching confirmed that the concentrations of more significant archaeology do correspond well with the geophysics and no other areas of unexpected remains of significance (barring the more isolated cremations described above) were identified.

10.3.22 The Assessment summarises the findings of an aerial survey assessment carried out by English Heritage (Stoertz 1998). This identified earthwork evidence for a Roman Road heading westwards from Alchester. It is described how such a feature could be extrapolated to extend across the northern part of the site (see Plan EDP 2 in Appendix 10.1). Buried remains of a Roman Road might be expected to produce a strong anomaly within the geophysical data and there is no such anomaly recorded in this location. Furthermore, the trial trenching did not identify any features that are clearly associated with a Roman road (no agger or suchlike). Consequently, on account of the aerial photographic evidence, there is considered to only be a very low potential for remains related to a road to cross the northern part of the site that avoided detection by the trial trenching.

10.3.23 The Assessment identified a moderate potential for unrecorded medieval remains comprising buried infilled furrows, reflecting the land's agricultural association with Grange Farm and/or the medieval villages of Chesterton and Wendlebury. It also identifies a high potential for later remains of post-medieval or modern date. As noted above, the trial trenching did record evidence for buried furrows in some area as well as a ditch related to post-medieval or modern agriculture.

10.3.24 With reference to Table 10.1, unrecorded remains related to prehistoric or Roman period settlement or to a Roman road would be considered to represent '*assets of regional or county*

importance', and such archaeological features would comprise heritage assets of **Medium** sensitivity.

10.3.25 Remains related to infilled medieval furrows, or post-medieval or modern agricultural features would be considered to represent '*heritage sites or features with very limited value or interest*', and would comprise heritage assets of **Negligible** sensitivity.

Non-designated heritage assets in the wider landscape

10.3.26 The Assessment identified a group of historic outbuildings set around a central courtyard at Grange Farm, c. 60m to the north-east of the site. The group represent a heavily modernised remnant of the post-medieval farm. The Assessment concluded that the group's former rural setting has been compromised by the construction of the large sheds to the west, south and east and the loss of its associated buildings including the farmhouse.

10.3.27 The Proposed Development will result in the removal of six large modern sheds constructed with metal frames, with corrugated metal and asbestos sheet roofing located to the west. However, other units that are closer to the outbuildings will remain, including to the west, as such, the removals will not overtly change the nature of the setting of these buildings.

10.3.28 It assessed therefore that, given their modern setting, and screening from the site by adjacent buildings and by the bund that is proposed on the site boundary, that they would be unaffected by its development and thus they have not been considered within the assessment presented within this chapter.

10.3.29 No other non-designated heritage assets were identified in the wider landscape that might be susceptible to change to their settings from the development.

Future Baseline

10.3.30 The Site is subject in all areas to an ongoing agricultural regime that includes arable farming. Such farming requires ploughing which has potential to gradually erode archaeological features present within the Site. This process is most clearly illustrated by the loss of medieval ridge and furrow earthworks within the site that are documented as extant in an aerial photograph of 1974 (Plan EDP 5 in Appendix 10.1) and which are completely removed in all but one field where they now barely have a surface presence.

10.3.31 Should the present regime continue, it might be expected that all archaeological remains within the site, as suggested by the geophysical survey and trial trenching, would be subject to gradual erosion and loss resulting in a loss of their archaeological interest and heritage value over time.

10.4 Mitigation

10.4.1 Mitigation measures are designed and intended to eliminate or reduce potentially significant effects from the Proposed Development.

Construction Phase

10.4.2 The archaeological evaluation trenching identified buried remains of archaeological value that cannot be preserved in situ. Subject to confirmation with Oxfordshire County Council's Lead Archaeologist, following the submission of the trial trenching report, the loss of such remains to development could be mitigated through a programme of archaeological recording. It is anticipated that this archaeological work would be undertaken by a contractor following a Written

Scheme of Investigation, the content of which will be agreed with Cherwell District Council, on the advice of Oxfordshire County Council's Lead Archaeologist prior to the commencement of the Proposed Development.

10.4.3 Archaeological mitigation work would either take the form of full area excavation, in advance of groundworks, or the monitoring and recording of groundworks associated with the construction of the Proposed Development to allow for the identification, investigation and recording of any exposed archaeological or artefactual deposits; i.e. a watching brief. The results of the fieldwork and any post-excavation analysis undertaken would need to be presented in an appropriately detailed and illustrated report and the project archive curated accordingly. Details of scope, methodology, reporting and archiving would be set out in the WSI in agreement with the Lead Archaeologist.

10.4.4 It is also anticipated that the archaeological mitigation would extend to a recording exercise carried out to identify and investigate any archaeological deposits of potential significance associated with the parish boundary which crosses the Application Site. This would occur when the bank and ditch are removed to a methodology set out in the WSI and agreed in advance with the Lead Archaeologist.

Operational Phase

10.4.5 No specific, additional mitigation measures are proposed to mitigate effects on heritage assets arising from the completed development, beyond those embedded in the proposals.

10.5 Residual effects

10.5.1 The residual effects assessment assumes that the mitigation described in the section above and embedded mitigation measures proposed as part of the scheme will be implemented in full.

Construction Phase

10.5.2 The programme of archaeological evaluation and mitigation descried above will serve to create a record of archaeological features and deposits within the Site. Although this would not entirely mitigate the loss of these assets, the record would serve to compensate for this loss. As such, the significance of effect is assessed as such for the following archaeological assets:

Slight Ridge and Furrow Earthworks

10.5.3 The ridge and furrow earthworks would be completely lost to development. Given their nature as very slight features, it is not anticipated that there would be any benefit in recording the earthworks other than through the record that is already available in the form of LiDAR data.

10.5.4 With reference to Table 10.2, this would result in a Large magnitude of change comprising '*Change to the significance of a heritage asset so that it is completely altered or destroyed*.' With reference to Table 10.3, a Large magnitude of change to an asset of Negligible sensitivity would result in a **Minor Adverse** permanent effect that is not significant.

Historic boundary between the parishes of Chesterton and Wendlebury

10.5.5 The part of the historic boundary that crosses the Site would be totally lost due to development. This loss would result in a loss of integrity to the historic boundary which would lose a degree of its intelligibility in the landscape, and thus a part of its historical value (although it would still be appreciable beyond the Site). It would also result in the loss of part of the boundary's physical

fabric and thus a loss of part of its archaeological interest.

10.5.6 As noted above, the loss of the boundary could be partly mitigated through the creation of a record of it prior to its removal.

10.5.7 With reference to Table 10.2, the loss of part of the boundary would result in a Medium magnitude of change comprising '*Change to the significance of a heritage asset so that it is significantly modified.'* With reference to Table 10.3, a Medium magnitude of change to an asset of Low sensitivity would result in a Minor Adverse permanent effect. Following the mitigation outlined above, this would be reduced to a **Negligible Adverse** permanent effect that is not significant.

Iron Age /and Roman period settlement enclosures and related features within the Site, infilled furrows and ditches and any possible unrecorded archaeological remains.

10.5.8 Any archaeological remains located within the footprint of development would be subject to total loss due to development. The geophysical survey and trial trenching indicates that archaeological remains extend beyond the Site boundaries and so archaeological features located at the edge of the Site would only be partially destroyed. The plan at Figure 10.1 illustrates where geophysical survey anomalies cross the site boundary. It is anticipated that, through mitigation by record, any adverse effects on archaeological assets will be reduced accordingly.

10.5.9 Potential effects on buried archaeological remains might therefore comprise either a Large or a Medium magnitude of change. With reference to Table 10.3, a Large magnitude of change to an asset of Medium sensitivity (such as prehistoric settlement or cremation remains that are located wholly within the development footprint) would result in a Major Adverse permanent effect. Following the mitigation outlined above, this would be reduced to a **Moderate Adverse** permanent effect that would be a significant effect.

10.5.10 With reference to Table 10.3, a Medium magnitude of change to an asset of Medium sensitivity (such as prehistoric settlement remains that represent part of a feature, such as a linear ditch, that extends beyond the site boundary) would result in a Moderate Adverse permanent effect. Following the mitigation outlined above, this would be reduced to a **Minor Adverse** permanent effect that would not be a significant effect.

10.5.1 Any effect on archaeological features of Negligible sensitivity (such as medieval furrows, post-medieval boundary ditches) would result in a **Negligible Adverse** permanent effect that would be non-significant.

Operational Phase

10.5.2 The Archaeological and Heritage Assessment has identified that the Proposed Development would be visible from the Grade II listed building Church of St Giles, seen as the upper part of the building above the adjacent hedgerow boundary of the A41. This visibility is illustrated in EDP Photoviewpoint 15.

10.5.3 Whilst the building would be separated from the asset by the intervening hedgerow and trees along the A41 and thus would not dominate the asset or compete with it for prominence, its presence would change the character of the asset's setting which presently reflects its situation on the edge of a rural village albeit located close to a main dual carriageway road (the A41). In this regard, an additional modern element would be introduced into the setting of the church degrading its character to a very minor degree.

10.5.4 With reference to Table 10.2, the change to the setting of the listed building would result in a Negligible magnitude of change comprising 'Change to the significance of a heritage asset that hardly affects it.' With reference to Table 10.3, a Negligible magnitude of change to an asset of High sensitivity would result in a **Minor Adverse** permanent non-significant effect.

10.5.5 The assessment has not identified any other effects on heritage receptors arising from the operational phase of the development.

10.6 Implications of Climate Change

10.6.1 All of the effects assessed will be through construction impacts within the Site. As such future climate change will not alter the magnitude of these effects.

10.7 Cumulative effects

10.7.1 Effects have been identified to heritage assets located within the Site boundary from construction phase impacts. Cumulative effects on archaeological remains are only applicable where remains found within the Site extend to adjacent sites where development is consented but not yet implemented.

10.7.2 Whilst probable archaeological features identified by the geophysical survey and trial trenching, as well as the historic boundary between the parishes of Chesterton and Wendlebury, do extend beyond the Site boundary, none of these features extend into land that has consent for development.

10.7.3 As such, no in-combination cumulative effects from construction phase impacts have been identified.

10.7.4 Regarding operational phase impacts, the only impact assessed is a Minor Adverse effect to the Grade II listed building Church of St Giles. None of the development or allocation sites assessed for cumulative impacts are located in or around Wendlebury and therefore no effects are likely that would arise from change to the setting of the church. As such, no in-combination effects with other committed or proposed development sites or allocated sites are assessed from the proposed development.

10.8 Summary

10.8.1 This chapter assesses the likely significant effects of the Proposed Development in terms of archaeology and cultural heritage.

10.8.2 A baseline assessment, in the form of an Archaeological and Heritage desk-based assessment, a geophysical survey (Appendix 10.1) and trial trenching (WSI and report at Appendix 10.3) have identified potentially sensitive archaeological and cultural heritage receptors (heritage assets) within the Site.

10.8.3 The assessment established that the Site contains no designated heritage assets and that it does not contribute to the value of any designated heritage assets or non-designated heritage assets in the wider landscape.

10.8.4 It was however assessed that, on account of the height of the proposed building, the upper part of the development will be slightly visible above the adjacent hedgerow from the Grade II listed building Church of St Giles in Wendlebury. This imposition into the church's setting is assessed as resulting in a Minor Adverse, permanent, non-significant effect. In terms of NPPF, this harm

would be at the lower end of the spectrum of 'less than substantial harm' and, in accordance with Paragraph 202 of NPPF, should be '*weighed against the public benefits of the proposal including, where appropriate, securing its optimum viable use.'*

10.8.5 Within the Site, the assessment has identified two heritage assets, slight ridge and furrow earthworks and a historic boundary between the parishes of Chesterton and Wendlebury. Where present in the Site, both of these assets will be removed by development. The removal of the ridge and furrow will result in a Minor Adverse, permanent effect that is not significant. Following mitigation by archaeological recording, the removal of the historic boundary will result in a Negligible Adverse, permanent effect that is not significant.

10.8.6 The assessment considered evidence for the site to contain previously unrecorded archaeological remains. The geophysical survey has identified anomalies that trial trenching has demonstrated represent the buried remains of Mid - Late Iron Age settlement enclosures, ditches and pits and cremations possibly of the Bronze Age. Some of these features extend into or are located within the Site. The assessment also identified potential for the Site to contain previously unrecorded archaeological features including a very low potential for the course of a possible Roman road although no evidence for this was found by the trial trenching.

10.8.7 Effects on archaeological remains depend on their sensitivity and where effects are significant, will be mitigated through archaeological recording which will reduce the level of effect. Following on from trial trenching, it is not thought that any remains identified within the Site are of greater than Medium value. Therefore, following mitigation, the highest possible effect would be a Moderate Adverse permanent, significant effect, where assets of Medium sensitivity (such as prehistoric settlement or cremation remains) would be subject to a Large magnitude of change.

10.8.1 Based on the results of the evaluation trenching, the requirement and scope of any further archaeological mitigation will be fully determined through consultation with Oxfordshire County Council's Lead Archaeologist, and implemented either in advance of, or during, construction works.

10.8.2 In terms of NPPF, residual effects on non-designated archaeological remains would need to be considered with reference to Paragraph 203 such that a '*balanced judgement will be required having regard to the scale of any harm or loss and the significance of the heritage asset'.*

10.9 References

- Chartered Institute for Archaeologists (CIfA) 2020. Standard and Guidance for Historic Environment Desk-based Assessment. Reading;
- Cherwell District Council (CDC) 2008. *Chesterton Conservation Area Appraisal*;
- Historic England (HE) 2015. *Managing Significance in Decision-Taking in the Historic Environment: Historic Environment Good Practice Advice in Planning Note 2.* London;
- Historic England (HE) 2016. Conservation Area Designation, Appraisal and Management, Historic England Advice Note 1 London;
- Historic England (HE) 2017. Historic Environment Good Practice Advice in Planning Note 3 (Second Edition): The Setting of Heritage Assets London; and
- Ministry of Housing, Communities and Local Government (MHCLG) 2021. The National Planning Policy Framework. London.

Table 10.4 Summary of effects

Receptor	Sensitivity of Receptor	Nature of potential impact	Proposed mitigation	Residual effect	Significant / not significant
Construction phase					
Slight Ridge and Furrow Earthworks	Negligible	Total loss due to construction groundwork	None Proposed	Minor Adverse, permanent	Not significant
Historic boundary between the parishes of Chesterton and Wendlebury	Low	Removal of boundary within the Site prior to construction groundwork	Archaeological recording prior to commencement to a methodology agreed in advance with the Oxfordshire County Council Lead Archaeologist	Negligible Adverse, permanent	Not Significant
Iron Age settlement enclosure ditches, pits, Bronze Age cremations located wholly within the development footprint	Medium	Total loss due to construction groundwork of features within the Site	Following review of the archaeological trial trenching report, any required mitigation would be probably by archaeological recording prior to commencement to a methodology agreed in advance with the Oxfordshire County Council Lead Archaeologist	Moderate Adverse, permanent.	Moderate adverse effects would be significant but as per NPPF, would comprise less than substantial harm to a non-designated heritage asset.
Iron Age settlement remains, such as a linear ditch, that extend beyond the site boundary	Medium	Partial loss due to construction groundwork of features that extend into the Site	Following review of the archaeological trial trenching report, any required mitigation would be probably by archaeological recording prior to commencement to a methodology agreed in advance with the Oxfordshire County Council Lead Archaeologist	Minor Adverse, permanent.	Not significant
Archaeological features of Negligible sensitivity (such as medieval furrows, post-medieval boundary ditches)	Negligible	Total or partial loss due to construction groundwork of features that extend into the Site	None proposed	Minor Adverse, permanent.	Not significant

Receptor	Sensitivity of Receptor	Nature of potential impact	Proposed mitigation	Residual effect	Significant / not significant
Operational phase					
Grade II listed Building Church of St Giles	High	Change within the asset's setting that affects its value	None	Minor Adverse	Non-significant

Mitigation commitments Summary

10.9.1 Please note that this section will be removed from this chapter by Savills and compiled into a chapter at the end of the ES.

Table 10.5 Summary for Securing Mitigation

Identified receptor	Type and purpose of additional mitigation measure (prevent, reduce, offset, enhance)	Means by which mitigation may be secured (e.g. planning condition / legal agreement)	To be delivered by	Auditable by
Construction				
Historic boundary between the parishes of Chesterton and Wendlebury	Archaeological recording prior to removal in order to create a record of the bank and ditch and any archaeological deposits contained within them. The scope and methodology of this mitigation would be agreed in advance via a WSI with the Oxfordshire County Council Lead Archaeologist. This measure would reduce the significance of the effect on this heritage asset.	Planning Condition	Archaeological contractor	
Loss of significant archaeological features within the Site	Following submission of the trial trench evaluation report, after consultation with the Oxfordshire County Council Lead Archaeologist, it may be necessary to preserve by record archaeological features within the Site that cannot be preserved in situ. The scope and methodology of this mitigation would be agreed in advance via a WSI with the Lead Archaeologist. This measure would reduce the significance of the effect on these heritage assets.	Planning Condition	Archaeological Contractor	
Operation				
None identified				

11 Hydrology, Flood Risk and Drainage

11.1 Introduction

11.1.1 This chapter assesses the effects of the proposed development on drainage and flood risk. In particular, it considers the potential effects of:

- Flood risk;
- Surface water quality (watercourses [rivers and canals]; reservoirs, lakes and ponds; and wetlands);
- Flood risk management; and
- Land drainage.

11.1.2 The chapter has been written by Tier Consult.

11.1.3 The study area used for this assessment includes both the Site and its nearby relevant hydrological features (extending at least to 1 km from the Site), including the catchments of local watercourses, surface water features and dependant habitats. It also includes hydrogeological features, including underlying geology, aquifers and nearby groundwater dependent features.

11.1.4 This chapter utilises the results of the site specific Flood Risk Assessment (FRA) prepared for the Proposed Development as a requirement of and in accordance with the National Planning Policy Framework (NPPF) and the associated Planning Practice Guidance.

11.1.5 This chapter is supported by the following reports produced by Tier:

- Flood Risk Assessment (Report Ref. T/18/2407/FRA) Appendix 11.1; and
- Surface Water Drainage Layout (T/20/2407-P3) Appendix 11.2.

11.1.6 The assessment covers the construction and operational phases of the Proposed Development and identifies aspects that have the potential to affect the existing baseline situation. The following issues have been considered:

- effects on surface water quality;
- changes to the natural drainage patterns;
- effects on base flows;
- effects on runoff rates and volumes;
- effects on erosion and sedimentation;
- effects on water resources; and
- effects on flooding and impediments to flow.

11.1.7 Where likely effects are predicted, their significance has been assessed taking into account measures incorporated into the design to mitigate or reduce the significance of these effects. Additional mitigation measures are then outlined to reduce any outstanding significant effects with significance then assigned to any residual effects following the implementation of the additional mitigation measures.

11.2 Planning Policy Context

The Flood and Water Management Act 2010

11.2.1 The legislative framework for flood and coastal risk management is set out principally in The Flood and Water Management Act 2010. The legislation endorses the principle of an integrated approach to water and drainage management. The intentions of the Act are summarised below:

11.2.2 Deliver improved security, service and sustainability for people and their communities;

- Clarify responsibilities for managing all sources of flood risk;
- Protect essential water supplies by enabling water companies to control more non-essential uses of water during droughts;
- Modernise the law for managing the safety of reservoirs;
- Encourage more sustainable forms of drainage in new developments through new arrangements for adoption and future operation of such features; and
- Make it easier to resolve misconnections to sewers.

Water Framework Directive

11.2.3 The Water Framework Directive 2000/60/EC is a European Union directive designed to improve and integrate the way water, from all sources, is managed throughout Europe. In the UK, much of the implementation work is undertaken by competent authorities such as the Environment Agency and Local Authorities. It came into force in December 2000 and was transposed into UK law in 2003. Member States are required to achieve good chemical and ecological status for their inland and coastal waters by 2015.

Water Resources Act 1991

11.2.4 Under the Act, it is an offence to "cause or knowingly permit poisonous, noxious or polluting matter or any solid waste to enter controlled waters" unless it is covered by a consent to discharge issued by the Environment Agency. Failure to comply may result in a fine. This includes discharge to surface water drains.

National Planning Policy Framework

11.2.5 The National Planning Policy Framework (NPPF) aims to ensure that flood risk is taken into account by all relevant statutory bodies from regional to local authority planning departments to avoid inappropriate development in areas at risk of flooding and to direct development away from areas of high risk. Where new development is, exceptionally necessary in high risk areas, the policy framework aims to make it safe, ensure that it will not increase flood risk elsewhere and, where possible, reduce overall flood risk in the local area (see Paragraph 159 of the NPPF).

11.2.6 Local Authorities should only consider development in flood risk areas as appropriate where it is informed by a Site-specific Flood Risk Assessment, based upon the Environment Agency's Standing Advice on flood risk. The Assessment should identify and assess the risks of all forms of flooding to and from the development and demonstrate how flood risks will be managed so that the development remains safe throughout its lifetime, taking climate change into account (see Paragraph 167 of the NPPF).

Adopted Cherwell Local Plan 2011-2031 (Part 1)

11.2.7 The Adopted Cherwell Local Plan 2011-2031 (Part 1) contains strategic planning policies for development and the use of land. It forms part of the statutory Development Plan for Cherwell to which regard must be given in the determination of planning applications.

11.2.8 The Plan was formally adopted by the Council on 20 July 2015. Policy Bicester 13 was re-adopted on 19 December 2016.

11.2.9 Policy ESD 6: Sustainable Flood Risk Management states:

"The Council will manage and reduce flood risk in the District through using a sequential approach to development; locating vulnerable developments in areas at lower risk of flooding. Development proposals will be assessed according to the sequential approach and where

necessary the exceptions test as set out in the NPPF and NPPG. Development will only be permitted in areas of flood risk when there are no reasonably available sites in areas of lower flood risk and the benefits of the development outweigh the risks from flooding.
In addition to safeguarding floodplains from development, opportunities will be sought to restore natural river flows and floodplains, increasing their amenity and biodiversity value. Building over or culverting of watercourses should be avoided and the removal of existing culverts will be encouraged.
Existing flood defences will be protected from damaging development and where development is considered appropriate in areas protected by such defences it must allow for the maintenance and management of the defences and be designed to be resilient to flooding.
Site specific flood risk assessments will be required to accompany development proposals in the following situations:

All development proposals located in flood zones 2 or 3
Development proposals of 1 hectare or more located in flood zone 1
Development sites located in an area known to have experienced flooding problems
Development sites located within 9m of any watercourses.

Flood risk assessments should assess all sources of flood risk and demonstrate that:
There will be no increase in surface water discharge rates or volumes during storm events up to and including the 1 in 100 year storm event with an allowance for climate change (the design storm event)
Developments will not flood from surface water up to and including the design storm event or any surface water flooding beyond the 1 in 30 year storm event, up to and including the design storm event will be safely contained on site.

Development should be safe and remain operational (where necessary) and proposals should demonstrate that surface water will be managed effectively on site and that the development will not increase flood risk elsewhere, including sewer flooding."

11.3 Assessment methodology

11.3.1 The approach to the assessment considers the significance of the likely effects upon the hydrological characteristics of the Site.

11.3.2 The approach to the assessment considers the degree (or the 'significance') of the likely effects upon the hydrological characteristics of the Site.

11.3.3 The study area used for this assessment includes both the Site and its nearby relevant hydrological features (extending at least to 1 km from the Site), including the catchments of local watercourses, surface water features and dependant habitats. It also includes hydrogeological features, including underlying geology, aquifers and nearby groundwater dependent features.

11.3.4 The following three criteria have been used in evaluating the significance of the effects of the Proposed Development:

- The sensitivity of the receiving water environment is assessed, as defined in Table 11.1.
- The magnitude of the effect has been evaluated, as defined in Table 11.2.
- The sensitivity of the receiving environment together with the magnitude of the effect defines the significance of the effect prior to application of mitigation measures as outlined within Table 11.3.

11.3.5 Professional judgement is used to assess the findings in relation to each of these criteria to give an assessment of significance for each effect. This approach has been used to inform the assessment of predicted effects.

Significance Criteria

11.3.6 The assessment takes into account inherent mitigation measures to be applied in the implementation of the development proposals.

11.3.7 The significance of effects is determined by considering the magnitude of the effect against the sensitivity of the environmental feature. A matrix is used to combine magnitude and sensitivity to generate the overall level of the effect for each receptor, as illustrated in Table 11.3.

Table 11.1 Value/sensitivity assessment

Receptor value / sensitivity	**Receptor type**
High	Receptor with a high quality and rarity, regional or national scale and limited potential for substitution / replacement. Inner Source Protection zone (Zone 1). Site of Special Scientific Interest (SSSI) or Special Area of Conservation (SAC). Excellent water quality. Large scale industrial agricultural abstractions >1000 m3/day within 2 km downstream, or abstractions for public drinking water supply. Designated salmonid fishery and/or salmonid spawning grounds present. Watercourse widely used for recreation, directly related to watercourse quality (e.g. swimming, salmon fishery etc.) within 2 km downstream. Conveyance of flow and material, main river >10 m wide. Active floodplain area (important in relation to flood defence), i.e. Flood Zone 3b.
Medium	Receptor with a high quality and rarity, local scale and limited potential for substitution / replacement or receptor with a medium quality and rarity, regional or national scale and limited potential for substitution / replacement. Outer Source Protection Zone (Zone 2). Principal Aquifer. Good water quality. Large scale industrial agricultural abstractions 500-1000 m3/day within 2 km downstream. Surface water abstractions for private water supply for more than 15 people. Designated salmonid fishery and / or cyprinid fishery. Watercourse used for recreation, directly related to watercourse quality (e.g. swimming, salmon fishery etc.). Conveyance of flow and material, main river >10 m wide. Active floodplain area (important in relation to flood defence), i.e. Flood Zone 3b and land having a 1 in 100 or greater annual probability of flooding, i.e. Flood Zone 3a.
Low	Receptor with a medium quality and rarity, local scale and limited potential for substitution / replacement or receptor with a low quality and rarity, regional or national scale and limited potential for substitution / replacement. Total Catchment Source Protection Zone (Zone 3). Secondary Aquifer. Fair water quality. Industrial / agricultural abstractions 50-499 m3/day within 2 km downstream. Designated cyprinid fishery or undesignated for fisheries - Occasional or local recreation (e.g. local angling clubs). Groundwater abstractions 50-500 m3/day - Private water supplies present. Designated cyprinid fishery, salmonid species may be present and catchment locally important for fisheries. Watercourse not widely used for recreation, or recreation use not directly related to watercourse quality. Land having between a 1 in 100 or greater annual probability of flooding, i.e. Flood Zone 2.

Receptor value / sensitivity	Receptor type
Negligible	Receptor with a low quality and rarity, local scale and limited potential for substitution / replacement. No SPZ. Unproductive Strata. Environmental equilibrium stable and resilient to changes that are greater than natural fluctuations, without detriment to its present character. Polluted / poor water quality. Industrial / agricultural abstractions < 50 m3/day within 2 km downstream. Fish sporadically present or restricted, no designated fisheries; not used for recreation. Watercourse < 5 m wide. Area does not flood / is located in Environment Agency Flood Zone 1. Receptor heavily engineered or artificially modified and may dry up during summer months.

11.3.8 Magnitude of impact, based on the change that the Proposed Development would have upon the resource/receptor, is considered within the range of high, medium, low, negligible. Consideration is given to scale, duration of impact/effect (e.g. for construction, short-term for 1-2 years, medium-term for 3-5 years, long-term for 5 years and greater, and permanent, dependent upon project timeframes) and extent of Proposed Development with reference to the definitions in the Table 11.2.

Table 11.2 Magnitude of impact

Magnitude	Description
High	Adverse: Increase in peak flood level* (> 100 mm); loss of fishery; deterioration in surface water ecological or chemical WFD element status or groundwater or quantitative WFD element status. Beneficial: Creation of additional flood storage and decrease in peak flood level* (> 100 mm), increase in productivity of size of fishery; improvement in surface water ecological or chemical WFD element status; improvement in groundwater qualitative or quantitative WFD element status.
Medium	Adverse: Increase in peak flood level* (> 50 mm); partial loss of fishery; measurable decrease in surface water ecological or chemical quality or flow with potential for deterioration in surface waste WFD element status or groundwater or quantitative WFD element status. Reversible change in the yield or quality of an aquifer, such that existing users are affected, with potential for deterioration in WFD element status. Beneficial: Creation of additional flood storage and decrease in peak flood level* (> 50 mm), measurable increase in surface water ecological or chemical quality or flow with potential for WFD element status to be improved. Measurable increase in the yield or quality of an aquifer, benefiting existing users, with potential for WFD element status to be improved. Improvement in groundwater qualitative or quantitative WFD element status.
Low	Adverse: Increase in peak flood level* (> 10 mm); measurable decrease in surface water ecological or chemical quality or flow; decrease in yield or quality of aquifer, not affecting existing users or changing any WFD element status. Beneficial: Creation of flood storage and decrease in peak flood level* (> 10 mm); measurable increase in surface water ecological or chemical quality; increase in yield or quality of aquifer not affecting existing users or changing any WFD element status. Measurable but limited change in a ground water supply reliability and quality.
Negligible	Negligible change to peak flood level* (< +/- 10 mm); discharges to watercourse

Magnitude	Description
	or changes to an aquifer which lead to no change in the attribute's integrity and / or in a ground water supply reliability and quality.

11.3.9 The predicted level of effect is based upon the consideration of magnitude of impact and sensitivity of the resource/receptor to come to a professional judgement of how important this effect is.

11.3.10 The sensitivity of the receiving environment together with the magnitude of the effect defines the level of the effect prior to application of additional mitigation measures, as outlined within Table 11.3.

Table 11.3 Level of effect

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

Consultation

11.3.11 Information regarding the current flood risk at the application site, local flood defences and flood risk has been obtained from the Environment Agency and is contained within the FRA within Appendix 11.1.

Assumption and Limitations

11.3.12 In the event that the development proceeds with a layout different to that shown by SGP-ZZ-ZZ-DR-A-131001-R, this would be subject to review at the appropriate time to determine the consistency of the model with the revised design details.

11.3.13 The assessment in this Chapter is reliant on the data presented in the FRA for the scheme and comments from Cherwell District Council as the Local Planning Authority (LPA), Oxfordshire County Council as the Lead Local Flood Authority (LLFA) and the Environment Agency. The Environment Agency's flood data can change over time. However, it is not considered that the above limitations would have a significant bearing on the outcome of this assessment.

11.4 Baseline conditions

Current Baseline

11.4.1 This section identifies the current drainage and flood risk conditions of the site and the study area.

11.4.2 The sources of information used in this desktop study are listed in Table 11.4.

Table 11.4 Data Sources

Topic	Sources of Information
Topography	Ordnance Survey Maps Site topographic survey
Geology	BGS Bedrock and Superficial Geological Map BGS online data
Hydrogeology	Environment Agency online data Relevant scientific literature
Hydrology	Meteorological Office Historic Rainfall Data Flood Estimation Handbook (FEH) National Soil Resource Institute Environment Agency Flood Risk Maps

Topography

11.4.3 Generally, ground levels fall from north to southeast, from approximately 77.50 metres Above Ordnance Datum (mAOD) to approximately 64.00 mAOD.

Catchment Hydrology / Existing Drainage

11.4.4 The Wendlebury Brook flows through the site, the Wendlebury Brook outfalls into the Langford Brook downstream from the site, after flowing through Wendlebury Village. There is a drainage ditch running along the east of the M40 which reduces flows reaching the northern end of the site. This was observed to be dry, and therefore suggests that it is not the primary flow route.

11.4.5 Currently, the site is not served by a positive surface water drainage system, with rainfall currently infiltrating into the ground where geological and hydrogeological conditions allow, and then runoff once the infiltration capacity of the ground has been exceeded.

Rainfall

11.4.6 The Site is located within an area of moderate rainfall. The 1961-1990 Standard Average Annual Rainfall (SAAR) for the Site is 755 mm per annum. The UK national average is 832 mm per annum.

Ground Conditions

11.4.7 The British Geological Survey (BGS) Map indicates that the site is underlain by areas of River Terrace Deposits, 2 - sand and gravel, locally with lenses of silt, clay or peat and Alluvium - clay, silt, sand and gravel.

11.4.8 The bedrock deposits underlying the site consist of the Kellaway Clay Member - mudstone, the Kellaway Sand Member - sandstone and siltstone, interbedded and the Peterborough Member – mudstone.

Hydrogeology

11.4.9 The superficial deposits are designated as a Secondary A Aquifer - Permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers.

11.4.10 The bedrock deposits are designated as:

- Secondary A Aquifer - Permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers.
- Unproductive - These are rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow.

11.4.11 The site is not located within an Environment Agency Source Protection Zone (SPZ).

Licensed Discharges to Controlled Waters

11.4.12 The licensed discharges to controlled water within 2 km of the Site are shown in Table 11.5.

Table 11.5 Licensed Discharges to Controlled Waters

Location	Address	Details	
57m N	Little Chesterton	Effluent Type: SEWAGE DISCHARGES - PUMPING STATION - WATER COMPANY Permit Number: TEMP.1350 Permit Version: 1 Receiving Water: GAGLE BROOK	Status: REVOKED - UNSPECIFIED Issue date: 02/11/1989 Effective Date: 02/11/1989 Revocation Date: 25/11/1997
85m SE	Rectory Close	Effluent Type: SEWAGE DISCHARGES - PUMPING STATION - WATER COMPANY Permit Number: TEMP.1782 Permit Version: 1 Receiving Water: LANGFORD BROOK	Status: TEMPORARY CONSENTS (WATER ACT 1989, SECTION 113) Issue date: 02/11/1989 Effective Date: 02/11/1989 Revocation Date: 02/09/2010
85m SE	Rectory Close	Effluent Type: SEWAGE DISCHARGES - PUMPING STATION - WATER COMPANY Permit Number: TEMP.1782 Permit Version: 2 Receiving Water: Langford Brook	Status: SURRENDERED UNDER EPR 2010 Issue date: 03/09/2010 Effective Date: 03/09/2010 Revocation Date: 13/10/2015
375m SE	SE COLLEGE FARM, WENDLEBURY,	Effluent Type: MISCELLANEOUS DISCHARGES - SURFACE WATER Permit Number: CTWC.3365 Permit Version: 1 Receiving Water: WENDLEBURY BROOK	Status: REVOKED - UNSPECIFIED Issue date: 16/06/1989 Effective Date: 16/06/1989 Revocation Date: 08/04/1991
377m SE	SE College Farm	Effluent Type: SEWAGE DISCHARGES - PUMPING STATION - WATER COMPANY Permit Number: TEMP.0721 Permit Version: 1 Receiving Water: LANGFORD BROOK	Status: TEMPORARY CONSENTS (WATER ACT 1989, SECTION 113) Issue date: 02/11/1989 Effective Date: 02/11/1989 Revocation Date: 02/09/2010

377m SE	SE College Farm	Effluent Type: SEWAGE DISCHARGES - PUMPING STATION - WATER COMPANY Permit Number: TEMP.0721 Permit Version: 2 Receiving Water: Langford Brook	Status: SURRENDERED UNDER EPR 2010 Issue date: 03/09/2010 Effective Date: 03/09/2010 Revocation Date: 13/10/2015

Groundwater Abstractions

11.4.13 The licensed groundwater abstraction within 2 km of the Site are shown in Table 11.6.

Table 11.6 Licensed Groundwater Abstractions

Location	Details	
91m SE	Status: Historical Licence No: 28/39/14/0064 Details: General Farming & Domestic Direct Source: THAMES GROUNDWATER Point: HOME FARM, WENDLEBURY (A) Data Type: Point Name: MILLER Easting: 455900 Northing: 219700	Annual Volume (m3): - Max Daily Volume (m3): - Original Application No: - Original Start Date: 10/10/1966 Expiry Date: - Issue No: 100 Version Start Date: 01/01/1985 Version End Date: -
453m SE	Status: Historical Licence No: 28/39/14/0267 Details: General Farming & Domestic Direct Source: THAMES GROUNDWATER Point: MANOR FARM, WENDLEBURY (A) Data Type: Point Name: J W BONNER & SONS Easting: 455900 Northing: 219200	Annual Volume (m3): - Max Daily Volume (m3): - Original Application No: - Original Start Date: 09/04/1973 Expiry Date: - Issue No: 100 Version Start Date: 01/01/1980 Version End Date: -
508m NE	Status: Historical Licence No: 28/39/14/0326 Details: General Farming & Domestic Direct Source: THAMES GROUNDWATER Point: BOWLERS COPSE, WENDLEBURY (A) Data Type: Point Name: PAIN Easting: 456400 Northing: 220300	Annual Volume (m3): - Max Daily Volume (m3): - Original Application No: - Original Start Date: 29/12/1993 Expiry Date: - Issue No: 100 Version Start Date: 29/12/1993 Version End Date: -

508m NE	Status: Historical Licence No: 28/39/14/0326 Details: General Farming & Domestic Direct Source: THAMES GROUNDWATER Point: BOWLERS COPSE, WENDLEBURY (A) Data Type: Point Name: PAIN Easting: 456400 Northing: 220300	Annual Volume (m3): - Max Daily Volume (m3): - Original Application No: - Original Start Date: 29/12/1993 Expiry Date: - Issue No: 100 Version Start Date: 29/12/1993 Version End Date: -
508m NE	Status: Historical Licence No: 28/39/14/0326 Details: General Farming & Domestic Direct Source: THAMES GROUNDWATER Point: BOWLERS COPSE, WENDLEBURY (A) Data Type: Point Name: PAIN Easting: 456400 Northing: 220300	Annual Volume (m3): - Max Daily Volume (m3): - Original Application No: - Original Start Date: 29/12/1993 Expiry Date: - Issue No: 100 Version Start Date: 29/12/1993 Version End Date: -
1337m NE	Status: Historical Licence No: 28/39/14/0329 Details: General Farming & Domestic Direct Source: THAMES GROUNDWATER Point: PROMISED LAND FARM, BICESTER (A) Data Type: Point Name: PROMISED LAND FARM Easting: 457200 Northing: 220600	Annual Volume (m3): - Max Daily Volume (m3): - Original Application No: - Original Start Date: 16/11/1994 Expiry Date: - Issue No: 100 Version Start Date: 16/11/1994 Version End Date: -
1365m NE	Status: Historical Licence No: 28/39/14/0300 Details: Drinking, Cooking, Sanitary, Washing, (Small Garden) - Commercial/Industrial/Public Services Direct Source: THAMES GROUNDWATER Point: BICESTER TRAILER PARK, OXFORD ROAD, WENDLEBURY Data Type: Point Name: M & L ROSSITER Easting: 457100 Northing: 220800	Annual Volume (m3): - Max Daily Volume (m3): - Original Application No: - Original Start Date: 19/03/1987 Expiry Date: - Issue No: 100 Version Start Date: 19/03/1987 Version End Date: -
1611m NE	Status: Active Licence No: 28/39/14/0295 Details: General Farming & Domestic Direct Source: THAMES GROUNDWATER Point: WENDLEBURY LANE, BICESTER (A) Data Type: Point Name: FACCENDA CHICKEN LTD Easting: 457400 Northing: 220800	Annual Volume (m3): 16,593 Max Daily Volume (m3): 68.20 Original Application No: - Original Start Date: 08/07/1983 Expiry Date: - Issue No: 100 Version Start Date: 08/07/1983 Version End Date: -

Surface Water Abstractions

11.4.14 The licensed surface water abstraction within 2 km of the Site are shown in Table 11.7.

Table 11.7 Licensed Surface Water Abstractions

Location	Details	
1730m SE	Status: Historical Licence No: 28/39/14/0350 Details: Make-Up Or Top Up Water Direct Source: THAMES SURFACE WATER - NON TIDAL Point: LANGFORD BROOK AT MERTON GROUNDS FARM, MERTON Data Type: Line Name: Emma Keeble and Francois Rodriges-Pereire Easting: 457560 Northing: 219140	Annual Volume (m3): 16256 Max Daily Volume (m3): 145.47 Original Application No: - Original Start Date: 06/05/2005 Expiry Date: 31/03/2018 Issue No: 3 Version Start Date: 09/06/2017 Version End Date: -

Potable Water Abstractions

11.4.15 The licensed potable water abstraction within 2 km of the Site are shown in Table 11.8.

Table 11.8 Licensed Potable Water Abstractions

Location	Details	
1365m NE	Status: Historical Licence No: 28/39/14/0300 Details: Drinking, Cooking, Sanitary, Washing, (Small Garden) - Commercial/Industrial/Public Services Direct Source: THAMES GROUNDWATER Point: BICESTER TRAILER PARK, OXFORD ROAD, WENDLEBURY Data Type: Point Name: M & L ROSSITER Easting: 457100 Northing: 220800	Annual Volume (m3): - Max Daily Volume (m3): - Original Application No: - Original Start Date: 19/03/1987 Expiry Date: - Issue No: 100 Version Start Date: 19/03/1987 Version End Date: -

Surface Water Quality

11.4.16 The surface water body Water Framework Directive (WFD) designations within 2 km of the Site are shown in Table 11.9.

Table 11.9 WFD Surface Water Bodies

Location	Type	Name	Water Body ID	Overall Rating	Chemical Rating	Ecological Rating	Year
1642m SE	River	Langford Brook (Bicester to Ray incl. Gagle Brook)	GB106039030140	Poor	Good	Poor	2016
				Poor	Fail	Poor	2019

Groundwater Water Quality

11.4.17 The groundwater body WFD designations within 2 km of the Site are shown in Table 11.10.

Table 11.10 WFD Groundwater Bodies

Location	Name	Water Body ID	Overall Rating	Chemical Rating	Quantitative	Year
On site	Bicester-Otmoor Cornbrash	GB40602G600800	Good	Good	Good	2016
			Poor	Poor	Good	2019

Flooding

11.4.18 The FRA utilises a hydraulic model of the Wendlebury Brook and Gagle Brook supplied by the Environment Agency to further assess the flood risk to the site and the impact of the proposed development on flood risk.

11.4.19 The site is unlikely to flood except in extreme conditions. The primary, but unlikely, flood risk posed to the site is from fluvial flooding from Wendlebury Brook however, the site has no history of flooding.

11.4.20 The Environment Agency's flood map indicates that the majority of the site is located within Flood Zone 1 and therefore has a 'low probability' of fluvial flooding, with less than a 1 in 1,000 annual probability of river flooding (<0.1%). However, a small proportion of the site, to the east on the left bank of the Wendlebury Brook, is located within Flood Zone 2 and therefore has a 'medium' probability of fluvial flooding, with between a 1 in 100 and 1 in 1,000 annual probability of river flooding (1% - 0.1%) in any year. These areas are located immediately adjacent to the Wendlebury Brook.

11.4.21 The site will not be inundated with floodwater for all events up to and including the 1 in 100 year (+20%) event, the site will be flood free during the 1 in 100 year (+20%) event. This has been confirmed by the Environment Agency data and the hydraulic modelling undertaken as part of the FRA.

11.4.22 A small area of the site will only be inundated with floodwater during the 1 in 1,000 year event. These areas are located immediately adjacent to the Wendlebury Brook and are located on the left bank of the Wendlebury Brook.

11.4.23 Given the scale and nature of the proposed development and the size and location of the fluvial flooding sources it has been concluded that fluvial flooding poses a low flood risk to the site therefore, the risk of fluvial flooding is considered to be of low significance. A secondary flooding source has been identified which may pose a low risk to the site. This is:

- Surface Water (pluvial) Flooding

11.4.24 The risk of flooding from all sources is considered to be low or not significant. The flooding sources will only inundate part of the site to a relatively low water depth and water velocity, will only last a short period of time, in very extreme cases and will not have an impact on the whole of the proposed development site.

Environmentally Sensitive Sites

11.4.25 The site is located within a nitrate vulnerable zone.

11.4.26 The identified environmentally sensitive site designations within 2 km of the Site are shown in Table 11.11.

Table 11.11 Environmentally Sensitive Sites

Location	Name	Designation
1341m S	Wendlebury Meads and Mansmoor Closes	Site of Special Scientific Interest (SSSI)
On site	Unknown	Designated Ancient Woodland
671m W	Middleleys Spinney	Designated Ancient Woodland
919m S	Wormough Copse	Designated Ancient Woodland
1029m SW	Meizen Copse	Designated Ancient Woodland
1544m SW	Weston Wood	Designated Ancient Woodland
1643m W	Unknown	Designated Ancient Woodland

Recreation and Fisheries

11.4.27 There are no designated fishery waterbodies and / or watercourses used for recreation within 2 km of the Site.

Sensitive Receptors

11.4.28 Based on the baseline conditions presented above, Table 11.12 presents the sensitive receptors which have been considered in the following assessment, along with their sensitivity to change which is based on the general criteria outlined below.

Table 11.12 Sensitive Receptors

Receptor	Medium	Sensitivity	Description
Flood Risk (all sources including river, surface water, groundwater, etc.)	Construction workers	Medium	Flooding may impact upon construction workers, but their sensitivity is lowered as a result of their competency in their role as well as operating in teams and/or prescribed systems.
	Residents/users of the surrounding area	Medium	Residents/users of the surrounding areas generally have little awareness of flood risk and residents vulnerability is high given their presence overnight (via sleeping accommodation).
	Future site occupants (staff and public)	Medium	The vulnerability is reduced as all buildings are located outside and above the design flood level.
Watercourses	Water quantity/ quality/ supply	Medium	This would only be felt over short distance of the watercourses compared to the overall length of the watercourses. Water quality issues would also be diluted rapidly within the watercourses.

11.5 Mitigation

11.5.1 The Proposed Development has the potential to affect the hydrology and hydrogeology in the vicinity of the Site, impacting surface water runoff, groundwater levels, flow direction and quality.

11.5.2 The significance of any potential pollution or changes in groundwater levels and flow would be dependent on the nature of the incident, incorporated mitigation measures and sensitivity of the potential receptor.

Construction Phase

Procedures

11.5.3 The design and implementation of the construction works will be undertaken in accordance with ISO 14001 and industry and regulatory procedures. As such, it is envisaged that the following documents will be prepared and, where appropriate, agreed with the regulatory bodies:

- Construction Environmental Management Plan (CEMP);
- Site Drainage Plan;
- Incidence Response Plan (IRP);
- Environmental training for personnel;
- Record keeping; and,
- The identification, mitigation and remediation of contaminated land.

11.5.4 The management of runoff during construction would be included in the CEMP. In summary, withdrawn Pollution Prevention Guidance[1] (PPG), Environment Agency guidance[2] and CIRIA guidance[3] states that the following methods of surface water management should be put in place during the construction phase to ensure pollution, sediment and erosion control.

11.5.5 Mitigation measures will be included within the CEMP, a Site Drainage Plan and as part of the Incident Response Plan. Mitigation will include:

- 8m working standoff from the watercourses/ditches to be retained (excluding drainage works and the construction of the attenuation ponds);
- Bunds will be used to prevent runoff entering watercourses;
- Compounds will have hard surfacing to prevent infiltration;
- Areas of localised contamination identified during the ground investigation will be remediated/ removed as appropriate;
- A procedure will be put in place to manage previously unidentified contaminated ground that is encountered during the works; and,
- Any surplus soil arisings from levelling or excavation works that has visual or olfactory evidence of contamination will be stored in sheeted stockpiles placed on hardstanding or sheeting pending its removal or treatment.

11.5.6 There is potential for the introduction of contaminated materials to the ground or groundwater due to incorrect storage or spillages of construction materials/fuels. Design of operational pollution prevention measures will be included in the CEMP. Impacts due to incorrect storage and spillage will be mitigated by the following:

- Design of a Drainage Plan for the site;
- Compounds will comprise hardstanding;
- Environmental training for all personnel;
- Designated re-fuelling areas on hardstanding with interceptor drainage, bunds, plant

[1] Pollution Prevention Guidelines PPG1: Understanding Your Environmental Responsibilities (July 2013).
Guidance for Pollution Prevention GPP2: Above ground oil storage tanks (January 2018).
Guidance for Pollution Prevention GPP5: Works and maintenance in or near water (January 2017).
Pollution Prevention Guidelines PPG6: Working at construction and demolition sites (March 2012).
Pollution Prevention Guidelines PPG7: The safe operation of refuelling facilities (July 2011).
Guidance for Pollution Prevention GPP8: Safe storage and disposal of used oils (July 2017).
Guidance for Pollution Prevention GPP13: Vehicle washing and cleaning (April 2017).
Guidance for Pollution Prevention GPP21: Incident Response Planning (July 2017).
Guidance for Pollution Prevention GPP22: Dealing with spills (October 2018).
Guidance for Pollution Prevention GPP23: Safe storage - drums and intermediate bulk containers (February 2019).
[2] Environment Agency Guidance 'Oil storage regulations for businesses' (2015).
Environment Agency Guidance 'Manage water on land: guidance for land managers' (2015).
[3] CIRIA C502 Environmental Good Practice on Site.
CIRIA C532 Control of Water Pollution from Construction Sites.
CIRIA C753 The SuDS Manual.

nappies or similar;
- Spill kits will be readily available;
- Storage areas for materials will be identified; and,
- Deliveries will be planned in advance.

Excavated and Exposed Ground

11.5.7 To limit the volume of runoff reaching the exposed ground, runoff diversion or interception devices can be placed upstream. To help prevent pollution from entering a watercourse, silt fences, hay bales or stilling ponds can be placed downstream.

11.5.8 The extent of all excavations would be minimised as far as is reasonably practicable. During construction activities, surface water flows would be captured through a series of cut-off drains to prevent water entering excavations or eroding exposed surfaces. If dewatering of excavations is required, pumped discharges would be passed through a washout area, settlement/ attenuation ponds and silt fences to capture sediments before release to a watercourse/ drain.

Stockpiles

11.5.9 Stockpiles will be located away from a watercourse or site drainage system to prevent leaching of contaminants. Protective coverings will help prevent runoff stripping a stockpile. Concrete should also be stored to prevent release into drains.

11.5.10 Topsoil / subsoil would be stored away from watercourses and on flat lying land (minimum 20m on flat land). Where this is not possible and it is to be stockpiled for longer than a two week period, the material would, as soon as possible either be covered with geotextile mats, seeded to promote vegetation growth, or drainage provided to a suitable settlement area.

Plant and Wheel Washing

11.5.11 Plant wheel washing will take place in designated locations. The area will be tanked and will not be allowed to discharge into a watercourse or infiltrate to groundwater. Some proprietary vehicle washing systems offer a recycling facility, which filter and settle solids, with effluent being pumped back into the system. The solid waste materials from this process need to be treated as contaminated waste due to the high hydrocarbon content.

11.5.12 Mud deposits would be controlled at entry and exits to the Site using wheel washing facilities and / or road sweepers operating during earthworks or other times as considered necessary.

11.5.13 Tools and plant would be washed out and cleaned in designated areas within the Site compound where runoff can be isolated for treatment before discharge to surface water drainage under appropriate consent and / or agreement with the Environment Agency and / or the LLFA, or otherwise removed from site for appropriate disposal at a licenced waste management facility.

Haul Roads

11.5.14 Haul roads will be designed so that the length is kept to a minimum, but still serves its purpose. The gradient will be shallow to prevent increasing runoff velocity and, if possible, bunds and / or discrete ditches constructed to intercept the runoff. Haul roads will be sprayed regularly to keep down dust. If any section of a haul road is hard surfaced, then it will be swept on a regular basis to prevent accumulation of dust and mud. Gullies will be covered when not in use before the final bituminous running surface is laid.

11.5.15 The movement of construction traffic (to / from and between main construction areas) would be controlled via defined tracks and hardstanding areas.

Oils and hydrocarbons

11.5.16 Simple measures can be taken to prevent oil and hydrocarbons becoming pollutants, such as:

- Maintenance of machinery and plant
- Drip trays
- Regular checking of machinery and plant for oil leaks
- Correct storage facilities
- Check for signs of wear and tear on tanks
- Care with specific procedures when refuelling
- Designated areas for refuelling
- Emergency spill kit located near refuelling area
- Regular emptying of bunds
- Tanks located in secure areas to stop vandalism

11.5.17 In accordance with the Environment Agency PPGs, all fuel tanks on-Site will have a bunded containment of a minimum of 110% fuel tank capacity. There would be no drainage point from the bunded catchment area and tamperproof taps / valves would be installed. All empty fuel containers or drums would be stored within a catchment area prior to their removal from the Site. Oil traps would be incorporated in pertinent drainage systems to prevent accidental spillage being discharged into the surface runoff. Furthermore, spill kits would be stored at refuelling areas in the event of accidental spillage.

11.5.18 Best practice measures would be undertaken when refuelling plant and machinery. Where fuelling of large machinery is required, drip trays and absorbent mats or pellets would be utilised. General maintenance would also be undertaken in a designated area and similar contamination prevention measures would be adopted.

11.5.19 All runoff from the Site would be intercepted and treated to remove sediment, oils and other substances prior to discharge. As construction of the Proposed Development progresses the drainage system would be progressively implemented and would also include pollution prevention control systems.

Watercourses / Drainage Channels

11.5.20 The gradient of the proposed drainage channels has been carefully considered. If the gradient is made too flat, then the channel is likely to silt-up and reduce the flow capacity of the channel and prevent sediment travelling downstream. Alternatively, if the gradient is made too steep, this can increase erosion of the ditch banks which would result in an increase in the quantity of sediments which migrate downstream.

11.5.21 The Proposed Development scenario has been modelled to assess the impact of the proposed development on flood risk. A number of different options for the channel dimensions have been modelled to ascertain the optimum solution which does not increase flood risk.

11.5.22 The Wendlebury Brook would be monitored throughout the construction period to identify any enhanced scouring of the catchment surface. If sediment from disturbed ground was found to be excessively mobilised through the minor channels network, this would be mitigated by temporary sediment control measures (e.g. geotextiles/straw bales).

Operational Phase

11.5.23 The flood risk posed to the Site would be reduced by using the following mitigation measures:

- Minimum Floor Level: There is no minimum finished floor level required. However, it is recommended that generally floor levels are located above the highways by 150mm (apart

from HGV loading areas) to enable the full capacity of any secondary flood conveyance to be utilised.

- Flood Resilience and Resistance: Relatively simple measures such as raising utility entry points, using first floor or ceiling down electrical circuits and sloping landscaping away from the buildings can be easily and economically incorporated into the development of the site.
- Access and Egress: The site and surrounding area is not located within the floodplain therefore a permanently safe and dry access can be maintained.
- Buffer Strip: The proposed development will include the creation of a 10m buffer strip on each bank of the Wendlebury Brook within the Site. This will allow access for maintenance of the watercourse while also accommodating any flooding.

11.5.24 Increasing the area of impermeable surface has the potential to increase surface water runoff rates and volumes. An increase in impermeable area across the Site could result in increased rates and volume of runoff that would not otherwise occur. A SuDS Strategy is proposed as part of the Proposed Development, details of which are contained in Appendix 11.1.

11.5.25 The SuDS Strategy ensures that a sustainable drainage solution can be achieved which reduces the peak discharge rate to manage and reduce the flood risk posed by the surface water runoff from the site. One of the aims of the NPPF is to provide not only flood risk mitigation but also to maximise additional gains such as improvements in runoff quality and provision of amenity and biodiversity. The SuDS Strategy takes into account the following principles:

- No increase in the volume or runoff rate of surface water runoff from the site.
- No increase in flooding to people or property off-site as a result of the development.
- No surface water flooding of the site.
- The proposals take into account a 40% increase in rainfall intensity due to climate change during the next 100 years which is the lifetime of the development.

11.5.26 A hierarchical approach to surface water management has been adopted within the SuDS Strategy with a restricted discharge to the Wendlebury Brook being utilised and will take the form of:

- Attenuation pond.
- Swale.
- Cellular attenuation storage.

11.5.27 It is proposed the surface water for the development will discharge into Wendlebury Brook at the QBAR runoff rate of 22.50l/s for all events up to and including the 1 in 100 year (+40%) events.

11.5.28 As a consequence of limiting the rate of discharge from the site, at times of heavy rainfall the volume of water leaving the site will be significantly less than that draining from it. In order to prevent this water backing up in the system and causing flooding, attenuation storage will be incorporated into the site layout of attenuation storage will be provided. The size of this attenuation storage has been calculated such that the proposed development has the capacity to accommodate the 100 year rainfall event including a 40% increase in rainfall intensity that is predicted to occur as a result of climate change.

11.5.29 The remainder of the site that is not formally drained, i.e. landscaped areas, will be permeable (grass). The majority of rainwater falling on these areas will soak into the ground. Surface water runoff would be directed to the drainage system through drainage gullies located around

the perimeter of the buildings and through contouring of the hardstanding areas.

11.5.30 These methods will reduce peak flows, the volume of runoff, and slow down flows and will provide a suitable SuDS solution for this site. These preliminary considerations are based on the outline development scheme provided and hence the design purposes. The adoption of a SuDS Strategy for the site represents an enhancement from the current conditions as the current surface water runoff from the site is uncontrolled, untreated, unmanaged and unmitigated. In adopting these principles, it has been demonstrated that a scheme can be developed that does not increase the risk of flooding to adjacent properties and development further downstream.

11.5.31 Storage and handling of fuels and oils at the Site would comply with the Environment Agency PPGs, Environment Agency guidance and CIRIA guidance. Standard pollution prevention procedures to mitigate the risks to surface water quality would be implemented throughout operation of the Proposed Development. Examples of some of the measures that would be adopted at the Site are: bunded fuel storage; provision of spill kits etc.; and minimising the amount of exposed ground.

11.5.32 In accordance with the Environment Agency PPGs, all fuel tanks on-site shall have a bunded containment of a minimum of 110% fuel tank capacity. There would be no drainage point from the bunded catchment area and tamperproof taps / valves would be installed. All empty fuel containers or drums would be stored within a catchment area prior to their removal from the Site. Oil traps would be incorporated in pertinent drainage systems to prevent accidental spillage being discharged into the surface runoff. Furthermore, spill kits would be stored at refuelling areas in the event of accidental spillage.

11.5.33 Best practice measures would be undertaken when refuelling plant and machinery. Where fuelling of large machinery is required, drip trays and absorbent mats or pellets would be utilised. General maintenance would also be undertaken in a designated area and similar contamination prevention measures would be adopted.

11.5.34 The Proposed Development scenario has been modelled to assess the impact of the proposed development on flood risk, including the proposed diversion of approximately 450m of the Wendlebury Brook. A number of different options for the channel dimensions have been modelled to ascertain the optimum solution which does not increase flood risk.

11.5.35 During the proposed scenario 1 in 100 year (+15%) event, there are no out of bank flows upstream of the A41 culvert as in the baseline model. During the proposed scenario 1 in 1,000 year event and shows that the flood outline upstream of the A41 culvert is reduced compared to the baseline scenario 1 in 1,000 year event. The post development scenario shows a reduced out of bank flooding upstream of Wendlebury.

11.5.36 There will be no detriment to the flood storage capacity of the site. The overall direction of the movement of water will be maintained within the developed site and surrounding area. The conveyance routes (flow paths) will not be blocked or obstructed. The proposed development will have no impact on the movement of floodwater across the site. There will be no increase in the floodwater levels due to the proposed development. There will be no loss in flood storage capacity and no change in the on-site and off-site flood risk.

11.6 Residual effects

11.6.1 This section summarises the significance of the anticipated residual environmental effects, which are those that remain after all proposed mitigation measures are implemented.

Construction Phase

Impact on Flood Risk - Construction Workers

11.6.2 The implementation of the mitigation measures will result in a negligible effect and no significant residual effect.

Impact on Flood Risk - Residents/Users of the Surrounding Area

11.6.3 The implementation of the mitigation measures will result in a negligible effect and no significant residual effect.

Watercourses – water quantity/quality/supply

11.6.4 The implementation of the mitigation measures will result in a negligible effect and no significant residual effect.

Operational Phase

Impact on Flood Risk - Residents/Users of the Surrounding Area

11.6.5 The implementation of the mitigation measures will result in a negligible effect and no significant residual effect.

Watercourses – water quantity/quality/supply

11.6.6 The implementation of the mitigation measures will result in a negligible effect and no significant residual effect.

11.7 Implications of Climate Change

11.7.1 Hydrological systems are in a state of constant flux. Two main influences on the hydrology of the Site have been identified, namely land use and climate change.

11.7.2 Climate is also variable, with observed historical and predicted future changes in global climate due to a combination of both natural and human causes. Projections of future climate change in the UK indicate more frequent, short-duration, high intensity rainfall and more frequent periods of long duration rainfall.

11.7.3 Guidance included within the NPPF recommends that the effects of climate change are incorporated into FRA. The FRA has assessed the effects of climate change on the flood risk posed to the Proposed Development and includes a 15% climate change allowance as per guidance. During the proposed scenario 1 in 100 year (+15%) event, there are no out of bank flows upstream of the A41 culvert as in the baseline.

11.7.4 The Drainage Strategy includes a 40% model climate change allowance as per guidance.

11.8 Cumulative effects

11.8.1 No developments have been identified which could give rise to likely significant environmental effects on surface water and flood risk.

11.9 Summary

11.9.1 This impact assessment has considered the potential adverse impacts on the waterbodies at or near the Site from the Proposed Development. The principal risks during construction are considered to be the potential for excess fine sediment, hydrocarbons, chemicals polluting waterbodies and increase in surface water runoff volumes. This could be exacerbated by the extensive earthworks that would be required at the Site.

11.9.2 An FRA (Appendix 11.1) has been prepared and used to inform this Chapter of the ES. The FRA utilises a hydraulic model of the Wendlebury Brook and Gagle Brook supplied by the Environment Agency to further assess the flood risk to the site and the impact of the proposed development on flood risk.

11.9.3 The site is unlikely to flood except in extreme conditions. The primary, but unlikely, flood risk posed to the site is from fluvial flooding from Wendlebury Brook however, the site has no history of flooding.

11.9.4 The Environment Agency's flood map indicates that the majority of the site is located within Flood Zone 1 and therefore has a 'low probability' of fluvial flooding, with less than a 1 in 1,000 annual probability of river (<0.1%). However, a small proportion of the site, to the east on the left bank of the Wendlebury, is located within Flood Zone 2 and therefore has a 'medium' probability of fluvial flooding, with between a 1 in 100 and 1 in 1,000 annual probability of river flooding (1% - 0.1%) in any year. These areas are located immediately adjacent to the Wendlebury Brook.

11.9.5 The site will not be inundated with floodwater for all events up to and including the 1 in 100 year (+20%) event, the site will be flood free during the 1 in 100 year (+20%) event. This has been confirmed by the Environment Agency data and the hydraulic modelling undertaken as part of the

11.9.6 A small area of the site will only be inundated with floodwater during the 1 in 1,000 year event. These areas are located immediately adjacent to the Wendlebury Brook and are located on the left bank of the Wendlebury Brook.

11.9.7 Given the scale and nature of the proposed development and the size and location of the fluvial flooding sources it has been concluded that fluvial flooding poses a low flood risk to the site therefore, the risk of fluvial flooding is considered to be of low significance.

11.9.8 The proposed development scenario has been modelled to assess the impact of the proposed development on flood risk including the diversion of Wendlebury Brook. A number of different options for the channel dimensions have been modelled to ascertain the optimum solution which does not increase flood risk.

11.9.9 During the proposed scenario 1 in 100 year (+15%) event, there are no out of bank flows upstream of the A41 culvert as in the baseline model. During the proposed scenario 1 in 1,000 year event and shows that the flood outline upstream of the A41 culvert is reduced compared to the baseline scenario 1 in 1,000 year event. The post development scenario shows a reduced out of bank flooding upstream of Wendlebury.

11.9.10 There will be no detriment to the flood storage capacity of the site. The overall direction of the movement of water will be maintained within the developed site and surrounding area. The conveyance routes (flow paths) will not be blocked or obstructed. The proposed development will have no impact on the movement of floodwater across the site. There will be no increase in the floodwater levels due to the proposed development. There will be no loss in flood storage capacity and no change in the on-site and off-site flood risk.

11.9.11 A Surface Water Drainage Strategy is proposed as part of the Proposed Development, details of which are contained in Appendix 11.2.

11.9.12 The Surface Water Drainage Strategy ensures that a sustainable drainage solution can be achieved, which reduces the peak discharge rate to manage and reduce the flood risk posed by the surface water runoff from the Site as well as providing water quality benefits.

11.9.13 It is proposed that the surface water runoff from the Proposed Development will be reduced to 20% less than the Greenfield QBAR rate of runoff for all events up to and including the 1 in 100 year (+40%) event.

11.9.14 A range of pollution prevention and mitigation measures have been described that would adequately manage the flood risk and water quality/quantity during construction. The assessment concludes that the mitigation measures described would reduce the magnitude of impacts to a negligible level and would prevent significant adverse effects arising.

11.9.15 In terms of operational impacts, a series of mitigation measures are incorporated into the design to avoid potential adverse effects on flood risk and water quality/quantity. The assessment concludes that the mitigation measures described would reduce the magnitude of impacts to a negligible level and would prevent significant adverse effects arising.

11.9.16 The findings of this assessment have demonstrated that the development would not result in any significant residual adverse impacts on surface waters, groundwaters or flood risk.

11.9.17 A summary of the assessment is set out in Table 11.13 overleaf.

11.10 References

Ministry of Housing, Communities and Local Government (2021) National Planning Policy Framework.

Department for Communities and Local Government (2014) Planning Practice Guidance - Flood Risk and Coastal Change.

https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances#high-allowances.

Table 11.13 Summary of effects

Receptor	Sensitivity of Receptor	Nature of potential impact	Proposed mitigation	Residual effect	Significant / not significant
Construction phase					
Impact on Flood Risk - Construction Workers	Medium	Minor Adverse	CEMP, Site Drainage Plan, IRP	Negligible	Not significant
Impact on Flood Risk - Residents/Users of the Surrounding Area	Medium	Minor Adverse	CEMP, Site Drainage Plan, IRP	Negligible	Not significant
Watercourses - Water Quantity/Quality/Supply	Medium	Minor Adverse	CEMP, Site Drainage Plan, IRP	Negligible	Not significant
Operational phase					
Impact on Flood Risk - Future site occupants (staff and public)	Medium	Minor Adverse	Finished Floor Levels, Surface Water Drainage Strategy	Negligible	Not significant
Impact on Flood Risk - Residents/Users of the Surrounding Area	Medium	Minor Adverse	Finished Floor Levels, Surface Water Drainage Strategy	Negligible	Not significant
Watercourses - Water Quantity/Quality/Supply	Medium	Minor Adverse	Surface Water Drainage Strategy	Negligible	Not significant

12 Ground Conditions and Soils

12.1 Introduction

12.1.1 This chapter identifies the existing soil and geological conditions and development constraints, evaluates the potential for contamination and assesses the potential effects on ground conditions during both the construction and operational phases. For full details please refer to Chapter 2 for details on the Proposed Development.

12.1.2 This chapter describes the methods used to assess the impacts, the baseline conditions currently existing at the site and surroundings, the potential direct and indirect impacts of the development arising from changes in topography, ground contamination, ground gas regime and the potential for re-use of soils, the mitigation measures required to prevent, reduce, or offset the impacts and the residual impacts. It has been written by Tier Environmental Ltd.

12.1.3 This chapter is supported by the Preliminary Risk Assessment for Symmetry Park Oxford North (Ref TE1585-TE-00-XX-RP-GE-001) Appendix 12.1.

12.1.4 A ground investigation will be undertaken to assess the ground conditions for geotechnical and geo-environmental parameters. If required, a Remediation Strategy will also be produced based on the findings of the ground investigation and the risks to controlled waters and human health.

12.2 Assessment Methodology

Policy and Planning Guidance

12.2.1 The National Planning Policy Framework (2021) has been utilised for this chapter and the following legislation forms the framework for undertaking this chapter:

- Construction (Design and Management) Regulations 2007;
- Town and Country Planning Act 1990;
- Environmental Protection Act 1990, Part 2A, Section 78;
- Environmental Protection Act 1995, Section 57; and,
- Contaminated Land (England) Regulations, 2006.

12.2.2 The following guidance has been considered when undertaking this section of the ES:

- Environmental Protection Act 1990, Part 2A Contaminated Land Statutory Guidance; 2012;
- Land Contamination Risk Management, DEFRA, 2020;
- CIRIA C552 ‘Contaminated Land Risk Assessment – A guide to good practice 2001’.; and,
- Local Planning Practice Guidance.

Assessment Methodology

12.2.3 This ES has been informed by information contained within the following reports to enable the establishment of baseline conditions and assessment of potential contaminant pathways which may, if unmitigated, present a potentially active contaminant linkage.

12.2.4 Preliminary Risk Assessment for Oxford North, Symmetry Park (Ref TE1585-TE-00-XX-RP-GE-001-V01, June 2021) by Tier Environmental. This report included Groundsure Enviro Insight and Geo Insight reports which presented data from the Local Authority, Environment Agency, British Geological Survey and the Coal Authority.

12.2.5 Additional risks from Ecology (Chapter 8) and Archaeology (Chapter 10) will be consulted before

any ground investigation works are undertaken.

12.2.6 A conceptual site model (CSM) and qualitative risk assessment have been prepared to identify potential sources, pathways and receptors for any geo-environmental contamination or potential contaminants of concern in respect to human health and controlled waters. The approach adopted follows the Environment Agency's Land Contamination Risk Management.

12.2.7 For each of the potential contaminant linkages, an estimate has been made of the potential severity of the risk and the likelihood of the risk occurring. An overall evaluation of the level of risk is gained from a comparison of the severity and likelihood.

12.2.8 The assessment of risks associated with each of the potential contaminant linkages identified at the Site is used as a basis for assessment of the Significance during both the Construction Phase and Operation Phase of the Proposed Development.

12.2.9 The spatial scope for this assessment includes both on-site and off-site human health and controlled waters receptors. Where multiple receptors of varying sensitivity are present, such as with neighbouring residents, the most sensitive have been selected when determining the magnitude of the effect.

12.2.10 The following will be considered in the assessment:

- Geology and soils;
- Controlled waters;
- Imported soils;
- Ground gas; and,
- Ground stability.

Assessment Criteria

12.2.11 The assessment takes into account any mitigation measures to be applied in the implementation of the development proposals in respect to the Ground Conditions.

12.2.12 The significance of effect is determined by considering the magnitude of the effect against the sensitivity of the environmental feature. A matrix is used to combine magnitude and sensitivity to generate the overall significance of the effect, as illustrated in Table 12.1

Table 12.1 Assessment Matrix

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

12.2.13 The criteria for determining any effects associated with the proposal are summarised in Table 12.2.

Table 12.2 Assessment of effects

Significance Criteria	**Definition**
Major Adverse	Considerable detrimental impact (by extent, duration or magnitude) of more than local significance or in breach of recognised acceptability/ legislation/ policy standards
Moderate Adverse	Limited detrimental impact (by extent, duration or magnitude) that may be considered significant

Minor Adverse	Slight, very short or highly localised detrimental impact
Negligible	No appreciable impact on the attribute, or the attribute of negligible importance
Minor Beneficial	Advantageous or positive impact to an environmental resource or receptor (e.g. improvement in groundwater quality) of slight, very short or highly localised impact of no significance
Moderate Beneficial	Advantageous or positive impact to an environmental resource or receptor (e.g. improvement in groundwater quality) of limited impact (by extent, duration or magnitude) that may be considered significant
Major Beneficial	Advantageous or positive impact to an environmental resource or receptor (e.g. improvement in groundwater quality) of considerable impact (by extent, duration or magnitude) of more than local significance

Scope of Assessment

12.2.14 The scope of the assessment is to understand the risks from contaminative processes and actions that could have led to potential contamination of the ground and controlled waters. The first stage is to assess the risks with a Preliminary Risk Assessment in line with Land Contamination Risk Management.

Consultation

12.2.15 At this stage there is no reason to liaise with statutory or regulatory bodies based on the findings of the Preliminary Risk Assessment from potential contaminants of concern.

Assumptions and Limitations

12.2.16 The Site is to be developed for a Class B2 general industrial development with associated infrastructure. Ground levels will be regraded to accommodate the development with a cut/fill balance to maximise the sustainability of the enabling works. The existing watercourse will also be realigned.

12.2.17 There may be other conditions prevailing on the Site which have not been revealed by these investigations and which have not been taken into account by this report.

12.3 Baseline conditions

Current Baseline

12.3.1 The majority of the Site is currently in agricultural use and extends across several open fields, with the Grange Farm Industrial Estate and Lower Grange Farm bordering the Site to the east, a small watercourse / M40 to the west, the A41 to the south and agricultural land to the north.

Geology and Ground Conditions

12.3.2 The current baseline is based on the Preliminary Risk Assessment report (referenced in 12.1.2) and will be expanded upon and confirmed by future ground investigation work to inform the detailed design based on the geo-environmental and geotechnical parameters.

12.3.3 The geology of the Site is anticipated to comprise:

Made Ground

- Southern Field with track leading off the A41 to the Site
- Northern Fields adjacent to the farm/within the Grange Farm Industrial Estate

Superficial Deposits

- Topsoil circa 0.0m-0.5m
- Subsoil circa 0.5m-0.8m

- River Terrace Deposits - Sand and Gravels (Central North)
- Alluvial Deposits - Clay, Silt, Sand and Gravel (linear along the brook and eastern part of the Site)

Bedrock Geology

- Peterborough Mudstone Member
- Kellaways Sand Member - Sandstone and Siltstone, interbedded
- Kellaways Clay Member - Mudstone
- Extreme North Only Cornbrash Formation Limestone

12.3.4 Radon affected properties are less than 1% and therefore no protection measures are required.

Controlled Waters

Surface Waters

12.3.5 There is a pond to the west of the Southern Field and Wendlebury Brook runs adjacent to the M40/Site to the South and then traverses through the southern area of the Site from west to east before flowing below the A41 off-site.

Groundwaters and Aquifer Designation - Superficial Deposits

12.3.6 Both the Alluvium and River Terrace Deposits have a Secondary A Aquifer designation.

Groundwaters and Aquifer Designation - Bedrock Deposits

12.3.7 The Kellaway Sand Member and Cornbrash Member (Limestone) have a Secondary A Aquifer designation.

12.3.8 All other formations have an Unproductive Aquifer designation.

Preliminary Contamination Assessment

12.3.9 The PRA Report highlighted the following potential issues with contaminants of concern:

- Made Ground - Southern Field and Northern Fields where construction occurred - moderate to low risk from asbestos, heavy metals, TPH and PAH for dust migration and inhalation and vapour inhalation.

Preliminary Ground Gas Assessment

12.3.10 Shallow monitoring wells have been recommended within the footprint of the proposed building to confirm the conceptual site model in conjunction with monitoring of groundwater.

Further Investigations and Future Baseline

12.3.11 A detailed design ground investigation will be undertaken to assist with the development design phase, this will incorporate targeting the potential contaminative sources for geo-environmental issues and also obtain geotechnical data for design purposes.

12.3.12 Dependent on the findings of the ground investigation, a Remediation Strategy Options Appraisal and Remediation Strategy may be required in line with LCRM (Land Contamination Risk Management).

12.3.13 Any remedial/enabling works will consider the use of a Materials Management Plan and Earthworks Specification to retain soils on site for reuse where the following criteria are met:

- A certainty of use in form of a cut and fill design;
- Chemically suitable for reuse; and,
- Geotechnically suitable for reuse.

12.3.14 This is in line with CL:AIRE Definition of Waste: Code of Practice and is a sustainable way to reduce the carbon footprint of developments. Sustainable remediation is covered by CL:AIRE SuRF-UK Framework (2020).

12.4 Potential Impacts (prior to mitigation)

12.4.1 The majority of the Site is readily developable with the exception of some farm outbuildings in the northeast of the Site. These existing structures are to be demolished as part of the proposed development. Some of the structures may contain asbestos containing materials (ACMs) and their absence/presence will be confirmed by a R&D asbestos survey. It is assumed that any ACMs will be removed prior to demolition to avoid any potential impact on soils due to uncontrolled spread.

12.4.2 Ground levels will be regraded to accommodate the proposed development with a cut/fill balance to maximise the sustainability of the enabling works.

Human Health Risk Assessment - Geology and Soils

12.4.3 A detailed risk assessment of the geology and soils is yet to be undertaken but based on the commentary from the PRA Report, the risk to human health will be localised and a low to moderate risk for construction workers and site end users.

12.4.4 Preliminary site clearance and development preparatory works associated with the construction phase will create the potential for adverse impacts to construction workers due to oral, inhalation or dermal contact with harmful potential contaminants of concern present within Made Ground soils and/or groundwater and the inhalation of soil derived dust that are potentially locally impacted based on the PRA CSM. The potential generation of dust, including during any regrading works, may also pose a potential risk to adjacent site users. The unmitigated effect is moderate (adverse). These works are likely to be undertaken on a phased basis during the development of the site.

12.4.5 Construction activities that are likely to lead to exposure of construction workers to these soils include those listed below and it is anticipated that these works will be ongoing during the development works and will have a negligible effect:

- Excavation of material during regrading works, for foundations and working platforms;
- Excavations for installation of services/utilities; and,
- Stockpiles of arisings from reprofiling earthworks/construction works.

12.4.6 During the earthworks and construction, there is the potential for the release of dust to the atmosphere, which is addressed in Chapter 6: Air Quality.

Controlled Waters Risk Assessment

12.4.7 Adverse impacts to controlled waters may locally arise due to the mobilisation of potential contaminants of concern within the potentially locally impacted Made Ground, shallow soils and perched groundwaters and the creation of preferential pathways during the installation of foundations. This could allow potential contaminants of concern to impact the surface waters on and offsite, the underlying groundwater and potential off-site receptors. It is considered, however, that a uniform aquitard/aquiclude is not currently present between these soils and the underlying groundwater across the majority of the site, therefore they will have an unmitigated negligible effect on controlled waters in the short to long term. There is a potential for mobilisation of contaminants into the groundwater and surface waters. It is anticipated that the unmitigated effects will be minor (adverse).

12.4.8 There is potential for introduction of contaminated materials to the ground or groundwater during the construction phase, such as the importation of unsuitable materials, the incorrect storage or spillages of materials such as paints, fuels or cement. Depending on the location of the spill, pollutants could infiltrate into the ground and contaminate groundwater, or run-off directly to watercourses and/or drainage systems. This is considered to be an unmitigated minor (adverse) impact.

12.4.9 The superficial and bedrock geology on Site is classed into Secondary A Aquifers and Unproductive Aquifers. It is not considered within the CSM that the groundwater is one continuous body, due to the presence of aquitards within some of the bedrock geology. Ground investigations and post fieldwork monitoring to confirm the groundwater regime. Given the likely potential for localised contaminants of concern on site, localised areas of potential contamination may be present. Left unmitigated, the magnitude of effect is minor (adverse).

Ground Gas

12.4.10 Currently there is limited information on the potential for ground gas on site for construction workers risk and site end users. There are several minor potential sources, such as alluvium, that will be assessed and quantified during detailed ground investigations. If left unmitigated, ground gas may present a minor (adverse) impact.

12.4.11 The Site is located in an area where less than 1% of properties are likely to be above the Radon Action Level therefore no protection measures are required. If left unmitigated, radon presents a negligible impact.

Imported Soils (if required)

12.4.12 Soils/aggregates may need to be imported for the installation of vibro stone columns, a construction/working platform, beneath areas of hardstanding and as backfill to drainage/utilities. If left unmitigated, the importation of potentially contaminated soils/aggregates may have a moderate (adverse) impact.

Ground Stability and Geotechnical Hazards

12.4.13 Given the anticipated shallow ground conditions, there may be localised geotechnical issues for shallow soils, in particularly within the Alluvial Deposits either side of the brook and in the east of the Site. Left unmitigated, these may present a potential moderate (adverse) impact due to unacceptable total and/or differential settlements affecting the structural integrity of structures, services and infrastructure during the construction phase.

Foundations

12.4.14 Dependent upon the loadings and geotechnical properties of the bedrock, shallow spread foundations following ground improvement may be suitable. It is likely from a geotechnical point of view that all foundations will be within the bedrock to avoid unacceptable settlements. These can create preferential pathways for potential contaminants of concern, if, unmitigated, may present a potential moderate (adverse) impact; to be confirmed during the proposed intrusive ground investigation.

Operational Phase

Human Health Risk Assessment - Geology and Soils

12.4.15 The proposed regrading works may result in the retention/relocation of potentially contaminated Made Ground within soft landscaped areas. If left unmitigated, this could result in minor (adverse) impacts in the long term. The proposed ground investigation and human health risk assessment will confirm these potential impacts.

Controlled Waters Risk Assessment

12.4.16 If contaminated soils and/or shallow groundwater are present within the proposed development area, these may have a minor/moderate adverse effect.

12.4.17 Assuming that any earthworks on Site and any imported soils are suitable for reuse/use and do not introduce any additional potential contaminants, the proposed development is considered to have a negligible effect on controlled waters in the short to long term.

Ground Gas Risk Assessment

12.4.18 The PRA assessed no significant potential sources of ground gas. However, there is the possibility of localised areas of deeper Made Ground and alluvium that could be potential sources. If left unmitigated, there is a potential impact minor (adverse) to future site users and structures/services.

12.4.19 The Site is located in an area where less than 1% of properties are likely to be above the Radon Action Level with regard to radon gas, therefore no protection measures are required. If left unmitigated, radon presents a negligible impact in the short to long term.

Imported Soils (if required)

12.4.20 Soils / aggregates may need to be imported for the installation of vibro stone columns, a construction/working platform, beneath areas of hardstanding and as backfill to drainage / utilities. If left unmitigated, the importation of potentially contaminated soils/aggregates may have a low/moderate (adverse) impact in the long term.

Ground Stability and Geotechnical Hazards

12.4.21 The development could cause issues with localised settlement in areas of differing geology in particularly the Alluvial Deposits centrally located in the southern part of the development. If left unmitigated, it may present a potential moderate (adverse) impact to the structural integrity of buildings, infrastructure and utilities/services on site.

12.5 Mitigation

Demolition and Construction Phase Mitigation

12.5.1 Specific mitigation measures to address potential adverse impacts to construction personnel from potentially contaminated soil and ground gas risks during the site works may include but are not limited to:

- Selection of appropriate Personal Protective Equipment (PPE) (e.g. gloves and overalls).
- Monitoring of gas concentrations in excavations and at surface if required, and ensuring procedures are in place to manage this risk.
- Implementation of site rules such as washing hands before eating, no eating in the work area and possibly shower facilities located close to the site entrance.
- Clear signage of contaminated land.
- Adequate site security is required to prevent trespassers gaining access to the site during the demolition and construction phase.

12.5.2 These and other necessary best practice measures relating to management of ground conditions and related factors will be included within the Construction Environmental Management Plan (CEMP). This includes dust management measures (see Chapter 6: Air Quality for further detail).

12.5.3 A Materials Management Plan (MMP) will be produced in accordance with the CL:AIRE Definition of Waste: Code of Practice (DoW CoP). The DoW CoP sets out good practice for the development industry to use when assessing whether excavated materials are classified as waste or not. It also allows the determination, on a site-specific basis, when treated excavated waste can cease to be waste for a particular use. Further, it describes an auditable system to demonstrate that this Code of Practice has been adhered to. If materials are dealt with in accordance with the DoW CoP, the Environment Agency (EA) considers that those materials are unlikely to be waste if they are used for the purpose of land development. This may be because the materials were never discarded in the first place, or because they have been submitted to a recovery operation which has been completed successfully so that they have ceased to be waste.

Human Health Risk Assessment - Geology and Soils

12.5.4 Detailed risk assessment from potentially contaminative sources on site is required to determine the risk to construction workers and future site end users, the Preliminary Risk Assessment has been undertaken and detailed ground investigation will determine the level of mitigation measures required. This will be undertaken in line with Land Contamination Risk Management (LCRM) and BS10175.

Protection of Controlled Waters

12.5.5 A detailed assessment of the controlled waters has not been undertaken and will be required to determine the potential risks to the surface waters and groundwaters. This will be undertaken with data from the detailed ground investigation.

12.5.6 Mitigation measures will be included within the CEMP, a Site Drainage Plan and as part of the Incident Response Plan. Mitigation will include:

- Protection of existing surface water (in line with Ecology report in Chapter 8).
- Bunds and surface water management system will be used to prevent run-off entering watercourses.
- Compounds will have hard surfacing to prevent infiltration from any spillages.
- Any areas of localised contamination identified during the proposed ground investigation will be remediated/removed as appropriate.
- A procedure will be put in place to manage previously unidentified contaminated ground that is encountered during the enabling works.
- Any surplus soil arisings from levelling or excavation works that have visual or olfactory evidence of contamination will be stored in covered skips, or on a sheeted stockpile placed on hardstanding or sheeting pending its removal or treatment.

12.5.7 There is potential for the introduction of contaminated materials to the ground or groundwater due to mobilisation of existing contaminants or the incorrect storage/ spillages of construction materials/fuels. Design of operational pollution prevention measures will be included in the Construction Environmental Management Plan. Impacts due to incorrect storage and spillage will be mitigated by the following:

- Groundwater monitoring in the vicinity of each development phase (if deemed necessary).
- Design of a Drainage Plan for the site.
- Compounds will comprise hardstanding.
- Environmental training for all personnel (as per CR-E).
- Designated re-fuelling areas on hardstanding with interceptor drainage, bunds or similar.
- Spill kits will be readily available.

- Storage areas for materials will be identified.
- Deliveries will be planned in advance.

Ground Gas

12.5.8 Detailed assessment of the ground gas risk is required to assess and mitigate any potential risk. The Health & Safety Executive has published information defining safe occupational exposure levels for various ground gases and substances and the latest guidance must be consulted to determine whether the ground gas regime necessitates specific precautions during site works.

Imported Soils (if required)

12.5.9 All soil materials imported to achieve the proposed development platform, the installation of vibro stone columns and backfill to drainage/utilities will be chemically and geotechnically assessed prior to importation to ensure that they are suitable for the intended use in accordance with the Materials Management Plan (MMP).

Ground Stability and Geotechnical Hazards

12.5.10 Detailed construction details are not currently available; however, it is understood that parts of the building will straddle the existing course of the brook from where it will be re-aligned.

12.5.11 Potential areas of deeper Made Ground and soft soils (such as Alluvium) will need assessing to confirm the risk of unacceptable settlements.

Foundations and Floor Slabs

12.5.12 It is anticipated that the main building and floor slabs will predominantly be founded on vibro stone columns installed to the shallow bedrock; care to be taken on the differing shallow rock formations that sub-crop on site to ensure no significant total and/or differential settlement occur.

12.5.13 The final foundation solution will be dependent on the loads of the various structures within the proposed development, the associated regrading works and the depth to bedrock; the intrusive ground investigation will confirm.

Operational Phase Mitigation

Human Health Risk Assessment - Geology and Soils

12.5.14 All of the existing site soils/materials which are considered suitable for retention and reuse beneath floor slabs, areas of hardstanding and within the landscaped and/or open spaces beneath an adequate depth of suitably verified clean cover soils (if required). This will be confirmed by the detailed ground investigation and if required, a Remediation Options Appraisal and Remediation Strategy.

Controlled Waters Risk Assessment

12.5.15 The risk to controlled waters is to be determined but based on the PRA the risk is considered low and any potentially impacted soils are to be localised and will be dealt with during the construction phase.

Ground Gas Risk Assessment

12.5.16 Ground gas monitoring and risk assessment will be undertaken to mitigate any risks to future site users. Any ground gas protection measures required will be designed in accordance with BS8485:2015A1:2019. If required, a separate Verification Plan and Verification Report will be produced for the gas protection measures in accordance with CIRIA C735.

12.5.17 No radon ground gas protection measures are required.

Imported Soils (if required)

12.5.18 The site preparatory works associated with the proposed development are likely to include the importation of suitable soils (vibro stone columns, hardstanding and drainage). Chemical and geotechnical testing of these materials will be undertaken to ensure that they are suitable for use.

Ground Stability and Geotechnical Hazards

12.5.19 Detailed ground investigation to confirm if there are any risks to ground stability or future geotechnical hazards.

Foundations

12.5.20 Detailed ground investigation to confirm the final solution to mitigate any risks.

12.6 Residual effects

Construction Phase

Human Health Risk Assessment - Geology and Soils

12.6.1 There is a requirement for a detailed ground investigation and risk assessments to assess the risk to construction workers and future site end users. This will inform any remediation options and/or strategy in line with the relevant guidance and assist with any potential reuse of materials on site for the MMP and Earthworks Specification. This will result in a minor (beneficial) effect within the development area and result in no significant residual impact.

Controlled Waters Risk Assessment

12.6.2 There is a requirement to assess the risk to the underlying aquifer and surface waters from potential localised areas of Made Ground with potential contaminants of concern.

12.6.3 Following the implementation of any required mitigation measures proposed for the construction period, the potential for groundwater impact on the underlying aquifer will be significantly reduced. The removal of potential pathway constitutes a minor (beneficial effect), which is not significant.

Ground Gas

12.6.4 Safe methods of working and ground gas monitoring to confirm the CSM within the development will determine the risk, appropriate mitigation measures during construction and operational phase will potentially result in a minor (beneficial) effect on construction workers and site end users, which is not significant.

Imported Soils (if required)

12.6.5 All soil materials imported to achieve the proposed development platform will be chemically and geotechnically assessed prior to importation to ensure that they are suitable for the intended use in accordance with the Materials Management Plan (MMP) will provide a minor (beneficial) effect to the site end user.

Ground Stability and Geotechnical Hazards

12.6.6 If potential hazards and stability issues are highlighted in the ground investigation then the mitigation measures will be implemented and there will be a potential minor (beneficial) effect to the site end user.

Operational Phase

Human Health Risk Assessment - Geology and Soils

12.6.7 There is a requirement for a detailed ground investigation and risk assessments to determine the risk to future site end users. This will inform any remediation options and/or strategy in line with the relevant guidance and assist with any potential reuse of materials on site for the MMP and Earthworks Specification. This will result in a minor (beneficial) effect within the development area and result in no significant residual impact.

Controlled Waters Risk Assessment

12.6.8 Ground investigation to confirm the risk and potential localised impacted soils, if required the implementation of remediation strategies will reduce the risk to the underlying aquifer or surface waters which will result in a minor (beneficial) effect as the pathways will have been removed.

Ground Gas Risk Assessment

12.6.9 Detailed ground investigation and monitoring to confirm the CSM to be undertaken and, if required, ground gas protection measures will result in a moderate (beneficial) effect to future site users.

Imported Soils

12.6.10 If clean cover soils are required within soft landscaped areas, these will have a moderate (beneficial) impact for site end users.

Ground Stability and Geotechnical Hazards

12.6.11 Localised areas of potentially impacted Made Ground areas to be confirmed by ground investigation and it will have a negligible effect on future site end users.

12.6.12 The residual impact effects of the above are summarised in Table12.3.

12.7 Implications of Climate Change

12.7.1 Reuse of soils will help reduce transportation (export and import of soils) and associated emissions and carbon footprint.

12.8 Cumulative Effects

12.8.1 No cumulative effects are considered necessary in respect to the ground conditions and soils.

12.9 Summary

12.9.1 The majority of the Site has been farmland for over 100 years.

12.9.2 The residual risk to the environment does not pose any significant environmental risks until it is disturbed. There is potential for localised contaminants of concern in the field in the south and outbuildings in the north.

12.9.3 The risk to controlled waters is considered low.

12.9.4 The risk to human health is considered moderate to low (localised).

12.9.5 The Preliminary Risk Assessment and the Conceptual Side Model have confirmed a moderate to low risk for potential localised contaminants of concern.

12.9.6 A detailed ground investigation is required to confirm the PRA and CSM. This will in turn, inform the need for any remedial measures and mitigations.

12.9.7 Temporary construction effects were identified, and these can be dealt with the Construction Environmental Management Plan and other methods of working to reduce the impact on the construction works and adjacent site users.

12.9.8 No significant residual effects remain following implementation of all stated mitigation during the Demolition (farm outbuildings to the North) and Construction Phase.

12.9.9 No significant residual effects remain following implementation of all stated mitigation within the Completed Development.

12.10 References

- BRE BR211 (2015). Radon: Guidance on Protective Measures for New Dwellings. IHS BRE Press, Bracknell.
- BRE SD1 (2005). Concrete in Aggressive Ground. Special Digest 1 (revised edition). IHS BRE Press, Bracknell.
- BRE 414 (2001) Protective measures for housing on gas-contaminated land. BRE.
- BS 10175:2011+A2:2017 Investigation of Potentially Contaminated Sites - Code of Practice. British Standards Institution, London.
- BS EN 1997-1:2004 Eurocode 7. Geotechnical Design. General Rules. British Standards Institution, London.
- BS EN 1997-2:2007 Eurocode 7. Geotechnical Design. Ground Investigation and Testing. British Standards Institution, London.
- BS5930:2015+A12020 Code of practice for ground investigations BSI
- BS EN ISO 17892-1-12:2018 Geotechnical investigation and testing BSI
- BS EN ISO 14688-1:2018 Geotechnical Investigation and Testing. Identification and Classification of Soil. Identification and Description. British Standards Institution, London.
- BS EN ISO 14688-2:2018 Geotechnical Investigation and Testing. Identification and Classification of Soil. Principles for a Classification. British Standards Institution, London.
- BS EN ISO 14689-1:2018 Geotechnical Investigation and Testing. Identification and Classification of Rock. Identification and Description. British Standards Institution, London.
- BS8485 2015 Code of Practice for the design of protective measures for methane and carbon dioxide ground gases in new buildings. British Standards
- BS85762013 Guidance on investigations for ground gas – permanent gases and volatile organic compounds (VOCs). BSI,

- CIRIA Rep R 97 (2001) Trenching Practice. Report 097, 2nd edition, CIRIA, London.
- CIRIA Rep R 149 (1995a) Protecting Development from Methane. Report 149, CIRIA, London.
- CIRIA Rep R 150 (1995b) Methane Investigation Strategies. Report 150, CIRIA, London.
- CIRIA Rep R 151 (1995c) Interpreting Measurement of Gas in the Ground Report 151, CIRIA, London.
- CIRIA Rep R 152 (1995d) Risk Assessment for Methane and Other Gases from the Ground. Report 152, CIRIA, London.
- CIRIA Rep R 132 (1996) A Guide for Safe Working on Contaminated Sites. Report 132, CIRIA, London.
- CIRIA C552 (2001) Contaminated land risk assessment. A guide to good practice (report no. C552).
- CIRIA C665 (2007) Assessing the risks posed by hazardous gases to buildings CIRIA, London
- CIRIA C748 (2014) Guidance on the use of plastic membranes as VOC barriers, CIRIA, London
- CIRIA C735 (2014) Good practice on the testing and verification of protection systems for buildings against hazardous ground gases. CIRIA.
- CIRIA C681 (2009) Unexploded ordnance (UXO) A guide for the construction industry (C681)
- CIRIA C785 (2019) Unexploded ordnance (UXO) risk management guide for land-based projects (C785)
- CIRIA C758D (2019) Abandoned mine workings manual (C758D)
- Contaminated Land: Applications in Real Environments (CL:AIRE) (2011) Definition of Waste Code of Practice (version 2).
- Department of Environment Food and Rural Affairs (DEFRA) (2012) Environmental Protection Act 1990:Part 2A Contaminated Land Statutory Guidance (report no. PB13735).
- Environment Agency (2000) Technical Aspects of Site Investigation. Report P5-065/TR, Environment Agency, Bristol.
- Environment Agency (2002) Guidance on Monitoring Landfill Leachate, Groundwater and Surface Water. Report LFTGN02, Environment Agency, Bristol.
- Environment Agency (2007) Evaluation of Models for Predicting Plant Uptake of Chemicals from Soil. Report SC050021/SR, Environment Agency, Bristol.
- Environment Agency (2006) Remedial Targets Methodology - Hydrogeological Risk Assessment for Land Contamination (report no.ea/br/e/std/vr10thanni).
- Environment Agency (2008) Science Report SC050021/SR7 Compilation of Data for Priority Organic Pollutants for Derivation of Soil Guideline Values.
- Environment agency, 2007. Inter-laboratory comparison of in vitro bioaccessibility measurements for arsenic lead and nickel in soil, Science Report SC040060/SR2.
- Environment Agency, 2009 Human health toxicological assessment of contaminants in soil (Science Report Final SC050021/SR2)
- Environment Agency (2015) Guidance on the Classification and Assessment of Waste Technical Guidance WM3 (1st edition). European Union (1998) Drinking Water Directive (Council Directive 98/83/EC).
- Gibbons, R. (1994) Statistical Methods for Groundwater Monitoring. Wiley, New York.
- Groundsure Report 2021 GSIP-2021-10752-4061

- Highways Agency (2006) Design of Pavement Foundations. Document HD 25/IAN 73/06.
- HSE (1991) Protection of Workers and the General Public During the Development of Contaminated Land. HMSO, London.
- HSE (2005) Occupational Exposure Limits. HSE report EH40/2005, HMSO, London.
- ICRCL (1986) Notes on the Fire Hazards of Contaminated Land. Guidance Note 61/84, 2nd Edition, Interdepartmental Committee on the Redevelopment of Contaminated Land, London.
- Jeffries, J. (2009). A review of body weight and height data used within the Contaminated Land Exposure Assessment model (CLEA). Project SC050021/ Technical Review 1. Bristol: Environment Agency
- Land Contamination Risk Management (LCRM) Environment Agency October 2020 https://www.gov.uk/government/publications/land-contamination-risk-management-lcrm .
- LQM/CIEH Ltd (2015) S4ULs for Human Health Risk Assessment. Land Quality Press, Nottingham.
- NHBC (2007) Guidance on Evaluation of Development Proposals on Sites where Methane and Carbon Dioxide are Present (report no .04).
- NRA (1994) Protocol for a Leaching Test to Assess the Leaching Potential for Soils from Contaminated Sites. R&D Note 181.
- SoBRA (2017) Development of Generic Assessment Criteria for Assessing Vapour Risks to Human Health from Volatile Contaminants in Groundwater – Version 1.0.
- The Water Framework Directive, (Standards and Classification) Directions (England and Wales).
- UK Water Industry Research (2010) Guidance for the Selection of Water Supply Pipes to be used in Brownfield Sites (report no. 10/WM/03/21)
- WHO (2000) Air Quality Guidelines for Europe. 2nd edition, WHO Regional Office for Europe, Copenhagen.
- World Health Organisation (2017) Guidelines for Drinking Water Quality (4th edition).
- Britain From Above - https://britainfromabove.org.uk/en/image/WPW060399
- http://www.warstateandsociety.com/Bombing-Britain
- https://www.epa.gov/pfas/basic-information-pfas
- UK Maps of Radon, http://www.ukradon.org/information/ukmaps
- Health and Safety Executive (2015) Construction (Design and Management) Regulations.
- Coal Authority Interactive Map Viewer, http://mapapps2.bgs.ac.uk/coalauthority/home.html
- BGS Geology of Britain Viewer http://mapapps.bgs.ac.uk/geologyofbritain/home.html

Table 12.3 Summary of effects

Receptor	Sensitivity of Receptor	Nature of potential impact	Proposed mitigation	Residual effect	Significant / not significant
Construction phase					
Human Health	High	Moderate Adverse	Detailed Ground Investigation, CEMP/MMP/Earthworks, Methods of working and PPE	Minor Beneficial	Not Significant
Controlled Waters	Low/Moderate	Minor Adverse	Detailed Ground Investigation, CEMP and methods of working	Minor Beneficial	Not Significant
Ground gas	High	Minor Adverse (localised)	Detailed Ground Investigation, earthworks, methods of working and monitoring	Minor Beneficial (localised)	Not Significant
Ground Stability and Geotechnical Hazards	Moderate/High	Moderate Adverse	Slope stability analysis, ground investigation, safe methods of working and earthworks/stabilisation	Negligible, Minor Beneficial	Not Significant
Imported Soils	Moderate	Moderate Adverse	Methods of working and CEMP	Minor Beneficial	Not Significant
Operational phase					
Human Health	High	Minor Adverse	MMP, remediation (if required) and verification	Minor Beneficial	Not Significant
Controlled Waters	Low/Moderate	Minor/Moderate Adverse	Assessment and potential source removal of soils/groundwaters of concern	Minor Beneficial	Not Significant
Ground Gas	Moderate	Minor Adverse (localised)	Gas Protection Measures (if required)	Minor Beneficial (localised)	Not Significant
Ground Stability and Geotechnical Hazards	Moderate	Moderate Adverse	Stabilisation and ground improvement of areas affected by deep Made Ground and soft natural soils	Negligible, Minor Beneficial	Not Significant
Imported Soils	Moderate	Low/Moderate Adverse	Protocols and testing to confirm all imported soils are suitable for use	Moderate Beneficial	Not Significant

13 Climate change

13.1 Introduction

13.1.1 This chapter assesses the effects of the proposed development (see chapter 3 and the EIA application plans) in relation to climate change. It considers impacts that may arise as a result of the proposed development on receptors sensitive to climate change.

13.1.2 The chapter describes the methods used to assess the impacts, the baseline conditions currently existing at the site and surroundings, the potential direct and indirect impacts of the development arising in relation to climate change, in particular, the impact of the project on climate change (i.e. the nature and magnitude of greenhouse gas emissions) as well as the vulnerability of the project itself to climate change, the mitigation measures required to prevent, reduce, or offset the impacts and the residual impacts.

13.1.3 When discussing 'carbon' in relation to climate change, this is a term used to cover all greenhouse gas emissions and is measured in terms of CO_2 equivalent (CO_2eq)

13.2 Policy Context

13.2.1 Details of planning policy relevant to the Proposed Development are contained in Chapter 4 and the Planning Statement. A summary of legislation particularly relating to Climate Change is provided in the following paragraphs.

Legislative Background

UK Net Zero Emissions by 2050

13.2.2 The Climate Change Act 2008 committed the UK to an 80% reduction in carbon emissions relative to the levels in 1990, to be achieved by 2050. In June 2019, secondary legislation was passed that extended that target to require that the UK reduce all greenhouse gas emissions to net zero by 2050 relative to 1990 levels. In April 2021 the Government confirmed its intention to ratify 'The Sixth Carbon Budget' which effectively requires a 78% reduction in UK territorial emissions between 1990 and 2035.

Planning Policy Context

National Planning Policy Framework

13.2.3 Section 14 of the National Planning Policy Framework (NPPF) specifically addresses the challenge of climate change. It states that:

'…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; and
(b) can help to reduce greenhouse gas emissions, such as through its location, orientation and design. Any local requirements for the sustainability of buildings should reflect the government's policy for national technical standard Local Plan and supplementary guidance...'

The Cherwell Local Plan 2011-2031

13.2.4 With respect to sustainability and energy considerations, the following policies are relevant to Climate Change and the district's development.

13.2.5 Cherwell District Council's strategic objective for ensuring sustainable development is: (Objective SO II) *'To incorporate the principles of sustainable development in mitigating and adapting to climate change impacts including increasing local resource efficiency, minimising carbon emissions, promoting decentralised and renewable or low carbon energy and ensuring that the risk of flooding is not increased'.*

13.2.6 *'Policy PSD I: Presumption in favour of sustainable development - we will take a proactive approach to reflect the presumption in favour of sustainable development contained in the National Planning Policy Framework when considering development proposals'.*

13.2.7 *'Policy BSC 2: The Effective and Efficient Use of Land - Brownfield Land and Housing Density – Housing development will be expected to make effective and efficient use of land. We will encourage the re-use of previously developed land in sustainable locations- new housing should be provided on net developable areas at a density of at least 30 dwellings per hectare'.*

13.2.8 *'Policy ESD 1: Mitigating and Adapting to Climate Change – Measures will be taken to mitigate the impact of development within the District on Climate Change. At a strategic level this will include:*

- *Distributing growth to the most sustainable locations.*
- *Deliver development that seeks to reduce the need to travel and which encourages sustainable travel options including walking, cycling and public transport.*
- *Designing development to reduce carbon emissions and use resources more efficiently, including water.*
- *Promoting the use of decentralised and renewable or low carbon energy.*

13.2.9 *Suitable adaptation measures in new developments to ensure that development is more resilient to climate change impacts will include consideration of the following:*

- *Taking into account known physical and environmental constraints when identifying locations for development.*
- *Demonstration of design approaches that are resilient to climate change impacts including the use of passive solar design for heating and cooling.*
- *Minimising the risk of flooding and making use of sustainable drainage methods.*
- *Reducing the effects of development on the microclimate through the provision of green infrastructure such as including open space and water, plants and green roofs'.*

13.2.10 '*Policy ESD 2: Energy Hierarchy and Allowable Solutions – To achieve reductions in carbon emissions we will promote an 'energy hierarchy' as follows:*

- *Sustainable design and construction measures to reduce energy use.*
- *Supplying energy efficiently and giving priority to decentralised energy supply.*
- *Making use of renewable energy.*
- *Making use of allowable solutions'.*

13.2.11 '*Policy ESD 3: Sustainable Construction – All new Non-residential development will be expected to meet at least BREEAM 'Very Good' with immediate effect and demonstrate the achievement of this target within the Energy Statement'.*

13.2.12 *'Policy ESD 4: Decentralised Energy Systems - The use of decentralised energy systems, providing either heating (District Heating) or heating and power (Combined Heat and Power) will be encouraged in all new developments. A feasibility assessment for DH/CHP will be required for:*

- *All applications for non-domestic developments above 1,000m2 floorspace'.*

13.2.13 *'Policy ESD 5: Renewable Energy - The potential local environmental, economic and community benefits of renewable energy schemes will be a material consideration in determining planning applications. Planning applications involving renewable energy development will be encouraged. Feasibility assessment of the potential for significant on-site renewable energy provision will be required for:*

- *All applications for non-domestic developments above 1,000m2 floorspace'*

13.2.14 *'Policy ESD 6: Sustainable Flood Risk Management - We will manage and reduce flood risk using a sequential approach to development; locating vulnerable developments in areas at lower risk of flooding. Opportunities will be sought to restore natural river flows and floodplains and existing flood defences will be protected from damaging development'.*

13.2.15 *'Policy ESD 7: Sustainable Drainage Systems (SuDS) - All development will be required to use sustainable drainage systems for the management of surface water runoff. In considering SuDS solutions, the need to protect ground water quality must be taken into account. SuDS should seek to reduce flood risk, reduce pollution and provide landscape and wildlife benefits'.*

13.2.16 *'Policy ESD 17: Green Infrastructure - The District's green infrastructure network will be maintained and enhanced through the following measures:*

- *Pursuing opportunities to maintain and improve the green infrastructure network, whilst protecting sites of importance.*
- *Protecting and enhancing existing sites and features and improving connectivity between sites.*
- *Ensuring that green infrastructure network considerations are integral to the planning of new developments.*
- *All strategic development sites to incorporate green infrastructure provision and proposals should include details for future management and maintenance'*

Other Relevant Policy, Standards and Guidance

Oxfordshire Energy Strategy

13.2.17 The Oxfordshire Energy Strategy sets out an ambitious framework to enable the county to be at the forefront of energy innovation to foster clean growth, which Cherwell District Council is a signatory. *'It is underpinned by three guiding principles:*

- *To secure a smart, modern, clean energy infrastructure.*
- *To reduce countywide emissions by 50% by 2030 (compared with 2008 levels) and set a pathway to achieve zero carbon growth by 2050.*
- *To enhance energy networking and partnership working.'*

Cherwell District Council, Climate Action Framework

13.2.18 CDC declared a Climate Emergency in July 2019, committing it to ensuring its own operations and activities are zero carbon by 2030. This declaration has also provided the goal of achieving net zero for the wider district by 2030 with the support of residents, businesses and other organisations. CDC's Climate Action Declaration set out a number of commitments covering its two connected roles:

- *'Ensure our own operations and activities are net zero by 2030.*
- *Do our part to achieve a net zero carbon district by 2030 and lead through example.'*

13.2.19 The document sets out CDC's approach to tackling to the Climate Emergency in its priority areas for action: *'our own estate, working with suppliers, ensuring our policies enable other to make low-carbon choices and working with partners and businesses'.*

Low Carbon Environmental Strategy

13.2.20 This is a strategy of the Cherwell Local Strategic Partnership; its aim is for Cherwell to make the transition to a low carbon economy and is part of an overarching objective of the Council's economic development strategy. The Key Actions are as follows:

- *'We will work with local partners to raise awareness and encourage take up of low carbon and renewable energy technologies and CO_2 saving actions by residents.*
- *We will actively encourage uptake of home energy efficiency measures and seek to provide additional support to those most in need.*
- *We will work with industry to embrace the opportunities of a low carbon economy by developing green knowledge and skills and supporting innovation in green technologies.*
- *We will encourage the take up of Green Travel Plans with businesses and organisations.*
- *We will work with the community in conjunction with the Oxfordshire Waste Partnership to further increase recycling and promote and facilitate waste minimisation and reuse.*
- *We will work with local partners to gain better understanding of what a changing climate means for the Cherwell community.'*

13.3 Assessment methodology

13.3.1 In accordance with the EIA regulations (2017), this chapter will address:

- The impact of the project on climate change.
- The vulnerability of the project to climate change (climate change resilience).

Impact of the project on climate change

Construction impacts

13.3.2 Given that the scheme is at an early stage of design there is insufficient detail to undertake a full Life Cycle Assessment to determine the construction-related CO_{2eq} emissions. However, this can be estimated using a typical benchmark. To give an idea of the scale of construction-related emissions, the assessment uses the commercial benchmark identified in the RIBA Sustainable Outcomes Guide (2019), which is taken from the M4i KPI Benchmarks (cradle to grave) from early 2000's.

Operational impacts

13.3.3 Data from the Transport Assessment has been used to determine operational transport related CO_{2eq} emissions. An assessment has been undertaken by Dunwoody to identify the CO_{2eq} emissions associated with the energy use of the development once operational. This assessment is based on the estimated demand figures provided by the fit-out team with an analysis of typical loading profiles, normal working practices and impact of external climate conditions.

Assessing Significance

13.3.4 According to the IEMA guidance (IEMA, 2017), the application of the standard EIA significance criteria is not considered to be appropriate for climate change assessments. To assess the significance of both construction and operational impacts, the following approach will therefore be taken:

- **Receptors:** The receptor for assessment of the impact of the project on climate change is the global climate. For the purposes of this assessment, the UK carbon budget will be used as a proxy for the global climate. The receptor is considered to be of high sensitivity.
- **Magnitude:** The magnitude of the impact will be based on the UK carbon budget, see Table 13.1. It is assumed that the development will be constructed during 2022 and 2023 and will become operational in 2024. The relevant UK carbon budgets are as follows (House of Commons Library, 2021):
    - Budget 4 (2023-2027): 1,950MtCO_{2eq}
    - Budget 5 (2028-2032): 1,765MtCO_{2e}
    - Budget 6 (2033-2037): 965 MtCO_{2e}

Table 13.1 Magnitude

	Description
Low magnitude	Emissions represent <0.001% of total emissions from the relevant 5 year UK carbon budget in which they arise
Medium magnitude	Emissions represent between 0.001% and 1% of total emissions from the relevant 5 year UK carbon budget in which they arise
High magnitude	Emissions represent >1% of total emissions from the relevant 5 year UK carbon budget in which they arise

13.3.5 Significance will be determined as per Table 13.2.

Table 13.2 Significance

Low magnitude	Minor significance
Medium magnitude	Minor significance
High magnitude	Major significance

13.3.6 Mitigation measures which are already being incorporated within the development will be taken into account when determining the significance.

Climate Change Resilience Assessment

13.3.7 To assess the vulnerability of the Proposed Development to climate change, a climate change resilience assessment in line with the Environmental Impact Assessment Guide to: Climate Change Resilience & Adaptation (IEMA, 2020) will be undertaken using the following approach:

- **Receptors:** Receptor groups will be identified and their sensitivity will be determined based on the susceptibility of the receptor (e.g. ability to be affected by a change – low, medium or high) and the vulnerability of the receptor (i.e. potential exposure to a change – low, medium or high).
    - Low susceptibility: receptor has the ability to withstand/not be altered much by the projected changes to the existing/prevailing climatic factors (e.g. retain much of its original function and form).
    - Medium susceptibility: receptor has some limited ability to withstand/not be altered by the projected changes to the existing/prevailing climatic conditions.
    - High susceptibility: receptor has no ability to withstand/not be substantially altered by the projected changes to the existing/prevailing climatic factors.
    - Low vulnerability: Climatic factors have little influence on the receptors.
    - Medium vulnerability: receptor is dependent on some climatic factors but able to tolerate a range of conditions.
    - High vulnerability: receptor is directly dependent on existing/prevailing

climatic factors and reliant on these specific existing climate conditions continuing in future or only able to tolerate a very limited variation in climate conditions.

Table 13.3 Receptor sensitivity

	1 (Low vulnerability)	**2 (Medium vulnerability)**	**3 (High vulnerability)**
1 (Low susceptibility	1 (Low sensitivity)	2 (Low sensitivity)	3 (Medium sensitivity)
2 (Medium susceptibility)	2 (Low sensitivity)	4 (Medium sensitivity)	6 (High sensitivity)
3 (High susceptibility)	3 (Medium sensitivity)	6 (High sensitivity)	9 (High sensitivity)

13.3.8 **Magnitude:** Magnitude will be based on a combination of likelihood (the chance of the effect occurring over the lifespan of the project if the risk is not mitigated) and consequence (which will reflect the geographical extent of the effect or the number of receptors affected, the complexity of the effect, degree of harm to those affected and the duration, frequency and reversibility of effect).

- Low likelihood: The event may occur once or on limited occasions during the lifetime of the development.
- Medium likelihood: The event may occur several times during the lifetime of the development.
- High likelihood: The event will occur on multiple occasions during the lifetime of the development.
- Low consequence: Minor disruption to business operations / no risk to building occupants / no damage to buildings / infrastructure.
- Medium consequence: Some disruption to building operations / slight risk to building occupants / slight damage to buildings / infrastructure.
- High consequence: Major disruption to business operations / risk to building occupants / significant damage to buildings / infrastructure.

Table 13.4 Magnitude

	1 (Low consequence)	**2 (Medium consequence)**	**3 (High consequence)**
1 (Low likelihood)	1 (Low magnitude)	2 (Low magnitude)	3 (Medium magnitude)
2 (Medium likelihood)	2 (Low magnitude)	4 (Medium magnitude)	6 (High magnitude)
3 (High likelihood)	3 (Medium magnitude)	6 (High magnitude)	9 (High magnitude)

13.3.9 **Significance:** The potential significance of each impact will be based on the magnitude of the impact and the sensitivity of the receptor.

Table 13.5 Significance

	1 (Low magnitude)	**2 (Medium magnitude)**	**3 (High magnitude)**
1 (Low sensitivity)	1 (Minor significance)	2 (Minor significance)	3 (Minor significance)
2 (Medium sensitivity)	2 (Minor significance)	4 (Minor significance)	6 (Major significance)
3 (High sensitivity)	3 (Minor significance)	6 (Major significance)	9 (Major significance)

13.3.10 Mitigation measures which are already being incorporated within the development will be taken into account when determining the significance.

Study area

13.3.11 The study area for the assessment of the impact on climate change is the boundary of the Proposed Development but also encompasses emissions arising outside of this boundary, including the embodied emissions associated with construction materials, and the emissions associated with the transportation of materials and workers to site and removal of waste from the site.

13.3.12 The study area for the climate change resilience assessment is the Proposed Development itself.

Assumption and Limitations

13.3.13 The assessment of construction stage carbon emissions is based on a typical benchmark. The actual quantity of carbon emissions is likely to be different to this as will vary depending on the construction materials, construction methods etc.

13.3.14 The assessment considers the operational carbon emissions up to 2037 only as the UK Carbon Budget has not been set beyond this. It is considered likely that the National Grid will be significantly decarbonised by this point, however the extent to which this is the case is unknown. Operational regulated carbon emissions have been calculated using an assessment based on the estimated demand figures provided by the fit-out team with an analysis of typical loading profiles, normal working practices and impact of external climate conditions.

13.3.15 The estimation of energy use in occupation for the Manufacturing Unit is difficult due to the nature of the production facility. The production area requires well controlled temperature conditions for both the manufacturing functions as well as maintaining good working conditions for the staff. At present the full details of the plant and equipment to be installed have not been finalised and apart from the levels of peak electrical demand no half hourly consumption projects have been produced.

13.3.16 Actual carbon emissions are likely to be different to the estimations provided, depending on both detailed design and operational use of the buildings. It is not possible to fully understand, at this time, how energy use and emissions will vary, but it has been assumed that energy use will remain the same, year on year, throughout the assessment period. Unregulated energy use could vary substantially when the proposed development is operational, but it is not possible to accurately predict this energy use.

13.3.17 The energy related CO_{2eq} figures are a worst-case assumption. They assume that all electricity will come from the National Grid and do not take into account any on-site renewables. They also assume the carbon intensity of the UK National Grid will not change, whereas there is a strong likelihood that with the push to renewables and Net Zero Carbon by 2050, the CO_{2eq} emissions associated with National Grid electricity production will decrease.

13.3.18 In addition, the current assessment does not take into account any potential reductions which may occur as a result of future changes to the Building Regulations. The UK Government is currently consulting on changes to Part L of the Building Regulations, which may require further improvements to energy efficiency and carbon emissions.

13.4 Baseline conditions

Impact of the project on climate change

13.4.1 In relation to the impact of the project on climate change, i.e. carbon emissions, the baseline is a scenario whereby the Proposed Development does not proceed.

Climate change resilience

Current climate

13.4.2 The existing baseline for the climate change resilience assessment is the current climate in the location of the Proposed Development. Historic climate data obtained from the Met Office website (accessed August 2020) recorded by the closest meteorological station to the Proposed Development (High Wycombe Station) for the 30-year climate period of 1981-2010 is summarised in Table 13.6.

Table 13.6 Historic climate data recorded by the closest meteorological station

Climatic factor	Month	Figure
Average annual maximum daily temperature (°C)	-	13.2°C
Warmest month on average (°C)	July	21.2°C
Coldest month on average (°C)	January	6.2°C
Mean annual rainfall levels (mm)	-	814.7mm
Wettest month on average (mm)	November	88.6mm
Driest month on average (mm)	July	52.2mm

13.4.3 The Met Office baseline climate averages for the South of England region (Met Office website, accessed August 2020) identify gradual warming between 1961 and 2010, as well as increased rainfall. Information on mean maximum annual temperatures (°C) and mean annual rainfall (mm) is summarised in Table 13.7.

Table 13.7 Historic climate data for the South of England

Climate period	Mean maximum annual temperatures (°C)	Mean annual rainfall (mm)
1961-1990	13.3°C	767.7mm
1971-2000	13.6°C	781.7mm
1981-2010	14°C	793.9mm

13.4.4 The Met Office website (accessed August 2020) confirms that past severe weather events in the last 5 years have included severe flooding, severe winter weather with significant snowfalls, record breaking heatwaves and storm and high wind events.

Future climate

13.4.5 UK Climate Projections published in 2018 (UKCP18) have been developed by the UK Climate Impacts Programme (UKCIP) to provide projections for future climate scenarios and trends. Table 13.8 provides a summary of predications for summer and winter changes by the 2070s (Met Office, 2018).

Table 13.8 Future climate estimates under a high emissions scenario (England)

Summer rainfall change	Winter precipitation change	Summer temperature change	Winter temperature change
57% drier to 3% wetter	2% drier to 33% wetter	1.1 °C warmer to 5.8 °C warmer	0.7 °C warmer to 4.2 °C warmer

13.5 Assessment of Effects

Impact of the project on climate change

Construction

13.5.1 Construction of the proposed development will result in CO_{2eq} emissions associated with construction transport (i.e. HGV movements and the transportation of the workforce) and emissions associated with the use of energy on site for construction activities.

13.5.2 Construction works will also result in carbon emissions associated with the embodied carbon within construction materials. Embodied carbon is the total greenhouse gas emissions generated to produce a built asset. This includes emissions caused by extraction, manufacture/processing, transportation and assembly of every product and element in an asset. It may also include the maintenance, replacement, deconstruction, disposal and end-of-life aspects of the materials and systems that make up the asset (UK Green Building Council, 2017).

13.5.3 Given the early stage of the proposals, the construction-related carbon emissions have been estimated using a typical benchmark, identified in the RIBA Sustainable Outcomes Guide, which is taken from the M4i KPI Benchmarks (cradle to grave) from early 2000's. Based on the worst-case benchmark of 1100kgCO_2/m^2, the proposed development (56,162m^2) can be estimated to result in carbon emissions of 61,778,200 kgCO_2. A Life Cycle Assessment will be undertaken during the design of the scheme to inform material selection to reduce the carbon footprint as far as possible. A Whole Life Carbon Assessment will then be undertaken of the final design to calculate the final carbon footprint (kgCO_{2eq}) of the construction of the development.

Summary of construction impacts

13.5.4 It is estimated that the construction of the Proposed Development may result in 61,778,200 kgCO_2. Based on the UK Carbon Budget period 4 (2023-2037), this equates to 0.0032% of the overall UK Carbon Budget. Based on these figures, the construction stage may result in an adverse impact of medium magnitude. Significance is therefore considered to be minor.

Operation

Operational transport

13.5.5 The operation of the Proposed Development will result in carbon emissions associated with operational transport (i.e. the transportation of workers to and from the site and deliveries). The Transport Assessment (Chapter 5 of the ES) includes an estimation of the additional road trips generated by the development. Information has been provided from Vectos, the transport consultants on the average trip distance. This has been used, together with the UK Government Greenhouse Gas Conversion Factors (2021) to estimate the potential CO_{2eq} emissions associated with transport to and from the site.

Daily (Weekday)Trips	Average trip distance	Average km per year	Carbon Factor (Average Car)	Total Average kg CO_{2eq}
1888	31.75km	15,585,440	0.17148	2,672,591

13.5.6 Please note this figure does not include HGVs or transport using method other than the private car, as this information was not readily available. However, this figure also does not account for the fact that there are also likely to be reductions in CO2 emissions when comparing against the existing facility in Eynsham, as some staff will now be travelling shorter distances, i.e. from Bicester.

Operational Energy

13.5.7 The operation of the Proposed Development will result in carbon emissions associated with energy usage for heating, cooling, ventilation, lighting and electrical equipment, which will therefore result in an increase in emissions compared to the baseline scenario. There will also be carbon emissions associated with any equipment the occupier may use. The estimation of energy use in occupation for the Manufacturing Unit is difficult due to the nature of the production facility. The production area requires well controlled temperature conditions for both the manufacturing functions as well as maintaining good working conditions for the staff. At present the full details of the plant and equipment to be installed have not been finalised and apart from the levels of peak electrical demand no half hourly consumption projects have been produced.

13.5.8 A Report on Energy Use in Occupation has been prepared by Dunwoody (2021). This includes an assessment based on the estimated demand figures provided by the fit-out team with an analysis of typical loading profiles, normal working practices and impact of external climate conditions.

13.5.9 The estimated annual energy consumption figure for the Proposed Development has been calculated as 8,894,784kWhr/annum. It is proposed that all energy demand will be met by electricity, therefore the UK Government Greenhouse Gas Conversion Factors (2021) can be used to convert this into an estimated CO_{2eq} figure. This indicates a figure of 1,888,629kg CO_{2eq}/annum.

Summary of operational impacts

13.5.10 In terms of transport related emissions, it is estimated that the Proposed Development could result in 2,672,591kg CO_{2eq}/annum.

13.5.11 In terms of emissions from building operations, it is estimated that the Proposed Development could result in 1,888,629kg CO_{2eq}/annum.

13.5.12 Therefore, the total emissions during the operation of the development are 4,561,220 CO_{2eq}/annum.

13.5.13 Based on the UK Carbon Budget periods, and assuming that the development is operational by 2024, this equates to:

- Budget 4 (2023-2027): 13,683.66 tonnes CO_2 out of 1,950MtCO_2 (0.007%)
- Budget 5 (2028-2032): 22,806.1 tonnes CO_2 out of 1,765MtCO_2 (0.01%)
- Budget 6 (2033-2037): 22,806.1 tonnes CO_2 out of 965MtCO_2 (0.02%)

13.5.14 The above assessment does not include for emissions beyond 2037.

13.5.15 These figures are a worst-case assumption without mitigation. They assume that all electricity will come from the National Grid and do not take into account any on-site renewables. They also

assume the carbon intensity of the UK National Grid will not change, whereas there is a strong likelihood that with the push to renewables and Net Zero Carbon by 2050, the CO_{2eq} emissions associated with National Grid electricity production will decrease.

13.5.16 Based on these figures, the magnitude of the operational impact is considered to be medium. Significance is therefore considered to be minor.

Climate Change Resilience Assessment

13.5.17 Given the relatively short timescale for the construction phase and its temporary nature, it is not considered that there will be any significant effects associated with the construction phase in relation to the climate change resilience assessment. This assessment considers the operation of the completed development only.

13.5.18 Table 13.10 identifies the potential impacts associated with climate change, the receptors affected (and the sensitivity of those receptors), the magnitude of the impact (likelihood*consequence of impact) and the overall significance (based on mitigation already incorporated).

Table 13.9 Climate Change Resilience Assessment

Hazard associated with climate change	Impact	Receptor	Magnitude			Significance
			Likelihood	Consequence	Summary of magnitude	
Increased flooding	Rising Flood levels can cause inundation of basements and ground floor accommodation. The majority of the site is located in Flood Zone 1 with a small area located within Flood Zone 2 which has a 'medium' probability of fluvial flooding. The FRA shows that the site will not be inundated with floodwater for all events up to and including the 1 in 100 year (+20%) event. The site will only be inundated with floodwater during the 1 in 1000 year event. The majority of the site has very low risk of surface water flooding with a chance of flooding of less than 1 in 1000 (0.1%) years). However, small areas of the site have a low to high risk of surface water flooding with a chance of flooding of 1 in 1000 (0.1%) years to greater than 1 in 30 (3.3%) years. See Chapter 11 and the FRA.	Buildings and infrastructure (Medium sensitivity)	1	3	Medium	Minor
Increased likelihood of storms (including high winds)	High winds can result in a risk of structural damage to buildings and reduction of mechanical ventilation capacity.	Buildings and infrastructure (Medium sensitivity)	3	2	High	Major
	Risk to the safety of building occupants from doors slamming.	Building occupants (Medium sensitivity)	3	3	High	Major
More extreme heat and cold events & greater temperature variation	Extremes of temperature may result in building services being unable to maintain thermal comfort levels.	Building occupants (Medium sensitivity)	3	2	High	Major
	Extreme cold events may lead to plant failure due to freezing or defrost cycles	Buildings and infrastructure (Medium sensitivity)	3	2	High	Major

Hazard associated with climate change	Impact	Receptor	Magnitude			Significance
			Likelihood	Consequence	Summary of magnitude	
	Landscape planting may be affected.	Planting (Medium sensitivity)	2	2	Medium	Minor
Wetter winters (including increased moisture and driving rain)	Increased moisture and rain may cause damage to building fabric and services.	Buildings and infrastructure (Medium sensitivity)	3	2	High	Major
	Increased rate of run off risks of system inundation leading to localised flooding. The majority of the site is located in Flood Zone 1 with a small area located within Flood Zone 2 which has a 'medium' probability of fluvial flooding. The FRA shows that the site will not be inundated with floodwater for all events up to and including the 1 in 100 year (+20%) event. The site will only be inundated with floodwater during the 1 in 1000 year event. The majority of the site has very low risk of surface water flooding with a chance of flooding of less than 1 in 1000 (0.1%) years). However, small areas of the site have a low to high risk of surface water flooding with a chance of flooding of 1 in 1000 (0.1%) years to greater than 1 in 30 (3.3%) years. See Chapter 11 and the FRA.	Buildings and infrastructure (Medium sensitivity	1	3	Medium	Minor
More drought events (including reduced summer rainfall)	Reduced rainfall may decrease the amount of water available for the development.	Building occupants (Medium sensitivity)	3	2	High	Major
	Drying soils could result in structural damage to buildings.	Buildings and infrastructure (Medium sensitivity)	2	3	High	Major
	Landscape planting may be affected.	Planting (Medium sensitivity)	2	2	Medium	Minor

Hazard associated with climate change	Impact	Receptor	Magnitude			Significance
			Likelihood	Consequence	Summary of magnitude	
Warmer summers and increased solar radiation	Increased temperatures may result in building services being unable to maintain thermal comfort levels.	Building occupants (Medium sensitivity)	3	2	High	Major
	Solar radiation may reduce the durability of roof and external wall materials.	Buildings and infrastructure (Medium sensitivity)	3	2	High	Major
	Reduced rainfall may decrease the amount of water available for the development.	Building occupants (Medium sensitivity)	3	2	High	Major
	Drying soils could result in structural damage to buildings.	Buildings and infrastructure (Medium sensitivity)	2	3	High	Major
	Landscape planting may be affected.	Planting (Medium sensitivity)	2	2	Medium	Minor
More precipitation e.g. rain and snow	Increased rate of run off risks of system inundation leading to localised flooding. The majority of the site is located in Flood Zone 1 with a small area located within Flood Zone 2 which has a 'medium' probability of fluvial flooding. The FRA shows that the site will not be inundated with floodwater for all events up to and including the 1 in 100 year (+20%) event. The site will only be inundated with floodwater during the 1 in 1000 year event. The majority of the site has very low risk of surface water flooding with a chance of flooding of less than 1 in 1000 (0.1%) years). However, small areas of the site have a low to high risk of surface water flooding with a chance of flooding of 1 in 1000 (0.1%) years to greater than 1 in 30 (3.3%) years.	Buildings and infrastructure (Medium sensitivity	1	3	Medium	Minor

Hazard associated with climate change	Impact	Receptor	Magnitude			Significance
			Likelihood	Consequence	Summary of magnitude	
	See Chapter 11 and the FRA.					
	Damage to building fabric and services	Buildings and infrastructure (Medium sensitivity)	2	3	High	Major
Milder winters	This may reduce winter heating requirements.	N/A	N/A	N/A	N/A	N/A
Subsidence or ground movement	Drying soils could result in subsidence / ground movement and resulting structural damage to buildings	Buildings and infrastructure (Medium sensitivity)	2	3	High	Major

13.5.19 The Climate Change Resilience Assessment identifies that climate change is likely to result in a number of hazards that may impact upon the development.

13.6 Mitigation

Impact of the project on climate change

Construction

13.6.1 Tritax Symmetry has made a commitment that all their new commercial buildings will be 'Net Zero Carbon in Construction'. A Life Cycle Assessment will be undertaken to inform material selection to reduce the carbon footprint as far as possible at the detailed design stage. A Whole Life Carbon Assessment will then be undertaken of the final design to calculate the embodied carbon footprint (kgCO2eq) of the development. Any residual embodied carbon emissions will then be offset through the funding of verified and accredited offset schemes, in line with principals set out in UKGBC's net zero framework (UKGBC, 2019).

13.6.2 Management of construction effects will form part of a comprehensive and auditable Construction Environmental Management Plan (CEMP). The building will also be assessed under BREEAM and a minimum 'Very Good' rating targeted. As part of the CEMP and BREEAM assessment, the Contractor will be required to monitor material and waste transport to and from the site and record the total carbon emissions associated with this to help identify where savings can be made. The Contractor will also be required to monitor the site energy usage by all construction plant, equipment (mobile and fixed) and site accommodation to help identify where savings can be made.

Operation

Transport Related Carbon

13.6.3 The Travel Plan (Vectos, 2021) contains details of the measures incorporated to reduce the impact of transport associated with the development. This will assist in reducing carbon emissions associated with operational transport.

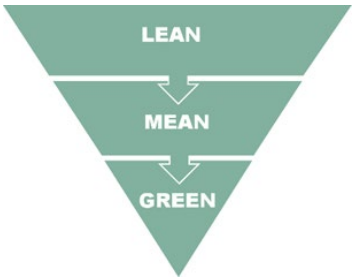
13.6.4 These measures include:

- Improvements to bus stops, including shelters and real time passenger information
- On site covered cycle parking.
- Showers, lockers and changing facilities for cyclists / walkers.
- Shared pedestrian/cycle routes
- 25% of spaces to be electric vehicle recharging facilities.

Energy Related Carbon

13.6.5 To mitigate for the anticipated operational energy related emissions, the Proposed Development will use the 'energy hierarchy' to reduce carbon emissions.

Figure 13.1 The Energy Hierarchy



Lean - Use advanced building modelling and passive construction techniques as far as is cost effective.

Mean - Incorporate high efficiency systems and effective controls throughout the design.

Green - Incorporate renewable energy sources where necessary and economically viable to achieve targets or provide desirable benefits.

Reduce demand (passive measures)

13.6.6 The first level in the hierarchy is to reduce operational energy usage using passive measures included within the design of the development. These will reduce energy use and the associated CO_2 emissions and include: U values which exceed Building Regulation requirements; Engineered facade design; Reduced air permeability.

13.6.7 U Values: Limiting heat losses across the entire building envelope will future proof the energy efficiency of the development over its whole life. To achieve this, the fabric thermal U-Value requirements as detailed within Approved Document L2A 2013 of the Building Regulations will be improved upon. Table 13.10 shows the limiting U-values required to meet Building Regulations compared to the targeted values exceed Building Regulations.

Table 13.10 Approved Document L2A U-Value comparison

Building Element	**AD L2A limiting U-Value (W/m2 K)**	**Target U-Value (W/m2 K)**
Roof	0.25	0.18
External Wall	0.35	0.23
Floor	0.25	0.22
Windows	2.2	1.6
Rooflights	2.2	1.8

13.6.8 The targeted values as noted will be confirmed during the detailed design stage of the buildings in conjunction with finalisation of the energy efficiency measures included.

13.6.9 Engineered Facade Design: Wall glazing and rooflights will maximise the use of natural daylight to offset demand for artificial lighting. This will maximise passive solar gains, and the façade will also be designed to minimise thermal losses through the use of high performance glazing and enhanced insulation levels above the minimum set down by Building Regulations. Table 13.11 shows the glazing solar G value used within the Part L2A 2013 solar heat gain calculations compared to the targeted values which exceed the Building Regulations requirements.

Table 13.11 Approved Document L2A G-Value comparison

Building Element	**AD L2A Solar G Value**	**Target Solar G Value**
Windows	0.68	0.44
Rooflights	0.68	0.44

13.6.10 Reduced Air Permeability: A significant percentage of heat loss from buildings is due to air infiltration associated with poor air tightness. By improving on the air tightness of the building it is possible to reduce infiltrations rates and thus reduce the heat losses, energy use and the associated CO_2 emissions. The development will be constructed to improved building air tightness criteria beyond the level required to comply with the Building Regulations. Table 13.12 shows the comparison of the targeted air permeability for the building against the allowable maximum limit set within Approved Document L2A of the Building Regulations.

Table 13.12 Air Permeability Standard

Building Regulation Document	Maximum Allowable Air Permeability	Targeted Allowable Air Permeability
Approved Document L2A	10.0 m3/h/m2 @ 50 Pa	2 m3/h/m2 @ 50 Pa

Energy Efficiency

13.6.11 The next level in the energy hierarchy is to maximise energy efficiency. High efficiency systems, plant, controls and equipment will be incorporated into the development as follows:

- Energy efficient LED lighting - Internal lighting within the process and office areas will incorporate energy efficient LED lighting where practicable.
- Enhanced lighting controls - Automatic presence detection will be included in appropriate areas of the building. This form of control will ensure lights are automatically switched off during periods of non-occupancy. External lighting will be designed to incorporate energy efficient luminaires and an automatic lighting control system utilising daylight sensors and time clock control to ensure energy-efficient operation of the lighting.
- Optimised plant controls - Control of heating plant will be optimised, and weather compensated to ensure plant operates as close to demand as possible and not a full capacity.
- Variable speed drives - Variable speed drives will be installed on circulation pumps and ventilation fans to allow the speed of the respective motors to be amended by the automatic controls to suit changing load of the building. This will ensure energy usage matches demand requirements thus reducing the carbon emissions to a minimum based on end user occupation.
- Inclusion of heat recovery on ventilation systems - The ventilation systems installed within the development will incorporate heat recovery within the air handling plant to recover heat from the air exhausted to heat the incoming fresh air and therefore reduce energy usage. The air handling plant will have a low specific fan power to minimise the energy used by the fans.

Renewable / Low Carbon Technology

13.6.12 The final level in the energy hierarchy is to incorporate renewables / low carbon technology. The Low Zero Carbon Technologies Options Report (Dunwoody, 2021), has considered a number of options for the scheme. As advised by this report, the following will be incorporated:

- Photovoltaics (PVs) - Planning permission is sought for a PV array extending to 100% of the useable roof area (i.e. the omission of space taken by roof lights; man-safe working and the roof signage). The level of PVs installed will be subject to individual occupier requirements or a technical ability and viability in the exportation of electricity generated by the PV array into the National Grid. This is to prevent installation and manufacture of unused PV panels and allows the most up to date technology to be fitted when required. A minimum of 18% of PV of the array will be installed prior to the use commencing. This will provide the normal base load of electricity to the unit prior to occupier specific requirements.
- Air source heat pumps - These technologies provide the most suitable renewable technology for use to heat and cool the office areas. They are highly energy efficient, do not use fossil fuel and are low carbon emission.

Climate Change Resilience Assessment

13.6.13 The following measures should be incorporated into the design of the development to ensure it is climate change resilient:

- The flood risk at the site is to be managed and mitigated by using a number of risk management techniques, and mitigation strategies to manage and reduce the overall flood risk at the site. With regards to pluvial flood risk, the site to be designed with a 40% climate change allowance for rainfall.
- Design of building and roof mitigated against the risk of high winds and all doors to be on restrictive stays to prevent them slamming shut unintentionally from wind.
- Cooling plant selection to be based on projected future temperatures. Facility for cooling capacity increase to be included in infrastructure.
- Heating plant selection to be based on projected temperatures. Adequate preheating to limit thermal lag on occupation
- Include use of waste heat on air-based equipment to raise operating temperatures.
- The whole external fabric to be designed as a weathertight structure. Roof and external wall materials to be guaranteed to perform for a minimum of 25 years.
- Low flush volume WCs and low flow rate taps to be specified to minimise water demand.
- A major leak detection system to be installed to identify leaks.
- Shut off valves to be installed on the water supply to WC areas which will stop the water supply to these areas when they are not in use, thereby minimising the impact of any minor water leaks in these areas.
- Pulsed output water meters to be installed on the water supply to each building so that occupants can monitor their water usage.
- The roofs to be fully designed for snow loads.
- Selection of hardy plants for the landscaping scheme.
- Fully investigate ground conditions and ensure the structure and main slab components are designed to accommodate ground conditions.

13.7 Residual Impacts – during construction / operation

Impact of the Project on Climate Change

Construction

13.7.1 The proposed development will result in carbon emissions during construction. However, with the additional mitigation, the development will be 'Net Zero Carbon in Construction' using the methodology outlined in the UKGBC's net zero framework. Carbon emissions will be reduced as much as feasibly possible. Following this, if there are any construction related residual carbon emissions, these will be offset through the funding of verified and accredited offset schemes, in line with principals set out in UKGBC's net zero framework. Therefore, the residual construction impact is considered to be negligible, not significant.

Operation

13.7.2 The proposed development will result in carbon emissions during operation through both operational energy use and operational transport. While the additional mitigation may result in the development reducing the carbon emissions below those estimated, the extent to which this will be achieved is unclear. Therefore the residual operational impact is considered to remain as a minor significant effect.

Climate Change Resilience Assessment

13.7.3 The Climate Change Resilience Assessment has been repeated, this time incorporating the additional mitigation, see Table 13.13 below.

Table 13.13 Climate Change Resilience Assessment with Additional Mitigation

Hazard associated with climate change	Impact	Mitigation	Receptor	Magnitude			Significance
				Likelihood	Consequence	Summary of magnitude	
Increased flooding	Rising Flood levels can cause inundation of basements and ground floor accommodation. See Chapter 11 and the FRA for more information.	The flood risk at the site, will be managed and mitigated by using a number of risk management techniques, and mitigation strategies to manage and reduce the overall flood risk at the site. With regards to pluvial flood risk, the site has been designed with a 40% climate change allowance for rainfall.	Buildings and infrastructure (Medium sensitivity	1	2	Medium	Minor
Increased likelihood of storms (including high winds)	High winds can result in a risk of structural damage to buildings and reduction of mechanical ventilation capacity.	Structural engineers will ensure design of building and roof is mitigated against the risk of high winds. Intake and exhaust positions protected from direct wind impact.	Buildings and infrastructure (Medium sensitivity)	1	2	Medium	Minor
More extreme heat and cold events & greater temperature variation	Extremes of temperature may result in building services being unable to maintain thermal comfort levels.	Cooling plant selection to be based on projected future temperatures. Facility for cooling capacity increase to be included in infrastructure. Heating plant selection to be based on projected temperatures. Adequate preheating to limit thermal lag on occupation	Building occupants (Medium sensitivity)	2	2	Medium	Minor
	Extreme cold events may lead to plant failure due to freezing or defrost	Plant selection to be based in projected temperatures. Include use of waste heat on air based equipment to raise operating	Buildings and infrastructure (Medium sensitivity)	1	2	Medium	Minor

Hazard associated with climate change	Impact	Mitigation	Receptor	Magnitude			Significance
				Likelihood	Consequence	Summary of magnitude	
	cycles	temperatures.					
	Landscape planting may be affected.	Planting designed to thrive across extremes of temperature and, precipitation events	Planting (Medium sensitivity)	1	2	Low	Minor
Wetter winters (including increased moisture and driving rain)	Increased moisture and rain may cause damage to building fabric and services.	The whole external fabric will be designed as a weathertight structure. Roof and external wall materials will be guaranteed to perform for a minimum of 25 years and in reality will do so for much longer. Intake and exhaust positions will be protected from water ingress.	Buildings and infrastructure (Medium sensitivity)	2	2	Medium	Minor
	Increased rate of run off risks of system inundation leading to localised flooding. See Chapter 11 and the FRA.	The flood risk at the site, will be managed and mitigated by using a number of risk management techniques, and mitigation strategies to manage and reduce the overall flood risk at the site. With regards to pluvial flood risk, the site has been designed with a 40% climate change allowance for rainfall.	Buildings and infrastructure (Medium sensitivity	1	2	Medium	Minor
More drought events (including reduced summer rainfall)	Reduced rainfall may decrease the amount of water available for the development.	Water supplies and storage to include allowance for more potable water consumption. Low water use sanitary fittings will be specified where appropriate to minimise water demand. Pulsed output water meters will be installed on the water supply so that occupants can monitor their water usage.	Building occupants (Medium sensitivity)	1	2	Low	Minor
	Drying soils could	Structural engineers will ensure	Buildings and	1	3	Medium	Minor

Hazard associated with climate change	Impact	Mitigation	Receptor	Magnitude			Significance
				Likelihood	Consequence	Summary of magnitude	
	result in structural damage to buildings.	design of foundations is mitigated against the risk ground shrinkage.	infrastructure (Medium sensitivity)				
	Landscape planting may be affected.	Planting designed to thrive across extremes of temperature and, precipitation events.	Planting (Medium sensitivity)	1	2	Medium	Minor
Warmer summers and increased solar radiation	Increased temperatures may result in building services being unable to maintain thermal comfort levels.	Cooling plant selection to be based on projected future temperatures. Facility for cooling capacity increase to be included in infrastructure.	Building occupants (Medium sensitivity)	2	2	Medium	Minor
	Solar radiation may reduce the durability of roof and external wall materials.	Roof and external wall materials will be guaranteed to perform for a minimum of 25 years and in reality will do so for much longer.	Buildings and infrastructure (Medium sensitivity)	2	2	Medium	Minor
	Reduced rainfall may decrease the amount of water available for the development.	Water supplies and storage to include allowance for more potable water consumption. Low water use sanitary fittings will be specified where appropriate to minimise water demand. Pulsed output water meters will be installed on the water supply to each building so that occupants can monitor their water usage .	Building occupants (Medium sensitivity)	2	2	Medium	Minor
	Drying soils could result in structural damage to buildings.	Structural engineers will ensure design of foundations is mitigated against the risk ground shrinkage	Buildings and infrastructure (Medium sensitivity)	1	3	Medium	Minor
	Landscape planting may be affected.	Planting designed to thrive across extremes of temperature and, precipitation events	Planting (Medium sensitivity)	1	2	Low	Minor

Hazard associated with climate change	Impact	Mitigation	Receptor	Magnitude			Significance
				Likelihood	Consequence	Summary of magnitude	
More precipitation e.g. rain and snow	Increased rate of run off risks of system inundation leading to localised flooding. See Chapter 11 and the FRA.	The flood risk at the site, will be managed and mitigated by using a number of risk management techniques, and mitigation strategies to manage and reduce the overall flood risk at the site. With regards to pluvial flood risk, the site has been designed with a 40% climate change allowance for rainfall.	Buildings and infrastructure (Medium sensitivity	1	2	Medium	Minor
	Damage to building fabric and services	The roofs will be fully designed for snow loads and to avoid ponding. Intake and exhaust positions will be protected from water ingress.	Buildings and infrastructure (Medium sensitivity)	1	3	Medium	Minor
Milder winters	This may reduce winter heating requirements.	N/A	N/A	N/A	N/A	N/A	N/A
Subsidence or ground movement	Drying soils could result in subsidence / ground movement and resulting structural damage to buildings	Structural engineers will ensure design of foundations is mitigated against the risk ground movement	Buildings and infrastructure (Medium sensitivity)	1	3	Medium	Minor

13.7.4 This assessment identifies that, while climate change is likely to result in increased hazards that may impact upon the development, the additional mitigation measures will result in impacts of minor adverse significance only.

13.8 Cumulative Impacts

13.8.1 Regarding intra-project cumulative effects, there are a number of potential interactions between the future effects of climate change and other ES topics, for example, in relation to Flood Risk and Transport. Where necessary, reference has been made to the relevant chapter / supporting documentation.

13.8.2 No inter-project cumulative effects are anticipated on the basis that climate change adaptation effects and impacts are specific to the development and will not result in impacts to neighbouring development.

13.9 Conclusion

Impact of the project on climate change

13.9.1 In terms of construction impacts, the development will be Net Zero Carbon. If there are any residual embodied carbon emissions, these will be offset through the funding of verified and accredited offset schemes, in line with principals set out in UKGBC's net zero framework. The effect will therefore be negligible, not significant.

13.9.2 In terms of operational impacts, the combined operational transport and energy related CO_{2eq} emissions of the development is predicted to result in a medium magnitude adverse effect. Significance is considered to be minor.

Climate Change Resilience Assessment

13.9.3 The proposed development is likely to be at increased risk of climate change related hazards. However, given the mitigation measures identified this is considered to have adverse impacts of minor significance only .

Table 13.14 Summary of effects

Receptor	Sensitivity of Receptor	Nature of potential impact	Proposed mitigation	Residual effect	Significant / not significant
Construction phase					
Global Climate	High	Construction-related CO_{2eq} emissions	Achieve Net Zero Carbon in Construction Construction Environmental Management Plan	Negligible	Not Significant
Operational phase					
Global Climate	High	Operational CO_{2eq} emissions	Use of Energy Hierarchy Installation of renewable technology (e.g. PVs) Implementation of Travel Plan Measures	Adverse	Significant
Buildings & Infrastructure	Medium	Rising Flood Levels / increased rate of run-off causing inundation	Flood Risk Management Site designed with a 40% climate change allowance for rainfall	Adverse	Significant
		High winds resulting in structural damage and reduction in mechanical ventilation capacity	Design of building and roof to mitigate against impact of high winds Intake and exhaust positions protected from direct wind impact	Adverse	Significant
		Extreme cold events leading to plant failure due to freezing or defrost cycles	Plant selection based on projected temperatures. Include use of waste heat on air based equipment to raise operating temperatures.	Adverse	Significant
		Drying soils could result in structural damage to buildings	Ensure design of foundations is mitigated against the risk of ground shrinkage and movement.	Adverse	Significant
		Increased moisture and rain causing damage to building fabric and services	External fabric designed as weathertight structure Roof and external walls guaranteed to perform for 25 years. Roofs designed for snow loads and to avoid ponding Intake and exhaust positions protected from water ingress	Adverse	Significant

Receptor	Sensitivity of Receptor	Nature of potential impact	Proposed mitigation	Residual effect	Significant / not significant
Building occupants	Medium	Extremes of temperature resulting in building services unable to maintain thermal comfort levels	Cooling plant selection to be based on projected future temperatures. Facility for cooling capacity increase to be included in infrastructure. Heating plant selection to be based on projected temperatures. Adequate preheating to limit thermal lag on occupation	Adverse	Significant
		Droughts may decrease water available	Water supplies and storage to include allowance for more potable water consumption. Low water use sanitary fittings specified. Pulsed output water meters will be installed on the water supply.	Adverse	Significant
Planting	Medium	Planting affected by extreme temperatures and drought	Planting design to thrive across extremes of temperature and precipitation events.	Adverse	Significant

13.10 References

Department for Environment, Food and Rural Affairs (DEFRA) (2018) The National Adaptation Programme and the Third Strategy for Climate Adaptation Reporting.
Dunwoody (2021) Low Zero Carbon Technologies Options Report.
House of Commons Library (2021). UK Carbon Budgets.
IEMA (2017). Environmental Impact Assessment Guide to: Assessing Greenhouse Gas Emissions and Evaluating their Significance.
IEMA (2020). Environmental Impact Assessment Guide to: Climate Change Resilience & Adaptation.
Royal Institute of British Architects (RIBA) (2019). Sustainable Outcomes Guide
Royal Institution of Chartered Surveyors (RICS) (2017) Whole life carbon assessment for the built environment.
The Met Office (2019). UK Climate Projections: Headline Findings.
The Met Office website (accessed September 2021). UK Climate Averages. https://www.metoffice.gov.uk/research/climate/maps-and-data/uk-climate-averages/
The Met Office website (accessed September 2021). Past Weather Events. https://www.metoffice.gov.uk/weather/learn-about/past-uk-weather-events
UK Green Building Council (2017). Embodied Carbon: Developing a Client Brief.
UK Green Building Council (2019). Net Zero Carbon Buildings.
Vectos (2021) Transport Assessment.
Vectos (2021) Travel Plan.

14 Socio-economic effects

14.1 Introduction

14.1.1 This chapter, prepared by SQW, considers the potential socio-economic effects of the proposed development, full details of which can be found in Chapter 2.

14.1.2 In particular, it considers the effects of the proposed development on employment during the construction and operational stages of the proposed development, and Gross Value Added (GVA)[i] generated as a result of new economic activity.

14.1.3 An important nuance to the assessment in this chapter is that this proposed development will facilitate the relocation and expansion of a major existing Oxfordshire-based employer, Siemens Healthineers (SH), from its existing facility in Eynsham. The proposed new production, research and development facility will accommodate SH's future growth requirements and allow it to invest in the continued development and production of superconducting magnets for medical devices used in MRI systems.

14.1.4 SH forecasts strong global market demand for MRI scanners. However, within the sector technologies are changing. The company anticipates a limited lifespan for the wet magnets (produced using considerable amounts of liquid helium) produced at its Eynsham facility given a transition to 'dry-magnet' technology.

14.1.5 The proposed new facility will enable SH to remain in Oxfordshire and expand its operations whilst its existing facility at Eynsham is wound down, closing by 2030. Should this proposed development not proceed the base position is that the Eynsham facility would still close, both leading to a reduction in existing employment and GVA in Oxfordshire as well as not realising any of the benefits of the proposed development.

14.1.6 This chapter summarises the key relevant statutory development plan policies and other relevant non-statutory policies and guidance, describes the methodology used to assess impact, the baseline conditions currently existing at the site and the surrounding area, and the potential effects of the proposed development during both the construction and operational phases.

14.2 Policy Context

14.2.1 Details of planning policy relevant to the Proposed Development are contained in Chapter 4 and the Planning Statement. There are no specific legislative requirements applicable to the assessment of socio-economic effects. Accordingly, the assessment is guided by UK Government planning policy and guidance. A summary of planning policy relevant to socio-economics and the proposed development is provided below.

Planning Policy Context

National Planning Policy Framework

14.2.2 The National Planning Policy Framework (NPPF) articulates that *'the purpose of the planning system is to contribute to the achievement of sustainable development'*[ii]; moreover, to achieve sustainable development the NPPF identifies three overarching objectives: *an economic objective*, a social objective and an environmental objective.

14.2.3 Of specific relevance to this proposed development is the economic objective: *'to help build a strong, responsive and competitive economy, by ensuring that sufficient land of the right types*

is available in the right places and at the right time to support growth, innovation and improved productivity; and by identifying and coordinating the provision of infrastructure'[iii].

14.2.4 The NPPF further identifies that *'significant weight should be placed on the need to support economic growth and productivity, taking into account both local business needs and wider opportunities for development. The approach taken should allow each area to build on its strengths, counter any weaknesses and address the challenges of the future. This is particularly important where Britain can be a global leader in driving innovation, and in areas with high levels of productivity, which should be able to capitalise on their performance and potential*.'[iv]

14.2.5 Paragraph 82(a) of the NPPF sets out that policies should *'set out a clear economic vision and strategy which positively and proactively encourages sustainable economic growth, having regard to Local Industrial Strategies and other local policies for economic development and regeneration*'[v].

14.2.6 In this context it is notable that Oxfordshire LEP's Local Industrial Strategy identifies Oxfordshire as 'the global leader in cryogenics' and 'home to the most powerful concentration of cryogenic expertise in the world'[vi], of which SH is an existing key part (see also Para 14.2.13 below).

14.2.7 Paragraph 82(d) of the NPPF also adds that policies should *'be flexible to accommodate needs not anticipated in the plan…and to enable a rapid response to changes in economic circumstances*[vii].

14.2.8 Paragraph 83 of the NPPF further acknowledges that *'planning policies and decisions should recognise and address the specific locational requirements of different sectors. This includes making provision for clusters or networks of knowledge and data-driven, creative or high technology industries*[viii]'

Non-statutory economic policy

14.2.9 In relation to national policy, the new UK Innovation Strategy is important. It emphasises government's commitment to innovation-led growth, focusing especially on fuelling businesses that want to innovate; attracting and creating innovation talent; and putting in place the institutions needed for effective innovation. It also focuses on the importance of mission-led approaches to innovation. It treads carefully in relation to the spatial dimensions of innovation – and commitments to levelling up are woven through the document – but in emphasising the effectiveness of the wider innovation system, it is implicitly recognising the criticality of innovation within clusters[ix].

14.2.10 The key themes within the Life Sciences Vision – published by government in July 2021 and including pharmaceuticals, biotechnology and medtech sectors – are broadly similar, and they have been sharpened by experiences of, and learning from, the pandemic. As with the Innovation Strategy, the focus will be on missions which are technology or disease-specific; and there is also a recognition of wider responsibilities in relation to levelling up across the UK. Beyond that, there is acknowledgement that *'to remain competitive and to deliver on the ambition set out in this Vision, the UK will focus relentlessly on areas in which it has, or can gain, competitive advantage*'[x].

14.2.11 At a regional level, ambitions for the Oxford-Cambridge Arc are relevant. An Economic Vision was published (by three LEPs and the Cambridgeshire and Peterborough Combined Authority) in April 2019: *'Our vision is for the Arc to be the world leading place for high-value growth, innovation and productivity. A global hub where ideas and companies are generated and thrive, home to exemplary models of 21st century development, with a high-quality environment and outstanding quality of life, and with a strong economic focus that drives inclusive clean growth'*[xi].

14.2.12 A consultation document on a vision for a spatial framework for the Arc has been published more recently. It states simply that *'the government's priority for the Oxford-Cambridge Arc is sustainable economic growth*'; and, further, that *'we are putting sustainable economic growth first because we think that the Arc can be one of the most productive places in the world". In developing an appropriate spatial framework, the significance of key clusters is recognised, and government commits to 'setting policies to meet the needs of different sectors and businesses – from large firms to start-ups and promoting the green economy, industry, innovation and technology*'[xii].

14.2.13 At a local level, the clearest and most up-to-date statement is from Oxfordshire's Local Industrial Strategy (which itself built on an earlier Innovation Strategy). Published in 2019, the LIS is underpinned by an ambition for the county to be 'a top three global innovation ecosystem by 2040'[xiii]. To achieve this ambition, the LIS states that Oxfordshire will develop the five foundations of productivity and build on the area's science and technology clusters. It goes on to prioritise local R&D investment and growth in Oxfordshire's breakthrough sectors and technologies, which include cryogenics and life sciences. As noted at para 14.2.6, cryogenics is a key cluster identified within the LIS.

14.2.14 SH forms a key part of this existing cryogenics cluster, producing superconducting magnets. A stated reason for SH wishing to stay in Oxfordshire is the importance of retaining its existing skilled workforce, and being proximate to the wider skilled labour pool of the cryogenics cluster and other linked / transferrable sectors. Further details of the relationship between SH and the wider cluster are provided in the supporting Socio-Economic Impact Statement.

14.2.15 Whilst now outdated, Cherwell's Economic Development Strategy (2011-16) was organised around the central theme of 'economic resilience' including seeking to continuously develop its local economy to ensure it remains internationally competitive, to enable the creation of jobs and prosperity now and for the future and to create a more diverse economy[xiv]. Additionally, this strategy placed significant emphasis on demonstrating leadership in the low carbon economy, including maximising the opportunities within engineering and construction to develop practical solutions to mitigate the impact of climate change and secure competitive, green business practice. It is notable that these dimensions are central to SH proposed new product lines and technologies (that significantly reduce the use of helium, a non-renewable resource) which this proposed development will facilitate being located and developed in Cherwell.

Local planning policy

14.2.16 The Statutory Development Plan for Cherwell District comprises the following:

- Adopted Cherwell Local Plan 2011-2031 (adopted July 2015)
- Adopted Cherwell Local Plan 2011-2031 (Part 1) Partial Review – Oxford's Unmet Housing Need (September 2020)
- Minerals and Waste Core Strategy (September 2017)
- 'Made' Neighbourhood Plans in Cherwell District
- Saved, retained policies of the Adopted Cherwell Local Plan 1996
- 'Made' Neighbourhood Plans in Cherwell District
- Saved policies from Oxfordshire County Council's Minerals and Waste Local Plan 1996

14.2.17 For the purposes of this application, there are no planning policies in the Cherwell Local Plan Partial Review (Part 1) Oxford's Unmet Housing Need, or the Minerals and Waste Plan (Part 1-Core Strategy) September 2017 or the Minerals and Waste Local Plan (1996) relevant to this planning application.

14.2.18 The Adopted Local Plan articulates a number of Strategic Objectives for Developing a Sustainable Local Economy. There are two of particular relevance to the proposed development:

- SO 1 - to facilitate economic growth and employment and a more diverse local economy with an emphasis on attracting and developing higher technology industries
- SO 3 - to help disadvantaged areas, support an increase in skills and innovation, improve the built environment and make Cherwell more attractive to business by supporting regeneration.

14.2.19 Consideration should also be made towards policy PSD1 (Presumption in Favour of Sustainable Development) which states " The Council will always work proactively with applicants to jointly find solutions which mean that proposals can be approved wherever possible, and to secure development that improves the economic, social and environmental conditions in the area"

14.2.20 The Local Plan references some of the challenges faced by Cherwell in seeking to achieve a sustainable economy, including *'the knowledge economy needs to grow'* and *'new employment sites are needed to meet modern business needs*'.

14.2.21 Explicit reference is made regarding the types of employment development the District wants to attract: advanced manufacturing/high performance engineering; the green economy; and innovation, research and development[xv].

14.2.22 Furthermore, the Local Plan also notes that *'significant employment growth at Bicester will be encouraged and we will: encourage green technology and the knowledge-based sectors, exploiting its position in the Oxford/Cambridge Corridor…and encourage high tech companies'*[xvi].

Summary

14.2.23 Both planning policy and economic policy, strategy and guidance reinforce the central importance of supporting the growth of advanced manufacturing and high-value businesses operating in the knowledge-economy in this location which is recognised to be significant at all spatial resolutions. Moreover, the importance of supporting existing innovation-intensive clusters is a clear national policy priority.

14.2.24 The accompanying Socio-Economic Impact Assessment submitted as part of this planning application includes more detailed analysis of the rationale behind SH's decision to relocate and significantly expand its operations within Oxfordshire and the relative importance of the cryogenics cluster - within the broader innovation-intensive knowledge economy of the Ox-Cam Arc - in informing this business decision. By developing a new production facility in relatively close proximity to its existing site, SH believes that it will be able to achieve three main outcomes: it will effect the transition from one magnet technology to another; it will expand overall levels of production to meet anticipated demand; and it will retain most of its specialist workforce.

14.2.25 However, the overarching point is that there is clear support in statutory and non-statutory policy terms for the nature of this Proposed Development as part of this planning application.

14.3 Assessment methodology

Predicting effects

14.3.1 There is no government or industry-standard guidance regarding the preferred methodology for assessing the socio-economic impact of major developments. Accordingly, the approach adopted in this assessment draws on SQW's expertise in socio-economic impact modelling. In the absence of guidance, SQW have had to exercise professional judgement on grading of the scale of the magnitude of potential economic impacts.

14.3.2 The assessment considers the following specific impacts:

- Employment during construction
- Employment during operation
- GVA during operation

14.3.3 Current ('baseline') socio-economic characteristics have been identified from nationally recognised research, surveys and datasets. These include:

- Annual Population Survey (APS)
- Annual Survey of Pay and Earnings (ASPE)
- ONS Business Register and Employment Survey (BRES)
- ONS UK Business Counts
- ONS Population Estimates and Projections

14.3.4 The assessment methodology stages are outlined below. Table 14.2 sets out the receptors which have been identified for each economic impact. Three principal receptors have been identified: the existing construction workforce (in relation to construction stage jobs), the existing total workforce (in relation to operational phase jobs), and the output of the existing economy (measured specifically in terms of GVA). The degree of sensitivity attributed relates to the geographic resolution and the relative resilience of the receptor type in the context of the Proposed Development.

Table 14.1 Value/sensitivity assessment

Receptor value / sensitivity	Receptor types
High	Cherwell District: (1) Construction workforce (2) Total workforce
Medium	Oxfordshire: (1) Construction workforce (2) Total workforce (3) Economic output (GVA)
Low	United Kingdom: (1) Construction workforce (2) Total workforce (3) Economic output (GVA)

14.3.5 Magnitude of impact, based on the change that the Proposed Development would have upon the receptor, is considered within the range of high, medium, low, negligible. Consideration is

given to scale, duration of impact/effect and the extent of the Proposed Development with reference to the definitions in the Tables below.

14.3.6 Three impacts of the development have been identified:

- The generation of employment during construction
- The generation of employment during occupation and operation of the new facility
- The creation of economic output (GVA) during occupation and operation of the new facility

14.3.7 The magnitude of each impact is considered separately below with explanation of the relative measures applied. With regard to the distinctions between impact magnitude, quantitative measures have been applied to bring some relative structure to the assessment, however it should be emphasised that in determining these categories and metrics a significant degree of discretion has been applied based on a qualitative understanding of the Proposed Development and its context.

Employment during construction

Table 14.2 Magnitude of impact: employment during construction

Magnitude	Description
High	>2% of the existing workforce (working in construction); Greater than 1 in 50 construction jobs
Medium	0.1% - 2% of the existing workforce (working in construction); Between 1 in 50 and 1 in 1000 construction jobs
Low	<0.1% of the existing workforce (working in construction); Less than 1 in 1000 construction jobs
Negligible	De minimis relative to the existing workforce (working in construction)

14.3.8 It is noted that construction impacts are only temporary, for the duration of the construction programme. Accordingly, the assessment of the effect of temporary construction effects, once established, are subsequently downgraded relative to the duration of the construction programme. A professional judgement is applied to the assessment of the effect and its relative significance.

14.3.9 The magnitude of the impact of creation of jobs in construction is calculated relative to the total existing workforce in the construction sector within the defined geographic area on the basis that the skills-base is relatively self-contained. The impacts are also moderated to take account of likely leakage factor for the particular geography - that is construction jobs being taken up by workers from outside the geographic assessment area - which can be significant for major construction contracts of this nature where specialist contractors are employed.

Employment during occupation and operation

14.3.10 The magnitude of employment generation impacts during operational maturity (i.e. steady-state once the proposed manufacturing facility is fully operational) are identified in the table below. The magnitude of the impact of job creation in the Proposed Development during operation is assessed relative to the total existing workforce across all sectors on the basis that the proposed advanced manufacturing facility will support a range of direct employees (i.e. engaged in the manufacturing process), indirect employees (engineers, R&D, HR, administration etc) as well as third-party contractors and temporary staff. SH note that it frequently employs individuals from other sectors (i.e. automotive engineering) due to the transferability of particular skills relevant to their operations. Accordingly, the impact of job creation is assessed relative to the wider workforce rather than solely restricting this to the manufacturing sector.

14.3.11 The level of effect is then moderated to reflect the importance of SH within the high-tech manufacturing cluster of which it is part.

Table 14.3 The generation of employment during operation

Magnitude	Description
High	>2% of the existing total workforce (>1 in 50 jobs)
Medium	0.1% - 2% of the existing total workforce (Between 1 in 50 and 1 in 1000 jobs)
Low	<0.1% of the existing total workforce (<1 in 1000 jobs)
Negligible	De minimis relative to the existing total workforce

Economic output (GVA)

14.3.12 The magnitude of potential economic output (GVA) impacts are identified in the table below. The relative impact of the potential GVA generated by the Proposed Development is considered specifically in the context of the GVA of the manufacturing sector which is considered to be the appropriate receptor as identified in Table 14.1

Table 14.4 Economic output (GVA) during operation

Magnitude	Description
High	>2% of existing economic output (manufacturing sector)
Medium	0.1% - 2% of existing economic output (manufacturing sector)
Low	<0.1% of existing economic output (manufacturing sector)
Negligible	De minimis relative to existing economic output (manufacturing sector)

Predicted Level of Effect (all categories)

14.3.13 The predicted level of effect is based upon the consideration of magnitude of impact and sensitivity of the resource/receptor to come to a professional judgement of how important this effect is.

Table 14.5 Level of effect

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

14.3.14 Any identified moderate or major effects are regarded as 'significant'.

14.3.15 Whilst effects can clearly either be regarded as either beneficial or adverse in this instance the effects will all be regarded as beneficial, for reasons explained more fully in the body of the assessment.

Consultation

14.3.16 Prior to the main Public Exhibition, a virtual presentation to local Ward Councillors was undertaken on Monday 13 September 2021 to explain the development proposals. The aim of this presentation, as well as getting the Councillors feedback, was to give Councillors information on the scheme, including the potential socio-economic impacts.

14.3.17 A public exhibition was held at the Chesterton Community Hall, Chesterton on the 14th September 2021 to which members of the public were invited to attend. This was an opportunity to view the proposals and speak with the project team.

14.3.18 Following these two events, meetings were held with Weston on the Green Parish Council on Wednesday 06 October, Chesterton and Wendlebury Parish Council on Friday 08 October.

14.3.19 Further details on the consultation that took place are contained in the Statement of Community Involvement accompanying this application.

Assumption and Limitations

14.3.20 There are currently no published technical significance criteria relating to the assessment of socio-economic effects. The assessment of effects is carried out against the current socio-economic baseline, derived from data sources referred to throughout this Chapter. As with any dataset, baseline data can change over time. This analysis uses the most recently published data. However, in some cases this may be several years old.

14.3.21 The proposed development is intended to form a new facility for SH. Its decision to relocate either to this location, or indeed elsewhere in the UK (or globally) will have a material impact on its existing manufacturing facility in Eynsham, Oxfordshire. Accordingly, the reference case has been structured to consider the net impact to account for both the closure of the existing facility (for the Oxfordshire and UK geographies) as well as the proposed new development.

14.3.22 The assessments have drawn on information provided by several parties including the applicant and their consultant team. These analyses assume the plans and information provided to SQW are accurate and that the current development proposals will be completed in accordance with the submitted plans.

14.4 Baseline conditions

Current Baseline

The Site

14.4.1 The current site comprises predominantly agricultural land with a small number of associated agricultural buildings which will be demolished as part of the proposed development. It is assumed that the existing level of employment is negligible in terms of employment supported.

The Reference Case

14.4.2 The proposed development will be compared with a 'reference case' to determine the difference it will make. The reference case is based on the applicant's view that activity at their current manufacturing facility will decline to zero by the end of 2030. Due to the specialist nature and aging condition of the current facility, it is assumed that the current facility would need to be demolished and the site redeveloped to be brought back into productive use. The analysis, therefore, assumes that no further redevelopment of their existing facility occurs prior to 2040.

14.4.3 This economic impact assessment is divided into two parts, the Operational phase and the Construction phase. Baseline data regarding existing and projected employment numbers has been provided by the proposed occupier, SH. This data has been incorporated into the calculation of the existing and projecting baseline positions on the basis that having an identified occupier brings a greater resolution and precision to the forecasting. The use of this data also reinforces the strength of the evidence supporting the existence and importance of a localised and skilled workforce within the wider Oxfordshire cryogenics cluster.

14.4.4 The table below identifies the jobs supported by the existing facility. Direct employees are described broadly as process operators. Indirect employees are engineers, research and development staff, management, HR, administration etc, and third party/visitors are contractors

and temporary staff.

Table 14.6 Existing jobs at SH's Eynsham facility[xvii]

Job type	Number of jobs
Direct	318
Indirect	210
3rd party/visitors	25
Total	553

14.4.5 The table below identifies the areas of residence of existing employees of SH's Eynsham facility. It is assumed that future employees will continue to be drawn from the same areas as currently.

Table 14.7 Percentage of employees by area of residence[xviii]

Area	Profile from existing postcodes
Cherwell	42%
Rest of Oxfordshire	48%
South-East	2%
Rest of UK	8%
Total	100%

Demography

14.4.6 Cherwell is a predominantly rural district, with population concentrated in the three main urban areas of Banbury, Bicester and Kidlington. According to ONS Population Estimates, in 2020, Cherwell District had a population of 151,846, accounting for 22% of Oxfordshire's total population of 696,880. The District's population has been generally increasing in line with Oxfordshire and England's growth rates – it increased by 10,509 or 7.4% from 2010 to 2020. Over the same period, Oxfordshire's population grew by 48,192, which is equivalent to the same overall growth rate of 7.4%. Cherwell District's population growth has, however, accelerated in the last three years and is projected to outpace those of Oxfordshire and England, at 9.7%, 6.4% and 7.3% from 2021 to 2040 respectively (ONS Population Projections).

14.4.7 In 2020, the District's proportion of working-age (16-64) residents was 61%, slightly below the Oxfordshire and England figures of 62%. From 2010 to 2020, Cherwell District and Oxfordshire both experienced a drop of four percentage points in the proportion of working-age population, relative to the national average of three percentage points. By 2040, the share of working-age residents is projected to fall to 58% and 59% for Cherwell District and Oxfordshire respectively. In 2020, the dependency ratio (the number of children and retired people divided by the number of working-age people) stood at 0.63 and 0.61 at the District and County levels – in 2040, it is projected to reach 0.74 and 0.71 respectively (relative to 0.69 nationally).

Qualifications

14.4.8 In 2020, 5.5% of Cherwell District's working-age residents had no formal qualifications, which is above the Oxfordshire-wide figure of 4.7% but below the national average of 6.2% (Annual Population Survey data). In terms of the highest qualification achieved, the District's proportion of working-age population with a Level 4 qualification or higher (i.e. at levels equivalent to higher education certificates and degrees) was 48.6% in 2020. This compares to 52.8% in Oxfordshire and 42.8% in England.

Employment

14.4.9 According to Annual Population Survey data for January-December 2020, at 82.9% and 82.4%, both Cherwell District and Oxfordshire had a higher economic activity rate than England as a whole (79.4%). In March 2020, the proportion of working-age residents claiming unemployment

benefits was 1.6% in the District, which was slightly above the Oxfordshire figure of 1.5% but below the England-wide level of 3% (ONS Claimant Count). This pattern persisted throughout the Covid-19 pandemic, with all three seeing an increase in the claimant count rate. As of August 2021, the claimant count rate in the District was 3.4%, compared to 3.1% in Oxfordshire and 5.3% in England.

14.4.10 In both Cherwell District and Oxfordshire, in 2020, the most commonly held occupations (by the residents) were professional occupations (27.0% and 30.2% respectively) and associate professional & technical occupations (16.3% and 14.9% respectively). The same two groups accounted for the biggest share of employment across England. England-wide employment was, however, more evenly spread across occupational groups, with professional occupations accounting for 22.7% of employment (Annual Population Survey data).

14.4.11 According to the most recent Business Register and Employment Survey, between 2017 and 2019, there were on average 81,000 jobs in Cherwell District . The corresponding figures for Oxfordshire and England were 380,000 and 26,884,000. The five sectors accounting for the largest share of Cherwell District's jobs were:

- Retail (12.8%),
- Manufacturing (11.1%),
- Business administration & support services (10.3%),
- Health (9.9%),
- Professional, scientific & technical activities (7.8%).

14.4.12 Across Oxfordshire, the five biggest sectors were education (15.2%), health (11.7%), professional, scientific & technical activities (11.2%), retail (8.9%) and accommodation & food services (7.2%). The biggest share of England-wide employment was in health (12.5%) and retail (9.3%), followed by professional, scientific & technical activities (9.0%), business administration & support services (9.0%) and education (8.6%).

Earnings

14.4.13 According to the latest Annual Survey of Hours and Earnings, in 2020, residence-based earnings exceeded workplace-based earnings in both Cherwell District and Oxfordshire, suggesting a relatively low concentration of workplace locations in the area. Among the District's residents working full-time, the median weekly gross pay was £601, in between the Oxfordshire and England figures of £662 and £590. At £575 per week, the median earnings of those employed full-time in the District were, however, lower than both Oxfordshire (£639) and England (£590).

Business structure

14.4.14 In 2020, there were 7,085 businesses in Cherwell District, accounting for 22% of Oxfordshire's total number of 32,250 businesses (ONS UK Business Counts). At both the District and County level, 89% were micro businesses (less than 10 employees), 9% were small (10 to 49 employees) and 2% had between 50 and 249 employees. The private sector accounted for 99% of businesses. This largely mirrors the business structure in England as a whole.

Future Baseline

Employment during construction

14.4.15 The economic impact of the construction phase is temporary, creating employment over the duration of the site development and build, with a wide range of contractors. The contractors used will have a considerable effect on the proportion of employment created in Cherwell District

and Oxfordshire. The estimates here are indicative, to provide a broad assessment of the number of jobs that would be associated with a construction project of this size.

14.4.16 The total cost of the construction and development of the site has been estimated by Savills to be around £80 million. Employment can be broadly estimated using ratios produced by Homes England, formerly the Homes & Communities Agency (HCA) in the Calculating Cost Per Job | Best Practice Note 2015 (3rd Edition)[xix] This provides an estimate of 10 jobs per £1 million for private industrial construction, in 2011 prices. This can be inflated to 2021 prices using the ONS Construction Output Price Indices (OPIs)[xx]. This gives an inflation adjusted figure of 8.38 jobs per £1 million. A total construction cost of £80 million could therefore support c.670 jobs.

Assessment of magnitude of impact

14.4.17 The magnitude of impact of the c 670 construction phase jobs is shown in Table 14.8. This is based on the assessment methodology outlined above with the number of construction jobs created by the project assessed as a percentage of the total construction jobs in the receptor geographic area.[xxi] Using our professional judgement and experience we have then moderated the assessed magnitude of impact to reflect the anticipated level of leakage (construction jobs likely to be taken up by workers from outside of the receptor area).

Table 14.8 The magnitude of impact on construction jobs

	Total number of construction jobs in receptor area	**Percentage construction jobs created by the development**	**Assessed magnitude of impact (unmoderated)**	**Moderating Factors**	**Assessed magnitude of impact (moderated)**
Cherwell District	4,000	17%	High	High level of leakage with a high proportion of workers anticipated from outside of Cherwell District	Medium (and temporary)
Oxfordshire	22,000	3%	High	Moderate level of leakage with a significant proportion of workers from outside Oxfordshire	Medium (and temporary)
UK	2,338,000	0.03%	Low	Low level of leakage anticipated outside of UK	Low (and temporary)

Assessment of effect

14.4.18 Following the methodology outlined above we have cross referenced the receptor sensitivity with the assessed magnitude of impact for each receptor area and moderated this based on our professional judgement to reflect the temporary nature of the impact. The results are shown in Table 14.9.

Table 14.9 The level of effect on construction jobs

	Receptor Sensitivity	Assessed magnitude of impact	Assessed level of effect (unmoderated)	Moderating Factors	Assessed magnitude of impact (moderated)
Cherwell District	High	Medium	Major	Temporary effect - construction period only	Moderate
Oxfordshire	Medium	Medium	Moderate	Temporary effect - construction period only	Minor
UK	Low	Low	Minor	Temporary effect - construction period only	Negligible

Employment during operation

14.4.19 As per the stated Reference Case, the Future Baseline takes into account the projected employment figures split across SH's existing factory in Eynsham, and the Proposed Development. As detailed more fully in the supporting Socio-Economic Impact Statement, its intention is to wind down operations at its existing facility gradually over time until closure in 2030; in parallel, it will target initial opening of its facility at the Proposed Development in 2024 until reaching maximum capacity in c. 2040 as it develops its new product lines and scales up manufacturing capacity.

14.4.20 Based on SH's projections between 2022 and 2040 direct employees increase by 696 (from 318 to 1,014) and the indirect jobs grow by 91 (210 to 301). When third party / visitor jobs are also taken into account the total number of jobs is forecast to grow from 553 to 1345 over the period.

Employment multipliers

14.4.21 The current and any future, additional economic activity will have knock-on effects through supply chains and as a result of the wages and profits that are re-spent in the economy. There are two types of multipliers:

- Type I multipliers reflect the supplier linkage effects (sometimes referred to as indirect effects) arise as beneficiaries increase their demands for goods and services from supplier businesses. These businesses in turn increase their demands for goods and services and so on down the supply chain: and
- Type 2 multipliers include both the supplier linkage effects described above and the income effect as the increased income is re-spent on final products.

14.4.22 The value of these multiplier effects varies depending on the geographical area. For example, the multiplier effects for a smaller area such as a neighbourhood or town, will be much smaller than for a region or nation. In this case we have used multipliers for two areas, Oxfordshire and the UK as a whole. The multipliers for the UK are a lot higher because they capture more of the supply chain and more of the re-spent earnings.

14.4.23 Employment multipliers at a UK level are available from the Office for National Statistics (ONS), but only for Type 1 effects (supply chain). The analysis here uses the ONS' Standard Industrial Classification Code 26 (SIC 26, manufacture of computer, electronic and optical products) which gives a Type 1 employment multiplier of 1.61 for the UK[xxii].

14.4.24 To convert this to a Type 2 multiplier we have used the ratio of Type 1 and Type 2 multipliers

reported in the Scottish Input Output Tables for the same Standard Industrial Classification Code. The Scottish multipliers are the only public and robust source available at a sufficiently detailed industrial categorisation. Applying this ratio gives a Type 2 multiplier value to 1.98 for the UK.

14.4.25 For Oxfordshire, the process is slightly different. There are no industry or sector multiplier values at this level of geography. Instead, Homes England Additionality Guidance[xxiii] provides some broad guidance on the values that could be used at different geographies. For activities with limited local supply linkages and induced or income effects it suggests a multiplier effect between 1.05 at a neighbourhood level to 1.3 at a regional level. Oxfordshire is between these two geographies and the analysis therefore uses 1.2 as a Type 2 multiplier.

Table 14.10 Estimated employment multipliers[xxiv]

	UK Type 2 multiplier estimate	**Oxfordshire Type 2 multiplier estimate**
Employment	1.98	1.20

Displacement

14.4.26 Displacement is the extent to which an increase in activity in one place is at the expense of activity somewhere else. Although there will be no product market displacement due to the nature of the product, there may be some labour market displacement given the high level of employment in Oxfordshire and the demand for technical skills. In other words, some of the additional employment created by the development will impact on the labour market making it harder for other businesses to recruit. From the employment projections, more than half of the employment impact of the proposal is in retaining the existing workforce, so there is no displacement effect. The project creates 792 new posts (in addition to retaining the 553 existing posts). Most of these are direct process operators, and will be trained, rather than necessarily requiring significant experience. This is likely to limit potential displacement. Based on the Homes England Additionality Guide, the analysis here uses an estimate of low displacement (25%) described as “there are expected to be some displacement effects, although only to a limited extent”. This is applied to the number and value of the new posts created.

Net impact on employment

14.4.27 Applying displacement and multipliers estimates gives the profile of change in employment shown in in the Figure below. This is the change in employment across both sites arising from the proposed development, compared to the reference case. The number of additional jobs is relatively small over the first few years as activity continues at the old site until 2030.

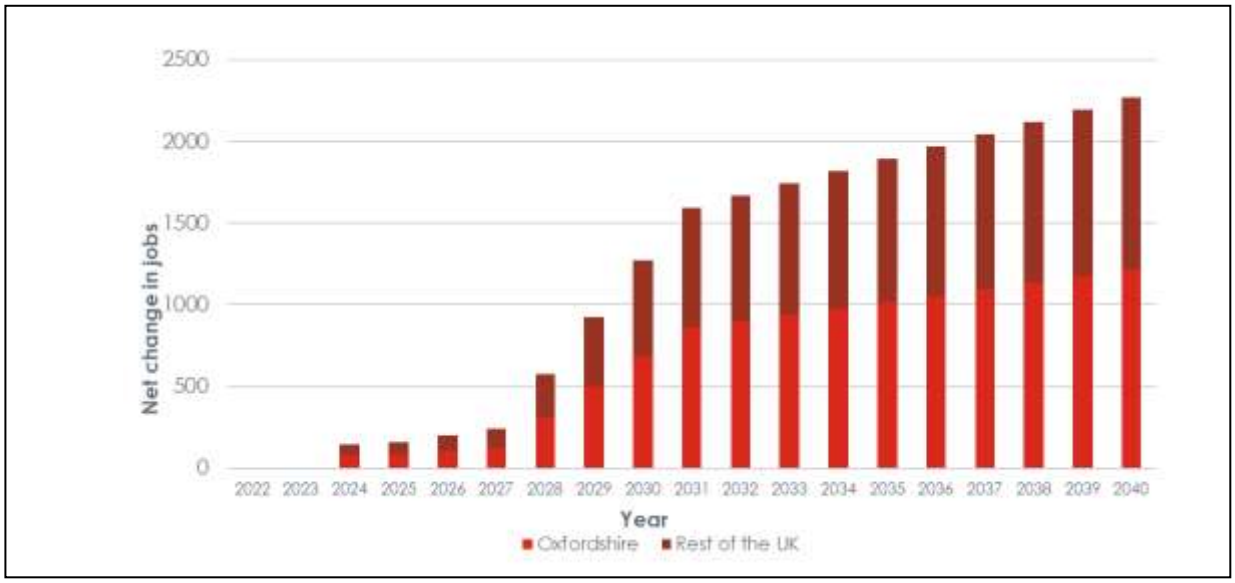


Figure 14.1 Change in employment across both sites arising from the proposed development compared to the reference case[xxv]

14.4.28 The Figure below shows the effect of the Proposal relative to the current position, that is, the number of new posts created (the top part of the chart) and the fall in employment if the Proposal does not proceed. With the project, employment in Oxfordshire would be expected to rise by 618. Without it, employment falls by 598. The Proposal therefore has a net effect of 1,216 jobs by 2040.

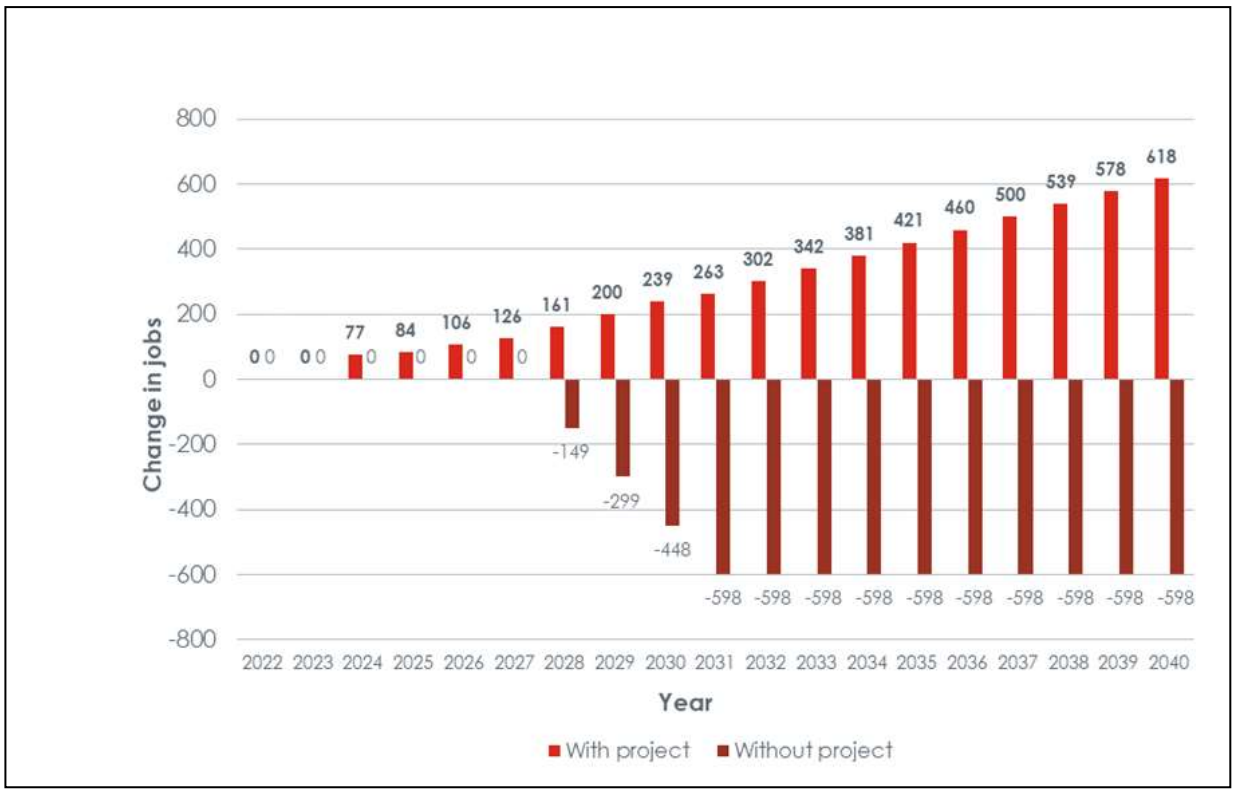


Figure 14.2 Change in employment with and without proposed development

14.4.29 The net change combines the effects of the 792 new posts created and the retention of the 553

current posts to give the 1,345 jobs. After applying displacement to the new posts gives 1,147 net jobs. At a UK level, applying the employment multiplier of 1.98 gives 2,268 in total by 2040. 90% of the jobs at the plants are Oxfordshire residents (1,121) and after allowing for displacement and the multiplier of 1.2, this gives 1,216 net change in jobs in Oxfordshire. This is around half the UK total.

14.4.30 The value to the rest of the UK is substantial because of the importance of the wider UK supply chain (reflected by the larger multiplier effects at a UK level).

14.4.31 The analysis above provides estimates for net employment change at the UK and Oxfordshire levels; for the purposes of this assessment, in order to undertake an assessment of the potential impact of operational jobs in Cherwell District, and in the absence of further data, we will assume that the distribution of jobs at the new facility reflects the percentage of employees presently living in Cherwell District and travelling to the existing Eynsham facility. At present 42% of the existing jobs are in Cherwell and 90% of the jobs are in Oxfordshire; thus, we can deduce that 47% of the Oxfordshire jobs are undertaken by people living in Cherwell District. This is possibly a conservative estimate as with the move of the new facility into Cherwell it is likely that the percentage of employees living locally may rise over time. This method therefore potentially underestimates the long-term beneficial impacts within Cherwell.

14.4.32 Applying this 47% to the net additional 1,216 jobs created in Oxfordshire (after displacement and multiplier effects), we therefore estimate that a total increase of 571 operational phase jobs may be anticipated in Cherwell once the new facility is fully operational.

Assessment of magnitude of impact

14.4.33 The magnitude of impact of the occupational phase jobs is shown in Table 14.11. This is based on the assessment methodology outlined above with the number of net jobs created by the project within the geographic area of effect assessed as a percentage of the total employment count / workforce in the receptor geographic area based on 2019 ONS data.[xxvi]

Table 14.11 The magnitude of impact on occupational phase jobs

	Total employment count in receptor area	**Net additional jobs created by the project within the receptor area**	**Percentage of jobs created by the development relative to total employment count**	**Assessed magnitude of impact**
Cherwell District	85,000	571	0.67%	Medium
Oxfordshire	389,000	1,216	0.31%	Medium
UK	35,557,000	2,268	<0.01%	Low

Assessment of effect

14.4.34 Following the methodology outlined above we have cross referenced the receptor sensitivity with the assessed magnitude of impact for each receptor area and moderated this based on our professional judgement to reflect the potential impact on job creation specifically within the high-tech manufacturing cluster of which SH is an important part. The results are shown in Table 14.12.

Table 14.12 The level of effect on construction jobs

	Receptor Sensitivity	Assessed magnitude of impact	Assessed level of effect (unmoderated)	Moderating Factors	Assessed magnitude of impact (moderated)
Cherwell District	High	Medium	Major	Important part of high-tech manufacturing cluster	Major
Oxfordshire	Medium	Medium	Moderate	Important part of high-tech manufacturing cluster	Major
UK	Low	Low	Minor		Minor

Economic output (GVA)

14.4.35 Data on the forecast financial performance of the new and current sites is not available. To provide some indication of these values we have used the Office for National Statistics Annual Business Survey data (2019 released 24 June 2021)[xxvii]. This provides turnover, GVA and employment figures for specific sectors. In this case the analysis uses SIC 26.6 (manufacture of irradiation, electromedical and electrotherapeutic equipment). An alternative would be company accounts, but at a UK level these included a lot of different activities and would not capture the specific site activities very well.

14.4.36 The ABS estimates 140 enterprises in this category and allows us to calculate ratios per employee, averaged over five years. These are set out in the table below.

Table 14.13 Annual Business Survey ratios for SIC26.6[xxviii]

Ratio	£s (2019 values)
Turnover per employee	334,892
GVA per employee	108,738
Employment costs per employee	55,476

14.4.37 These ratios are applied to the *net additional* employment at the site to give estimates of the turnover and GVA to 2040.

Output and GVA multipliers

14.4.38 For commercial reasons SH is unable to disclose the value or distribution of suppliers that are used. The estimates here use the UK multiplier values for SIC 26[xxix]. These are Type 1 multipliers which exclude the effects of the re-spending of wages and profits in the economy. As was done for employment we have used the ratio of Type 1 and Type 2 multipliers reported in the Scottish Input Output Tables to uplift the UK Type 1 values to provide an estimate for Type 2.

14.4.39 For Oxfordshire, the analysis uses 1.2 as described above from the Homes England Additionality Guidance[xxx]. This is used as a Type 2 multiplier. The multiplier values applied are shown in the Table below.

Table 14.14 Output and GVA multipliers[xxxi]

	UK	Oxfordshire
Output	1.71	1.20
GVA	1.73	1.20

Displacement

14.4.40 As described in the employment section, this is based on the Homes England Additionality Guide and uses low displacement (25%) primarily to take account of a modest labour market impact.

Discounting (present value)

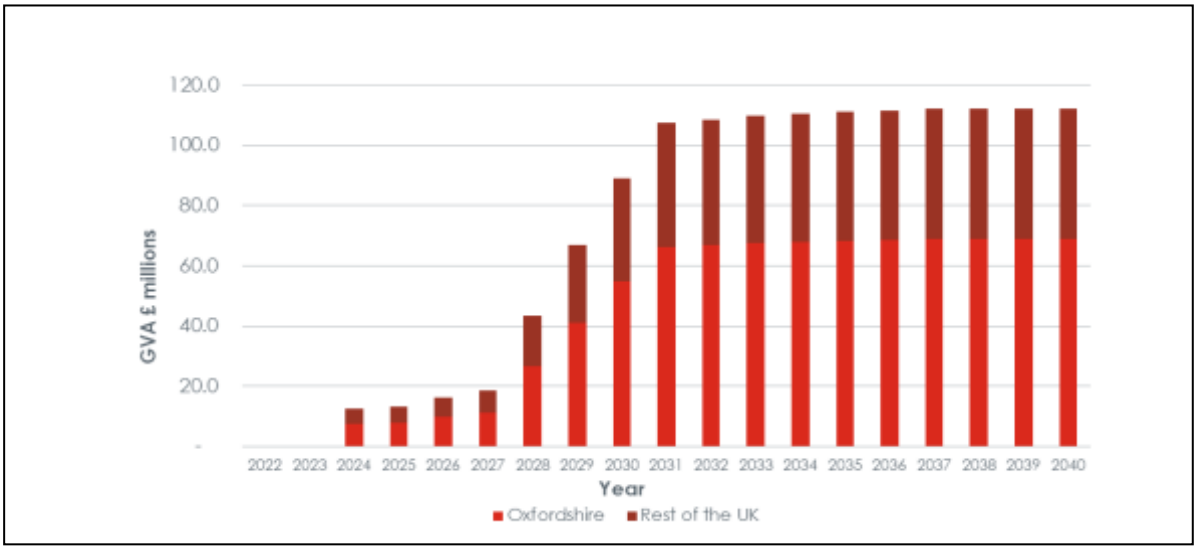
14.4.41 Financial values are presented in 2021 prices but are discounted at the Treasury Green Book rate of 3.5%.

Net impact on GVA

14.4.42 The following Chart shows the Present Value of the net GVA increase estimated from the proposal in Oxfordshire and the rest of the UK. The growth in GVA is slower than the growth in employment shown previously, because of the discounting.

14.4.43 Over the whole period, to 2040, the additional GVA would be around £820 million in Oxfordshire and £360 million in the rest of the UK. By 2040, these estimates suggest that the proposed development would add more than £60 million of GVA a year to the Oxfordshire economy.

14.4.44 For comparison, GVA from manufacturing in Oxfordshire was £2.77 billion in 2018, including £740 million in Cherwell[xxxii].



Present Value of net GVA increase from proposal

Assessment of magnitude of impact

14.4.45 For the purposes of assessing the potential magnitude of impact we have compared the additional GVA derived from the proposed development with the size of the Oxfordshire and UK manufacturing economy. Strictly, the GVA for the project presented above includes economic activity stimulated in other sectors due to multiplier effects, however it is anticipated that many of the supply chain effects will be within the manufacturing economy and furthermore, a comparison of the GVA for the whole economy would underrepresent the potential importance and impact within the manufacturing sector. The assessment of impact is set out in Table 14.15:

Table 14.15 The magnitude of impact on the manufacturing economy (GVA)

	Total GVA of the manufacturing sector in the receptor area	Net additional GVA created by the project per annum	Percentage increase in GVA	Assessed magnitude of impact
Oxfordshire	£2.77bn	£60m	2.2%	High
UK	£192bn	£110m	0.06%	Low

Assessment of effect

14.4.46 Following the methodology outlined above we have cross referenced the receptor sensitivity with the assessed magnitude of impact for each receptor area and moderated this based on our professional judgement to reflect the importance of the effect on the high-tech manufacturing cluster in which SH is an important part. The results are shown in Table 14.16

Table 14.16 The level of effect on the manufacturing economy (GVA)

	Receptor Sensitivity	Assessed magnitude of impact	Assessed level of effect (unmoderated)	Moderating Factors	Assessed magnitude of impact (moderated)
Oxfordshire	Medium	High	Major	Important part of high-tech manufacturing cluster	Major
UK	Low	Low	Minor		Minor

14.5 Mitigation

14.5.1 The socio-economic impacts assessed in this chapter - the creation of jobs both during the construction and operational phase and increased GVA at various scales - are all considered to be beneficial impacts. Mitigation of those impacts is not therefore required.

14.5.2 However, measures that facilitate the uptake of employment opportunities by Cherwell or Oxfordshire residents and retain expenditure within the local economy have the potential to increase the economic benefits experienced at a local scale.

Construction Phase

14.5.3 The generation of jobs during construction is considered beneficial. Given the temporary duration of these jobs the effect in our assessment has been downgraded due to the limited duration of the impact.

14.5.4 A dimension of this assessment of impact which is not quite so easily captured is the associated effect of job creation on the skills of the existing workforce and the training of new entrants. It is noted that Cherwell District Council's adopted Development Contributions SPD will require a number of apprenticeships to be delivered during the course of development, to be delivered via an Employment and Skills Training Plan secured via S106 Agreement.

14.5.5 It is too early in the design and planning process, ahead of construction, to accurately project the number of apprenticeships which will be delivered as part of the construction of this Proposed Development, and this will be established during the S106 process. The creation of

construction apprenticeships has the potential to increase the accessibility of construction stage jobs for local people and assist them into longer term employment within the sector.

Operational Phase

14.5.6 As detailed in the assessment set out above in this chapter none of the identified effects are considered to be adverse, and whilst some effects might well be significant at a local, or indeed County-wide, scale given the beneficial nature of these effects (i.e. employment generation and the generation of GVA output) no mitigations are recommended.

14.5.7 It is however notable that SH have a significant Social Value programme including training and outreach programmes that may aid the accessibility and uptake of jobs locally, further details of which are set out in the separate Socio-Economic Impact Assessment prepared by SQW.

14.6 Residual effects

Construction Phase

14.6.1 The potential scale of an apprenticeship programme has not yet been determined and due to the temporal nature of the construction project is likely to be modest. It is therefore unlikely to significantly change the magnitude of beneficial impacts and therefore the classification of the level of effect on jobs at any of the geographic scales assessed above.

14.6.2 It is therefore our assessment that the residual level of effect on construction stage jobs at all scales remains as assessed above.

Operational Phase

14.6.3 No specific mitigation measures are proposed for the operational phase impacts and therefore the level of effect on jobs and GVA at all scales remains as assessed above.

14.7 Implications of Climate Change

14.7.1 It is not considered that climate change will have any implications on the potential economic impacts identified either in the magnitude of their impact or the significance of their effect.

14.7.2 Whilst not expressly climate change driven, it is notable that the rationale underpinning SH's decision to invest in new magnet technologies include (a) the imperative to lessen reliance on a non-renewable natural resource (helium) and (b) the development of a technology which is more efficient to run (i.e. 'dry' magnets are more energy efficient relative to 'wet' magnet technology), thus being less energy intensive during operation, with corresponding potential carbon footprint benefits.

14.8 Cumulative effects

14.8.1 The following table sets out potential development projects - extracted from the full list of potential developments provided in Chapter 3 that have been considered as part of this cumulative assessment on the basis that they each contain a potentially significant quantum of proposed employment floorspace. It should be noted that the proposed mix of land uses has been extracted directly from source information (i.e. Cherwell Local Plan and/or planning applications); recent updates to the Use Classes Order have clearly impacted on applicable use classes where policy documents pre-date this change (i.e. prior to September 2020), however for simplicity we have not updated the Use Class reference of any adopted planning policy allocations.

Table 14.17 Relevant Cumulative Proposed Developments

Map ref.	Proposed Development	Estimated jobs	Mix of uses
16	CDC Planning Ref. 21/03267/OUT - OS Parcel 2636 NW Of Baynards House Ardley	TBC	c. 100,000 sqm of logistics (Use Class B8) and c. 7,000 sqm of ancillary office (Use Class E(g)(i) floorspace only)
16	CDC Planning Ref. 21/03268/OUT - OS Parcel 2636 NW Of Baynards House Ardley	TBC	c. 270,000 sqm of logistics (Use Class B8) and c. 10,000 sq m of ancillary office (Use Class E(g)(i) floorspace only)
1	Policy Bicester 1: North-West Bicester Eco-Town	6,000 (3,000 during the plan period)	B1, B2, B8 - 'limited B2 and B8'
2	Policy Bicester 2: Graven Hill	2,000	B1, B2, B8
4	Policy Bicester 4: Bicester Business Park	Up to 6,000 jobs	B1a focus - a high-quality office development
10	Policy Bicester 10: Bicester Gateway	Up to 3,500 jobs	B1 - knowledge economy focus
11	Policy Bicester 11: Employment Land at North-East Bicester	Up to 1,000 jobs	B1, B2, B8
15	National Infrastructure Planning Scoping Opinion 15th July 2021 - Oxfordshire Strategic Rail Freight Interchange	TBC	up to 675,000 sqm of logistics (Use Class B8)

14.8.2 In terms of cumulative effects, it is important to note that the Proposed Development principally comprises Class B2 floorspace to support advanced manufacturing facilities with ancillary office space for a very specialist occupier, SH. The nature and scale of the Proposed Development is therefore relatively unique when compared with the projects identified as potentially generating cumulative effects.

14.8.3 It is notable that only three of the eight projects identified include any scope for Class B2 floorspace. Of these projects Project 1 (Bicester Eco-Town) is indicated as including 'limited B2 and B8 floorspace'; and the scale of Project 11 (employment land at north-east Bicester) at up to 1,000 jobs is smaller than the Proposed Development. Only the potential development at Graven Hill (Project 2) is potentially of a scale and use mix comparable to the Proposed Development.

14.8.4 Notwithstanding the relative uniqueness of the Proposed Development in this context, from the perspective of considering cumulative effects as considered in this Chapter - relating to construction employment, operational employment and GVA during the operational stage - it is considered that the cumulative interaction of the effects of these could likely be regarded as beneficial.

14.8.5 It is of particular note that a key reason for SH choosing to remain in Oxfordshire are cluster-related benefits - articulated more fully in the supporting Socio-Economic Impact Statement - which includes their desire to remain close to a skilled workforce both in terms of their existing employees and potential recruits from other transferable and linked sectors (including within the cryogenics cluster, of which they are part, and the automotive sector). Whilst not necessarily all manufacturing-oriented developments, the potential focus - indicatively at least - of some of

these identified cumulative projects explicitly focus on knowledge-economy type uses, and most have the capacity to support a broad range of occupiers and sectors, all of which could serve to positively reinforce the workforce depth, skills profile and resilience of the Oxfordshire economy, including in the cryogenics cluster which SH forms part of and which is a clearly identified strength and priority in the Local Industrial Strategy.

14.8.6 In summary, whilst the socio-economic effects of these proposed developments are not yet known, it is considered that each will potentially result in employment and GVA benefits which collectively will be positive for Cherwell District and aligned with local, regional and national policy priorities, not least the recognition in the NPPF of the importance of supporting and reinforcing clusters of economic activity. These proposed developments could support the continued growth of Oxfordshire's productive and high-tech sectors, reinforcing a cluster of which SH is a key part. Cumulative socio-economic effects are therefore, based on the limited information available, considered to likely be positive in effect.

14.9 Summary

14.9.1 This chapter assesses the socio-economic impact of the proposed development. It has identified three receptors: the construction workforce; the total workforce and the economic output (GVA). Impacts and the level of effect on those receptors have been assessed at different geographic scales: Cherwell District, Oxfordshire and the UK.

14.9.2 Our assessment has concluded that the following significant impacts are anticipated as a result of the proposed development:

Construction Phase:

- Increase in construction jobs during construction period at the Cherwell District Scale.

Operational Phase:

- Increase in total jobs in a high-tech manufacturing cluster at the Cherwell District and Oxfordshire scale.
- Increase in economic output (GVA) at the Oxford scale [Cherwell scale not assessed for this metric due to lack of available data though it is reasonable to assume that this will also be significant].

14.9.3 All of the impacts are considered to be beneficial and therefore no mitigation is required. A construction stage apprenticeship scheme, as required by local planning policy, would however help secure a greater proportion of the beneficial impact of construction stage job creation locally.

14.9.4 A summary of the assessment is set out in Table 14.18 overleaf.

Table 14.18 Summary of effects

Receptor	Sensitivity of Receptor	Nature of potential impact	Proposed mitigation	Residual effect	Significant / not significant
Construction phase					
Cherwell District construction workforce	High	Increase in construction jobs during construction period	None - this is a benefit Construction Apprenticeship scheme may help deliver increased skills and help those entering the workforce and to access jobs - thus retaining an increased proportion of benefits locally	Moderate	Significant
Oxfordshire construction workforce	Medium	Increase in construction jobs during construction period	None - this is a benefit Construction Apprenticeship scheme may help deliver increased skills and help those entering the workforce and to access jobs - thus retaining an increased proportion of benefits locally	Minor	Not significant
UK construction workforce	Low	Increase in construction jobs during construction period	None - this is a benefit	Negligible	Not significant
Operational phase					
Cherwell District total workforce	High	Increase in jobs in high-tech manufacturing cluster	None - this is a benefit	Major	Significant
Oxfordshire total workforce	Medium	Increase in jobs in high-tech manufacturing cluster	None - this is a benefit	Major	Significant
UK total workforce	Low	Increase in jobs	None - this is a benefit	Minor	Not significant
Oxfordshire Economic Output (GVA)	Medium	Increase in GVA	None - this is a benefit	Major	Significant
UK Economic Output (GVA)	Low	Increase in GVA	None - this is a benefit	Minor	Not significant

14.10 References

[i] GVA represents the new economic activity generated by new business activity. It is equivalent to sales less the total inputs of goods and services associated with those sales.
[ii] National Planning Policy Framework (2021), Paragraph 7
[iii] National Planning Policy Framework (2021), Paragraph 8
[iv] National Planning Policy Framework (2021), Paragraph 81
[v] National Planning Policy Framework (2021), Paragraph 82(a)
[vi] Oxfordshire Local Enterprise Partnership (September 2019) Local Industrial Strategy
[vii] National Planning Policy Framework (2021), Paragraph 82(d)
[viii] National Planning Policy Framework (2021), Paragraph 83
[ix] Department for Business, Energy and Industrial Strategy (July 2021) UK Innovation Strategy: Leading the future by creating it
[x] HM Government (2021) Life Sciences Vision
[xi] OXLEP, SEMLEP, BTVLEP and Cambridgeshire and Peterborough Combined Authority Economic Vision (April 2019)Oxford Cambridge Arc: Home of the new innovation economy. ,
[xii] HM Government (July 2021) Creating a vision for the Oxford-Cambridge Arc – Consultation.
[xiii] Oxfordshire Local Enterprise Partnership (September 2019) Local Industrial Strategy
[xiv] Cherwell Local Strategic Partnership (2011) Economic Development Strategy for Cherwell, North Oxfordshire
[xv] Cherwell District Council (2015) Cherwell Local Plan, Para B.31
[xvi] Cherwell District Council (2015) Cherwell Local Plan, Para B.33
[xvii] Data provided by Siemens Healthineers Magnet Technology (2021)
[xviii] Data provided by Siemens Healthineers Magnet Technology (2021)
[xix] http://www.nwueu.ac.uk/NWUEU/LatestUpdates/PDF/CPJ%20BPN%20%202015%203rd%20Edition%20-%20Final.pdf
[xx] https://www.ons.gov.uk/businessindustryandtrade/constructionindustry/datasets/interimconstructionoutputpriceindices
[xxi] Cherwell & Oxfordshire: ONS Business Register and Employment Survey: open access. 2019 data from Nomis. UK data: ONS workforce jobs by industry (SIC2007) seasonally adjusted June 2019.
[xxii] ONS UK employment multiplier values https://www.ons.gov.uk/file?uri=/economy/nationalaccounts/supplyandusetables/adhocs/009746typeiukemploymentmultipliersandeffectsreferenceyear2015/ftemultipliersfull.xls
[xxiii] Homes England Additionality Guidance suggests that for activities with a limited local supply linkages and induced or income effects, the multiplier effect will be between 1.05 at a neighbourhood level to 1.3 at a regional level. For Oxfordshire we have used 1.2. See https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/378177/additionality_guide_2014_full.pdf
[xxiv] Source: SIC 26.02: Computer, electronic and optical products
[xxv] SQW estimates based on Siemens Healthineers Magnet Technology employment projections
[xxvi] Cherwell & Oxfordshire: ONS Business Register and Employment Survey: open access. 2019 data from Nomis. UK data: ONS workforce jobs by industry (SIC2007) seasonally adjusted June 2019.
[xxvii] Office for National Statistics Annual Business Survey data (2019 released 24 June 2021 https://www.ons.gov.uk/file?uri=%2fbusinessindustryandtrade%2fbusiness%2fbusinessservic

es%2fdatasets%2fuknonfinancialbusinesseconomyannualbusinesssurveysectionsas%2fcurrent/abssectionsas.xls

[xxviii] ONS ABS 2019, SIC 26.6

[xxix] ONS United Kingdom Input-Output Analytical Tables, 2017 https://www.ons.gov.uk/file?uri=%2feconomy%2fnationalaccounts%2fsupplyandusetables%2fdatasets%2fukinputoutputanalyticaltablesdetailed%2f2017/nasu1719pr.xlsx

[xxx] Homes England Additionality Guidance suggests that for activities with a limited local supply linkages and induced or income effects, the multiplier effect will be between 1.05 at a neighbourhood level to 1.3 at a regional level. For Oxfordshire we have used 1.2. see https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/378177/additionality_guide_2014_full.pdf

[xxxi] ONS United Kingdom Input-Output Analytical Tables, 2017 and Homes England Additionality Guidance

[xxxii] Regional gross value added (balanced) by industry: local authorities by NUTS1 region - https://www.ons.gov.uk/file?uri=%2feconomy%2fgrossvalueaddedgva%2fdatasets%2fregionalgrossvalueaddedbalancedlocalauthoritiesbynuts1region%2fukjsoutheast/regionalgrossvalueaddedbalancedbyindustrylocalauthoritiesukjsoutheast.xlsx

15 Summary of mitigation, residual and interaction effects

15.1 Introduction

15.1.1 This final Chapter provides a summary of the proposed mitigation, residual effects predicted with the mitigation in place (15.2 – 15.11), and potential interaction effects caused by a combination of impacts on a receptor (15.12). This Chapter does not provide a summary of the ES. A Non-Technical Summary is provided separately.

15.1.2 The summary of proposed mitigation measures is provided to assist the formulation of planning conditions and clauses of any legal agreement required, to ensure that the measures contained and assessed in this ES are implemented (Table 15.13).

15.1.3 If planning consent is granted, it is likely to include a condition ensuring that the development takes place in accordance with the parameters plans, which therefore secures the implementation of the inherent mitigation measures. Additional mitigation is not generally capable of being shown on assessment parameter plans and other planning application drawings. It is this additional mitigation that is detailed below.

15.1.4 These measures together with other elements of the planning application demonstrate the Applicants' commitment to the implementation of necessary mitigation measures in agreement with the local planning authority.

15.2 Transport and access

15.2.1 The impact of construction traffic has been assessed as negligible, and as no significant effect would occur, no mitigation is required. However, a Construction Traffic Management Plan will be submitted to CDC and agreed as a management control measure. This will include information relating to construction vehicle routing as well as operational hours, wheel washing, monitoring and reviewing the construction programme.

15.2.2 Residual effects of the completed development in operation are shown in the table below.

Table 15.1 Transport

Receptor	Residual Effect	Significant?
Pedestrian Severance	Minor beneficial	No
Pedestrian Amenity	Minor beneficial	No
Pedestrian / Cyclist Delay	Minor beneficial	No
Fear and Intimidation	Negligible	No
Driver Delay	Negligible	No
Accidents and Safety	Minor beneficial	No

15.3 Air quality

15.3.1 Dust emissions caused by demolition and construction activities will be controlled using best practice management measures via the implementation of a Construction Environmental Management Plan. This will control activities in proximity to surrounding human receptors, deemed to be of high sensitivity, and ecological receptors, characterised as of low sensitivity.

15.3.2 The assessment has demonstrated that the overall effect of development-generated traffic emissions would not have a significant impact on local air quality. Whilst mitigation is not required, the reduction of pollutant emissions from road traffic associated with the proposal will be promoted through implementation of Travel Plan.

15.3.3 Residual effects are shown in the table below.

Table 15.2 Air quality

Potential impact	Residual effect	Significant?
Particulate matter / dust deposition to human / ecological receptors	Negligible	No
NO_2, PM_{10} and $PM_{2.5}$ pollutants affecting human / ecological receptors	Negligible	No

15.4 Noise and vibration

15.4.1 A Construction Environmental Management Plan will be submitted to CDC for approval prior to commencement of construction. The objectives of the CEMP will be to control and limit noise and vibration levels, so far as is reasonably practicable, to minimise disturbance following the recommendations set out in paragraph 7.5.1.

15.4.2 No significant effects have been identified associated with noise from operation of the Proposed Development affecting existing receptors during the daytime, or through the night.

15.4.3 The potential change in road traffic noise levels near the A41 and the A34 have been assessed. For each of these links, the impact and associated effect is considered negligible, such that mitigation for road traffic noise at existing receptors is not required.

Table 15.3 Noise and vibration

Potential impact	Residual effect	Significant?
Construction noise and vibration	Negligible	No
Construction traffic noise	Negligible	No
Noise from completed development		
Vehicle movements/fixed plant	Negligible to low	No
Off-site road traffic noise	Negligible	No

15.5 Biodiversity

15.5.1 Mitigation in the Construction Environmental Management Plan will identify any specific locations for the protection of ecology, in particular to ensure appropriate management and operational systems are in place to avoid or minimise adverse pollution effects in the vicinity of the watercourse and the area of ancient woodland.

15.5.2 An Ecological Construction Method Statement will set out in detail the measures to be implemented to protect important ecological features, overseen by an appointed Ecological Clerk of Works. This document will cross reference with the CEMP, where relevant, and a detailed Arboricultural Method Statement which will set out measures to protect trees and hedgerows during the construction phase.

15.5.3 A Landscape and Ecological Management Plan will detail the measures to be implemented to ensure the successful installation of new habitats/features and the long-term maintenance and management of both existing and new habitats/features proposed as part of the soft landscape scheme.

15.5.4 Overall, the GI proposals include a mix of public open space sports/play areas flood attenuation and semi-natural habitats, integrated with and linked to the existing retained habitats at the Site, which will be restored and enhanced as part of the GI.

15.5.5 Residual effects are set out in the Table below, none of what are categorised as significant in the EIA.

Table 15.4 Biodiversity

Receptor	Residual effect	Significant?
Construction		
Bowlers Copse CDWS	Negligible	No
Habitats / vegetation	Negligible	No
Broad-leaved semi-natural woodland	Beneficial	Yes, at a local level
Fauna	Negligible	No
Completed Development		
Bowlers Copse CDWS	Negligible	No
Habitats / vegetation	Negligible	
Fauna	Negligible	

15.6 Landscape and visual effects

15.6.1 Mitigation at the construction phase will be controlled by a CEMP to protect retained features and implement best site practice.

15.6.2 The existing landscape resource and the visual receptors have been considered by the planning and design process and have informed the application scheme. This has entailed collaboration between landscape, ecological and heritage professionals. The key aspect of the mitigation strategy is the detailed landscape proposals prepared by EDP. The key landscape design principles include:

- Existing boundary hedgerows and trees would be retained where possible (with buffers to the proposed development), reinforced and brought into regular, long-term management;
- Creation of a landscaped buffer from proposed development zones to protect and enhance retained boundary features of landscape and ecological interest;
- Provision of structural landscaping, native trees and shrubs that reflect the local context, particularly within the northern areas of the Application Site, existing landscape features would be reinforced with additional planting;
- Provision of landscape screening, in the form of landscaped bunds and native tree planting, to properties and PRoW in close proximity to the site;
- Native heavy standard tree planting within landscape buffers to fragment views of the proposed development, particularly for receptors in close proximity to the north-eastern and eastern boundaries;
- Additional structural landscaping proposed to the western boundary, enhancing the landscape corridor and providing visual screening from the M40 and to the west;
- New scrub planting to include blackthorn to provide new egg-laying opportunities for brown hairstreak butterflies, and shelter for small mammals, birds and other wildlife;
- Species-rich wildflower grassland to be created within areas of green open space to provide nectar-rich habitats for pollinating insects such as bees, butterflies and moths;
- The proposals should complement the existing landscape features of the Application Site and character of adjacent uses and rural areas.

15.6.3 Residual effects are set out in the Table below.

Table 15.5 Landscape and visual

Receptor	Residual effect	Significant?

Construction (Short-term, adverse and temporary effects)		
Landscape Character of the Application Site and Context	Major/Moderate	Significant
On-site Landscape Features	Major/Moderate	Significant
Clay Vale LCT	Moderate	Significant
Landscape character after dark	Moderate/Minor	Not Significant
Visual receptors travelling directly past the Application Site on the A41	Moderate/Minor	Significant
Road users and pedestrians in the wider context only	Minor	Not Significant
PRoW users in the wider context only	Moderate/Minor	Not Significant
Visual receptors (ProW and minor road users) in close proximity to the Application Site	Major/Moderate	Significant
Residential receptors (Little Chesterton)	Major/Moderate	Significant
Residential receptors (wider context)	Moderate/Minor	Not Significant
Operation (Year 1) (**Medium-term, adverse and temporary effects)**		
Landscape Character of the Application Site and Context	Moderate	Significant
On-site Landscape Features	Moderate	Significant
Clay Vale LCT	Minor	Not Significant
Landscape character after dark	Moderate/Minor	Not Significant
Visual receptors travelling directly past the Application Site on the A41	Moderate/Minor	Significant
Road users and pedestrians in the wider context only	Minor	Not Significant
PRoW users in the wider context only	Moderate/Minor	Not Significant
Visual receptors (PRoW and minor road users) in close proximity to the Application Site	Major/Moderate	Significant
Residential receptors (Little Chesterton)	Moderate	Significant
Residential receptors (wider context)	Moderate/Minor	Not Significant
Operation (Year 15) (**Long-term, adverse and permanent effects)**		
Landscape Character of the Application Site and Context	Moderate/Minor	Not Significant
On-site Landscape Features	Moderate (Neutral)	Significant
Clay Vale LCT	Minor	Not Significant
Landscape character after dark	Minor	Not Significant
Visual receptors travelling directly past the Application Site on the A41	Minor	Not Significant
Road users and pedestrians in the wider context only	Minor/Negligible	Not Significant
PRoW users in the wider context only	Minor	Not Significant
Visual receptors (PRoW and minor road users) in close proximity to the Application Site	Moderate	Significant
Residential receptors (Little Chesterton)	Moderate/Minor	Significant
Residential receptors (wider context)	Moderate/Minor	Not Significant

15.7 Heritage

15.7.1 The potential physical loss of sub-surface archaeology will be addressed through a programme of archaeological works, to be agreed with Cherwell District Council, on the advice of Oxfordshire County Council's Lead Archaeologist prior to the commencement of the Proposed Development. Archaeological mitigation work would either take the form of excavation in advance of groundworks, or the monitoring and recording of groundworks associated with the

construction of the Proposed Development. The results of the fieldwork and any post-excavation analysis undertaken would need to be presented in an appropriately detailed and illustrated report and the project archive curated accordingly.

15.7.2 It is also anticipated that the archaeological mitigation would extend to a recording exercise to identify and investigate any archaeological deposits of potential significance associated with the parish boundary. This would occur when the bank and ditch are removed to a methodology agreed in advance with the Lead Archaeologist.

15.7.3 This additional mitigation is considered in the evaluation of residual effects recorded in the table below.

Table 15.6 Heritage

Receptor	Residual effects	Significant?
Construction		
Slight Ridge and Furrow Earthworks	Minor Adverse, permanent	Not significant
Historic boundary between the parishes of Chesterton and Wendlebury	Negligible Adverse, permanent	Not significant
Iron Age and Roman period settlement enclosure ditches, pits, cremations or road remains located wholly within the development footprint settlement enclosures or road remains within the Site	Moderate Adverse, permanent.	Significant, but less than substantial harm to a non-designated heritage asset (NPPF).
Iron Age and Roman period settlement or road remains that represent part of a feature, such as a linear ditch, that extends beyond the site boundary	Minor Adverse, permanent	Not significant
Undated buried linear features either wholly within or partially within the Site	Minor Adverse, permanent.	Not significant
Archaeological features of Negligible sensitivity (such as medieval furrows, post-medieval boundary ditches)	Minor Adverse, permanent.	Not significant
Completed		
Grade II listed Building Church of St Giles	Minor Adverse	Not significant

15.8 Drainage and flood risk

15.8.1 Mitigation measures required over and above the inherent mitigation of the drainage strategy are outlined below. The prediction of residual effects assumes that these mitigation measures have been implemented via the Construction Environmental Management Plan and a Site Drainage Plan during the watercourse re-alignment and construction operations. This is to control works in or near the Wendlebury Brook, pumping and de-watering operations, the management of surface water run-off, and the potential for the release of pollutants, including sediment.

15.8.2 The proposed surface water drainage system with sustainable drainage features is sufficient to ensure negligible effects and therefore no additional mitigation measures are required. The SuDS will reduce peak flows, the volume of runoff, and slow down flows, and will continue to operate for the lifespan of the Proposed Development. The onsite drainage network is designed to accommodate a 40% increase in rainfall intensity as an allowance for climate change. It will provide treatment of surface water run-off before it is discharged into the receiving local

watercourse network. The proposals will therefore not result in an increase in flood risk downstream.

Table 15.7 Drainage and flood risk

Receptor	Residual effect	Significant?
Construction phase		
Flood Risk	Negligible	No
Watercourse – quality/quantity	Negligible	
Completed Development		
Flood Risk on-site	Negligible	No
Flood Risk off-site	Negligible	No
Watercourse – quality/quantity	Negligible	No

15.9 Ground conditions and soils

15.9.1 Mitigation for the change in use is limited to reuse of the soils in an appropriate manner to re-establish the existing functions of the soil, principally for storing and cycling water and carbon, and for supporting habitats, biodiversity and landscape planting.

15.9.2 The disturbance of ground during the construction works will be undertaken in accordance with current best practice guidance and legislation. This will be supplemented by the management to be defined in the Construction and Environmental Management Plan, a Materials Management Plan earthworks and any remediation necessary.

15.9.3 These measures will be designed to minimise waste, reduce off-site disposal and importation of materials, limit construction movements as far as reasonably practicable, and minimise impacts to neighbours.

15.9.4 With the implementation of this best practice, the environmental effects during demolition, construction and operation are listed below.

Table 15.8 Ground conditions and soils

Receptor	Residual effect	Significant?
Human health	Minor Beneficial	No
Controlled waters	Minor Beneficial	
Ground gas	Minor Beneficial Localised	
Ground stability	Negligible / Minor Beneficial Localised	
Soils	Minor Beneficial	

15.10 Climate change

15.10.1 During construction, the development will use the methodology 'Net Zero Carbon in Construction' outlined in the UKGBC's net zero framework. Consequently, carbon emissions will be reduced as much as feasibly possible. Following this, if there are any residual construction related carbon emissions, these will be offset through the funding of verified and accredited offset schemes, in line with principals set out in UKGBC's net zero framework

15.10.2 The transport-related mitigation will assist in reducing carbon emissions associated with operational transport. These measures include:

- Improvements to bus stops;

- Cycle parking;
- Showers, lockers and changing facilities;
- Shared pedestrian/cycle routes;
- Electric vehicle recharging facilities.

15.10.3 To mitigate for operational energy related emissions, the Proposed Development will use passive measures included within the design of the development. These will reduce energy use and the associated CO_2 emissions and include: U values which exceed Building Regulation requirements; Engineered facade design; Reduced air permeability. The next level in the energy hierarchy is to maximise energy efficiency. High efficiency systems, plant, controls and equipment will be incorporated into the development.

15.10.4 The third level in the energy hierarchy is to incorporate renewables / low carbon technology. A number of options have been considered, with the following being identified as suitable:

- Photovoltaic Panels (a minimum of 18% of useable roof area to be installed initially).
- Reverse cycle air source heat pump for the office area.

Table 15.9 Climate change

Impact	Residual effects	Significant?
Construction carbon emissions	Negligible	No
Operational transport emissions	Negligible	No
Operational carbon emissions	Minor adverse	Yes

15.11 Economic effects

15.11.1 As the creation of jobs both during the construction and operational phase and increased GVA at various scales are all considered to be beneficial, mitigation is not required. The residual effects are set out in the table below.

Table 15.10 Economic effects

Receptor	Residual effects	Significant?
Construction		
Workforce in CDC	Moderate beneficial	Yes
Workforce in Oxfordshire	Minor beneficial	No
UK Workforce	Negligible	No
Completed development		
Workforce in CDC	Major beneficial	Yes
Workforce in Oxfordshire	Major beneficial	Yes
UK Workforce	Minor beneficial	No
Oxfordshire economic output	Major beneficial	Yes
UK economic output	Minor beneficial	No

15.12 Interaction of effects on receptors

15.12.1 The potential for effects caused by a combination of impacts from the Proposed Development on a particular receptor, acting together, may cause a more significant impact collectively than individually, or potentially, a combination of beneficial and adverse effects may be experienced at a particular location. For interaction between effects to be possible, there would need to be an identifiable residual effect from one or more environmental aspects after considering the mitigation proposed. Tables 15.11 and 15.12 below, list all of the receptors for which a residual effect greater than negligible has been identified in the principal assessment topic for that receptor (shown by ✓ - positive or adverse, significant or not significant) for the construction period and when the development is in operation.

15.12.2 For each of the identified receptors, professional judgement of the EIA coordinator has then been used to consider whether the receptor might also experience interaction effects connected with other assessment topics in the ES. Those that are identified in these tables with a **?** are considered in the paragraphs below.

Potential for interaction effects during construction

Table 15.11 Construction

	Assessment topic										
Receptor	Transport	Air quality	Noise	Biodiversity	Landscape	Visual	Heritage	Drainage/ flood risk	Ground / soils	Climate	Economics
Broad-leaved semi-natural woodland	✗	✗	✗	✓+ve	✗	✗	✗	?	?	✗	✗
Landscape Character /Features	✗	✗	✗	✗	✓-ve	✗	✗	✗	✗	✗	✗
Visual Receptors	✗	?	?	✗	✗	✓-ve	✗	✗	✗	✗	✗
Archaeology	✗	✗	✗	✗	✗	✗	✓-ve	✗	✗	✗	✗
Ground Conditions / Human health	✗	?	✗	✗	✗	✗	✗	✗	✓+ve	✗	✗
Ground Conditions / Controlled waters	✗	✗	✗	✗	✗	✗	✗	?	✓+ve	✗	✗
Ground stability / soils	✗	✗	✗	✗	✗	✗	✗	?	✓+ve	✗	✗
Workforce (economic)	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✓+ve

✓ = residual effect +ve = positive -ve = adverse ✗ = negligible **?** = consider potential interaction

15.12.3 **Broad-leaved semi-natural woodland** is assessed to experience a beneficial effect as a result of enhancement of retained habitat. The potential for groundworks and change to the drainage regime during construction to affect woodland will be controlled by a Construction Environmental Management Plan and a Site Drainage Plan during the watercourse re-alignment and construction operations such that the woodland will be protected and additional effects are not predicted.

15.12.4 **Visual receptors** include road users, pedestrians and local residential properties. The potential level of construction noise at the nearest residential properties has been assessed, along with

the potential effect from dust and vehicle emissions. The noise limit for construction noise will be met at these receptors and the impact has been assessed as negligible. No interaction effects are predicted.

15.12.5 In relation to dust soiling effects and human health impacts, potential effects during the construction phase are considered to be temporary in nature and may only arise during certain activities and/or meteorological conditions, when there could be a potential interaction with the temporary visual effect.

15.12.6 **Ground conditions** assessment in relation to human health, controlled waters and soils has identified minor beneficial effects. The Construction Environmental Management Plan will control the potential human health impacts from air quality, the site drainage, and the protection of soil function during the construction phase and no additional interaction effects are predicted.

Table 15.12 Operation

	Assessment topic										
Receptor	Transport	Air quality	Noise	Biodiversity	Landscape	Visual	Heritage	Drainage/ flood risk	Ground / soils	Climate	Economics
Pedestrians /cyclists	✓+ve	✗	✗	✗	✗	?	✗	✗	✗	✗	✗
Road safety	✓+ve	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗
Church Lane Residents (noise)	✗	✗	✓-ve	✗	✗	?	✗	✗	✗	✗	✗
Visual Receptors	✗	✗	?	✗	✗	✓-ve	✗	✗	✗	✗	✗
Landscape Character /Features	✗	✗	✗	✗	✓-ve	✗	✗	✗	✗	✗	✗
St Giles Church Building	✗	✗	✗	✗	✗	✗	✓-ve	✗	✗	✗	✗
Ground Conditions / Human health	✗	?	✗	✗	✗	✗	✗	✗	✓+ve	✗	✗
Ground Conditions / Controlled waters	✗	✗	✗	✗	✗	✗	✗	?	✓+ve	✗	✗
Ground stability / soils	✗	✗	✗	✗	✗	✗	✗	?	✓+ve	✗	✗
Climate (operational)	✗	✗	✗	✗	✗	✗	✗	✗	✗	✓-ve	✗
Workforce	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✓+ve
Economic output	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✓+ve

✓ = residual effect +ve = positive -ve = adverse ✗ = negligible ? = consider potential interaction

15.12.7 **Pedestrians/cyclists** are assessed as experiencing a positive effect as a result of the inclusion of dedicated pedestrian/cycle crossing points within the signalised access and the links to improved bus stops. In the medium-term users of paths in close proximity to the development will also experience a change in visual experience of varying magnitudes, ranging from minor to major adverse. Longer-term (+15 years) the effects lessen as the proposed landscaping matures, ranging from minor/negligible to moderate adverse. The interaction of the experience

of improved infrastructure is not considered to result in an effect that is of greater significance for the change in visual context for the receptors assessed in the LVIA (Chapter 9). Furthermore, due to the reduction in traffic speed on the A41 the noise level from traffic will reduce.

15.12.8 Background night-time sound levels at **Church Lane properties** are predicted to increase by 1dB(A). This amount of change is assessed as a low impact, and is not considered that there would be a potential interaction with the visual effect predicted for the receptors in proximity to the development.

15.12.9 **Ground conditions** assessment in relation to human health has identified minor beneficial effects. The air quality assessment predicts negligible changes in pollutant concentrations when the development is operational and no additional interaction effects are predicted.

15.13 Summary of mitigation

15.13.1 Table 15.13 provides a summary of the additional mitigation measures.

Table 15.13 **Mitigation Summary**

Identified receptor	Additional mitigation measure	Mitigation secured by	To be delivered by	Auditable by
Transport				
Construction				
n/a	Construction Traffic Management Plan	Planning condition	Developer	Local Planning Authority (LPA)
Operation				
None identified	n/a	n/a	n/a	n/a
Air quality				
Construction				
Human / ecological	Construction Environmental Management Plan (CEMP)	Planning condition	Developer	LPA
Operation				
Human / ecological	Travel Plan (enhance)	n/a	n/a	n/a
Noise				
Construction				
Human	Construction Environmental Management Plan (CEMP)	Planning condition	Developer	LPA
Operation				
None identified	n/a	n/a	n/a	n/a
Biodiversity				
Construction				

Identified receptor	Additional mitigation measure	Mitigation secured by	To be delivered by	Auditable by
Habitats and species	Construction Environmental Management Plan (CEMP) – prevention or reduction of pollution events (air, noise, water environment)	Planning condition	Developer	LPA
Habitats and species	Ecological Construction Method Statement (ECMS) - prevention or reduction of damage or harm	Planning condition	Developer	LPA
Operation				
Habitats and species	Soft Landscape Scheme – new habitat creation to offset the impacts of habitat losses	Details submitted as part of planning application	Developer	LPA
Habitats and species	Landscape and Ecological Management Plan (LEMP) – creation of new habitat features, and enhancement of existing habitats, to offset the impacts of habitat losses and achieve biodiversity net gain	Planning condition	Developer	LPA
Landscape and visual effects				
Construction				
Landscape / Human	Construction Environmental Management Plan (CEMP)	Planning condition	Developer	LPA
Operation				
None identified	n/a	n/a	n/a	n/a
Heritage				
Construction				
Historic boundary between the parishes of Chesterton and Wendlebury	Archaeological recording prior to removal in order to create a record of the bank and ditch and any archaeological deposits contained within them. The scope and methodology of this mitigation would be agreed in advance via a WSI with the Oxfordshire County Council Lead Archaeologist. This measure would reduce the significance of the effect on this heritage asset.	Planning Condition	Archaeological contractor	LPA
Loss of significant archaeological features within the	Following the trial trench evaluation, after consultation with the Oxfordshire County Council Lead Archaeologist, it may be necessary to preserve by record archaeological features	Planning Condition	Archaeological Contractor	LPA

Identified receptor	Additional mitigation measure	Mitigation secured by	To be delivered by	Auditable by
Site	within the Site that cannot be preserved in situ. The scope and methodology of this mitigation would be agreed in advance via a WSI with the Lead Archaeologist. This measure would reduce the significance of the effect on these heritage assets.			
Operation				
None identified	n/a	n/a	n/a	n/a
Hydrology, flood risk and drainage				
Construction				
Flood risk	CEMP, Site Drainage Plan	Planning Condition	Principal Contractor	LPA
Water quality	CEMP, Site Drainage Plan	Planning Condition	Principal Contractor	LPA
Operation				
Flood risk	Surface Water Drainage Strategy	Planning Condition	Principal Contractor	LPA
Water quality	Surface Water Drainage Strategy	Planning Condition	Principal Contractor	LPA
Ground conditions and soils				
Construction				
Human Health	Detailed ground investigation, risk assessment and appropriate methods of working, including PPE where necessary	Planning Condition(s)	Tier - GI Principal Contractor - Risk Assessments and Method Statements (RAMS)	LPA
Controlled Waters	Detailed ground investigation, risk assessment and production of a Construction Management Plan (appropriate methods of working to prevent pollution incidents)	Planning Condition(s)	Tier - GI Principal Contractor - RAMS and Construction Management Plan	LPA, Environment Agency
Ground Gas	Detailed ground investigation, risk assessment and appropriate methods of working, including PPE and monitoring where necessary to prevent harm to workforce and nearby receptors	Planning Condition(s)	Tier - GI Principal Contractor - RAMS	LPA

Identified receptor	Additional mitigation measure	Mitigation secured by	To be delivered by	Auditable by
Ground Stability and Geotechnical Hazards	Detailed ground investigation and assessment of soils. Production of Earthworks Specification and Construction Management Plan to maximise the reuse of site won soils and provide a suitable development platform.	Materials Management Plan (MMP) for the reuse of site won soils. Contractual.	Tier - MMP and Earthworks Specification. Principal Contractor - regrading works and ground improvement	CL:AIRE - MMP. Tier to review performance testing during enabling works
Imported Soils	Construction Management Plan outlining the acceptance criteria for imported soils/aggregates	Planning Condition	Principal Contractor	LPA
Operation				
Human Health	Detailed ground investigation, risk assessments and appropriate mitigation (remedial) measures, if required, to reduce risk to end users	Planning Condition	Tier - GI Principal Contractor - Remediation/mitigation measures	LPA
Controlled Waters	Detailed ground investigation, risk assessments and appropriate mitigation (remedial) measures, if required, to reduce risk to controlled waters (surface water and/or groundwater)	Planning Condition	Tier - GI Principal Contractor - Remediation/mitigation measures	LPA
Ground Gas	Detailed ground investigation, risk assessment and the incorporation of mitigation measures to reduce ground gas ingress and subsequent risk to end users	Planning Condition	Tier - GI Principal Contractor - Mitigation measures	LPA
Ground Stability and Geotechnical Hazards	Suitable development platform provided by regrading the site, stabilisation and ground improvement.	Contractual	Principal Contractor	Tier
Imported Soils	Only soils/aggregates considered suitable for use will be retained within the development.	Planning Conditions	Principal Contractor	LPA
Climate change effects				
Construction				
Global Climate	Achieve Net Zero Carbon in Construction	Planning Condition	Contractor	LPA
	Construction Environmental Management Plan	Planning Condition	Contractor	LPA
Operation				
Global Climate	Use of Energy Hierarchy	Planning Condition	Contractor	LPA
	Installation of renewable technology (e.g. PVs)	Planning Condition	Contractor	LPA

Identified receptor	Additional mitigation measure	Mitigation secured by	To be delivered by	Auditable by
	Implementation of Travel Plan Measures	Planning Condition	Occupier	LPA
Buildings & Infrastructure	Flood Risk - 40% climate change allowance	Drainage strategy	Civil Engineer & Contractor	LPA
	Design of building and external fabric Roof and external walls guaranteed to perform for 25 years. Roofs designed for snow loads and to avoid ponding.	Planning Condition	Architect / Civil Engineer / Contractor	LPA
	Intake and exhaust positions protected from direct wind/rain Plant selection based on projected temperatures. Use of waste heat on air based equipment to raise operating temperatures.	Planning Condition	Contractor / Fit Out Contractor	LPA
Building occupants	Cooling plant selection. Facility for cooling capacity increase to be included in infrastructure. Heating plant selection based on projected temperatures. Adequate preheating to limit thermal lag on occupation. Water supplies and storage allowance for more potable water. Low water use sanitary fittings specified. Pulsed output water meters installed on the water supply.	Planning Condition	Contractor / Fit Out Contractor	LPA
Planting	Planting to thrive across temperature and precipitation events.	Planning Condition	Landscape Architect / Contractor	LPA
Socio-economic effects				
Construction				
Workforce	The provision of a construction stage apprenticeship scheme to help deliver increased skills and help those entering the workforce and to access jobs - thus retaining an increased proportion of benefits locally	S106 legal agreement	The developer	LPA
Operation				
	None required	n/a	n/a	n/a