

Outline Application

NW Bicester Planning Application 1

Environmental Statement: Volume 1 Main Text

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A2Dominion Group

North West Bicester

Application 1 - North of Railway

Environmental Statement

Volume 1: Main Text

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Abbreviations

AADT	Annual Average Daily Traffic
AAWT	Annual Average Weekly Traffic
ABI	Annual Business Inquiry
ALC	Agricultural Land Classification
APIS	Air Pollution Information System
AQAP	Air Quality Action Plan
AQLVs	Air Quality Limit Values
AQMA	Air Quality Management Area
AQO	Air Quality Objective
AQS	Air Quality Strategy
BAP	Biodiversity Action Plan
BBOWT	Berkshire, Buckinghamshire and Oxfordshire Wildlife Trust
BGS	British Geological Society
BLHS	Bicester Local History Society
BMV	Best and Most Versatile
BMW	Biodegradable Municipal Waste
BOCC	Birds of Conservation Concern
BPEO	Best Practicable Environmental Option
BRE	Building Research Establishment
CDC	Cherwell District Council
CD&E	Construction, Demolition and Excavation
CDM	Construction and Design Management Regulations
CEMP	Construction Environmental Management Plan
CERC	Cambridge Environmental Research Consultants
CHP	Combined Heat and Power
CI	Commercial and Industrial
CIRIA	Construction Industry Research and Information Association
CIZ	Central Impact Zone
C&LG	Communities & Local Government
COSHH	The Control of Substances Hazardous to Health
CRTN	Calculation of Road Traffic Noise
CTA	Conservation Target Areas
dB	Decibel
dB(A)	A-weighted decibel
DBA	Desk-based Assessment
DEFRA	Department for Environment Food and Rural Affairs
DHN	District Heating Network
DMP	Dust Management Plan
DMRB	Design Manual for Roads and Bridges
DMV	Deserted Medieval Village
EA	Environment Agency
EEC	European Economic Community
EHA	English Heritage Archive

EHO	Environmental Health Officer
EIA	Environmental Impact Assessment
EQS	Environmental Quality Standards
EPO	Environmental Protection Officer
EPR	Environmental Permitting Regulations
EPS	European Protected Species
EPUK	Environmental Protection UK
ES	Environmental Statement
ETBS	Eco-town Biodiversity Strategy
EU	European Union
FTE	Full Time Employment
GP	General Practitioner
GSV	Gas Screening Value
HAP	Habitat Action Plan
HCA	Homes and Community Agency
HDV	Heavy Duty Vehicle
HER	Historic Environment Record
HIA	Health Impact Assessment
HWCN	Hazardous Waste Consignment Note
IAQM	Institute of Air Quality Management
IEEM	Institute of Ecology and Environmental Management
IEMA	Institute of Environmental Management and Assessment
IfA	Institute for Archaeologists
IMD	Index of Multiple Deprivation
IPSS	Institute of Professional Soil Scientists
IVC	In Vessel Composting
JSA	Jobs Seekers Allowance
LA10	Percentile noise level (10%)
LAeq	A-weighted equivalent noise level
LAQM	Local Air Quality Management
LAs	Local Authorities
LBAP	Local Biodiversity Action Plan
LDF	Local Development Framework
LHMP	Landscape and Habitats Management Plan
LNR	Local Nature Reserves
LSOA	Lower Super Output Areas
LWS	Local Wildlife Site
MAFF	Ministry of Agriculture, Fisheries and Food
MAGIC	The Multi-Agency Geographic Information for the Countryside website
MPS 2	Minerals Policy Statement 2
MRF	Materials Recovery Facility
MUGA	Multi Use Games Area
NE	Natural England
NEAP	Neighbourhood Area Equipped for Play

NEC	Noise Exposure Category
NERC	Natural Environment and Rural Communities
NGR	National Grid Reference
NHS	National Health Service
NMR	National Monuments Record
NNR	National Nature Reserve
NO	Nitrogen oxide
NO ₂	Nitrogen dioxide
NO _x	Total oxides of nitrogen
NPPF	National Planning Policy Framework
NSRI	National Soil Resources Institute
OCC	Oxfordshire County Council
OffPAT	Office of Project and Programme Advice and Training
ONS	Office for National Statistics
OOS	Oxfordshire Ornithological Society
OS	Ordnance Survey
PIA	Personal Injury Accident
PM ₁₀	Particulate matter with an aerodynamic diameter of less than 10µm
PPE	Personal Protective Equipment
PPGs	Pollution Prevention Guidelines
PPG	Planning Policy Guidance
PPS	Planning Policy Statement
PRoW	Public Rights of Way
RAF	Royal Air Force
RoWIP	Rights of Way Improvement Plan
SAM (SM)	Scheduled Monument
SAC	Special Area of Conservation
SAP	Species Action Plan
SDA	Severe Disablement Allowance
SGV	Soil Guideline Values
SHMA	Strategic Housing Market Assessment
SLR	Single Lens Reflex
SPA	Special Protection Area
SPOSH	Significant possibility of significant harm
SRP	Soil Resources Plan
SSSI	Site of Special Scientific Interest
SuDS	Sustainable Drainage System
SWMP	Site Waste Management Plan
SWRP	Sustainable Waste and Resources Plan
TA	Transport Assessment
TVERC	Thames Valley Environmental Records Centre
TWUL	Thames Water Utilities Ltd.
UK	United Kingdom
UKBAP	United Kingdom Biodiversity Action Plan
WAC	Waste Acceptance Criteria

WCS	Water Cycle Study
WFD	Water Framework Directive
WaFD	Waste Framework Directive
WIZ	Wider Impact Zone
WRAP	Waste & Resources Action Programme
WSE	Waste Strategy for England
WwTW	Wastewater Treatment Works
Z_0	Roughness length
Zol	Zone of Influence

1 Introduction

1.1 The Development

- 1.1.1.1 The NW Bicester site is identified in the Local Plan submission (January 2014) as falling within an area to provide for circa 5,000 new homes, and related social and community facilities. The allocation of the site in the emerging Local Plan follows the identification of land at north-west Bicester as a potential eco-town in the supplement to PPS1 (July 2009): 'Eco-Towns' a supplement to PPS1 Delivering Sustainable Development'. The PPS1 supplement includes requirements relating to sustainability, affordable housing, low and zero carbon technologies and public transport.
- 1.1.1.2 The emerging Local Plan identifies a broad area to the north west of Bicester within which the site falls. A Masterplan has been submitted to the Council in response to the requirements of the supplement to PPS1 in March 2014 with additional/ amended information provided in May 2014. It is understood that the Council is minded to adopt the Masterplan, following consultation and review (and amendment as appropriate) as non-statutory policy.
- 1.1.1.3 The NW Bicester Masterplan area comprises some 406 hectares (ha) and sets out the strategy for the development of the site.
- 1.1.1.4 Planning permission was granted in 2012 for the development of some 21 ha of land within the Masterplan area as an 'exemplar phase'. This permission will be implemented shortly and provides for 393 new homes, land for a new primary school, together with social and community facilities, business and retail accommodation.
- 1.1.1.5 A2Dominion intend to bring forward three separate applications for planning permission as follows:
- Application 1 (North of Railway) – Outline application comprising some 155 ha of land, to provide for circa 2,600 residential dwellings, land for new primary schools, associated open space, recreation and play space, social and community facilities and employment land, access and infrastructure works
 - Application 2 (South of Railway) – Outline application comprising some 51 ha of land, to provide for circa 900 residential dwellings, land for a new secondary school, new primary schools, associated open space, recreation and play space, social and community facilities and employment land, access and infrastructure works
 - A4095 NW Strategic Link Road – Detailed application comprising some 20 ha of land for the provision of new highway and crossings below the existing railway
- 1.1.1.6 An Environmental Impact Assessment (EIA) has been undertaken for each application, and three separate Environmental Statements have been prepared, presenting the findings of each EIA.

- 1.1.1.7 This ES presents the findings of the EIA for the proposed Application 1 land to the North of the Railway Line and A4095 Lords Lane and West of B4100 Banbury Road, surrounding Lords Farm and Hawkwell Farm, development, hereafter referred to as ‘the Development’, also known as the ‘Application 1’ Site. The location of Application 1 can be referred to in Drawing 3-1 in Volume 2. Two separate ES have been prepared for Application 2 Site and the A4095 NW Strategic Link Road.
- 1.1.1.8 This ES describes the Development, alternatives considered, uncertainties and limitations encountered, the baseline environment and the significant and non-significant environmental effects after mitigation. The purpose of the ES is to ensure that the likely effects of the development on the environment are fully understood and taken into account before any decision by the Local Planning Authority (LPA) is taken on the proposals.
- 1.1.1.9 This ES has been prepared by Hyder Consulting (UK) Limited on behalf of A2Dominion Group.

1.2 Background

- 1.2.1.1 In July 2009, the Department for Communities and Local Government published ‘Planning Policy Statement (PPS): eco-towns’ (Ref 1-1) as a supplement to PPS1 Delivering Sustainable Development (Ref 1-2). The PPS1 supplement includes requirements on sustainability, waste reduction, zero carbon buildings and sustainable public transport.
- 1.2.1.2 Within the PPS1 supplement, Eco-towns are defined as sustainable developments of at least 5,000 homes. In July 2009, four ‘first wave’ locations were identified with the potential to have an Eco-town; one of which was NW Bicester (Ref 1-3).
- 1.2.1.3 The Eco-towns PPS outlines the Government’s objectives for planning that are set out in PPS1:
- “To promote sustainable development by:
 - ensuring that eco-towns achieve sustainability standards significantly above equivalent levels of development in existing towns and cities by setting out a range of challenging and stretching minimum standards for their development, in particular by:*
 - *providing a good quantity of green space of the highest quality in close proximity to the natural environment*
 - *offering opportunities for space within and around the dwellings*
 - *promoting healthy and sustainable environments through ‘Active Design’ principles and healthy living choices*
 - *enabling opportunities for infrastructure that make best use of technologies in energy generation and conservation in ways that are not always practical or economic in other developments*
 - *delivering a locally appropriate mix of housing type and tenure to meet the needs of all income groups and household size, and*
 - *taking advantage of significant economies of scale and increases in*

land value to deliver new technology and infrastructure such as for transport, energy and community facilities.

- To reduce the carbon footprint of development by:
ensuring that households and individuals in eco-towns are able to reduce their carbon footprint to a low level and achieve a more sustainable way of living.”

- 1.2.1.4 The National Planning Policy Framework (NPPF) (Ref 1-4) was published in March 2012 and with it the majority of Planning Policy Statements were replaced. The NPPF does not refer explicitly to eco-towns, however, the eco-towns supplement to PPS1 remains extant.
- 1.2.1.5 The NW Bicester development lies within the jurisdiction of CDC, and the Masterplan for the area identified has been submitted to the Council for consideration. A planning application (Ref: 10/01780/HYBRID) was submitted in December 2010 for the first phase of the NW Bicester development, the Exemplar Site, with an Addendum submitted in April 2011. The Exemplar Site received planning permission on 10 July 2012, and is currently under construction. The remainder of the Masterplan area is to be brought forward subject to separate planning applications. This ES has been prepared in relation to the area lying north of the railway, as shown on Drawing BIMP6 102B in Appendix 3A.

1.3 Legal Basis of the Environmental Statement

- 1.3.1.1 The Development requires planning consent under the Town and Country Planning Act 1990 (as amended). In accordance with the Town and Country Planning (Environmental Impact Assessment) (England and Wales) Regulations 2011 (SI 2011 No.1824) (Ref 1-5), which implement EU Directive 2011/92/EU and its amendment 2014/52/EU, the Development constitutes a Schedule 2 development, based upon the scale of development exceeding 0.5ha. Due to the nature and scale of the proposals and its associated infrastructure, the Development is likely to have significant effects on the environment, and therefore triggers the need for an EIA. The ES includes all the necessary information outlined in Schedule 4 of the Regulations (Ref 1-5).
- 1.3.1.2 Several guideline documents have been used in defining the scope of the EIA and the assessment methodology to be used. The LPA issued a formal Scoping Opinion in July 2014. Consultation has been ongoing with CDC, Oxfordshire County Council (OCC) and key stakeholders since 2010, enabling issues to be considered in the design and ES preparation ahead of receiving the formal Scoping Opinion. The EIA Scoping Report and LPA’s Scoping Opinion are included in Appendix 1A of this ES. In addition to observing the formal requirements of the EIA Directives and the EIA Regulations, best practice and recognised technical guidance has informed the assessment. Examples include Planning Practice Guidance; the National Planning Policy Framework (NPPF); and Guidelines for Environmental Impact Assessment (IEMA, 2004) (Ref 1-6).
- 1.3.1.3 The main aims of the ES are:

- To provide a description of the proposals.
- To provide detailed information regarding the likely main environmental effects of the proposals having taken into account the measures proposed to avoid, reduce and if possible remedy any predicted significant adverse effects on the environment or to enhance the beneficial effects of the proposals.
- To provide a forum for the public and consultees to express an opinion before the LPA makes a decision on whether or not to proceed with the Proposals.
- To provide an outline of the main alternatives studied by the developer and an indication of the main reasons for the choice, taking into account the environmental effects.
- To identify any limitations or uncertainties encountered during the assessment process – these are identified within environmental topic chapters.

1.4 Structure of the Environmental Statement

1.4.1.1 The ES is structured as follows:

- Volume 1 (this volume) explains the purpose of the proposals (Chapter 2), describes the proposals and summarises alternatives considered (Chapter 3) and the overall approach to the environmental impact assessment (Chapter 4). It presents the mitigation measures and draws together the significant environmental effects after mitigation for each environmental topic in Chapter 5 to 16. Cumulative effects are presented in Chapter 17 and also within individual topic chapters, and the conclusions are given in Chapter 18.
- Volume 2 contains the ES drawings referred to in Volume 1 ES main text
- Volume 3 contains the ES appendices referred to in Volume 1 ES main text
- The Non-Technical Summary (NTS) summarises the principle sections of the ES in non-technical language to make it readily understandable by members of the public. The NTS is available as a separate leaflet and is also included as text in Volume 0.

1.5 Inspection of the Environmental Statement

1.5.1.1 A full copy of the ES is available to view at the following deposit locations:

- Cherwell District Council, Bodicote House, Bodicote, Banbury, Oxfordshire, OX15 4AA
- Banbury (Castlequay) Linkpoint, 43 Castle Quay, Banbury, Oxfordshire, OX16 5UW
- Bicester Linkpoint, 38 Market Street, Bicester, OX26 6AL
- Kidlington Linkpoint, Exeter Hall, Oxford Road, Kidlington, OX5 1AB

- 1.5.1.2 A full set of drawings will be available at Bicester Town Council, The Garth, Launton Road, Bicester, Oxon, OX26 6PS.
- 1.5.1.3 The ES will also be available to view in the Planning section on CDC's website; www.cherwell.gov.uk. The Planning Application will also be available to view on the NW Bicester website; www.nwbicester.co.uk.
- 1.5.1.4 Copies of the ES can be purchased from Barton Willmore at the address below:

FAO: Ms A Wilson
Barton Willmore
7 Soho Square
London
W1D 3QB

- 1.5.1.5 All interested parties are invited to comment in writing on the ES and the dates for consultation will be publicised through the CDC website. Comments should be sent to CDC at the following address:

FAO Jenny Barker
Planning Department
Cherwell District Council
Bodicote House
Bodicote
Banbury
Oxfordshire
OX15 4AA

2 The Need for the Development

2.1 Policy Requirements

- 2.1.1.1 The land at NW Bicester is identified in the Supplement to PPS1 entitled 'Eco-towns' (July 2009) (Ref 2-1) as one of four locations for a potential Eco-towns. A2 Dominion Group is promoting the overall site for a mixed use residential led development. Within the emerging Cherwell Local Plan (Ref 2-2), Cherwell District Council (CDC) identified land to the NW of Bicester as a strategic allocation to provide for circa 5,000 new homes. A number of representations/comments in respect of the detail of the policy have been submitted to CDC, which is now the subject of independent examination. During the Examination in Public on the emerging Local Plan, the Inspector requested that CDC objectively assesses its housing needs against the Oxfordshire Strategic Housing Market Assessment (2014). Accordingly, the Examination in Public was suspended whilst the Council explores options to increase the housing delivery within the plan period. Moving forward, the Council is reviewing its evidence base. As part of this, CDC consulted on its Strategic Housing Land Availability Assessment (SHLAA) Update in June 2014. A2 Dominion submitted representations as part of this consultation setting out anticipated housing delivery at NW Bicester up to 2031. It is anticipated that the emerging Local Plan (Main Modifications) will be consulted on in August 2014 and submitted in October 2014, with the Examination in Public resuming in Winter 2014. Subject to Examination, we understand the emerging Local Plan is likely to be adopted in 2015.
- 2.1.1.2 The emerging Local Plan Policy Bicester 1 – North West Bicester Eco-Town, as set out in the Cherwell Local Plan Submission (January 2014), seeks to:
- Provide a development of 5,000 homes.
 - Provide approximately 5,000 jobs (about 1,800 to be delivered by 2031).
 - Create a development that will be a zero carbon development as defined in the PPS and the Eco Bicester One Shared Vision (Ref 2-3).
 - Deliver a high quality local environment taking into account climate change adaptation.
 - Create homes that achieve Level 5 of the Code for Sustainable Homes.
 - Provide access to one employment opportunity for each new dwelling within easy reach by walking, cycling and / or public transport.
 - At least 50% of trips originating from the development should be made by means other than the car.
 - Provide 40% of the total gross site area as green space of which half will be public open space. These open spaces would be publicly accessible and consist of a network of well managed, high quality green/open spaces which are linked to the countryside.
- 2.1.1.3 In response to the PPS1 Supplement, the Council and A2Dominion have agreed a masterplan brief. This seeks to take forward the guidance set out in the PPS1 Supplement in the context of the specific example of NW Bicester, as

informed by local circumstances and the wider aspirations for Bicester and the District. The Masterplan for NW Bicester is intended to set out the framework for the future development of the area and will be used to help guide forthcoming planning applications.

- 2.1.1.4 The District Council has instructed White Young Green (WYG) to prepare a master plan for the wider Bicester area. This will address the policy issues arising from the local plan allocations at Bicester. A draft has been published and a further draft is to be published for consultation over the summer. Once finalised, it is anticipated that the Council will adopt the WYG masterplan as non statutory policy.
- 2.1.1.5 Adoption of both masterplans as SPD is dependent upon adoption of the local plan. If the adoption of the local plan is delayed, it is open to the Council to adopt both documents as non-statutory interim policy. This is a matter for the Council. However, in the absence of an up to date local plan, the applications, in policy terms, primarily fall to be considered against the terms of the PPS1 Supplement and the NPPF. Little weight should be attached to the emerging local plan given the stage that it has reached, whilst the adopted local plan (1996) and is considered out of date in terms of housing land supply.

2.2 Development Objectives

- 2.2.1.1 The Vision (Ref 2-3) for NW Bicester development is “to achieve more sustainable ways of living through low carbon lifestyles”. The proposals will be developed around community hubs to provide facilities to meet the day to day needs of residents and opportunities for employment. The development will promote walking, cycling and use of public transport over the use of the private car. This vision will be underpinned through a number of fundamental principles established for the Masterplan by the masterplan team. The principles include:
- Seeing a minimum of 6,000 homes built.
 - Ensuring a mix of affordable housing is included in line with CDC’s requirements.
 - Ensuring 40% of the overall area comprises open spaces and green landscape infrastructure.
 - Creating one job per home within a sustainable travel distance.
 - Ensuring homes are built to Code for Sustainable Homes Level 5 and BREEAM excellent standards.
 - Delivering zero carbon energy across all buildings.
 - Allow for future climate change adaptation by incorporating forward thinking technologies and design within homes.
 - Providing real time energy and travel monitoring in every home.
 - Ensuring high levels of energy efficiency in the fabric of the buildings and their design.
 - Providing primary schools located within 800m of all homes.
 - Enabling and encouraging local food production.

- Attaining a net gain in local biodiversity.
- Striving towards water neutrality.
- Creating a management program to ensure zero waste goes into landfill during construction.
- Making a commitment towards a Local Management Organisation.

3 The Development

3.1 Development Context

- 3.1.1.1 The town of Bicester lies approximately 24km to the north-east of Oxford, and 28km to the southeast of Banbury. The M40 runs approximately 2km to the southwest, with Junction 9 providing access to the town via the A41.
- 3.1.1.2 Bicester is served by two railway stations; namely Bicester North and Bicester Town. Chiltern Railways operate services from Bicester North between Birmingham Snow Hill and London Marylebone. Branch line services to Oxford (via Islip) operate from Bicester Town. This lies to the south of the town and uses the old Varsity Line track between Oxford and Cambridge.
- 3.1.1.3 The Development which this ES relates to is referred to as Application 1, and lies within the area identified by CDC for the NW Bicester Eco development. The Application 1 site boundary is illustrated on Drawing 3-1. The Site lies approximately 1.5km north west of Bicester town, within the parish of Caversfield, between the B4030 and the B4100. The Site's southern boundary runs alongside the A4095 (Lords Lane), the western boundary runs along the railway line and northern boundary runs briefly along the B4100 before connecting with the Exemplar Site boundary.
- 3.1.1.4 Application 1 currently comprises areas of Grade 3a agricultural land and surrounds a number of farmhouses and other buildings. The railway line runs in a north west to south east direction through the middle of the Masterplan site; bounding the south west edge of the Application 1 site. The villages of Bucknell and Caversfield are located to the north and east of the site respectively.
- 3.1.1.5 The Exemplar Site, located on the north eastern edge of the Masterplan area is the first phase of the Masterplan Area development. Development has commenced and will provide 393 residential units, an energy centre, a nursery, community centre, retail units, eco-business centre, offices and land for a primary school.
- 3.1.1.6 The location of Application 2 (South of Railway) and the A4095 NW Strategic Link Road are shown on Drawing 3-1.

3.2 Description of the Development

- 3.2.1.1 Application 1 covers approximately 155 hectares (ha) and comprises the majority of the land within the masterplan area to the north of the railway line. The Development proposals for the Site include provision for the following:
- 3.2.1.2 The proposals, within a total site area of 154.82 hectares, can be summarised as follows:
- Retention of the existing storage building adjacent to Bucknell Road;
 - Provision of up to 2,600 new homes (Use Class C3) across 66.97 hectares of net residential land, to include up to 250 homes to be provided on an 'Extra Care' basis (Use Class C3);

- 1.02 hectares of land to accommodate commercial uses (falling within Use Classes A1-A5, B1 and B2) within a new local centre;
- 0.47 hectares of land to accommodate social and community facilities (Use Class D1) including a community hall;
- 2.22 hectares of land to accommodate a new two form entry primary school and playing fields, plus 0.79 hectares for possible playing fields to expand two form to three form;
- 0.88 hectares of land to accommodate an extension to the primary school approved as part of the Exemplar (LPA reference 10/01780/HYBRID);
- Provision of 68.01 hectares of green infrastructure (circa 46% of the total site area) excluding school playing fields but including 4 hectares to be offered to the Council as a burial ground, 2 hectares of allotments and 1 hectare of community farm;
- 0.2 hectares of land to accommodate an energy centre where on-site energy will be generated through low carbon technology such as a biomass boiler and/ or biomass or gas Combined Heat and Power plant ('CHP');
- Quantum and tenure split of affordable homes to be determined through viability assessment;
- New homes to be constructed to achieve a minimum of Code for Sustainable Homes Level 5;
- All residential units to be designed to Lifetime Homes standards;
- Commercial buildings constructed to achieve BREEAM 'excellent';
- Development as a whole to be 'true' zero carbon (taking in to account regulated and unregulated energy as defined in the PPS1 Supplement) to be achieved through a range of measures including high performance building fabric, reduced energy consumption, renewable and low carbon energy generation;
- Water Treatment Works to be provided on-site subject to technical considerations;
- Retention of the majority of existing trees and hedgerows and provision of strategic landscaping;
- Adoption of a range of measures to encourage a net gain in biodiversity;
- New roads, cycle routes and pedestrian footpaths including the partial realignment of Bucknell Road with routes designed to give priority to buses, cyclists and pedestrians.

3.2.1.3 The planning application for the Development will be submitted in outline with all matters reserved. All such development shall accord with the Application Plans and Development Parameters Schedule.

3.2.2 Application Details

Ground Levels and Contours

- 3.2.2.1 The Site for Application 1 slopes predominantly from northwest to south east with elevations ranging from around 93m AOD to 80m AOD), with two watercourses crossing the site which sit in shallow river corridor depressions. The proposed ground levels would generally follow the existing topography, but may in instances be levelled where localised depression or rises would be filled or cut accordingly. This may be necessary to regularise the ground levels and assist drainage. Other localised minor earthworks that would be undertaken include the creation of water features or ponds and mounding as part of the landscaping scheme and bridge crossing abutments.

Development Area

- 3.2.2.2 The net residential developable area in the Development comprises 68.73 ha. The net non-residential developable area (to be developed for commercial, social, community uses, green infrastructure and supporting infrastructure) in the Development comprises 90 ha.

Green Infrastructure

- 3.2.2.3 Forty percent of the total area of land at North West Bicester is to be allocated to green space of which half should be public spaces. A network of well-managed high quality green/open spaces which are linked to the wider countryside would be provided. Green spaces would be multifunctional: accessible for play and recreation, walking or cycling and supporting wildlife, urban cooling and flood management. The Green Infrastructure Masterplan is included in Appendix 3B.

Energy Centre

- 3.2.2.4 An Energy Centre would be located within Application 1 and would integrate the production of usable heat and power (electricity) in one single, highly efficient process. It would comprise (worst case scenario):
- To serve circa up to 2,600 homes plus non-domestic
 - A flue height of approximately 18m
 - Gas Combined Heat and Power (CHP) engines as the lead engine(s)
- 3.2.2.5 It has been sized to meet 90% of the thermal demand, with the remaining thermal demands (10%) being met by highly efficient conventional gas boilers.
- 3.2.2.6 A District Heat Network (DHN) would be constructed alongside all new infrastructure. The DHN is a network of insulated pipes used to deliver heat, in the form of hot water or steam, from the point of generation (the Energy Centre) to the end user.
- 3.2.2.7 DHN tend to be installed in areas of medium to high density living and work better where there is a constant thermal demand; which is often achieved in mixed use developments, such as NW Bicester, where there is both day time and night time heat demand.

- 3.2.2.8 A thermal store is proposed for Application 1 to regulate the heat demand, which would enable the hot water generated by the Gas CHP and boilers to be buffered, stored and released into the distribution network as needed.
- 3.2.2.9 The Application 1 Energy Centre would need to provide sufficient heat and power for 1,900 dwellings and commercial buildings. The remaining dwellings would be connected to the energy centre within the adjacent consented Exemplar site, as the Exemplar energy centre is capable of providing heat to 707 more homes than are being constructed in the Exemplar site.

Land Uses

- 3.2.2.10 Table 3-1 summarises the proposed land use across the Development.

Table 3-1 Proposed Land Uses of Development

Use	Area (ha)
Housing – Mixed Use with Flats	66.97
Primary School (excluding green infrastructure)	1.47
Care Home/Hotel/Other	0
Commercial/Business (excludes green infrastructure)	0.77
Social/Community	0.47
Retail/Leisure	0.25
Energy Production	0.2
Green Infrastructure	68.01
Existing Farms Mixed Use	0
Proposed Infrastructure / Roads	8.27
Existing Bucknell Road and Lords Lane	5.99

General Layout and Framework

- 3.2.2.11 The development of the site shall accord with the general principles and layout set out on Appendix 3A. The Development, as part of the overall Masterplan, has been designed with landscape as the key driver to the layout of the site. Care has been taken to preserve and enhance hedges and water courses within the development and for the natural landscape to be accessible for residents to enjoy.

Site Access

- 3.2.2.12 The construction phase of the Application 1 Development would extend over approximately an eighteen year period, with the wider Masterplan extending over approximately a twenty five year period. It is anticipated that over the construction period, all construction traffic would use the A41/Vendee Drive from the M40 Junction 9 and the A4421 around the eastern side of Bicester. The Access and Travel Strategy for NW Bicester aims to minimise traffic

impacts by promoting high quality walking and cycling linkages within the Development and connection to the town and wider area.

- 3.2.2.13 The internal site layout would be designed to facilitate the safe and convenient movement of pedestrian, cycle and vehicular traffic with priority given to non-car routes. In relation to vehicular traffic, the road system would be designed to control vehicle speeds for the benefit of road safety while the pedestrian and cycle routes would aim to provide a safe and permeable network for these travel modes.
- 3.2.2.14 Street lighting would be provided within public areas and would incorporate, where appropriate, full cut-off luminaires together with use of timed and low energy systems.

Parking

- 3.2.2.15 Parking provision for the development has been developed through the application of Oxfordshire County Councils 'Parking Standards for New Residential Developments'. Table 3-2 provides details of allocated residential parking space provision per unit type. All dwelling types are lower than the maximum standards with the exception of a small number of 5 bedroom dwellings with more allocated space. As a total however, the provision of parking would be less than the standards. Garages are included as allocated spaces and the unallocated spaces includes visitor parking provision.

Table 3-2 Indicative Residential Parking Provision

Unit Type	Provision	
	Allocated space	Unallocated
1b	1	0
2b	1	1.22
3b	2	0.22
4b	2	0.22
5b	3	0.22

Surface Water Drainage

- 3.2.2.16 Surface water drainage would be managed using a Sustainable Drainage System (SuDS). This would involve a combination of gravel-filled channels, underground storage facilities, above ground attenuation basins (some of which would support water for most of the year) and other wetland features. Those attenuation basins that would not hold water permanently would be specifically designed to do this to create habitats of value to wildlife. A concept plan for SuDS is included in Appendix 3A Parameter Plans.

Services

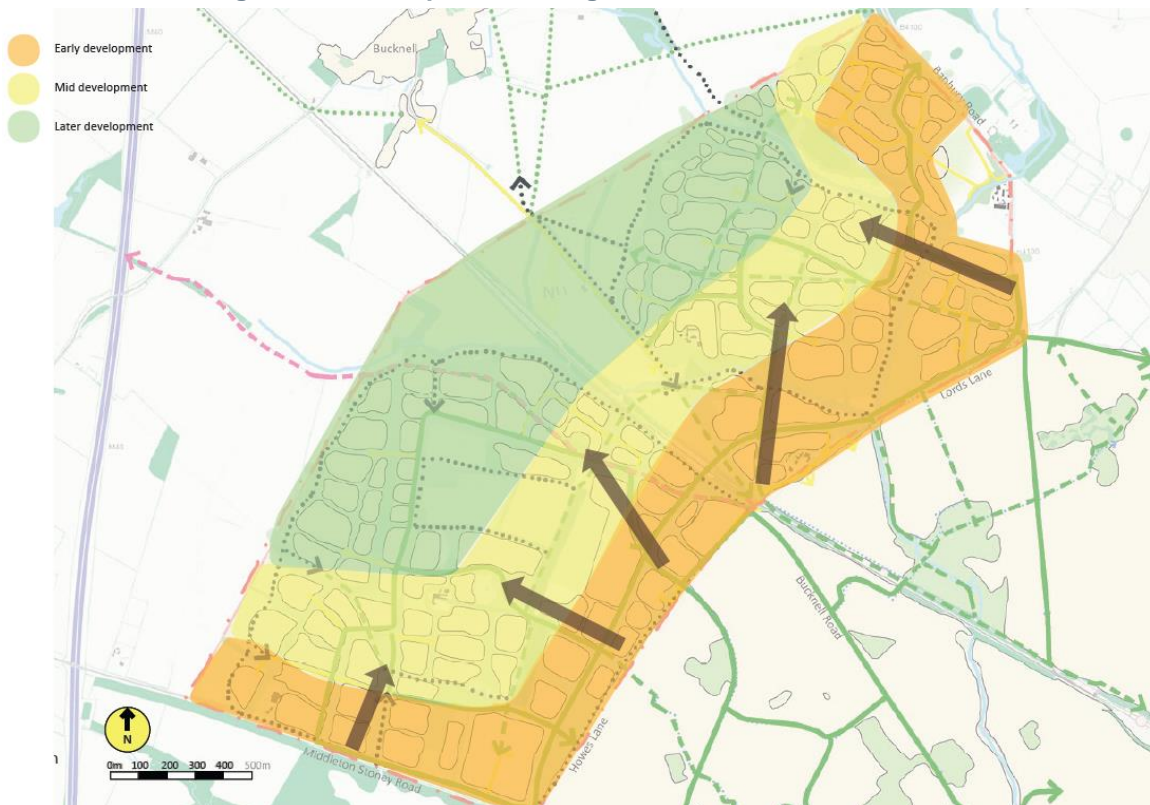
- 3.2.2.17 There are several utilities crossing the Masterplan site, as shown in Appendix 3C; including telecoms (BT), 11kv and LV Electricity supplies (SSE) and foul water mains (Thames Water) along and near to Buckell Road, and potable water (Thames Water) distribution main along Lords Lane.

- 3.2.2.18 The proposed utilities serving the proposed housing and other uses would be located in the spine footways and road ways. Reinforcement and interconnection with the existing utility infrastructure would be required. The electricity system would incorporate supply connections from an on-site Energy Centre that would also supply the proposed district heating system.
- 3.2.2.19 Although the Exemplar is phased ahead of the main NW Bicester development, the utility provision in this initial phase would be set out to allow connectivity with the future renewable energy strategy for the NW Bicester development.

Phasing of Development

- 3.2.2.20 The Masterplan site shall be developed in phases for over a twenty five year period, starting in 2018. Figure 3-1 presents the conceptual phasing and build out. The proposed phasing would consist of three phases: early development, mid development and later development. The early development work would cover areas nearest Howes Lane, Middleton Stoney Road and Banbury Road. This would be followed by the development of the area in the middle of the site. Then the rest of the site, mostly in the northern part would be developed. Application 1 would follow this conceptual phasing and build out.

Figure 3-1 Conceptual Phasing and Build Out



3.3 Construction Strategy

- 3.3.1.1 The construction work is anticipated to commence in 2018.
- 3.3.1.2 Routes for construction traffic would be in accordance with HGV limits in place throughout Bicester. As a result, Development Site construction traffic would be likely to use the following routes:

- The B4100 Banbury Road for travel to/from Junction 10 of the M40
- The A4095, A4221 and A41 for travel to/from Junction 9 of the M40

3.3.1.3 A Construction Environmental Management Plan (CEMP) would be prepared and would incorporate the mitigation measures outlined in the ES. This would be implemented throughout the construction phase.

3.3.1.4 The Development has been designed for long-life, adopting future-proofing principles. It is unlikely that the Development would be decommissioned within a period that can be forecast, therefore decommissioning is not included as part of this ES. However, the design of the scheme has been done in such a way that materials can be reused and recycled during decommissioning.

3.4 Alternatives Considered

3.4.1 Introduction

3.4.1.1 This section of the ES summarises the main alternatives considered during the development of the proposals, and reasons why they have been discounted. This considers the evolution of the proposal from the time when a NW Bicester development was first shortlisted within Cherwell District, to the specific layout within the Masterplan Site boundary. This section also identifies how potential environmental impacts have been taken into consideration through-out the design process.

3.4.2 Weston Otmoor NW Bicester Development Site

3.4.2.1 Following publication of PPS1 – eco-towns, LPAs across the UK submitted applications for eco-towns to be considered within their local areas. Twelve locations were shortlisted, one of which was located within Cherwell District. The original location was near the village of Weston-on-the-Green; this proposal was known as Weston Otmoor. It comprised 15,000 dwellings, 15,000 jobs and a range of retail space, leisure facilities, primary and secondary schools, healthcare provision and community facilities. CDC objected to the Government’s proposal at Weston Otmoor, raising the suggestion of an alternative eco-town at NW Bicester. This concept was based upon Local Development Framework (LDF) work undertaken by CDC.

3.4.2.2 The Eco-towns Location Decision Statement (Ref 3-1) stated ‘the [Weston Otmoor] site was considered not to demonstrate the potential to meet the sustainability and deliverability requirements for successful development as an eco-town at this time’. Some of the key sustainability issues of the site included being partially on the Oxford Green Belt, being located on high grade and versatile agricultural land (Grade 2), on a site incorporating Ancient Woodland, Sites of Special Scientific Interest (SSSI) and a Nature Reserve, being in an area of ‘serious’ water stress, and being close to a congested road junction on the M40 and A34 which could encourage commuting and exacerbate congestion.

3.4.3 Determining the Masterplan Site Boundary

- 3.4.3.1 During the development of the Masterplan Site proposals, A2Dominion Group considered a number of alternative boundaries for the site. The environmental consultants advising the design team were consulted at all stages to comment on proposed land parcel selection.

3.4.4 Development of Site Layout

Previous Masterplan

- 3.4.4.1 The masterplan produced for the 2010 consultation suggested a concept of four villages separated by green spaces. This concept required the green infrastructure to be subdivided to provide at least three areas separating villages. The resultant fragmentation of green areas did not relate well to the existing hedgerows and streams and the green space between housing areas were not of sufficient size to create a distinctive visual and environmental quality or to be suitable for green infrastructure uses.
- 3.4.4.2 The residential catchment for four villages of 1,000-1,500 homes would have been below the optimum size of 2,000-3,000 needed to create viable convenience retail and a cohesive local centre with amenities.

Masterplan Alternatives Considered Since 2010

- 3.4.4.3 Since the 2010 consultation, design work has continued to evolve with a number of different alternative layouts and options being explored taking into consideration the findings of the consultation. The following alternatives were considered in the Masterplan development process.
- 3.4.4.4 Options were considered for location and size of employment land in one or more locations within the Masterplan site. This included spreading employment use across the site in four equal portions, but businesses could have considered these locations too close to housing, with the risk of disturbance and general complaints which could affect their business practices. There would also be increased movement of goods traffic through existing and new residential areas.
- 3.4.4.5 The masterplan process studied how to create good connections within the development and minimise traffic going through existing communities. Options that were explored included doing minor improvements to Howes Lane and existing junctions, providing road loops on the north and south sides of the railway line, providing either 'bus/cycle/pedestrian only' or 'all traffic' links across the railway in the site's centre, and a walking and cycling route parallel with the railway going towards the town centre. The masterplan process also explored OCC's option for a perimeter road, including one around the NW Bicester site. However, this new route was seen as separating rather than joining existing Bicester with the proposed new development.
- 3.4.4.6 Different options for the number of houses were studied. A 5,000 home option was considered, and at the assumed average density, would require 330ha (800 Acres) of land – a similar area to the 2010 NW Bicester Masterplan. The overall net developable area has been determined on the basis of the

assessment of constraints and opportunities. A reduction in net land, which the 5,000 home option would represent, was considered artificial and would compromise the spatial strategy. Likewise, a reduction in the assumed average density would not result in an efficient use of land and would compromise place making ambitions.

Summary of Main Changes from 2010 to 2014

- 3.4.4.7 The current NW Bicester Masterplan has extended the site area fully within the area proposed by the NW Bicester masterplan (approximately 400 ha) increasing the masterplan potential to 6,000 homes. Taking into account the increased site area and fresh consideration of opportunities and constraints, the spatial layout was revised to create two clusters of development, instead of four villages. This enabled green infrastructure to be grouped in larger quantities in strategic locations. Two local centres would also provide a larger catchment/footfall.
- 3.4.4.8 The current Masterplan incorporates a realigned Howes Lane and a new crossing under the railway line, as part of the new A4095 NW Strategic Link Road, and would create an Urban Boulevard and front new residential on high quality urban streets along with new amenities linking new and existing neighbourhoods.
- 3.4.4.9 During the December 2013 consultation these proposals were presented and discussed with the local community and the principles were generally accepted subject to further detail being presented.

4 Assessment Methods

4.1 Introduction

4.1.1.1 This ES presents the assessment of the environmental effects likely to result from the construction and operation of the Development. As outlined in Section 3.3, decommissioning of the Development is not considered in this ES. This chapter sets out the various stages of the EIA and the methods used to assess the various environmental topics.

4.2 Scoping of Environmental Topics

4.2.1.1 In accordance with Regulation 5 of the Town and Country Planning (Environmental Impact Assessment) Regulations 2011, a request for screening and scoping opinion was submitted in May 2014 by Hyder Consulting. This identified that the Development could potentially have significant environmental effects on the following topic areas:

- Landscape and Visual Impact
- Ecology
- Flood Risk and Hydrology
- Air Quality
- Noise
- Built Heritage and Archaeology
- Contaminated Land
- Agriculture and Land Use
- Human Health
- Socio-Economics and Community
- Waste
- Traffic and Transport

4.2.1.2 The following areas have been scoped out of the ES:

- A separate Sustainability chapter has not been included as this is being covered in a separate Sustainability Statement. This will be submitted as part of the Development planning submission.
- Microclimate studies have not been included within the ES, as it is not considered that there will be significant effects on environmental receptors.

4.2.1.3 The Scoping Report provided an outline approach for the identification of potentially adverse and beneficial effects. It was sent to the following statutory consultees and stakeholders for comment:

- Cherwell District Council
- Environment Agency
- English Heritage

- Natural England
- Oxfordshire County Council
- Local landfill operators
- Local waste management facilities
- Thames Valley Environmental Records Centre
- Parish Councils
- Oxfordshire Clinical Commissioning Groups
- Bicester Town Council
- Banbury Constabulary
- Thames Water

4.2.1.4 Consultation has been undertaken with these organisations since the Exemplar phase of NW Bicester. The scoping has evolved with the design over this period and reflects the iterative nature of the consultation process. The Scoping Report is included in Appendix 4A and responses are included in Appendix 4B.

4.3 Consultation

4.3.1.1 From the outset, A2Dominion has had an open approach to information about the development and has made a substantial number of public and private presentations and ensured information is made available via www.nwbicester.co.uk.

4.3.1.2 As well as through numerous ad hoc meetings and conversations, there has been structured contact through both the project workstream structure and formal periods of consultation.

4.3.1.3 From 2008 to 2014, A2Dominion has consulted with the public and stakeholders through workshops, public engagements and roadshows, providing the local community with details of the 2008 masterplan and integrated the communities' feedback into the current masterplan. Further detail on consultation is set out in the Statement of Community Involvement.

4.3.1.4 The detailed work to produce the wider Masterplan and specific proposals for the Exemplar scheme began with an Open Planning Week which established local ambitions, context and concerns. Other events include: Bike Day 2013, 2011 exemplar model and consultation and masterplan stakeholder workshops in 2013.

4.3.1.5 There is a significant level of active support for the proposed Masterplan from key groups, including elected representatives on Town, District and County councils and in consultation responses from the local parish – Caversfield. There has also been consistent support from Bicester Vision (the public-private partnership) and the Bicester Chamber of Commerce. Various other groups, including the Bicester Local History Society, the residents' associations and individual business and community associations have shown consistent interest.

- 4.3.1.6 A good level of awareness of the proposals for NW Bicester has been established and a significant amount of interest shown in information presented publicly. Primary concerns have centred on whether the development would reach the high expectations of sustainability and the impact of the additional population on traffic and other infrastructure.
- 4.3.1.7 During the EIA process, statutory and key non-statutory consultees have been engaged both as part of the scoping process and during ES preparation. These key consultees include English Heritage, Natural England, the Environment Agency (EA), Cherwell District Council (CDC) and Oxfordshire County Council (OCC). Topic specific consultation is described in the relevant topic chapter.

4.4 Environmental Impact Assessment General Methodology

- 4.4.1.1 In accordance with relevant guidelines, the EIA has incorporated the following elements:

The Baseline: Baseline environmental conditions, including those that are predicted to exist immediately prior to construction and operation of the development as well as those currently existing, have been identified through a number of means. They were determined through consultation, the use of existing data or through undertaking additional surveys, studies and modelling. Each environmental discipline has identified key resources and receptors that have been taken into account during the assessment process.

Assessment Scenarios: For all topics, assessments have been made of the impacts with (Do-Something) and without (Do-Minimum) the Development. The Do-Minimum scenario represents a baseline against which the environmental effects of the development can be measured. This takes account of the likely future baseline conditions, allowing for environmental trends and planned future development that has not yet been implemented. The reference year for future traffic flows is 2031, as agreed with OCC and CDC, and is applied in Chapter 8 Air Quality, Chapter 9 Noise and Vibration and Chapter 16 Transport.

Spatial Scope: The area over which impacts could occur could be wider than the area of land directly taken by the proposals. Therefore, it was inappropriate to define a single study area for the assessment, since the spatial scope varied depending on the topic under consideration. The study areas allow for the assessment of indirect as well as direct effects, including off-site works such as spoil disposal and routes for construction traffic.

Temporal Scope: In considering the environmental effects of the development, it is necessary to identify impacts that may occur during construction or operation. Construction extends from the commencement of site works to the date immediately prior to opening of the development. Operation extends from immediately after opening of the development for the remainder of its life. In addition, it is recognised that some environmental design measures would take time to become established and effective. The assessment therefore has considered impacts in Year 1 (Opening Year) and in Year 15 (Design Year),

where appropriate. It is also recognised that some effects would be of a permanent nature whereas others would be temporary.

Assessing Impacts: Impacts associated with the construction and operational stages of the Development have been identified. These have been considered in terms of their nature, the physical extent of their influence and the magnitude of their effects. In considering the nature and significance of the impacts, the effects were assessed on the basis of whether they would be:

- Direct or indirect
- Temporary, short, medium or long term
- Reversible or irreversible
- Beneficial or adverse
- Cumulative

Qualitative and quantitative techniques have been used to assess these impacts, as appropriate. The EIA identifies those elements of the development that have been introduced to mitigate potential adverse effects and assesses the significance of the impacts that remain after mitigation measures have been put in place (the “residual impacts”).

Determining Significance: Determining whether or not an impact is significant is an important step in the formal EIA process, and is necessary in order to satisfy statutory reporting requirements. In general, the significance of an impact reflects the importance or value of the affected resource or receptor, its sensitivity to change, and the magnitude of the predicted impact. The criteria for determining significance varies from topic to topic but the general principle that has been followed is that higher magnitude impacts on important resources would be regarded as significant. Lower magnitude impacts on less important resources would not generally be regarded as significant.

4.5 Cumulative Impacts

4.5.1.1 Cumulative impacts result from the incremental impacts of the development when added to other past, present and reasonably foreseeable future actions. The impacts from a single development may not be significant on their own but when combined with other impacts and other developments, these effects could become significant.

4.5.1.2 Cumulative effects have been considered by describing and assessing the following:

- Interaction of impacts from the development with those from other plans or activities, including the various phases of the redevelopment of this site.
- Interaction of different impacts of the development, which affect the same resource or receptor.

4.5.1.3 Cumulative impacts have been considered in each topic chapter as necessary, and summarised in Chapter 17 Cumulative Effects. Details of consented and planned schemes considered are provided in Tables 17-1 and 17-2 of this ES.

4.5.1.4 The planned and consented developments near the Site listed Table 17-1 and Table 17-2 have been taken into consideration when assessing the potential cumulative impacts. However, it should be noted that the number and location of receptors vary for each environmental topic and so does the extent of study area (due to the different nature of impacts). Therefore, each topic considers those developments on Drawing 17-1 and 17-2 which are likely to have an impact on the identified potential receptors within their study area.

5 Landscape and Visual

5.1 Introduction

5.1.1.1 This chapter considers the landscape and visual implications of the Development. Landscape is defined in the European Landscape Convention (Ref 5-1), as ‘...an area, as perceived by people, whose character is the result of the action and interaction of natural and/or human factors’. Visual considerations relate specifically to the views of a landscape afforded to people. These separate but related issues form the basis for landscape and visual impact assessment (LVIA).

5.2 Regulatory and Policy Framework

5.2.1.1 This impact assessment has been undertaken in accordance with current international and national legislation, and national, regional and local plans and policies relating to landscape and visual amenity in the context of the Development. A summary of the relevant legislation and policies, the requirements of these policies and the Development response has been provided in Table 5-1 below.

Table 5-1 Landscape and Visual Regulatory and Policy Framework

Policy/Legislation	Summary of Requirements	Development Response
National Planning Policy Framework (Ref 5-2)	Landscape to be taken into account in the planning process through protection and enhancement of landscapes.	Development will respect and enhance local landscape character, securing appropriate mitigation where damage to local landscape character cannot be avoided. This will be achieved, in large part, through green infrastructure proposals and through design in response to the local vernacular.

5.3 Methodology

5.3.1 General Approach

5.3.1.1 The assessment process has been carried out based on guidance entitled ‘Guidelines for Landscape and Visual Impact Assessment: Third Edition’, produced by the Landscape Institute and Institute of Environmental Management and Assessment, in 2013 (Ref 5-4).

5.3.2 Consultation

5.3.2.1 The general approach to assessment and specific viewpoints have been agreed with Cherwell District Council, following attendance at workshops, telephone conversations and correspondence, between 2010 and 2013. LVIA has also been carried out in accordance with Natural England’s response to the EIA Scoping consultation in 2014, which is included in Appendix 4A of this ES.

5.3.3 The Study Area

5.3.3.1 The Study Area is broadly defined by the likely Zone of Visual Influence (ZVI) of the Development, or the approximate, theoretical area from which any part of the Development would be visible. As part of the assessment process, a local landscape character assessment has been undertaken for land to the north-west of Bicester, within which the Development site sits. Landscape character areas extend beyond the ZVI where there is continuity of respective landscape characteristics outside of the Study Area. The ZVI is illustrated on Drawing 5-1, landscape character areas are shown on Figure 5-1.

5.3.4 Methodology for Establishing Baseline Conditions

Establishing the Existing Baseline

5.3.4.1 Relevant information has been obtained from Natural England, Oxfordshire County Council, CDC and Ordnance Survey, supported by field survey. Key information sources are as follows:

- Cherwell District Council (2014); 'Local Plan Submission' (Ref 5-3).
- Countryside Agency (1999); 'Countryside Character' (Ref 5-5)
- Cherwell District Council (1995); 'Cherwell District Landscape Assessment' (Ref 5-6)
- Oxfordshire County Council (2004); 'Oxfordshire Wildlife and Landscape Study' (Ref 5-7)
- WYG Planning & Environment (2013): 'Bicester Landscape Sensitivity Capacity Assessment' (Ref 5-8)

5.3.4.2 Viewpoints have been selected to represent the range of visual receptors and views affected, against which visual sensitivity was assessed. These have been agreed with Cherwell District Council and corresponding photographs have been produced in accordance with Landscape Institute Advice entitled 'Photography and Photomontage in Landscape and Visual Impact Assessment' (Ref 5-9). Photographs have been taken using the digital equivalent of a 50mm lens for 35mm format camera, with digital single lens reflex (SLR) camera lens at 1.65m above ground level. Photographs have been reproduced in the form of stitched, multiple-frame panoramas with the vertical frame dimension fixed at that for a standard 6" (150mm) x 4" (100mm) photograph and a panorama composition broadly of one third sky and two thirds land.

Forecasting the Future Baseline ("Without Development" Scenario)

5.3.4.3 The Bicester Eco Development Exemplar is taken into account in the assessment, where relevant.

Defining the importance/sensitivity of resource

5.3.4.4 The importance or sensitivity of each resource is assessed using the criteria provided in Table 5-2.

Table 5-2 Determining the Importance / Sensitivity of Landscape and Visual Receptors

Importance/ sensitivity of receptor	Criteria
Very High	<p><u>Landscape</u></p> <p>Value: Typically of very high importance and rarity, international scale, and very limited potential for substitution (e.g. World Heritage Site). *Susceptibility to change: Landscape very unlikely to tolerate the change proposed, even with mitigation.</p>
	<p><u>Visual</u></p> <p>Recreational routes within nationally valued landscapes (such as National Parks or Areas of Outstanding Natural Beauty), where appreciation of affected views may be the principal activity.</p>
High	<p><u>Landscape</u></p> <p>Value: Typically of high importance and rarity, national scale, and limited potential for substitution (e.g. National Park or Area of Outstanding Natural Beauty). *Susceptibility to change: Landscape very unlikely to tolerate the change proposed, even with mitigation.</p>
	<p><u>Visual</u></p> <p>Recreational routes outside of nationally valued landscapes, where attention may be focussed on affected views. Residential Properties.</p>
Medium	<p><u>Landscape</u></p> <p>Value: Typically of high or medium importance and rarity, regional scale, and limited potential for substitution (e.g. Registered Historic Park and Garden, Conservation Area). *Susceptibility to change: Landscape has the potential to tolerate the change proposed, with appropriate mitigation.</p>
	<p><u>Visual</u></p> <p>Open areas/ recreation areas outside of nationally valued landscapes, where attention may be focussed on affected views.</p>
Low	<p><u>Landscape</u></p> <p>Value: Typically of low or medium importance and rarity, local scale, such as undesignated landscape. *Susceptibility to change: Landscape likely to tolerate the change proposed, with appropriate mitigation.</p>
	<p><u>Visual</u></p> <p>Places of work or commercial properties, where attention is unlikely to be focussed on affected views.</p>
Negligible	<p><u>Landscape</u></p> <p>Value: Typically of very low importance and rarity, local scale, such as degraded landscape identified for enhancement in policies. *Susceptibility to change: Landscape likely to readily absorb the change proposed.</p>

Importance/ sensitivity of receptor	Criteria
	<u>Visual</u> Roads and railways, where views are transient due to travelling through the landscape.

Source: Professional judgement. *The professional judgement concerning susceptibility to change is made by considering the nature/characteristics of the development and receiving landscape, following evaluation of value/importance and prior to the assessment of effects.

5.3.5 Methodology for Assessing Impacts

5.3.5.1 The magnitude of each impact is assessed using the criteria provided in Table 5-3.

Table 5-3 Assessing Magnitude of Impact

Magnitude of Impact	Criteria
Major	<u>Landscape</u> Adverse: Loss of landscape character and/or quality and integrity of landscape designation; severe damage to key landscape characteristics, features and elements. Beneficial: Large scale or major improvement of landscape quality; extensive restoration or enhancement; major improvement of landscape attribute quality.
	<u>Visual</u> Adverse: Where the Development would cause a substantial deterioration in existing views. Beneficial: Where the Development would cause a substantial improvement in existing views.
Moderate	<u>Landscape</u> Adverse: Loss of landscape character, but not adversely affecting the integrity of landscape designation; partial loss of/damage to key landscape characteristics, features or elements. Beneficial: Benefit to, or addition of, key landscape characteristics, features or elements; improvement of landscape attribute quality.
	<u>Visual</u> Adverse: Where the Development would cause a noticeable deterioration in existing views. Beneficial: Where the Development would cause a noticeable improvement in existing views.
Minor	<u>Landscape</u> Adverse: Some measurable change in landscape attributes, quality or vulnerability; minor loss of, or alteration to, one (maybe more) key landscape characteristics, features or elements. Beneficial: Minor benefit to, or addition of, one (maybe more) key landscape characteristics, features or elements; some beneficial impact on landscape attribute or a reduced risk of negative impact occurring.

Magnitude of Impact	Criteria
	<u>Visual</u> Adverse: Where the Development would cause a minor deterioration in existing views. Beneficial: Where the Development would cause a minor improvement in existing views.
Negligible	<u>Landscape</u> Adverse: Very minor loss or detrimental alteration to one or more landscape characteristics, features or elements. Beneficial: Very minor benefit to or positive addition of one or more landscape characteristics, features or elements.
	<u>Visual</u> Adverse: Where the Development would cause a very inconspicuous deterioration in existing views. Beneficial: Where the Development would cause a very inconspicuous improvement in existing views.
No Change	<u>Landscape</u> No loss or alteration of landscape characteristics, features or elements; no observable adverse or beneficial impact.
	<u>Visual</u> No discernable deterioration or improvement in existing views.

5.3.5.2 Magnitude of impacts can be positive (beneficial) or negative (adverse).

5.3.5.3 The significance of impacts is determined using the approach described in Chapter 4 of this ES.

5.3.5.4 This assessment relates to an outline planning application, as a result block-wireline photomontages have been prepared, based on parameter plans, rather than more detailed representations of the Development. These have been produced in accordance with Landscape Institute Advice entitled 'Photography and Photomontage in Landscape and Visual Impact Assessment' (Ref 5-9).

5.3.6 Limitations and Assumptions

5.3.6.1 Field survey work was undertaken during summer. At this time of year, deciduous trees and shrubs are with leaves such that there is less visibility within the landscape than in winter months (when there is not deciduous leaf cover).

5.4 Description of the Baseline Conditions

5.4.1 Existing Baseline

5.4.1.1 The site and immediate surroundings are not covered by any landscape designations.

5.4.1.2 Natural England has produced a landscape character assessment of England entitled 'Countryside Character', 1999 (Ref 5-5). Land to the north west of Bicester is defined by the transition between National Character Areas 107 and 108, the 'Cotswolds' and 'Upper Thames Clay Vales', respectively. More locally, the area forms part of the 'Oxfordshire Estate Farmlands' Character Area identified in Cherwell District Landscape Assessment (1995) (Ref 5-6). This is broadly described as having a rolling landform, with underlying limestone geology, characterised by a distinctive pattern of woodlands and mixed farmland - much of which is associated with 18th Century parkland. Most recently, the Oxfordshire Wildlife and Landscape Study (2004) (Ref 5-7), places the site within 'Wooded Estatelands' Landscape Character Type, with the following key characteristics:

- 'Rolling topography with localised steep slopes.
- Large blocks of ancient woodland and mixed plantations of variable sizes.
- Large parklands and mansion houses.
- A regularly shaped field pattern dominated by arable fields.
- Small villages with strong vernacular character.'

5.4.1.3 Within this Character Type, the land near Bicester is classified as 'Middleton Stoney' Landscape Character Area, described as follows:

'The area is dominated by large arable fields and localised improved grassland. There are smaller grass fields around villages, particularly Bletchington and Kirtlington. Woodland is a strong landscape element, and large woodland blocks are associated with the parklands and estates. It is mainly ancient semi-natural woodland, with species such as ash, oak, hazel, and field maple, as well as mixed plantations. Throughout the landscape, there are belts of young mixed and coniferous plantations next to roadside hedges and they often function as field boundaries. Hedgerow trees such as ash, sycamore and occasionally oak are found in some roadside hedges, but they are sparser to the north where there is more intensive arable cropping. In parts there are dense corridors of willow and ash, belts of semi-natural woodland and poplar plantations bordering watercourses. Hedgerows vary from tall, thick species-rich hedges with shrubs such as wayfaring tree, dogwood, hazel, field maple, spindle and wild privet through to low, gappy internal field hedges. Parklands are a prominent feature throughout and they include Middleton, Bignell and Tusmore Parks in the north and Kirtlington and Bletchington Parks in the south.'

5.4.1.4 The landscape strategy for the Wooded Estatelands, within which the Middleton Stoney area lies, is to safeguard and enhance the characteristic landscape of parklands, estates, woodlands, hedgerows and unspoilt villages.

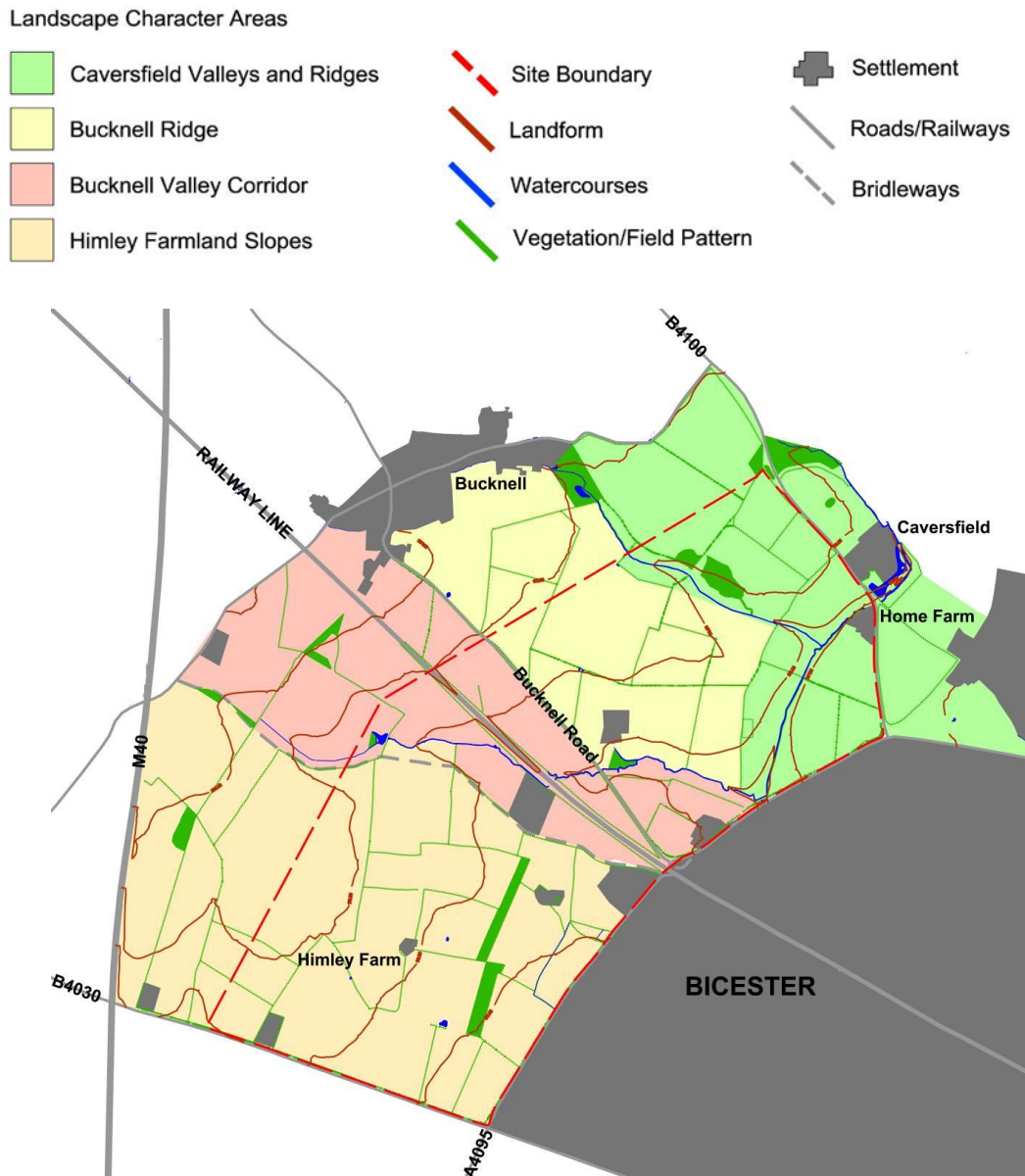
5.4.1.5 In addition to the landscape character assessments outlined above, WYG Planning & Environment was commissioned by Cherwell District Council to produce 'Bicester Landscape Sensitivity and Capacity Assessment' (Ref 5-8) which forms part of the evidence base for the Cherwell Local Plan Submission. The landscape of the masterplan site is described as follows:

'The site comprises a relatively flat landform ranging between 80m and 95m AOD. The area is dissected by the Bicester to Banbury railway line passing

through the centre of it in a south east to north west orientation; Bicester Road/Bucknell Road runs parallel to the railway line and creates a wedge of land in the middle of the site which is isolated from the surrounding area by the railway line and road. There are a number of streams and drainage ditches passing through the northern area providing field drainage, some of these converge in the northern area of the site and pass through the adjacent housing area to the south east and feed into Bure Park Nature Reserve. This drainage network provides a slightly more varied topography to the north of the railway line than to the south. There is one Public Footpath passing through the area in a south east to north west orientation, again almost parallel with the railway line. This route enables views over the surrounding arable lands to the south of the footpath although views north are truncated by the elevated alignment of the railway line. Views are available south as far as Himley Farm in the southern area of the site before the land falls slightly towards Bignell Park. The site is crossed by a number of low voltage transmission lines although these are primarily within the southern half of the site. Whilst these are detracting within the views, they are not dominantly visible due to the deciduous plantations which screen them in places.'

- 5.4.1.6 The sensitivity and capacity assessment identifies the masterplan site has having medium-high capacity for residential, employment and recreation development, which is defined as the capacity to accommodate development as long as recognition is given to protect the landscape character and the visual resource of the site. Specifically, the assessment suggests maintaining the visual separation with outlying satellite settlements such as Bucknell. In terms of general landscape maintenance/management, the assessment suggests enhancement of the railway line as a wildlife corridor; development of improved structure planting along site boundaries; improvements to the water courses, including introduction of native species planting; and improved access through the area creating a series of footpaths from the adjacent housing estates.
- 5.4.1.7 As part of the landscape impact assessment process for the NW Bicester development project, a landscape character assessment has been prepared for land to the north west of Bicester based on the principles set out in 'Landscape Character Assessment Guidance for England and Scotland', produced by the Countryside Agency and Scottish Natural Heritage, in 2002 (Ref 5-10). In line with this guidance, landscape character areas have been identified and key landscape characteristics defined for each. The sensitivity of each landscape character area to the masterplan has also been identified, based on the criteria set out in the methodology, above.
- 5.4.1.8 Local landscape character areas that have been identified for land to the north-west of Bicester, each with a distinctive sense of place in the form of key characteristics, as illustrated and described below. This provides the local landscape character context for the North West Bicester development Masterplan Site, within which the Development would sit:

Figure 5-1 Local Landscape Character Areas



Caversfield Valleys and Ridges:

- Distinctive valley and ridge landform.
- Valleys defined by tree lined watercourses, woodland blocks and relatively steep fields predominantly laid to pasture.
- Mixed farmland on ridges, with fields bounded by established hedgerows and woodland blocks.
- Settlement comprising the historic, stone built village of Caversfield, including Home Farm and the Anglo-Saxon St Lawrence's Church (Listed Buildings), with the church tower forming a visible element in the local landscape.
- Generally strong sense of enclosure due to characteristic landform, vegetation and settlement edges.

5.4.1.9 Based on the criteria set out in Section 5.3 above, landscape value is considered to be low. The setting of St Lawrence's Church and Home Farm are key considerations for any future development within this character area. This setting is currently defined in large part by undeveloped agricultural land with associated rural qualities, in turn allowing views from these areas to the church tower, such that built development without adequate open buffers would be incongruous. Development edges made up of soft landscape proposals and sensitively designed built form have the potential to conserve and enhance the current setting of historic features and would respond well to the existing tree and woodland cover, described above. The strong landscape structure and general sense of enclosure across the landscape are such that with careful consideration for retention and enhancement of local features (described above) development could be accommodated without resulting in disruption to the local landscape pattern. Overall, taking into account the existing landscape and scope for mitigation, this landscape is considered to have a **low** sensitivity.

Bucknell Ridge:

- Ridgeline defined by subtly raised landform, with land falling away to local watercourses and Bicester urban edge.
- Large, rectilinear fields, predominantly in arable use.
- Established hedgerows with hedgerow trees.
- Settlement limited to scattered farmsteads of clustered farm buildings.
- Open, expansive views framed by established hedgerow vegetation.

5.4.1.10 Based on the criteria set out in Section 5.3 above, landscape value is considered to be low. Development in this raised area has the potential to form an obtrusive element within the landscape. However, if new built form responds to the local pattern of clustered settlement, buffered by tree planting and separated by open land, development could occur without undue urbanising effects in the wider landscape. Overall, taking into account the existing landscape and scope for mitigation, this landscape is considered to have a **low** sensitivity.

Bucknell Valley Corridor:

- Shallow valley depression, falling between local ridgelines.
- Landscape pattern heavily influenced by linear communications and drainage features, with generally narrow, elongated fields separated by communications and drainage corridors.
- Farmland comprising mixture of fields in arable and pastoral use, bounded by established hedgerows and copses.
- Settlement defined by a mixture of scattered farmsteads and, nearer the urban edge, modern offices /depots.
- Strong sense of enclosure due to vegetation cover, railway embankment and settlement edges.

5.4.1.11 This enclosed landscape offers limited views across the area and, with careful consideration for existing vegetation; development could be accommodated without resulting in significant disruption to the local landscape characteristics.

There is considerable scope to enhance communications/drainage corridors through landscape proposals that improve amenity value, particularly where there is currently/could be public access. Overall, taking into account the existing landscape and scope for mitigation, this landscape is considered to have a **low** sensitivity.

Himley Farmland Slopes:

- Gently sloping farmland, predominantly in arable use, interspersed with woodland shelter belts.
- Medium to large-scale fields bounded by established hedgerows with hedgerow trees.
- Settlement limited to isolated farmsteads, including the historic Himley Farm buildings (the barns are Listed Buildings), connected by hedgerow lined tracks.
- A number of overhead power lines, which form urbanising elements, traverse the area.

5.4.1.12 Based on the criteria set out in Section 5.3 above, landscape value is considered to be low. This gently sloping, enclosed landscape, offers limited views across the area, and with careful consideration for local features (described above), development could be accommodated without resulting in disruption to the local landscape pattern. Whilst Listed Buildings present a constraint, their setting could be respected through careful layout of proposals, retention of landscape features and structural planting, where appropriate. Overall, taking into account the existing landscape and scope for mitigation, this landscape is considered to have a **low** sensitivity.

5.4.1.13 Visual receptors include residential properties at and outlying the northern edge of Bicester, Public Rights of Way, and roads. Viewpoints have been selected to represent the range of visual receptors and views affected, against which visual sensitivity is assessed. The location of viewpoints is indicated on Drawing 5-1, with corresponding panoramic photographs illustrated on Drawing 5-2.

- Viewpoint 1: View north-eastwards from field gate off A4095 Lords Lane: This view represents users of Lords Lane road, at the northern edge of Bicester, and visual sensitivity is therefore considered to be **negligible**. This view illustrates the glimpsed views to the fields in which the Development site lies, available through field gateways. The backdrop is formed by hedgerows and trees in the distance.
- Viewpoint 2: View north-eastwards from junction of Germander Way and A4095 Lords Lane: This view represents users of Lords Lane road and cycleway together with adjacent properties, at the northern edge of Bicester. Given the presence of residential properties and a recreational route, visual sensitivity is considered to be **high**. Existing visual amenity is characterised by established tree and shrub planting along Howes Lane, which also serves to direct views along the road corridor.
- Viewpoint 3: View north-westwards from B4100 Banbury Road south of Home Farm/Caversfield: This view represents users of Banbury Road and as such visual sensitivity is considered to be **negligible**. Hedgerows and

intermittent hedgerow trees limit views out to the wider landscape, such that the road, signage, grass verges and adjacent hedgerows form the dominant elements, with only glimpses to the Development site. Once constructed, the Bicester Eco Development Exemplar will form part of the foreground in the view.

- Viewpoint 4: View westwards from residential properties south of Caversfield: This view represents residential properties and adjacent minor roads south of Caversfield (near Skimmingdish Lane). Given the presence of residential properties, visual sensitivity is considered to be **high**. At ground level, dense hedgerows dominate the foreground, allowing only glimpses of the agricultural fields beyond. From first floor windows views are more open, but with hedgerows in the wider landscape preventing unimpeded views to the Development site. Once constructed, glimpsed views of the Bicester Eco Development Exemplar will be available, within the backdrop.
- Viewpoints 5 and 6: Views south-westwards and north-westwards at entrance to Home Farm Business Units: This viewpoint represent views of Home Farm business unit users, visual sensitivity is therefore considered to be **low**. From the properties and outbuildings, established trees at the periphery of the farm complex filter views out to the surrounding agricultural fields and Development site. Whether from the access or business premises, views of the Development site are impeded by dense hedgerows and intermittent hedgerow trees. Once constructed, Bicester Eco Development Exemplar will be visible beyond the immediate hedgerows.
- Viewpoints 7 and 8: Views southwards from Public Footpath northwest of Caversfield: These views represent views from a recreational route and as such visual sensitivity is considered to be **high**. Current views towards the Development site are defined by the local agricultural landscape, with arable fields forming the foreground and a backdrop of established hedgerows, copses and woodlands. Once constructed, Bicester Eco Development Exemplar will be visible beyond the nearest hedgerows.
- Viewpoint 9: View southwards from junction off B4100 Banbury Road near Bainton Road: This view represents users of Banbury Road and as such visual sensitivity is considered to be **negligible**. Due to the slightly elevated position of the road views out to the local agricultural landscape are available, in which the foreground is defined by hedgerows and arable fields and the backdrop is formed by established hedgerows, copses and woodlands. Views of the Development site are impeded by dense hedgerows. Once constructed, Bicester Eco Development Exemplar will be visible amongst vegetation within the backdrop.
- Viewpoint 10: View southwards from Public Footpath south of Bucknell: This view represents views from recreational routes, visual sensitivity is therefore considered to be **high**. Views towards the Development site are defined by the local agricultural landscape, with open fields forming the foreground and a backdrop of established hedgerows and hedgerow trees. Views of the Development site are impeded by these dense hedgerows.
- Viewpoint 11: View southwards from Public Footpath off Bucknell Road: This view represents views from a recreational route, visual sensitivity is

therefore considered to be **high**. Current views towards the Development site are defined by the local agricultural landscape, with open arable fields forming the foreground and a backdrop of established hedgerows with substantial and closely spaced hedgerow trees.

- Viewpoints 12 and 13: View eastwards from field gate off Bucknell Road: This view represents views from the road and therefore visual sensitivity is considered to be **negligible**. Current views are generally limited to those of the dense hedgerows and trees that line Bucknell Road, with intermittent views out to pastoral fields, with which the Development sits, bounded by hedgerows and trees.
- Viewpoint 14: View eastwards from Public Bridleway near Crowmarsh Farm barns: This view represents views from a recreational route and therefore visual sensitivity is considered to be **high**. The Development site is obscured by intervening tree and hedgerow vegetation, which forms the backdrop to open arable fields.
- Viewpoint 15: View south-eastwards from road bridge over M40, near Bucknell: This view represents users of the minor road, visual sensitivity is therefore considered to be **negligible**. The M40 is located in-cutting which restricts views out to the surrounding landscape. The bridge offers panoramic views across arable farmland, to the hills beyond. The Development site is barely discernible, amongst vegetation within the backdrop.
- Railway: It is not possible to obtain a geo-referenced viewpoint from the railway due to the movement of the trains; however, these views, of **negligible** visual sensitivity, are described as follows: Elevated views over the Development site are available when approaching or leaving Bicester, on embankment. In these views, the enclosed agricultural land that makes up the site is seen within the context of Bicester's current urban edge, defined by urban extensions dating to the 1990s. Views are partially obscured by vegetation on the railway and trees within the wider landscape.

5.4.2 Future Baseline

- 5.4.2.1 In terms of landscape character, Bicester Eco Development Exemplar, once constructed, would partly define the characteristics of the Caversfield Valleys and Ridges local landscape character area. The Exemplar Development is also taken into account in the viewpoint analysis above.

5.5 Design and Mitigation

5.5.1 Construction Approach and Mitigation of Short-Term Construction Effects

- 5.5.1.1 Construction best practice would be employed to minimise landscape and visual disruption, specifically with respect to protecting retained trees and hedgerows; careful management of retained vegetation at the site periphery to provide visual screening; and locating construction compounds and areas for material/plant storage away from sensitive views, wherever possible.

5.5.2 Scheme Design and Mitigation of Permanent Operational Effects

- 5.5.2.1 The Development responds to landscape character, as expressed through landscape character assessments (set out above). This would be achieved in large part through carefully considered spatial layout, creation of a network of multi-functional green space/infrastructure (including enhancement of public access, watercourses/drainage features and biodiversity), and a commitment to high quality built form. This would include provision of appropriate open land/landscape buffers at key locations, namely land around Bucknell and bordering the existing urban edge of Bicester along Howes Lane.

5.6 Construction Impacts

- 5.6.1.1 There would be disruption to landscape character and visual amenity, principally due to construction compounds, use of construction plant, earthworks and materials storage during construction. However, whilst disruption would be caused, these effects would be minimised by construction best practice, as set out in Section 5.5 above, and, due to their temporary nature, impacts would be of negligible adverse magnitude with significance ranging from neutral to slight adverse. Overall the significance of landscape and visual effects are considered to be **slight adverse**.

5.7 Permanent Operational Impacts

- 5.7.1.1 The Development would not lie within a valued landscape, as expressed through designation. However, as described above, the site is subject to planning policy in respect of landscape character and local landscape characteristics should therefore be taken into account. The Development site falls within the 'Wooded Estatelands' of the Oxfordshire Wildlife and Landscape Study. Landscape characteristics exhibited more locally relate to those of the character areas defined as part of the NW Bicester development project. The implications of the Development for each of these landscape character areas are set out below:
- 5.7.1.2 Caversfield Valleys and Ridges: The Development would alter the existing landscape through the introduction of new high quality built form together with green infrastructure proposals that would assimilate the proposals with the wider landscape. The Development would be separated from St Lawrence's Church/Home Farm by the Bicester Eco Development Exemplar. As a result the magnitude of landscape impact is considered to be minor beneficial. Taking into account low landscape sensitivity the significance of landscape effect is considered to be **neutral**.
- 5.7.1.3 Bucknell Ridge: The Development would alter the existing landscape through the introduction of new high quality built form together with green infrastructure proposals that would assimilate the proposals with the wider landscape. In addition, the landscape structure/enclosure would be retained/enhanced a separation with Bucknell would remain in place. As a result the magnitude of landscape impact is considered to be minor beneficial. Taking into account low

landscape sensitivity the significance of landscape effect is considered to be **neutral**.

- 5.7.1.4 Bucknell Valley Corridor: The Development would alter the existing landscape through the introduction of new high quality built form together with green infrastructure proposals that would assimilate the proposals with the wider landscape and enhance existing communications corridors. As a result the magnitude of landscape impact is considered to be minor beneficial. Taking into account low landscape sensitivity the significance of landscape effect is considered to be **neutral**.
- 5.7.1.5 Himley Farmland Slopes: There would be no changes to the fabric of this landscape character area and views to the Development would be restricted by intervening vegetation. As a result the magnitude of landscape impact is considered to be no change and the significance of effect is considered to be **neutral**.
- 5.7.1.6 The overall significance of landscape effects is considered to be **neutral**.
- 5.7.1.7 The locations of viewpoints are indicated on Drawing 5-1, with corresponding panoramic photographs and photomontages illustrated on Drawing 5-2. Visual effects are assessed as follows:
- Viewpoint 1: View north-eastwards from field gate off A4095 Lords Lane: Views over the agricultural landscape would be replaced by built development at close quarters. Whilst there is a commitment to high quality built form with green infrastructure, and a number of existing features (such as trees and hedgerows) would be retained, views across open fields would be lost. As a result the magnitude of visual impact is considered to be moderate adverse. Taking into account negligible visual sensitivity, the significance of visual effect is considered to be **slight adverse**.
 - Viewpoint 2: View north-eastwards from junction of Germander Way and A4095 Lords Lane: Existing visual amenity, characterised by established tree and shrub planting along Howes Lane, would remain largely unchanged with only glimpsed views to the Development. As a result the magnitude of visual impact is considered to be minor adverse. Taking into account high visual sensitivity, the significance of visual effect is considered to be **slight adverse**.
 - Viewpoint 3: View north-westwards from B4100 Banbury Road south of Home Farm/Caversfield: The Development would be glimpsed through intervening trees, within the backdrop. Once constructed, the Bicester Eco Development Exemplar will obscure the Development such that there would be no change in the future view. As a result the magnitude of visual impact is considered to be no change. Taking into account negligible visual sensitivity, the significance of visual effect is considered to be **neutral**.
 - Viewpoint 4: View westwards from residential properties south of Caversfield: The Development would be almost entirely obscured by intervening vegetation. As a result the magnitude of visual impact is

considered to be negligible adverse. Taking into account high visual sensitivity, the significance of visual effect is considered to be **neutral**.

- Viewpoints 5 and 6: Views south-westwards and north-westwards at entrance to Home Farm Business Units: The Development would be partially obscured by intervening hedgerows and trees. Once constructed, the Bicester Eco Development Exemplar will almost entirely obscure the Development such that there would be very limited change in the future view. As a result the magnitude of visual impact is considered to be negligible adverse. Taking into account negligible visual sensitivity, the significance of visual effect is considered to be **slight adverse**.
- Viewpoints 7 and 8: Views southwards from Public Footpath northwest of Caversfield: The foreground would continue to be defined by arable fields with the Development sitting within the middle ground and a backdrop of established hedgerows, copses and woodlands. Once constructed, Bicester Eco Development Exemplar will be visible amongst vegetation within the backdrop. Whilst there is a commitment to high quality built form with green infrastructure, and a number of existing features (such as trees and hedgerows) would be retained, views across open farmland would be lost. As a result the magnitude of visual impact is considered to be moderate adverse. Taking into account high visual sensitivity, the significance of visual effect is considered to be **moderate adverse**.
- Viewpoint 9: View southwards from junction off B4100 Banbury Road near Bainton Road: The Development would be visible amongst trees within the backdrop, would be partly obscured by vegetation and would not substantially break the skyline. Once constructed, Bicester Eco Development Exemplar will also be visible amongst vegetation within the backdrop. As a result the magnitude of visual impact is considered to be minor adverse. Taking into account negligible visual sensitivity, the significance of visual effect is considered to be **slight adverse**.
- Viewpoint 10: View southwards from Public Footpath south of Bucknell: The foreground would continue to be formed by open farmland and the Development would be visible amongst vegetation, where there is a break in intervening lines of trees. The Development would not substantially break the skyline and the commitment to high quality built form and green infrastructure would help to assimilate the Development with the wider panorama. As a result the magnitude of visual impact is considered to be minor adverse. Taking into account high visual sensitivity, the significance of visual effect is considered to be **slight adverse**.
- Viewpoint 11: View southwards from Public Footpath off Bucknell Road: The foreground would continue to be formed by open farmland and the Development would be visible amongst vegetation through limited breaks in intervening lines of trees. The Development would not substantially break the skyline and the commitment to high quality built form and green infrastructure would help to assimilate the Development with the wider panorama. As a result the magnitude of visual impact is considered to be minor adverse. Taking into account high visual sensitivity, the significance of visual effect is considered to be **slight adverse**.
- Viewpoints 12 and 13: View eastwards from field gate off Bucknell Road: Views over the agricultural landscape would be replaced by built

development at close quarters. Whilst there is a commitment to high quality built form with green infrastructure, and a number of existing features (such as trees and hedgerows) would be retained, views across open pastoral fields would be lost. As a result the magnitude of visual impact is considered to be moderate adverse. Taking into account high visual sensitivity, the significance of visual effect is considered to be **moderate adverse**.

- Viewpoint 14: View eastwards from Public Bridleway near Crowmarsh Farm barns: The Development would be glimpsed amongst vegetation within the backdrop. As a result the magnitude of visual impact is considered to be negligible adverse. Taking into account high visual sensitivity, the significance of visual effect is considered to be **slight adverse**.
- Viewpoint 15: View south-eastwards from road bridge over M40, near Bucknell: The Development would be visible amongst trees in the distance, resulting in an inconspicuous addition of built form to the vegetated backdrop. As a result the magnitude of visual impact is considered to be negligible adverse. Taking into account negligible visual sensitivity, the significance of visual effect is considered to be **neutral**.
- Railway: In these views, proposed built development would be seen in the context of existing urban edge of Bicester and road corridors, and would be integrated with the wider context through green infrastructure proposals. As a result the magnitude of visual impact is considered to be negligible adverse. Taking into account negligible visual sensitivity, the significance of visual effect is considered to be **neutral**.

5.7.1.8 The overall significance of visual effects is considered to be **slight adverse**.

5.8 Cumulative Impacts

5.8.1.1 The Development is part of a large-scale mixed use development on the wider Masterplan Site for NW Bicester. The Development and Application 2 (South of Railway) would both result in alterations to the Bucknell Valley Corridor local landscape character area. However the railway line (on vegetated embankment), would provide a separation between the two areas of development (limiting inter-visibility) such that additive effects in relation to landscape character would not be significant. From Viewpoints 14 and 15, the Development would be glimpsed amongst vegetation within the backdrop, therefore the combined visibility of the Development and Application 2 (South of Railway), in these views, would not result in significant cumulative visual effects. In summary, there are not likely to be significant cumulative landscape and visual effects.

5.9 Summary

5.9.1.1 The landscape and visual implications of the Development have been considered through comprehensive landscape and visual impact assessment, in accordance with best practice guidance. The site falls within a landscape that is not designated and the Development would respond to landscape character through a carefully considered spatial layout, creation of a network of multi-

functional green space/infrastructure, and a commitment to high quality built form. In views to the Development, the high level of enclosure within the local landscape would generally serve to integrate built form with the rural landscape such that visual impacts would be localised, resulting in limited change to visual amenity overall. Overall, the significance of landscape effects is considered to be **neutral** and the significance of visual effects is considered to be **slight adverse**.

Table 5-4 Landscape and Visual Impact Summary Table

Impact description	Temporary/Permanent	Significance rating
Disruption to landscape character and views during construction.	Temporary	Landscape and visual: Slight adverse
Alteration to landscape character and views resulting from operation.	Permanent	Landscape: Neutral Visual: Slight adverse

6 Ecology

6.1 Introduction

- 6.1.1.1 This chapter assesses the likely significant impacts of the Development known as Application 1 (North of Railway) in terms of Ecology and Nature Conservation. This chapter is supported by the reports presented in Appendix 6A to 6I. Appendices 6A to 6I present the full baseline information relating to Ecology and Nature Conservation. Appendix 6J contains the Biodiversity Strategy.
- 6.1.1.2 The baseline against which the likely significant effects are to be assessed is the current environmental conditions at and surrounding the study area, which comprises an area of land to the north west of Bicester, Oxfordshire, identified as the Masterplan Site on Drawings 6-1 to 6-3. The study area has been widened to allow the effects of the Development on particular species or species groups of conservation concern to be examined (see Appendix 6A for further details). This impact assessment addresses the construction phase and the completed development, or operational phase relating to the Application. It should be noted that the Application 1 covers only part of the Masterplan Site as shown on Drawing 3-1.
- 6.1.1.3 This impact assessment has been undertaken by a Chartered Environmentalist and full member of the Chartered Institute of Ecology and Environmental Management employed by Hyder Consulting (UK) Ltd.
- 6.1.1.4 This assessment has been carried out in accordance with the guidance set out in the Institute of Ecology and Environmental Management's (IEEM) Guidelines for Ecological Impact Assessment (2006) ('the IEEM Guidelines') (Ref 6-1), in order to provide Cherwell District Council with "clear and concise information about the likely significant ecological effects associated with the project" (IEEM, 2006). It is noted that since publication of these guidelines, IEEM is now known as the Chartered Institute of Ecology and Environmental Management.
- 6.1.1.5 The surveys that underpin the ecological impact assessment were undertaken during the period 2010 to 2013; see Appendix 6A for more details.

6.2 Regulatory and Policy Framework

- 6.2.1.1 This impact assessment has been undertaken in accordance with current international and national legislation, and national, regional and local plans and policies relating to nature conservation in the context of the Development. A summary of the relevant legislation and policies, the requirements of these policies, and the Development response has been provided in Table 6-1 below.

Table 6-1 Ecology Regulatory and Policy Framework

Policy/Legislation	Summary of Requirements	Development Response
Habitats Directive (92/43/EEC) as transposed into UK	The Regulations provide for the designation of both Special Protection Areas (SPAs) (first	There are no Natura 2000 sites within 10km of the Site, thus development on this Site is unlikely to have any effects on

<p>legislation by 'The Conservation of Habitats and Species Regulations 2010 (as amended)'. The Directive promotes the maintenance of biodiversity in Europe. The Regulations 2010 constitute the UK government's implementation of the Directive in England and Wales.</p>	<p>established under the Birds Directive, 1979) and Special Areas for Conservation (SACs) as part of the Natura 2000 network of protected areas across Europe. The Regulations also provide protection for European Protected Species (EPS) from deliberate capture, killing or disturbance. It is also an absolute offence to destroy or damage the resting site or breeding site of an EPS.</p>	<p>sites of European importance. There is a confirmed bat roost within a tree on Site (all bats are EPS). This tree is retained within an area of open space associated with the stream corridor. Bats are also known to forage over the Site and their commuting routes and foraging corridors have been safeguarded in the Framework Plan (Drawing number BIMP6 116C) layout, maintaining links between confirmed and potential roost sites both on and off site. Otters are also EPS. Their presence on site has not been confirmed. Nevertheless, the measures put in place to safeguard the watercourses would ensure otters could use the Site in the future.</p>
<p>The Wildlife and Countryside Act (1981), as amended. This Act is the principal mechanism for the legislative protection of wildlife in Great Britain.</p>	<p>The Act provides for the designation of Sites of Special Scientific Interest (SSSI), which are selected as the best national examples of habitat types, sites with notable species and sites of geological importance. Section 1 of the Act provides for the protection of wild birds, their nests and their eggs with special protection given to those species listed in Schedule 1. Full protection is given under Section 9 of the Act to certain animals listed on Schedule 5, including all species of bat. Partial protection under Section 9 is given to certain other species, including all widespread species of reptile. Section 13 of the Act details protection for plants (and fungi), which are listed on Schedule 8.</p>	<p>There are no SSSIs within the Site. There are three SSSIs within 5km of the Site, and a further nine within 10km. Air quality impacts on SSSIs arising from traffic and emissions from the Energy Centre(s) have been assessed in Chapter 8. Species protected by the Act recorded within the Site are common lizard, grass snake, bats and all nesting birds. No protected plant or invertebrate species have been recorded within the Site. As identified above (with respect to the Habitats Directive) the Framework Plan (Drawing number BIMP6 116C) layout incorporates measures to safeguard bat populations. Mitigation measures that would be implemented during construction would ensure no reptiles would be killed or injured. Measures would be implemented during construction to ensure that nests are protected and birds are not disturbed when on their nest.</p>
<p>National Parks and Access to the Countryside Act 1949 Local Nature Reserves (LNRs) are designated by Local Authorities under Section 21 of this act as amended by Schedule 11 of the Natural Environment and Rural</p>	<p>LNRs are places with a wildlife or geological interest of local value that are capable of being managed with the conservation of nature and/or the maintenance of public access as priority concerns.</p>	<p>The northern boundary of Bure Park LNR is 25m from the Site boundary. This LNR comprises the River Bure and adjacent land. The implementation of standard measures to protect water quality during construction and as part of the sustainable drainage system (SuDS) would also ensure that no adverse effects on the River Bure would arise as a result of the Development.</p>

Communities Act 2006.		
Countryside and Rights of Way Act (2000)	<p>This Act (2000) gives greater protection to SSSIs and strengthens wildlife enforcement legislation by the introduction of the offence of 'recklessness' in the damage/destruction or obstruction of protected species' places of shelter or rest and the disturbance of these species within such places. The Act also requires Government Departments to have regard to biodiversity and conservation; Section 74 of the Act required lists of habitats and species of Principal Importance to be produced, for which conservation steps should be taken or promoted. The requirement to prepare such lists of habitats and species was extended by the Natural Environment and Rural Communities (NERC) Act 2006 (see below).</p>	See response to Wildlife and Countryside Act (above) and the NERC Act (below).
Natural Environment and Rural Communities (NERC) Act (2006)	<p>The NERC Act places a duty upon public bodies to consider enhancement of biodiversity within all of their actions. Sections 40 and 41 of this Act superseded Section 74 of the CROW Act. Section 41 lists flora, fauna and habitats considered by the Secretary of State to be of Principal Importance for conserving biodiversity in England.</p> <p>In addition, this Act provides for those species that were previously identified within the UK Biodiversity Action Plan (UKBAP) and the relevant Local Biodiversity Action Plans (LBAPs) to be considered as biodiversity conservation priorities. The UKBAP has been superseded by England's Biodiversity Strategy (see Section 6.2.2 below).</p>	The protection and enhancement of Section 41 and LBAP habitats and species have been considered as part of this assessment. Habitats and species of Principal Importance recorded within the Site include: pond, hedgerow; common lizard, brown hare, hedgehog, bird species (see Table 6-4), noctule, soprano pipistrelle, and brown long-eared bat.
Protection of Badgers Act (1992)	Badgers are protected by the Protection of Badgers Act (1992)	All of the badger setts recorded within the Site would be retained and protected

	<p>which consolidates the legislation specific to badgers. The Act makes it an offence to wilfully take, kill, injure or ill-treat a badger; to obstruct, destroy, or damage in any part, a badger's sett; or to disturb badgers within a sett.</p>	<p>within areas of green space.</p>
<p>The European Water Framework Directive (WFD) (2000)</p>	<p>The European Water Framework Directive came into force in December 2000 and became part of UK law in December 2003.</p> <p>The purpose of the Directive is to establish a framework for the protection of inland surface waters, transitional waters, coastal waters and groundwater.</p> <p>To meet the objectives of the WFD, Member States have established River Basin Districts and developed Plans and Programmes of Measures that detail the actions that need to be taken within each District. The overall aim is for the 'water bodies' and 'protected areas' within each River Basin District to achieve 'good ecological status' by 2015.</p>	<p>The implementation of standard measures to protect water quality and quantity within the Site during construction and as part of SuDS would ensure that no adverse effects on the watercourses within the Site and downstream would arise as a result of the Development. In addition the watercourses within the Site would be maintained within a 60 metre-wide buffer of semi-natural vegetation that would enable the water to follow a natural path. These measures would ensure that the Development does not conflict with the requirements of the WFD.</p>
<p>The Hedgerows Regulations (1997)</p>	<p>The Hedgerows Regulations (1997) provide protection for 'important' hedgerows for which replanting is no substitute. The 'importance' of a hedgerow depends upon a number of archaeological, wildlife and landscape criteria.</p>	<p>The majority of the hedgerows within the Site are species-rich (supporting five or more woody species) and most would be considered 'important' using the wildlife and landscape criteria. The design includes the retention of the majority of the hedgerows within wide bands of semi-natural vegetation.</p>
<p>Planning Policy Statement: Eco-towns. A Supplement to Planning Policy 1 (PPS1)</p> <p>This policy sets out the minimum standards for Eco-town development to ensure that they are exemplars of good practice and provide sustainable, low-carbon living. It states that the design of eco-towns should take full account</p>	<p>Key features of PPS1 that seek to safeguard biodiversity include:</p> <p>ET14 Green Infrastructure sets that forty percent of the eco-town's total area should be allocated to green space, of which at least half should be open to the public. Eco-town applications will also need to demonstrate a range of types of green space. These should be multi-functional, including the supporting of wildlife.</p>	<p>44% of the Site has been allocated to green space.</p> <p>Off-site mitigation would be provided to offset the impacts on farmland birds. Significant areas of green space would be created within the Site. Overall, this would deliver a net gain to biodiversity, as identified in the Biodiversity Strategy that accompanies this planning application.</p> <p>No impact is envisaged on Internationally designated sites within 10km of the Site (as outlined above with respect to European designated sites).</p>

<p>of the impact on local ecosystems, mitigating negative impacts as far as possible and maximising opportunities to enhance their local environments</p>	<p>ET16 Biodiversity stipulates that the eco-town will need to demonstrate a net gain in local biodiversity. Planning permission may not be granted for eco-town proposals which have a significant adverse effect on internationally designated nature conservation sites or Sites of Special Scientific Interest (SSSI). The eco-town development should include a strategy for conserving and enhancing local biodiversity, and this is to accompany the planning application.</p>	<p>Air quality impacts on Nationally designated sites arising from traffic and emissions from the Energy Centre have been assessed in Chapter 8: Air Quality.</p>
<p>National Planning Policy Framework (NPPF) The NPPF sets out how the planning system should protect and enhance nature conservation interests. Its intention is to consolidate previous planning guidance (including Planning Policy Statement 9 (PPS9), the previous guidance on the protection of biodiversity through the planning system) into a single document.</p>	<p>A key function of the NPPF is to promote sustainable development whilst ensuring that planning decisions should protect, and try to improve, wildlife and the habitats they live in. The framework sets out nationally important issues whilst leaving other planning matters to be decided upon by local authorities and communities through the presumption of sustainable development.</p>	<p>The Development retains and protects the following features on the Site; the hedgerows, the watercourses, the mature woodlands, the pond, badger setts and bat roost. There are also opportunities to enhance the value of the newly created areas of green space for biodiversity. Overall, the open space associated with the Development together with the off-site mitigation will deliver a net gain in biodiversity.</p>

6.2.2 Biodiversity Strategy and Action Plans

England's Biodiversity Strategy

- 6.2.2.1 The document entitled 'Biodiversity 2020: A Strategy for England's Wildlife and Ecosystem Services' sets out England's Biodiversity Strategy. Its aim is to halt the loss of biodiversity, support healthy well-functioning ecosystems and establish coherent ecological networks. It takes a large landscape-scale approach to conservation on both the land and at sea. It identifies the need to establish Local Nature Partnerships to deliver the Strategy through community involvement. It supports the establishment of Nature Improvement Areas, measures to increase the number of SSSIs in favourable conservation status, and the creation of a network of Marine Protection Areas. It also identifies that improvement and protection of the natural environment are part of the planning system and identifies that biodiversity offsetting will be piloted to deliver planning policy more effectively. It promotes flood and erosion management to conserve the natural environment and improve biodiversity. Whilst the Site is not within a Nature Improvement Area, there would be opportunities as part of

the Development to enhance the biodiversity value of the retained habitats within the Site and to create new habitats. Biodiversity offsetting would also be used to compensate for the impact on farmland birds.

Local Biodiversity Action Plans

- 6.2.2.2 Local BAPs relevant to the Development are the Oxfordshire BAP and Cherwell BAP.

Oxfordshire BAP

- 6.2.2.3 The Oxfordshire BAP (Ref 6-2) identifies Conservation Target Areas (CTAs) for the maintenance, restoration and creation of BAP habitats within the county. Those BAP habitats relevant to the Site comprise woodland, hedgerows and rivers. Biodiversity targets have been created for these habitats within the CTAs. The Site is not within or in close proximity to any of the identified CTAs; however, there are two CTAs located within 5km of the Development. The nearest CTA is the Tusmore and Shelswell Parks with Stoke Lyne Woodlands CTA, located approximately 1km to the north-west. This CTA is designated for its parkland, lowland mixed deciduous woodland (including ancient woodland), and associated habitats including large parkland lakes, ponds and wet woodland. The River Ray CTA, located approximately 2.5km to the south east of the Site, largely comprises lowland meadow and wet grassland habitats.

Cherwell BAP

- 6.2.2.4 The Cherwell Corporate BAP 2013-2014 (Ref 6-3) sets out how the District Council will fulfil its duties under the NERC Act and meet other biodiversity legislation. It identifies that biodiversity is an important consideration in the planning process and that this will be set out in the Local Plan. It also identifies that the CTAs are important areas of high ecological value and supports the development of the Local Nature Partnership.

6.3 Methodology

6.3.1 General Approach

- 6.3.1.1 In accordance with the IEEM Guidelines, an assessment has been carried out which collates all of the existing baseline information through a desk-based study and field surveys, and predicts all of the significant impacts of the Development on 'Key Ecological Receptors', with mitigation in place. Where significant adverse impacts have been predicted, the measures to mitigate these impacts have been developed such that the residual impacts of the Development would not be significant.
- 6.3.1.2 In addition, measures have been developed to address the legislative and policy requirements associated with those species and habitats for which significant impacts are not expected, but which nevertheless warrant mitigation. Measures to enhance biodiversity in the area affected by the Development and those which help to deliver Action Plan and local policy targets are also recommended. The Development also provides opportunities for habitat creation and enhancement, incorporating ecological features of benefit to species already present within the Site, and habitats and species which have

currently not been recorded but for which an overall benefit can be provided. This, together with Biodiversity Offsetting, will ensure that a net gain in local biodiversity is provided by the Development, and is a key component of the proposal. This approach is considered to represent best practice.

6.3.2 Consultation

- 6.3.2.1 Consultations were undertaken with statutory and non-statutory nature conservation organisations, including: Natural England; the Environment Agency; Oxfordshire County Council; Cherwell District Council; the NW Bicester Eco-Town BioRegional Development Co-ordinator; Bicester Town Council; Thames Valley Police; and Berkshire, Buckinghamshire and Oxfordshire Wildlife Trust. Consultation meetings were held in 2013 on the 14 May, 8 July, 24 September and 12 November. A Site visit was undertaken on the 2 December with representatives of these organisations to discuss the results of the ecological surveys, implications for the emerging Masterplan, and opportunities for habitat creation and enhancements. Measures that were discussed that have been incorporated into the Development are identified below.
- 6.3.2.2 Consultees agreed with the scope of the ecological surveys and desk study assessment that has been undertaken to inform the impact assessment. It was agreed that the habitats and features of greatest value to biodiversity within the Site should be retained within the Masterplan Site with appropriate buffer zones as part of the proposals. Surveys have revealed that these habitats and features include: the hedgerows; watercourses; woodlands; pond; badger setts; confirmed bat roost and bat commuting routes/foraging corridors. It was established that the hedgerows would be retained within 20 metre-wide corridors, the watercourses within 60 metre-wide corridors, and the mature woodlands with 10 metre-wide buffers. Hedgerows and watercourses are in the site and care has been taken to ensure that they would continue to provide wildlife corridors that are linked to larger areas of green space within the Masterplan Site. The principal of creating green spaces that are 'inter-woven' into the Development was agreed. The need to provide dark corridors for nocturnal species was also identified to enable these species to cross the Masterplan Site safely.
- 6.3.2.3 It was accepted at an early stage that the Site was of value to farmland birds and that these species could not be accommodated within the Development once built. In order to achieve a net gain in biodiversity, it would be necessary to enhance the value of land that is off-site for farmland birds. The Development has sought to create a network of green spaces linked by green corridors that would support a range of native species in order to achieve a net gain in biodiversity. Consultees requested that areas be created for biodiversity. In response to this request, the Masterplan Site as a whole provides a Country Park and Nature Reserve; it also has space for a wetland waste water treatment facility, green burial sites, areas of woodland, and SuDS features that would provide benefits to biodiversity. The Country Park, wetland waste water treatment facility and SuDS features are all located with the Site.

6.3.3 The Study Area

- 6.3.3.1 The baseline survey information has been established by combining the results of field surveys that were undertaken by Arup and Hyder Consulting. These surveys cover the wider Masterplan Site and additional land. The Arup surveys were undertaken before the Masterplan Site boundary was finalised and therefore the survey area that was adopted by Arup was larger than the final Masterplan Site. It comprised the Masterplan Site and the fields immediately adjacent (to the west and north west, extending up to 650m from the Site). For great crested newts, the survey area was increased further to include water bodies that were within 500m of the extended Masterplan Site boundary. Access was not available to all ponds within 500m of the Site boundary; therefore, the suitability of ponds where access was not available was assessed using a combination of inspections from adjacent land and aerial photographs. For bats, the survey area was extended to include a known bat roost site at St Laurence Church, Caversfield. This church is north of the B4100, which is the minor road adjacent to the eastern boundary of the Masterplan Site. The desk study extended up to approximately 5km from the centre of the Masterplan Site in order to identify records of protected species, species of conservation concern and non-statutory designated sites of nature conservation importance. A distance of up to 10km was searched for European and nationally designated sites.
- 6.3.3.2 These survey/study areas make up the Zone of Influence (Zol) for the Masterplan Site. The Zol describes the area over which the activities associated with the Masterplan could influence ecological resources in the wider area. In summary, the ecological baseline surveys have covered an area of land that is far larger than the Site and the results of these surveys are presented in Appendix 6A to 6I, with a summary of the information that is relevant to the Site provided in this Chapter (Section 6.4).

6.3.4 Methodology for Establishing Baseline Conditions

Establishing the Existing Baseline

- 6.3.4.1 As identified in 6.3.3, above, the baseline conditions have been established in part through a desk-based assessment which obtained existing records relating to habitats and species of nature conservation concern both within the Masterplan Site and within the 5km search area defined on the basis of the Zol for the development. Records were obtained from Thames Valley Environmental Records Centre (TVERC), Oxford Ornithological Society, Banbury Ornithological Society, and the Oxfordshire branch of the Barn Owl Conservation Network. The Oxfordshire Bat Group was also consulted with regard to likely bat species present in the local area. The County Butterfly and Moth recorders were consulted in order to obtain species records for the NW Bicester Eco-development and the wider area. In addition, the MAGIC website (Ref 6-4) was reviewed for designated sites within the Zol. Detailed results of the desk-based assessment are included in Appendix 6A.
- 6.3.4.2 Suitably qualified ecologists employed by Arup undertook field surveys within the Masterplan Site and the surrounding habitats, including a Phase 1 habitat and protected species walkover survey in Spring 2010 to identify any habitats

likely to be of conservation value, and to investigate the presence (or likely presence) of protected species of plants and/or animals. A suitably qualified ecologist employed by Hyder Consulting undertook a survey to update the Phase 1 habitat information in October 2013.

- 6.3.4.3 The 2010 Phase 1 Habitat survey that was undertaken by Arup revealed the need for more detailed surveys to inform the assessment and the design of the Masterplan. Consequently, further surveys were undertaken for: terrestrial and aquatic invertebrates; white-clawed crayfish; great crested newt; breeding birds; wintering birds; badgers (including a bait-marking study); bats (including emergence surveys of potential roost sites and bat activity surveys); dormice; water voles; and otters. A botanical survey was also undertaken of the hedgerows, areas of grassland, and the mature woodlands. The additional field surveys were completed between May and October 2010, with further surveys undertaken in April and May 2011 to investigate the presence of great crested newt, and in October 2012 to ascertain the quality of the water in the watercourses. Detailed methodologies and results for the various surveys can be found in Appendices 6A to 6I. As outlined in 6.3.9 (below) further surveys would be undertaken, at an appropriate time of year, in advance of each phase of site clearance (first phase of construction currently scheduled for 2018) to further inform the detail of mitigation measures. In particular to confirm the location and status of any badger setts, bat roosts and potential locations of reptile habitat.

Forecasting the Future Baseline (“Without Development” Scenario)

- 6.3.4.4 The Future baseline considers how the habitats and species on the Site are likely to change in the absence of Development on Site taking account of the developments that are listed in Tables 17-1 and 17-2. This also considers the effects of climate change.

Defining the importance/sensitivity of resource

- 6.3.4.5 In accordance with the Town and Country Planning (Environmental Impact Assessment) (England and Wales) Regulations 2011 as amended, and the guidance set out in the IEEM Guidelines, it is considered inappropriate to attempt to investigate in detail all potential ecological issues in relation to the Site. It is therefore necessary, under the Regulations, to focus on those activities that could potentially generate significant ecological effects; this is determined by considering ‘Key Ecological Receptors’. In accordance with the British Standard BS42020:2013 Biodiversity- Code of Practice for Planning and Biodiversity, this assessment has followed the IEEM guidelines.
- 6.3.4.6 In order to determine the likelihood of a significant ecological effect, it is first necessary to identify whether a receptor is sufficiently important for a significant impact upon it to be material in decision-making. To achieve this, where possible, animal species and their populations have been valued on the basis of a combination of their rarity, status and distribution, using contextual information where it exists. Habitats and plant communities are evaluated against existing selection criteria, wherever possible (such as those developed to aid the designation of SSSIs or non-statutory designated sites). Only those receptors that it was considered could experience significant impacts (i.e. impacts that could adversely affect the integrity of the habitat or the favourable conservation

status of a species' local population), and which were identified as being of sufficient value to be material to decision-making (i.e. of **Medium** (District/Borough) level importance or above), have been classified as being 'Key Ecological Receptors' and have been considered in the impact assessment (see Table 6-2, below).

- 6.3.4.7 The habitats and features within the Zol are known as the 'ecological receptors'. The nature conservation importance/value of each of the 'ecological receptors' considers the protected species and species of conservation concern that they may support, to avoid pseudo-replication. For example, the importance for species associated with the hedgerows (breeding birds, reptiles and hedgehogs) has been taken into account as part of categorising the overall importance/value of the hedgerow.
- 6.3.4.8 The following geographic frame of reference has been used to determine the importance of ecological receptors: International; National; Regional/ County/Borough; District; and Parish/ Neighbourhood, as set out in in Table 6-2 below.

Table 6-2 Determining the Importance / Sensitivity of Resource

Importance/ sensitivity of resource or receptor	Criteria
Very High	A statutory designated site of International or European importance for nature conservation: for example, an SAC, SPA or Ramsar site, or site that supports a population of a mobile species that, whilst not designated, is deemed to be functionally-linked to a statutory designated site of International or European importance, or a species population or assemblage that is considered to be of International or European importance.
High	A statutory designated site of National importance for nature conservation such as a SSSI or a species population or assemblage of National importance.
Medium	A non-statutory designated site of Regional/County/District/Borough importance to nature conservation: this would include CTAs, Sites of Importance for Nature Conservation (SINCs) and Local Wildlife Sites (LWSs). It would also include species populations and assemblages of Regional, County or District importance.
Low	A site or species assemblage of Parish/Neighbourhood importance. Whilst such sites are not are not considered sufficiently important to be material in decision-making, they do contribute to the biodiversity value of a site.
Negligible	A site of limited importance to nature conservation comprising common species which are not restricted to particular habitats.

Source: Hyder Consulting.

6.3.5 Methodology for Assessing Impacts

- 6.3.5.1 Those sites, habitats and/or species classified as of '**Medium**' importance and above are considered to be sufficiently valuable for a significant impact upon them to be material in decision-making. These receptors have been identified as 'Key Ecological Receptors'. Where habitats and species within the Site do

not constitute 'Key Ecological Receptors' based upon their nature conservation value, and have not formed part of the detailed assessment, they may still warrant consideration during the design and mitigation of the Development on the basis of their legal protection, their implications for environmental (and related) policies and plans, or other issues such as animal welfare. These receptors have been identified as 'Other ecological receptors requiring mitigation'.

- 6.3.5.2 The results of the ecological valuation process are presented in Section 6.4, Table 6-5 Description of Existing Baseline Conditions (below); this summarises the results of the desk study and field surveys, and identifies which of the resources are 'Key Ecological Receptors', which are 'Other ecological receptors requiring mitigation', and those which have been scoped out of the assessment altogether. It is important to note that the selection of 'Key Ecological Receptors' has been informed by an assessment not only of nature conservation value but also of the likely impacts upon them, the methodology for which is described below.

Impact Characterisation

- 6.3.5.3 Once the ecological receptors within the Zol have been identified and valued, it is then necessary to investigate potential impacts on those receptors in order to understand how they might be affected by the Development.
- 6.3.5.4 The impact assessment has been based on an understanding of the likely activities associated with the Development, the biophysical changes that could be predicted as a result of these activities, and the area over which such effects might be experienced by different receptors. These impacts have been considered for the construction and operational phase of the Development. They have been characterised and described in detail using the following parameters: Significance (positive and negative effects); Probability of occurrence; Complexity; Extent and context; Magnitude; Reversibility; Duration; Timing; and Frequency.

Assessing significance

- 6.3.5.5 The significance of an impact has been determined on the basis of an analysis of the factors that characterise the impact. An assessment is provided of the confidence of this assessment, in line with the definitions provided in Table 6-3 below. The nature conservation value of significantly affected receptors has then been used to guide further mitigation and related measures and help interpret the significance of residual impacts. Note this is a departure for the methodology outlined in Chapter 4, but is in line with the IEEM guidelines.

Table 6-3 Assessment of significance

Definition
Significant adverse impacts on a feature of very high (international) importance , inhibiting the delivery of conservation objective(s) for a European site or the restoration to favourable status of a feature of European importance
Significant adverse impact on a feature of high (national) importance , inhibiting the delivery of conservation objective(s) for SSSI (or equivalent) objective(s)

Definition
Significant adverse impact on a feature of medium (regional/county/district/borough) importance , inhibiting the delivery of conservation objective(s) for sites of county importance; or Local Plan Policy; or NERC Act objectives or local Biodiversity Action Plan objective(s)
No significant impact
Significant beneficial impact on a feature of medium (regional/county/district/borough) importance , promoting the delivery of conservation objective(s) for sites of county importance; or Local Plan Policy; or NERC Act objectives or local Biodiversity Action Plan objective(s)
Significant beneficial impact on a feature of high (national) importance , promoting the delivery of conservation objective(s) for SSSI (or equivalent) objective(s)
Significant beneficial impacts on a feature of very high (international) importance , promoting the delivery of conservation objective(s) for a European site or the restoration to favourable status of a feature of European importance

Source: This table is based on that provided in the IEEM guidelines – updated to include reference to the NERC Act.

6.3.6 Limitations and Assumptions

- 6.3.6.1 The ecological baseline for this assessment has largely been informed by surveys undertaken in 2010 and 2011. A walkover survey, undertaken 2013, revealed that the conditions of the habitats on the Site had not changed significantly, that the badger sett remained active and the tree supporting the bat roost remained present. It was therefore considered that the survey results obtained previously accurately reflect the importance of the habitats and features on the Site. Consequently, the desk study has been updated but no further field surveys were undertaken to inform this impact assessment as agreed with consultees. It was accepted by consultees that the Development would take place over a large number of years and that pre-construction surveys would be undertaken in advance of each phase to refine any mitigation measures and take account of any changes in legislation or guidance. This approach would ensure that the mitigation employed on the Site during site clearance and construction is up-to-date and follows best practice guidelines.

6.4 Description of the Baseline Conditions

6.4.1 Existing Baseline

- 6.4.1.1 As described in Section 6.3.4 (above), a suite of surveys were undertaken within the wider Masterplan Site by Arup and Hyder Consulting, the results of which are presented in Appendices 6A to 6I. The results that are relevant to the current Site have been summarised below.

Site Description

- 6.4.1.2 The Site comprised arable fields and grazed pasture supporting improved grassland. Most of the field boundaries supported species-rich hedgerows, the majority of which would be classified as 'important' under the Wildlife and Landscape Criteria of the Hedgerows Regulations (1997). Several of the hedgerows supported mature trees.

- 6.4.1.3 The mainline railway that links Bicester to Banbury forms the southern boundary to the Site. This railway line is on an embankment covered by trees and scrub. It is noted that four parcels of land are excluded from the Site, as shown on Appendix 3A.
- 6.4.1.4 A number of semi-natural habitats were identified within the Site, these comprised: broadleaved woodland; species-rich hedgerows; running water; and standing water. Bat and barn owl boxes had been installed on a number of trees, the majority of which were located on trees within the ownership of Home Farm. One bat roost was confirmed within a tree on Site with further roosts confirmed in buildings and trees out with the current Development (as illustrated on Drawing 6-3). The hedgerows provide suitable foraging and commuting habitat for bats, and nesting habitat for birds, including species of conservation concern. The field margins were found to support reptiles, including small numbers of grass snakes and common lizards. These margins were found to be of limited value to invertebrates; however, two Nationally Scarce species, the Shaded Pug Moth and Roesel's Bush-cricket, were recorded within the field margins adjacent to the northern boundary of the Site. One large badger sett and two smaller setts were recorded close to the stream corridor in the north of the Site (sett locations shown on Drawing 6-3). One pond was recorded on the site close to Hawkwell Farm; this pond did not support great crested newts. The field surveys found no evidence of use of the hedgerows within or in close proximity to the Site by dormice. In summer 2010, the River Bure and tributaries which cross the Site did not hold water, and there was no evidence of use by protected species such as otters, water voles, or white-clawed crayfish. Water was recorded in these features in subsequent years and it appears that they are seasonally wet, more commonly holding water in the autumn/winter and into the spring, but largely dry in the summer months. The precise pattern of water flow is dependent on rainfall. More detail regarding the Site and its surroundings is provided below.

Statutory designated sites

SSSI within 5km

Ardley Cutting and Quarry SSSI

- 6.4.1.5 At its closest point to the Development, Ardley Cutting and Quarry SSSI is located approximately 300m north west from the boundary of the Site. It is linked to the Site via the railway line. It is designated for its calcareous grasslands, woodland and wetland habitats which support a diverse invertebrate fauna including moth and butterfly species that are uncommon in Oxfordshire. The quarry ponds also contain significant populations of great crested newts. There is no public access to the SSSI and no hydrological links between the Site and the SSSI.
- 6.4.1.6 The only potential impact that the Development could have on this SSSI is as a result of changes in air quality; specifically during the operational phase as a result of road traffic emissions of NO₂ and PM₁₀ and Energy Centre emissions of NO_x. The assessment of impacts arising from changes in Air Quality as a result of the development have been shown to be neutral (see Chapter 8 for further details), so it is therefore considered that the Development would have

no impacts on this SSSI and it has not been considered any further in this assessment.

Ardley Trackways SSSI

- 6.4.1.7 Ardley Trackways SSSI is located approximately 1.4km south west from the Site boundary at its closest point, and is designated for its geological interest. There are no Public Rights of Way linking this SSSI to the Site. There is the potential that oxides of nitrogen pollutants originating from the Energy Centre could have adverse impacts on the habitats within the SSSI; however, the prevailing winds (from the south west) mean that the likelihood of pollutants reaching this site is low. Also, this site is 2.6km from the proposed location of the Energy Centre. It is therefore considered that the Development would have no impacts on this SSSI and it has not been considered any further in this assessment.

Stratton Audley Quarries SSSI and Local Wildlife Site (LWS)

- 6.4.1.8 Stratton Audley Quarries SSSI, located approximately 1.9km from the Site boundary, was designated as a site of national importance for its geological interest. It has also been designated a LWS. Natural England assessments of this site have declared the SSSI destroyed through infilling with waste material and water. Given that this is a geological SSSI that has been destroyed, impacts on this SSSI have not been considered in this assessment. However, further consideration has been given to the potential impacts on the LWS in the text below.

Other SSSIs within 10km of the Site

- 6.4.1.9 There are a further nine SSSIs within 10km of the Development, these are: Weston Fen SSSI, located 6.2km to the south west; Wendlebury Mead and Mansmoor Closes SSSI, located 6.2km south; Arncott Bridge Meadows SSSI, located 6.4km to the south-east; Kirtlington Quarry SSSI, located 8.3km to the south west; Otmoor SSSI, located 9km to the south; Bestmoor SSSI, located 8.3km to the north west; Whitecross Green and Oriel Woods SSSI, located 8.8km to the south; Long Herdon Meadow SSSI, located 8.5km to the east and Tingewick Meadows SSSI, located 9.7 km north-east.
- 6.4.1.10 Airborne pollutants, and specifically oxides of nitrogen originating from the Energy Centre, would be dispersed and attain background levels before they reach these SSSIs. These sites are not within 200 metres of any roads that would be significantly impacted by the Development. (This is the distance where significant impacts on sensitive habitats associated with road traffic could be generated.) It is therefore anticipated that there would not be any impacts relating to changes in air quality that could affect these SSSIs.
- 6.4.1.11 Although the habitats that these SSSIs support may be sensitive to trampling and disturbance, given the distance between these SSSIs and the Site, is not envisaged that residents would regularly walk to these sites. It is not envisaged that local residents would regularly make trips to these sites by car and any of the sites that are publicised as nature reserves would be expected to provide a clearly defined path network that to ensure that the nature conservation value of the sites are not compromised.

- 6.4.1.12 Three of the SSSIs: Weston Fen SSSI; Wendlebury Meads and Mansmoor Closes SSSI; and Otmoor SSSI appear to be hydrologically linked to the Site. The implementation of standard measures to protect water quality and runoff rates within the Site is proposed to maintain water quality and quantity within the River Bure. This would also ensure that no adverse effects on these SSSIs would arise as a result of the Development during construction. SuDS would also ensure that water quality and flow-rates are protected once the Site is operational.
- 6.4.1.13 Overall, it is considered that the Development would not give rise to effects that would have a significant impact on these SSSIs and they have not been considered further in this impact assessment.

Bure Park LNR

- 6.4.1.14 The River Bure and two of its tributaries flow through the Site before they enter Bure Park Local Nature Reserve (LNR). The LNR is located 25m south of the Site; it includes the River Bure, several ponds, mature hedgerows and trees, scrub, and meadow habitat. As the LNR is hydrologically linked to the Site there is the potential for adverse effects on water quality and quantity. However, it would be possible to avoid adverse effects on water quality through the implementation of standard techniques to protect water quality during the construction phase. The SuDS that form part of the Development would ensure that water quality is protected once the Site is operational. Such measures would be required to comply with the requirements of the WFD, and it is not envisaged that the Development would have adverse effects on this LNR. The new residents associated with the Development are likely to pass through the park on a regular basis and therefore there would be an increase in visitor numbers to the park, however, the park is already well used by the public and the habitats and species that it supports are already tolerant of high levels of disturbance. It is therefore considered unlikely that the increase in visitor pressure would have a discernable impact on habitats or species.
- 6.4.1.15 The terrestrial habitats within the park are largely man-made and on soils that are nutrient-rich. The site is also subject to regular management to retain the mosaic of open grassland and scrub. These habitats are not sensitive to airborne oxides of nitrogen that would be generated by the Energy Centre and traffic. Any effects that these pollutants would have on these habitats would not be detectable.
- 6.4.1.16 Overall, it is considered that the Development would not give rise to effects that would have a significant impact on this LNR and it has not been considered further in this impact assessment.

Non-statutory designated sites

Tusmore and Shelswell Parks with Stoke Lyne Woodlands CTA

- 6.4.1.17 Tusmore and Shelswell Parks with Stoke Lyne Woodlands CTA is situated at a distance of approximately 1.1km from the Site at its closest point (Twelve Acres Copse). The CTA comprises the large parklands at Tusmore and Shelswell, together with large areas of mixed deciduous broadleaved woodland, including ancient woodland sites near to Stoke Lyne, and large parkland lakes. The CTA

includes several LWSs: Twelve Acre Copse, Stoke Little Woods, Stoke Woods, and Stoke Bushes. Twelve Acre Copse LWS is a small area of ancient woodland set among arable fields. Stoke Little Wood LWS is an area of ancient woodland which supports a species-rich ground flora, with one ride and several wet areas. Stoke Woods LWS is an area of ancient woodland adjacent to Junction 10 of the M40 motorway: it supports a species-rich ground flora, and the eastern track and internal rides support a good butterfly population. Stoke Bushes LWS is an area of Oak-Ash woodland, with a field layer of Dog's Mercury. It supports a diverse ground flora and there are a number of historical records of rare plant species for the site.

- 6.4.1.18 Given the proximity of Site to the CTA and the LWSs within it, it is considered that the new residents may visit this area via existing Public Rights of Way; others may use the car park at Stoke Wood. It is envisaged that those residents that choose to walk to the CTA would keep to the existing footpath network and not have a significant effect on flora and fauna since the existing paths follow the woodland edge. The Development provides for significant areas of open space with opportunities for formal and informal recreation which includes a Country Park. It is therefore anticipated that the new residents would use the open space within the Masterplan Site on a regular basis rather than choose to travel by car to Stoke Wood.
- 6.4.1.19 The B4100 (minor 'B' road) which passes through this CTA would experience a minor increase in traffic flows (see Chapter 16 Transport). This has potential to cause mortality to fauna travelling across the CTA. However it is not anticipated that the mortality rates would be significantly greater than existing levels. Similarly, it is not anticipated airborne pollutants arising from vehicles would give rise to significant effects (see Chapter 8 Air quality). The closest part of the CTA (Twelve Acre Copse) is over 2km from the proposed location for the Energy Centre and the air quality modelling has shown that oxides of nitrogen would be back to background levels at this distance from the Site (see Chapter 8 for further details regarding air quality impacts).
- 6.4.1.20 Overall, it is considered that the Development would not give rise to effects that would have a significant impact on this CTA, and therefore it has not been considered further in this impact assessment.

Ray CTA

- 6.4.1.21 The Ray CTA is located 2.5km to the south-east of the Site, with Bicester town between the CTA and the Site. The CTA comprises lowland meadow and wet grassland with species-rich and well-structured hedgerows. It includes several LWSs: Gavray Drive Meadows, Meadows NW of Blackthorn Hill, Cutter's Brook Meadows, and Field by Beacon Hill Ditch. Although the watercourses within the Site are tributaries of the River Ray, they converge with this watercourse at a point which is downstream of the Ray CTA. It is therefore considered that the Development would have no direct or indirect hydrological effects on the Ray CTA. Whilst it is possible that the new residents may visit the farmland that comprises this CTA via the existing road and footpath network, the CTA does not support habitats or a landscape that is likely to attract large numbers of visitors. In addition, there are large parts of the CTA that are not accessible

from public rights of way. The Development includes large areas of open space for formal and informal recreation.

- 6.4.1.22 Parts of this CTA are within 200m of the main A road the A4221 Charbridge Lane. This road would experience a significant increase in traffic flows as a result of the Development (see Chapter 16 Transport). This road separates the town of Bicester from the open countryside associated with the CTA. It is not envisaged that the fauna associated with the CTA would make use of the built area and therefore they would not regularly cross the road, particularly since it is already a very busy road. For these reasons it is not anticipated that the increase in traffic volumes would lead to an increased risk of mortality. Similarly, it is not anticipated airborne pollutants arising from vehicles would give rise to significant effects (see Chapter 8 Air quality). The Development is sufficient distance from the Energy Centre for pollutants, principally oxides of nitrogen, to be dispersed. It is therefore anticipated that there would be no impacts on this site associated with air quality.
- 6.4.1.23 Overall, it is considered that the Development would not give rise to effects that would have a significant adverse impact on this CTA, and therefore it has not been considered further in this impact assessment. It should be noted that there is the potential for off-site mitigation to have a beneficial impact on this CTA; however, the details of this have yet to be determined.

Other LWSs outside CTAs

- 6.4.1.24 In addition to the LWSs located within the CTAs listed above, there are a further nine LWSs within 5km of the Masterplan Site, as well as three proposed LWSs:
- Trow Pool LWS: 1.6km from the Site, on the other side of the M40 motorway. Two shallow ponds formed by damming a small stream, the larger of which is used for fishing.
 - Bicester Airfield LWS (and proposed LWS extension): an area of species-rich grassland located 1.4km to the east of the Site.
 - Stratton Audley Quarry LWS: 1.7km east of the Site. This site comprises a diverse mosaic of habitats which have developed on the former limestone quarry.
 - Bicester Wetland Reserve LWS: This site is located 2.8km south of the Site. It is mostly maintained as wet grassland by outflow from the sewage works and includes a small area of reed bed, open water, wet ditches, banks with tall herb and a dry grassland field to the east. The margins around the open water have swamp vegetation and areas of wet grassland.
 - Graven Hill LWS: An area of mixed deciduous woodland, 3.6km south of the Site.
 - Upper Heyford Airfield LWS (and proposed LWS extension): 3.7km north west of the Site. This large area of grassland ranges in diversity and includes some species-rich calcareous areas. The site supports a number of butterfly species and several bird species (including ground nesting species: skylark, curlew, grey partridge and corn bunting) are thought to breed on the site.

- Meadow east of Fringford LWS: 5.2km north-east of the Site, an area of wet meadow in a small valley near Fringford with a rich variety of grassland wildflowers.
- Hopyard Spinney LWS: an area of old broadleaved woodland, open wetland habitat and scrub is 5.2km north-east of the Site.
- Pool Spinney LWS: an area of old broadleaved woodland, open wetland habitat and scrub is 5.2km north-east of the Site.
- Skimmingdish Lane Fields - Proposed LWS: 2.3 km to the south-east of the Site.
- Jarvis Lane – Proposed LWS: 2.1km to the east of the Site.
- Ardley Fields Quarry – Proposed LWS: 3.2km to the north-east of the Site on the other side of the M40 motorway.

- 6.4.1.25 The majority of the LWSs are sufficient distance from the Site for regular visits from the new residents to be unlikely. However, Stratton Audley Quarry LWS is sufficiently close that the new residents may visit this site via existing Public Rights of Way. However, it is envisaged that there would not be a significant effect on the flora and fauna on this site, since the existing paths are limited to a small section of the northern area of Stratton Audley Quarry LWS. As noted previously, the Development provides for significant areas of open space with opportunities for formal and informal recreation that would be more attractive to members of the public than the LWS. It is therefore anticipated that the majority of new residents would use the open space within the Masterplan Site on a regular basis, rather than LWSs further afield.
- 6.4.1.26 None of the LWSs are hydrologically linked to the Site. All are sufficient distance from the Site and the proposed Energy Centre for there to be no effects associated with airborne pollutants (principally oxides of nitrogen). With the exception of Bicester Airfield LWS, none of the LWSs are located within 200m of any roads that would experience significant increases in traffic volumes.
- 6.4.1.27 Bicester Airfield LWS (like part of the Ray CTA, above) is next to of the main A road the A4221 Charbridge Lane (see Chapter 16 Transport). This road would experience a significant increase in traffic flows. However, as indicated previously with respect to the CTA, it is not anticipated that this would have a significant effect on the LWS since the road separates the airfield from the built development associated with Bicester. The majority of the fauna associated with the LWS would not make use of the built area and would not regularly cross the road. Species associated with the LWS which may cross the road, such as birds and invertebrates would be unlikely to cross the road at a height where they are at risk of mortality. It is not anticipated that mortality or airbourne pollutants generated by the vehicles would give rise to significant effects (see Chapter 8 Air quality).
- 6.4.1.28 Overall, it is considered that the Development would not give rise to effects that would have a significant impact on these LWSs, and therefore they have not been considered further in this impact assessment.

Habitats on Site

Hedgerows

- 6.4.1.29 The majority of the hedgerows within the Site were species-rich, supporting five or more woody species. Many of the hedgerows were associated with dry ditches that were shaded by the hedgerow shrubs. The hedgerow ground floras were species-poor with few if any hedgerow species. Several of the hedgerows supported mature and semi-mature trees with Ash, Pedunculate Oak, Horse-chestnut and willow the most commonly recorded species. Many had been replanted with a diverse mix of native shrub species. More detail regarding the composition of the hedgerows that were subject to survey is presented in Appendix 6D; Drawing 6-2 shows the location of these hedgerows.
- 6.4.1.30 The hedgerows provide habitat links across the Site. They were of value to foraging and commuting bats, reptiles, and breeding birds and likely to be of value to hedgehogs; these species are discussed in more detail below.
- 6.4.1.31 Hedgerows are a Habitat of Principal Importance under the Section 41 of the NERC Act (2006) hereafter referred to as 'Section 41 habitat'; they are also an Oxfordshire LBAP habitat. Due to their nature conservation value and the species they support, the hedgerows within the Site are considered to be part of a hedgerow network of **Medium** 'District/Borough' Importance.

Watercourses

- 6.4.1.32 The River Bure and two tributaries of this watercourse cross the Site. The upper reaches of the tributaries were dry for large parts of the year. Where water was present, common wetland plants were recorded. The aquatic invertebrate surveys revealed that water quality within the River Bure was 'moderate'.
- 6.4.1.33 The riparian habitats associated with the River Bure and its tributaries were found to be of value to commuting and foraging bats and foraging grass snakes. However, given the fact that sections of these watercourses do not hold water throughout the year, they were considered to be of limited value to otter, water vole and aquatic invertebrates including white-clawed crayfish. Species associated with the watercourses are discussed in more detail below.
- 6.4.1.34 Rivers are a Section 41 habitat. They are also an Oxfordshire LBAP habitat. Given the scarcity of water within the Site, it is considered that overall these watercourses are of **Medium** 'District/Borough' Importance.

Broadleaved woodland

- 6.4.1.35 There were two blocks of semi-natural broadleaved woodland within the Site, west of Home Farm (see Drawings 6-1 and 6-2). Most of the canopy trees in these areas had been felled and replaced by recently planted Scots Pine and Norway Maple. The canopy comprised a small number of retained Ash trees, but the shrub layer of Hawthorn, Elm and Elder formed the main canopy of these woodlands. The ground flora largely comprised Dog's Mercury and Common Nettle (for further details of other common plant species recorded in these woodlands see the quadrat data presented in Appendix 6B). These woodlands most closely resembled the NVC woodland plant community W8d Ash-Field Maple (*Acer campestre*) – Dog's Mercury woodland Ivy (*Hedera helix*)

sub-community. However, they had clearly been subject to disturbance associated with tree felling, replanting and historical use as a site in which to rear game birds.

- 6.4.1.36 The areas of semi-natural woodland did not support particularly diverse or valuable ground floras, and would not be classified as Section 41 habitats; nor would they be priority habitats targeted for action in the LBAP. However, woodlands are a scarce resource in this part of the Cherwell District. Therefore these areas of broadleaved semi-natural woodland were considered to be of **Medium** 'District/Borough' Importance.

Arable land and grasslands

- 6.4.1.37 The arable fields within the Site are intensively managed. Arable field margins are a Section 41 habitat, and a LBAP habitat; however, these arable field margins and arable fields did not support any notable or protected plant species, or any communities of high botanical value.
- 6.4.1.38 The grassland habitats were classified as 'improved' and intensively grazed. They supported a limited diversity of common grass species of limited nature conservation value, with very few forbs (non-grass species). The grasslands within the Site would not be classified as Section 41 habitats; nor would they be priority habitats targeted for action in the LBAP.
- 6.4.1.39 Both habitats are common and widespread in the locality and not considered to be of particular conservation value. Overall these habitats are considered to be of limited intrinsic nature conservation importance; nevertheless they are of value to farmland birds see paragraphs 6.4.1.54 to 6.4.1.64 below.

Pond

- 6.4.1.40 There was one pond within the Site, north west of Hawkwell Farm. It was found to support few wetland plants and smooth newts. Ponds are a Section 41 habitat and small field ponds are considered to be a scarce resource in the locality. Overall this habitat is considered to be of **Medium** 'District/Borough' Importance.

Species

Aquatic Invertebrates

- 6.4.1.41 The River Bure and its tributaries were considered sub-optimal for white-clawed crayfish, since they do not hold water throughout the year. In addition, North American signal crayfish have been recorded within the catchment, and a dead signal crayfish was found close by in the Masterplan Site. Furthermore, the targeted surveys did not reveal the presence of white-clawed crayfish. Given the negative survey result, and the fact that signal crayfish and native crayfish rarely co-exist, it is considered extremely unlikely that white-clawed crayfish are present within the Site.
- 6.4.1.42 The upper reaches of these watercourses are winterbournes, and during the 2010 field surveys the channels within the Site were largely dry by June. Surveys for aquatic invertebrate surveys were undertaken in October 2010 once the flow of water had returned. The 2010 aquatic invertebrate surveys revealed

that the River Bure supported a small number of common and widespread aquatic invertebrate species. The 2012 aquatic invertebrate surveys revealed that the River Bure supported a limited diversity of common aquatic invertebrates and overall the river was assessed to be of 'moderate' water quality. The desk study revealed a single historical (1988) record of a Nationally Scarce (Notable B – Nb) (Ref 6-6) scavenger water beetle within a pond in Bucknell, approximately 300m away; if present on the Site, it would be associated with the pond (although this is considered unlikely given the condition of the pond). Although no uncommon or notable aquatic invertebrates were recorded, the presence of aquatic invertebrates in the watercourses does contribute to the valuation of these this habitat as a feature of **Medium** 'District/Borough' Importance.

Terrestrial invertebrates

- 6.4.1.43 The desk study revealed a range of rare and uncommon moth and butterfly species from the area surrounding the Site. This included recent records of two Section 41 species: brown hairstreak, from Bure Park, and white-letter hairstreak, from the Whitelands Farm area to the south of the Site, and from habitats along the B4030 Middleton Stoney Road also south of the Site.
- 6.4.1.44 The habitats within the Site that were of potential value to terrestrial invertebrates, and which were targeted for survey, were the hedgerows and the more overgrown areas across the site (See Appendices 6A and 6F for more details). No legally protected invertebrates were recorded during the surveys. Nine moth species listed as Section 41 species were recorded during the invertebrate surveys: beaded chestnut, green brindled crescent, centre-barred sallow, small phoenix, ghost moth, dot moth, cinnabar moth and sallow. Most were recorded in the wider Masterplan Site but five were recorded on the tree and shrub-lined lane leading to Lord's Farm.
- 6.4.1.45 Five Nationally Scarce (Notable B - Nb) (Ref 6-5) invertebrates were also recorded on the Masterplan Site during the invertebrate surveys. Those recorded within the Site were Roesel's bush-cricket and a bark beetle; both found on the lane leading to Lord's Farm. It should be noted that Roesel's bush-cricket has undergone a substantial increase in its range over recent years due to climate change, and is generally now generally considered to be a Nationally Local species rather than Nationally Scarce. In addition, 21 Nationally Local invertebrates were recorded during the surveys on the Masterplan Site, mainly within the habitats on the wider site but also in association with the hedgerows. A complete account of the terrestrial invertebrates that were recorded during the targeted surveys is presented in Appendix 6F.
- 6.4.1.46 Brown hairstreak butterfly eggs were identified during the targeted surveys and suitable habitat for this species (Blackthorn shrubs for egg-laying within the hedgerows, and mature trees for display and mating) was present across the Site. Elm, a food plant of the white-letter hairstreak butterfly, was recorded in the hedgerows. Given that white-letter hairstreaks have been recorded in hedgerows to the south of the Site, it would appear likely that this species would be present within the hedgerows on the Site, or at least have the potential to be present in the future.

6.4.1.47 The Site comprises habitats with limited structural and botanical diversity that consequently support a limited diversity of terrestrial invertebrates. The parts of the site that were of greatest value to invertebrates were the hedgerows and the mature trees and shrubs associated with the access track leading to Lord's Farm. Overall, the value of the site as a whole for terrestrial invertebrates is considered to be of **Low** 'Parish/Neighbourhood' Importance. However, the presence of the hairstreak butterflies in the hedgerows does contribute to the valuation of these features as a habitat of **Medium** 'District/Borough' Importance.

Fish

6.4.1.48 Targeted surveys for fish were not undertaken the watercourses would be retained within their existing stream corridors and it was considered that the Development would not have a significant impact on fish. Nevertheless, fish species recorded incidentally during the aquatic invertebrate surveys of the River Bure included three-spined stickleback, ten-spined stickleback, and bullhead; a species associated with good water quality. Overall the value of the Site is considered to be of limited value to fish, but their presence in the watercourses does contribute to the valuation of these features as habitats of **Medium** 'District/Borough' Importance.

Amphibians

6.4.1.49 Great Crested newts are protected under European and UK legislation they are also a species of principal importance under section 41 of the NERA Act (2006). A number of ponds within and close to the Masterplan Site were identified as being potentially suitable for breeding amphibians including great crested newts. The presence of breeding populations of great crested newts was confirmed in several ponds most of which are over 500m from the Site boundary and therefore the newts associated with these features are unlikely to forage within the Site. One pond (identified as P7 on Drawing 6-2) is 240m from the western boundary of the Site. Great crested newts typically forage within 250 metres of their breeding pond; there is therefore the potential that newts associated with this pond may forage within suitable habitat (in this case primarily the bases of the hedgerows) on the edge of the Site. The pond on Site (P10) was found to be used by smooth newts.

6.4.1.50 It is considered that the Site is of **Low** 'Parish/Neighbourhood' Importance for amphibians.

Reptiles

6.4.1.51 The targeted surveys for reptiles revealed the presence of small numbers of common lizards within suitable habitats adjacent to the railway embankment and within the strip of ruderal vegetation parallel with Howes Lane. It is considered likely that small numbers of common lizard would be present in other areas of suitable habitat (the unmanaged field margins and stream corridors) across the Site.

6.4.1.52 There are historical records for grass snake to the south of the Site, and a grass snake was recorded on the northern boundary of the woodland to the west of Home Farm. It is considered likely that grass snakes would be present in other areas of suitable habitat, in particular, within the areas of grassland adjacent to

the pond and watercourses. The habitats within the Site were considered largely sub-optimal for use by slow-worm, and the desk study did not reveal any records for this species. These three species of reptile are identified as Section 41 species. They are also protected under UK legislation.

- 6.4.1.53 The Site supports small populations of reptiles within the field margins, riparian habitat along the River Bure and its tributary, and railway embankment. The value that has been assigned to the hedgerows and the watercourses takes into account their value to reptiles; and the railway embankment would be largely unaffected by the Development. The remainder of the Site is considered to be of **Low** 'Parish/Neighbourhood' Importance for reptiles.

Breeding birds

- 6.4.1.54 Table 6-4 below provides a list of the bird species of conservation concern (listed as either Red or Amber RSPB Birds of Conservation Concern (BOCC)) (Ref 6-7) associated with the trees, farm buildings, fields, and hedgerows within the Site, that were recorded as breeding or probable breeding during the 2010 and 2011 surveys. The habitats that these species were nesting in have also been recorded.

Table 6-4 Species recorded as breeding or probable breeding within the Site

Species	Conservation Status	Nesting Habitat
Skylark	Red list BOCC, Section 41 species	Arable fields
Yellowhammer	Red list BOCC, Section 41 species	Hedgerows
Linnet	Red list BOCC, Section 41 species	Hedgerows
Common whitethroat	Amber list BOCC	Hedgerows
Marsh tit	Red list BOCC, Section 41 species	Woodland
Song thrush	Red list BOCC, Section 41 species	Hedgerows
House sparrow	Red list BOCC, Section 41 species	Farm buildings
Bullfinch	Amber list BOCC, Section 41 species	Hedgerows
Dunnock	Amber list BOCC, Section 41 species	Hedgerows
Swallow	Amber list BOCC	Farm buildings
Green woodpecker	Amber list BOCC	Trees close to Lords Farm
Willow warbler	Amber list BOCC	Woodland

- 6.4.1.55 Other species of conservation concern that were recorded breeding, or likely breeding, within the wider Masterplan Site comprise barn owl, yellow wagtail, reed bunting, stock dove, kestrel, cuckoo, starling and mistle thrush. Although starling and mistle thrush were not confirmed to be nesting on the Site, potentially suitable nesting and foraging habitat was recorded within the Site, and it would appear likely therefore that they may nest on the site in future years.

- 6.4.1.56 The field surveys recorded nine farmland specialist bird species breeding within the Masterplan Site. The Masterplan Site as a whole supported approximately 28 pairs of skylark and 64 pairs of yellowhammer. With the exception of linnet (where 28 pairs were recorded); the remaining farmland bird species (starling, stock dove, reed bunting, kestrel and common whitethroat) were recorded in low numbers.
- 6.4.1.57 Barn owl, a species specially protected under Schedule 1 of the Wildlife and Countryside Act, has been recorded nesting within the Masterplan Site. They were nesting in a specifically designed barn owl nest box located on a tree to the west of Home Farm. The barn owl nest box was relocated further west in 2012 to the western edge of the broadleaved semi-natural woodland in the Site, as a mitigation measure for the consented NW Bicester Exemplar eco development. Another two boxes were installed close by at this time, to provide alternative nest sites.
- 6.4.1.58 In addition, the desk study also revealed records for two BOCC Red list (Ref 6-7) and Section 41 NERC Act species within the Masterplan Site in previous years. These were corn bunting and grey partridge. Neither of these species was recorded during the 2010 and 2011 breeding bird surveys. For more details regarding the birds recorded on site see Appendix 6A; a full list of the birds recorded during the 2010 and 2011 surveys is presented in Appendix 6H.

Wintering Birds

- 6.4.1.59 The distribution of wintering birds reflected the field and hedgerow management, with stubble fields and the less heavily trimmed hedgerows supporting higher numbers. The text below, presents the results of the entire Masterplan Site: whilst not all of the species were recorded within the Site, habitat suitable for these species was present and these species may use habitats within the Site in future years if they were cultivated appropriately. Wintering birds are highly mobile, moving in response to changes in weather and food resources.
- 6.4.1.60 Eleven BOCC Red list (Ref 6-7) species were recorded overwintering within the Masterplan Site: skylark, linnet, yellowhammer, herring gull, marsh tit, house sparrow, grey partridge, starling, redwing, song thrush and lapwing. Skylark, linnet, yellowhammer, herring gull, marsh tit, house sparrow, grey partridge, starling, song thrush and lapwing are also Section 41 species; as are reed bunting and dunnoek, which were also recorded during the wintering bird surveys, see below.
- 6.4.1.61 The wintering bird surveys revealed moderate numbers of yellowhammer (flocks of up to 150), skylark (flocks of up to 24), redwing (flocks up to 50) and fieldfare (flocks of up to 150). Low to moderate numbers of other bird species of conservation concern that were recorded during the surveys included mallard, linnet, reed bunting, kestrel, herring gull, red kite, marsh tit, house sparrow, grey partridge, green woodpecker, dunnoek, bullfinch, starling and song thrush (up to three birds).
- 6.4.1.62 No barn owls were recorded within the Masterplan Site during the surveys. For more details regarding the birds recorded on the Masterplan Site see Appendix 6A.

6.4.1.63 As identified above, red kite (a species specially protected under Schedule 1 of the Wildlife and Countryside Act, whilst breeding) were observed flying over the Masterplan Site during the wintering bird surveys; but they were not recorded nesting during the breeding bird surveys. It is considered unlikely that red kite would nest within the small woodlands that are present within the Site since they require large trees for nesting, which are absent from the Site. Similarly, although both fieldfare and redwing were recorded on site during the wintering bird surveys and both species are listed on Schedule 1 of the Wildlife and Countryside Act and therefore specially protected whilst nesting, neither species would nest within the Site, since they do not breed in southern Britain.

Breeding and wintering birds

6.4.1.64 The hedgerows were found to be of value to nesting and foraging birds and the value of these features for both farmland and non-farmland specialist species has been taken into account when assigning the value of **Medium** 'District/Borough' Importance to the hedgerows. However, given that the Masterplan Site as a whole has been found to support a diverse range of bird species, including nine specialist farmland species, species of conservation concern and Species of Principal Importance, the breeding and wintering bird assemblage on the Masterplan Site as a whole is considered to be of **Medium** 'District/Borough' Importance. Given that the Site occupies a significant part of the Masterplan Site it is considered that the bird population that it supports should also be assigned a similar value. The Site is therefore considered to be of **Medium** 'District/Borough' Importance to breeding and wintering birds.

Bats

6.4.1.65 Noctule, soprano pipistrelle and brown long-eared bats are Section 41 species. The desk study revealed records for common pipistrelle, brown long-eared and Natterer's bat within 5km of the Masterplan Site. There are also known common pipistrelle and brown long-eared bat roosts 3.2km south of the Site. Further known roosts for Leisler's bat and serotine are located greater than 10km from the Site.

6.4.1.66 The presence of roosting common pipistrelle bats was confirmed in several locations on the Masterplan Site (locations of confirmed bat roosts are illustrated on Drawing 6-3). This includes a mature Ash tree on the edge of the woodland to the west of Home Farm (this roost is within the Site) and two further roosts close to/at Home Farm but outside the Site boundary (see Appendix 6A for further details). Bat activity around the buildings associated with Lord's Farm shortly after dusk indicated that the buildings may support a small common pipistrelle bat roost, although its location was not confirmed. This farm is outside the Site boundary and unaffected by the Development.

6.4.1.67 In addition, three additional bat roosts were confirmed outside of the Masterplan Site boundary. These comprised two adjacent mature oak trees supporting individual common pipistrelle bats; and a roost of brown long-eared bats and another unconfirmed species within St Laurence Church, Caversfield. The locations of these roosts are also shown on Drawing 6-3.

6.4.1.68 The majority of the bat activity was associated with the stream corridors and largely comprised foraging and commuting common pipistrelle bats, but regular

activity of soprano pipistrelle, brown long-eared bat, serotine, noctule, Leisler's bat and *Myotis* species were also recorded. A number of hedgerows were also revealed to be key features for foraging and commuting bats. Key activity corridors are also shown on Drawing 6-3. A number of potential roost sites were identified in trees on the watercourses but, since these trees would be retained within the Site, the presence/absence of bat roosts in these trees was not investigated further.

- 6.4.1.69 The assessment of the value of the hedgerows and stream corridors as features of **Medium** 'District/Borough' importance has incorporated their value for foraging and commuting bats. The bat roosts themselves are also considered to be of **Medium** 'District/Borough' value to bats.

Dormice

- 6.4.1.70 No evidence of dormice was found during the targeted surveys undertaken within the wider Masterplan Site. No records of this species were obtained from TVERC and the links between the Site and suitable habitat for dormice off site were limited. It is therefore considered unlikely that dormice would be present on Site, and therefore they have not been considered in the impact assessment.

Water voles

- 6.4.1.71 There are records dating from 2010 for water voles on the River Bure downstream of the Masterplan Site. Within the Site, the watercourses were shaded by trees and considered at best, sub-optimal for use by water voles, as they supported little or no emergent vegetation within the Site. No signs of water vole activity were recorded during the surveys. Water voles are therefore considered to be absent from the Site and have not been considered further in the impact assessment.

Otters

- 6.4.1.72 Desk study records of otter were provided close to the fishery at Trow Pool, located 1.6km south west of the Site boundary and not hydrologically linked to the Site. In most years, the watercourses on the Site hold very little water and support few fish and other prey items suitable for otters. It is considered that these features would be of limited value to foraging otters. The watercourses provided suitable resting sites for otters and, although it is considered likely that otters would use these features whilst travelling across their home range, no signs of otter activity were recorded during the survey.
- 6.4.1.73 Overall, based on the survey data and conditions on the Site, it is considered to be of **Low** 'Parish/Neighbourhood' Importance for otters.

Badgers

- 6.4.1.74 A 'main' badger sett was located on a bank of tributary of the River Bure, west of Home Farm (beyond the Site boundary). A further large sett (a 'subsidiary' sett) was located in the area of broadleaved semi-natural woodland 200m to the north west, with a further two small 'outlying' setts in between these two setts. These three setts are within the Site and are occupied by the same social group of badgers as the 'main' sett (approximate sett locations shown on Drawing 6-3).

- 6.4.1.75 Further badger setts have been recorded in the wider Masterplan Site; see Appendix 6A for more details. Although legally protected, badgers are not a species of conservation concern and they are reasonably common within the wider area. Consequently, the Site is considered to be of **Low** 'Parish/Neighbourhood' Importance for badgers.

Other mammals of conservation concern

Brown hare

- 6.4.1.76 The Brown hare is a Section 41 species. Brown hares have been recorded within the NW Bicester eco-development area but not within the Masterplan Site. It is possible that brown hares would forage and rear their young within the arable fields on the Site; however, given the intensity of the grazing in the pasture fields, it is considered unlikely they would rear young in those fields. Given the availability of suitable habitat within the locality it is considered that the arable fields within the Site would not be of particular importance to brown hare. Overall the Site is considered to be of no more than **Low** 'Parish/Neighbourhood' Importance for brown hare.

Hedgehog

- 6.4.1.77 The hedgehog is a Section 41 species. Although targeted surveys for hedgehog have not been undertaken, it is likely that they would be present within the Site. However, it is considered unlikely that the Site, which largely comprises intensively managed farmland, would be of particular importance to hedgehogs. Overall the site is considered to be of no more than **Low** 'Parish/Neighbourhood' Importance for hedgehogs.

Polecats

- 6.4.1.78 The polecat is a Section 41 species. Polecats are known to be present in the surrounding area and it is possible that they could be present within the Site; however, the habitats present were considered sub-optimal for this species. Overall the Site is considered to be of no more than **Low** 'Parish/Neighbourhood' Importance for polecats.

Harvest mice

- 6.4.1.79 The Harvest Mouse is a Section 41 species. Harvest mice could be present within the hedgerows; however, given that the intensity of the management of the arable fields and grasslands, the Site is considered to be sub-optimal for this species. Overall the Site is considered to be of no more than **Low** 'Parish/Neighbourhood' Importance for harvest mice.

Selection of Key Ecological Receptors

- 6.4.1.80 Table 6-5 summarises all ecological receptors that have been considered, and highlights those which have been selected as 'Key Ecological Receptors' for further investigation in this assessment. The locations of these habitats and features and other known ecological constraints are illustrated on Drawings 6-1 to 6-3.

Table 6-5 Summary of Ecological Receptors

Ecological receptor	Associated species/habitats	Nature conservation importance	Potentially significant impact
Key Ecological Receptors			
Hedgerows (including breeding birds, reptiles, and hedgehogs)	Invertebrates (in particular hairstreak butterflies); amphibians (including great crested newts); foraging bats.	Medium District/Borough	<p>Habitat fragmentation: fragmentation of hedgerows by access roads</p> <p>Habitat degradation – pollution: potential for sediment laden runoff and dust during construction</p> <p>Habitat loss: potential temporary loss of habitat for breeding birds, reptiles and hedgehogs during construction</p> <p>Species disturbance: potential for disturbance and mortality of nesting birds during hedgerow removal if undertaken during the breeding bird season</p> <p>Species mortality: potential mortality of reptiles and hedgehogs if present during hedgerow removal</p> <p>Habitat degradation – context: context of hedgerows altered since no longer adjacent to farmland</p>
Watercourses	Aquatic invertebrates; reptiles; foraging and commuting bats; and otters	Medium District/Borough	<p>Habitat loss: vegetation removed to facilitate bridge crossings</p> <p>Habitat degradation – construction phase pollution: potential for pollution/degradation of watercourses.</p> <p>Habitat fragmentation: fragmentation of stream corridors by access roads.</p> <p>Species disturbance: roosting and foraging bats could be disturbed during site clearance</p> <p>Habitat degradation – operation phase pollution: Potential for pollution/degradation of watercourses.</p> <p>Habitat degradation – public access and other disturbance</p>

Broadleaved woodland (including breeding birds)	Invertebrates (in particular hairstreak butterflies); foraging and hibernating reptiles; foraging birds; foraging bats; foraging and hibernating hedgehogs.	Medium District/Borough	Species disturbance: potential for disturbance to nesting birds if undertaken close to woodlands during the breeding bird season Habitat degradation – construction phase pollution: potential for pollution/degradation of habitat. Habitat degradation – public access: Trampling and other disturbance Species disturbance: noise and visual disturbance during the operation phase
Pond	Amphibians; aquatic invertebrates	Medium District/Borough	Habitat loss and fragmentation – construction phase Habitat degradation – pollution during the construction phase: potential for pollution or habitat degradation. Habitat loss and fragmentation – operation phase Habitat degradation – pollution during the operation phase Habitat creation
Barn owls	Trees; arable fields; grasslands	Medium District/Borough	Disturbance: potential for disturbance to nesting barn owls, which in turn could potentially affect breeding success. Habitat loss: loss of small areas of suitable foraging habitat.
Breeding and overwintering birds	Farmland; woodland and hedgerows	Medium District/Borough	Habitat loss: the majority of the land that supports farmland specialist bird species would be lost. Increased predation: domestic pets associated with new residents may also lead to an increase in predation of birds using the adjacent farmland Species disturbance: noise and visual disturbance
Bat roosts	Mature trees; farm buildings	Medium District/Borough	Species disturbance: Potential disturbance of bats though construction phase lighting and noise. Habitat loss and fragmentation – construction phase loss and disruption of foraging and commuting habitat through land, take, illumination and noise Species disturbance: Potential disturbance of bats though operation phase night-time lighting and noise.
Other ecological receptors requiring mitigation			

Amphibians	Stream corridor; hedgerows; grasslands	Low Parish/ Neighbourhood	Potential for mortality during construction included within hedgerow and watercourse receptors above. The remainder of the Site not sufficiently valuable for significant impacts on amphibians to arise.
Reptiles	Stream corridor; hedgerows; grasslands	Low Parish/ Neighbourhood	Potential for mortality during construction included within hedgerow and watercourse receptors above. The remainder of the Site not sufficiently valuable for significant impacts on reptiles to arise.
Badgers	Hedgerows; arable fields; grasslands.	Low Parish/ Neighbourhood	Potential disturbance of badger setts during construction. Loss/fragmentation of foraging habitat.
Brown hares	Arable fields	Low Parish/ Neighbourhood	Habitat loss, but receptor not sufficiently valuable for significant effects to arise.
Hedgehogs	Hedgerows; tall grassland	Low Parish/ Neighbourhood	Potential for mortality during construction considered within hedgerow receptor above.
Ecological receptors not considered further			
Arable land and grasslands	Invertebrates; reptiles; farmland birds; barn owls	Low Parish /Neighbourhood	Habitat loss, impacts on birds and barn owls considered under those ecological receptors.
Invertebrates	Arable field margins; hedgerows; mature trees	Low Parish/ Neighbourhood	Loss of habitat used by invertebrates during construction. Impacts on brown hairstreak and white-letter hairstreak considered under hedgerows.
Aquatic invertebrates and fish	Ponds and watercourses	Low Parish/ Neighbourhood	Direct and indirect effects on water quality that might affect these species considered under pond and watercourses.
Dormice	Hedgerows	Negligible	No effects predicted as considered to be absent from the Site.
Water voles	Watercourses	Negligible	No effects predicted as considered to be absent from the Site.
Otters	Watercourses	Low Parish/ Neighbourhood	The Site is not considered to be sufficiently valuable for otters for significant effects on their population to arise.
Polecats	Hedgerows and Watercourses	Low Parish/ Neighbourhood	The site is not considered to be sufficiently valuable for polecats for significant effects on their population to arise.
Harvest Mice	Arable fields and grasslands	Low Parish/ Neighbourhood	The site is not considered to be sufficiently valuable for harvest mice for significant effects on their population to arise.

Ardley Cutting and Quarry SSSI	Calcareous grassland; woodland and wetlands	Low National	No direct effects or no indirect effects that would lead to significant impacts predicted.
Ardley Trackways SSSI	Geological interest	Low National	No direct effects or no indirect effects that would lead to significant impacts predicted.
Stratton Audley Quarries SSSI	Geological interest	Low National	The geological interest of this site has been destroyed.
Nine further SSSIs within 10km of the Site	Various	High National	No direct effects or no indirect effects that would lead to significant impacts predicted.
Tusmore and Shelswell Parks with Stoke Lyne Woodlands CTA	Parkland; mixed broadleaved deciduous woodland	Medium County/Regional	No direct effects or no indirect effects that would lead to significant impacts predicted.
Ray CTA	Lowland meadows; riparian habitat; hedgerows.	Medium County/Regional	No direct effects or no indirect effects that would lead to significant impacts predicted.
Nine further LWS outside the CTA	Various	Medium County/Regional	No direct effects or no indirect effects that would lead to significant impacts predicted.
Bure Park LNR	River; riparian; woodland; grassland; water voles	Medium District/Borough	No direct effects or no indirect effects that would lead to significant impacts predicted.

6.4.2 Future Baseline

6.4.2.1 In the absence of development it is anticipated that the Site would continue to be actively farmed. The fields would continue to be cultivated or grazed by livestock, the hedgerows would continue to be managed, and the mature woodlands would be likely to continue to receive some management in response to the loss of mature trees. Mature trees present in the hedgerows and stream corridors may be felled or receive tree surgery in response to disease. Some new tree planting may take place. The number and species of birds present on the site would change in response to alterations in cropping regimes and in response to changes that occur in the wider countryside. Overall, it is considered that the Site would continue to support a similar suite of species. The importance of the Site for nature conservation could be enhanced through deliberate intervention, but this would only occur if funds were provided by an external source. Similarly, the value of the Site for nature conservation could decline if there was a major change in management; however, this is unlikely to occur in the absence of development.

- 6.4.2.2 As identified in Tables 17-1 and 17-2, there are a number of consented and proposed developments in the vicinity of the Site including several residential developments. The new residents associated with these developments could cause disturbance to flora and fauna within the Site. However, the Site is intensively managed for agriculture, it is not open to the public, and there are no public rights of way across the Site. It is therefore anticipated that the new residents would not have access to the Site and therefore they would not cause disturbance to habitats and species there in. Mobile species such as birds could be displaced onto the Site by development. It is not anticipated that such displacement would affect the importance of the Site for these species, since the importance of the Site is determined by the carrying capacity of the habitats on the Site and is not considered likely to change. It is considered that, in the absence of the Development, the Site would continue to be intensively managed and therefore its importance for flora and fauna would remain largely unchanged.
- 6.4.2.3 Overall, it is considered that management on the Site is relatively stable, that development nearby is unlikely to have any direct or indirect effects on the Site, and the future baseline would be similar to the current conditions on the Site. Species numbers and distributions may alter, but fundamentally the Site would remain as agricultural fields with hedgerows, watercourses and small blocks of woodland. Over time climate change would affect the plant communities on site and the species assemblages that they support. Cropping regimes are likely to be altered in response to climate change and this would affect the fauna on site. It is unlikely that the status of individual habits and species would change sufficiently to affect the overall importance of the Site for nature conservation.

6.5 Design and Mitigation

6.5.1 Construction Approach and Mitigation of Short-Term Construction Effects

- 6.5.1.1 46% of the Site would comprise green space, which exceeds Policy ET14 in the guidance document, PPS: Eco-towns (a supplement to PPS1). The green space would include the most valuable habitats: the riparian habitat along the watercourses; hedgerows; the pond; and the mature woodlands. The badger setts, the confirmed bat roost; and the bat foraging and commuting routes would also be retained with appropriate buffer zones supporting semi-natural vegetation.
- 6.5.1.2 As well as retaining the most valuable features, ecological corridors would be maintained and enhanced on Site to provide important links to the green space beyond the Site boundary: in particular, to Bure Park LNR (to the east), to the railway corridor (to the south), to Caversfield (to the north) and Bucknell (to the west). The links to the north and east are severed by the existing road network, but the layout has sought to create significant corridors of semi-natural vegetation through and around the Site to facilitate the movement of species. Mitigation and enhancement measures that have been incorporated into design with respect to Key Ecological Receptors are identified below. Habitat enhancement and creation measures that form part of the design to ensure a

'net gain in biodiversity', in keeping with Policy ET14 and the Local Plan policy, are also identified.

- 6.5.1.3 To minimise the ecological impacts of the Development, buffer habitats comprising semi-natural vegetation have been incorporated into the layout. Consequently the hedgerows would be retained within 20 metre-wide corridors of semi-natural vegetation, the stream corridors within 60 metre-wide corridors of semi-natural vegetation and the semi-natural broadleaved woodlands with 10 metre-wide buffers of semi-natural vegetation. Other measures have been incorporated into the layout to minimise the impact of the Development on each of the receptors, as outlined below. In addition, a Construction Environmental Management Plan (CEMP) or similar document would be in place in advance of site clearance to ensure that measures are put in place to protect the environment as outlined below.

Hedgerows

- 6.5.1.4 The development layout retains the majority of the hedgerows. The road and path network has also sought to minimise the number of times hedgerows are breached, and ensures that, wherever possible, hedgerow breaches are at right angles to minimise hedgerow loss. Where sections of hedgerows require removal, the length of the removed section would be kept to a minimum. The layout has also ensured that the hedgerows would be retained within buffer zones of semi-natural vegetation that extend a 10 metres either side, this has been reduced to 6 metres where there is a leisure route within the buffer. As part of the detailed design, the development layout would also seek to ensure that where development is located close to a hedgerow, buildings etc. would face the hedgerow i.e. hedgerows would remain in public open space and not form curtilage boundaries. This would ensure that the hedgerow remains part of an area of public open space to allow for future management. Retained hedgerows would not be located within private gardens. The retention of hedgerows and the maintenance of buffer habitats would maintain nesting opportunities and foraging resources for birds, and continue to provide habitat and wildlife corridors for species such as invertebrates (including hairstreak butterflies), reptiles, hedgehogs and bats. The buffers and adjacent green spaces would also help to protect these species from disturbance arising from increased human presence, site traffic, noise and lighting during construction.
- 6.5.1.5 In addition, the green space that would be created as part of the Development would create new links between hedgerows along the western boundary. The Development would be phased and take place over a period of approximately 25 years. It would be possible, therefore, to ensure that new planting takes place in advance of hedgerow removal. This would ensure that the planting has time to mature. In the early phases of the Development, where this would not be possible, hedgerow translocation would be undertaken to generate mature habitats more quickly. Any hedgerows removed would be translocated to areas of green space to create new linkages between retained hedgerows within the Site.
- 6.5.1.6 New planting to create new links between hedgerows and to fill gaps in the existing hedgerows would ensure that in the long-term there is no net loss in the length of hedgerows within the Site. Prior to any removal of hedgerows, pre-

construction checks for any species of conservation concern, such as reptiles and hedgehogs, would be undertaken. Any features of importance to hibernating reptiles would not be disturbed during the reptile hibernation period (October through to March). Should hedgehog(s) be found, they would be moved to a safe location.

- 6.5.1.7 The CEMP would ensure best practice site clearance and construction methods are employed to prevent dust and sediment laden runoff from having a detrimental effect on the flora and fauna associated with the hedgerows. The measures outlined below would also be incorporated into the CEMP.
- 6.5.1.8 Haul routes, storage compounds and staff facilities would be located away from retained hedgerows to minimise disturbance to the species they support. In addition, any night-time lighting would be kept away from retained hedgerows and limited only to those areas where absolutely necessary. In advance of site clearance and during construction, retained hedgerows and the adjacent buffer zones would be fenced to ensure that they are not subject to accidental damage. This protective fencing would also ensure that the roots of the hedgerow trees and shrubs are not affected during any excavation works.
- 6.5.1.9 To avoid impacts on breeding birds, the works close to hedgerows would preferably be undertaken outside of the bird breeding season (i.e. between the months of September and February, inclusive). Where this is not possible and hedgerow removal is required, to minimise the risk of killing and/or injuring birds, or damaging or destroying nests (all of which would be unlawful), specialist ecological supervision would be provided to confirm the absence of nesting birds prior to the removal operations, and ensure the protection of any confirmed nesting sites. Should the presence of nesting birds be established, works would cease in the locality until the young have fledged. In advance of construction, bird nesting boxes would be installed on some of the retained trees and in hedgerows, in suitable locations away from the construction. This would ensure alternative nesting opportunities are provided to mitigate for any temporary loss of nesting bird habitat. A combination of bird boxes (those suitable for hole-nesting species and open-fronted boxes) would be installed (two boxes for every 100m of hedgerow).
- 6.5.1.10 As part of the detailed landscape design, buffers of diverse grassland areas would be created alongside the hedgerows so that they are suitable for invertebrates, including Roesel's Bush-cricket. Proposed planting would incorporate plants favoured by the Shaded Pug moth, such as Field Scabious, to aid the retention of these species within the Site. The implementation of a Landscape and Habitats Management Plan would ensure that the hedgerows maintain their value to hairstreak butterflies.
- 6.5.1.11 All hedgerow loss would be compensated for with new planting and hedgerow translocation to ensure no net loss to biodiversity. The new planting would take the form of hedgerows and tree belts in areas of green space, which would be managed to benefit biodiversity. All hedgerows removed would be translocated to accelerate the development of habitat of value to flora and fauna. New planting would also be provided and where possible, in advance of hedgerow removal in addition to the hedgerow translocation.

- 6.5.1.12 All works required to safeguard the biodiversity associated with the hedgerows would be identified in method statements. This would include a specific method statement for the habitat translocation, which would ideally be undertaken in the autumn/winter months. This would require advanced works to safeguard fauna.

Watercourses

- 6.5.1.13 In accordance with the landscape strategy, all watercourses would be retained within a 60 metre-wide buffer zone of semi-natural habitat. Construction site drainage would be carefully designed and controlled, with silt traps established at the outset of the works; such works would take place in accordance with the provisions of the CEMP. This would ensure that all works would incorporate relevant legislation for the protection of surface and groundwater and implement best practice guidelines for works within or near water. Relevant guidance including Pollution Prevention Guidelines prepared by the Environment Agency and literature produced by CIRIA would form the basis for pollution control measures.
- 6.5.1.14 Road and pedestrian/cycle bridges would be designed to minimise impacts on the watercourses and associated protected species, maintaining a dark corridor beneath the structures. Care would be taken in the detailed design and during construction to minimise damage to the banks and/or any sensitive features in close proximity, such as mature trees. Care would also be taken with the detailed bridge designs to ensure that they provide safe crossings within/below the bridge for large mammals such as badgers and otters even during peak water flows. This would include the use of culverts and/or mammal ledges or open span structures that maintain access to the banks above typical flood levels.
- 6.5.1.15 The CEMP would also ensure that water quality samples would be collected and analysed from the watercourses in advance of construction to provide a baseline for water quality monitoring during and post-construction. On each watercourse, samples would be collected from three locations: 1) upstream of construction works; 2) in proximity to the proposed location of construction works; and 3) downstream of construction works. Water quality samples would then be taken at regular intervals during construction and on completion to ensure that remedial actions can be taken if required to maintain water quality.
- 6.5.1.16 As discussed above, current best practice guidance would be followed to ensure water quality is protected during construction close to watercourses. If night-time construction lighting is required it would be kept away from the watercourses. This commitment would be formalised through the CEMP. The CEMP would also ensure that a pre-construction ecological survey would be undertaken to ascertain the presence of badger setts, and/or any potential otter holts/resting sites or other features which would constrain the construction of the bridges over the watercourses.

Broadleaved woodland

- 6.5.1.17 The blocks of semi-natural broadleaved woodland west of Home Farm would be retained within buffer zones of semi-natural habitats, and linked to larger areas of green space associated with the watercourses. This would protect the woodlands from encroachment from surrounding land uses. No construction

works would take place within the woodland, since the footpaths and cycleways avoid these habitats. There would be no requirement to illuminate these habitats during construction and provisions in the CEMP would ensure that these habitats are not lit.

- 6.5.1.18 Bat boxes and bird boxes would be installed on suitable trees and additional planting undertaken to compensate for any disturbance effects during site clearance and construction. These boxes would also enhance the nature conservation importance of these woodlands for these fauna in the longer term. The boxes would be installed in advance of site clearance. The implementation of a Landscape and Habitats Management Plan, as required by local plan policy, would ensure that the woodlands maintain their importance to nesting birds.

Pond

- 6.5.1.19 The pond would be retained within an appropriate buffer linked to green space associated within the Country Park and allotments. Water quality within the pond would be protected through the implementation of standard mitigation techniques during construction (through the CEMP). Care would be taken in the detailed design to ensure that the retained pond only receives surface water runoff that is balanced and treated to ensure that water quality in this feature is protected.

Barn owls

- 6.5.1.20 The area of semi-natural broadleaved woodland to the west of Home Farm where three barn owl boxes are located would be retained with a 10 metre-wide buffer of semi-natural habitat. Development would take place within 250 metres of these boxes and therefore there is the potential that barn owls using these boxes would be disturbed. Before site clearance works take place in the vicinity of these boxes, they would be moved to suitable locations on the edge of the Site where there is no potential for disturbance. Locations would be selected to ensure that the barn owls have access to suitable foraging habitat. Any damaged boxes would be replaced at this time. These boxes would also provide suitable nesting habitat for the kestrels that were recorded nesting within a barn owl box on the wider Masterplan Site. Existing nest boxes would only be moved once it has been confirmed, by an experienced, licensed ecologist, that they were not currently occupied. The Landscape and Habitats Management Plan would ensure that the barn owl boxes are monitored and maintained.

Breeding and wintering birds

- 6.5.1.21 Habitats of importance to nesting and foraging birds such as the hedgerows and woodlands would be retained within suitable buffers of semi-natural habitat. These habitats, together with the creation of large areas of open space that includes a Country Park, a wetland waste water treatment facility and areas of woodland, would reduce the scale of this impact on certain species. Nevertheless, there would be a loss of nesting sites associated with the loss of hedgerows, and disturbance to birds within the hedgerows and woodlands. As identified previously with respect to these habitats, new nest boxes would be provided in advance of site clearance to compensate for habitat loss and/or

disturbance. In addition, the provision of nest boxes within the areas of open space and within the areas of built development would lead to the creation of new nest sites for certain species; this would include BOCC and Species of Principal Importance. The number of boxes would follow the guidance for low and zero carbon buildings (Ref 6-8).

- 6.5.1.22 The Development would also lead to the loss of arable land and grassland fields that supported bird species that are of conservation concern and Species of Principal Importance; this includes farmland specialist species, for which off-site mitigation would be provided. As part of the Development, funds would be provided to enhance local habitats for farmland birds through appropriate, proven management regimes to increase the carrying capacity of local habitats. It is considered that such enhancement measures would compensate for the loss of habitat for farmland birds. Measures that have been developed as part of the Government's Stewardship Schemes; in particular High Level Stewardship, provide safe nesting sites, summer food and winter food for farmland birds. Those measures that could be adopted within local habitats include: the creation of in-field nesting habitat such as skylark plots and beetle banks; the provision of over-wintering seed food as a crop; the provision of bought seed to provide supplementary feeding in winter; the creation of insect-rich foraging habitat such as unharvested fertiliser-free conservation headland and uncropped, uncultivated margins for rare plants on arable land. This off-site mitigation would also provide habitat suitable for other farmland specialist species such as brown hare and harvest mice. The requirement to deliver and monitor this off-site mitigation would be delivered through a Section 106 or similar legal agreement.

Bat roosts

- 6.5.1.23 The tree which was found to support roosting bats would be retained within the buffer of semi-natural vegetation associated with the mature woodland and the stream corridor. As such, it would be protected from disturbance (including illumination) during site clearance and construction. The existing farm buildings within the Study Area also have the potential to support roosting bats; however, these buildings are not within the Site, and would remain unaffected by the Development. It is therefore not proposed to alter the lighting around the farm buildings.
- 6.5.1.24 The Site contained very few natural roost sites. As part of detailed design proposals, artificial roosting sites (bat bricks and bat boxes) would be incorporated into the Development, and installed on trees in the areas of open space. This would enhance the importance of the Site for roosting bats. The number of boxes would be informed by the guidance for low and zero carbon buildings (Ref 6-8).
- 6.5.1.25 As well as retaining the most valuable features for bats, a green network of ecological corridors would be created across the Site. Dark corridors suitable for foraging and commuting bats form part of the Development design; these corridors are associated with retained habitats alongside the stream corridors and would be protected during site clearance and construction.

- 6.5.1.26 New habitats of importance to foraging bats would also be created; this would include new woodland planting on the western edge of the Site, a wetland waste water treatment facility and a Country Park. The habitats created within the wetland waste water treatment facility and the Country Park would comprise native species that support the invertebrates that the bats would feed on.
- 6.5.1.27 Habitat enhancement and creation measures (detailed below) that would improve the importance of the Site for invertebrates would also be of benefit to the bats that feed on them. Such measures include the creation of long grassland habitats, SuDS features supporting wetland vegetation, areas of diverse grassland and allotments. The provision of invertebrate boxes and other structures that provide shelter for invertebrates would also be beneficial to foraging bats and represent a habitat enhancement.

Other ecological receptors requiring mitigation

Amphibians

- 6.5.1.28 There is a low risk of encountering amphibians in the hedgerows and grassland close to the pond on Site and a low risk of encountering great crested newts within the hedgerows within 500 metres of the pond that supports these newts off site. The amphibian hibernation period is the same as the reptile hibernation period and therefore the measures outlined below with respect to reptiles would also safeguard amphibian populations.

Reptiles

- 6.5.1.29 Hedgerow removal should ideally be undertaken during the autumn/winter to avoid disturbance to nesting birds. However, at this time reptiles would be entering into, or be within, their hibernating period (typically between October and March) and disturbing reptiles at this time can cause mortality. Given the low number of reptiles recorded on site it is considered unlikely that hibernating reptiles would be present within the footprint of the of hedgerows/vegetation to be removed; however, provisions in the CEMP would ensure that a check for features suitable for hibernating reptiles would be carried out by a suitably experienced ecologist as part of the pre-construction survey, prior to their removal. Any features considered likely to support hibernating reptiles would be identified and their removal left until the following March, in suitable warm weather conditions, to avoid killing or injuring reptiles.
- 6.5.1.30 Should hedgerow/vegetation removal be carried out during the reptiles' active period, a check for the presence of reptiles would be undertaken by an experienced ecologist. If suitable habitat for reptiles was present, gradual vegetation clearance would be employed to displace any reptiles into nearby retained areas of suitable habitat. If no such habitat occurred nearby, a small-scale translocation operation would be undertaken in advance of site clearance. This would involve moving any reptiles captured to a suitable area of retained habitat. In either case, reptiles would not be moved outside the area in which the small populations have already been found to exist. Therefore there would be no issues associated with introducing individuals to a different population, or creating new populations with small numbers of animals.

6.5.1.31 Following the displacement and/or translocation of reptiles, destructive searches would be undertaken as appropriate to further avoid the incidental mortality of individuals. The need for reptile-resistant fencing would be reviewed throughout the construction phase. Given the small areas of suitable habitat for reptiles that would be removed, this is considered unlikely to be a requirement at the early phases of Development. The need for fencing during the later phases would depend on whether the site remains in agricultural production in advance of Development. Reptiles would be expected to persist within the Site once it is developed, as the railway embankment, hedgerows and riparian habitat would be maintained within suitable buffer zones of semi-natural vegetation.

Badgers

6.5.1.32 Badgers are afforded protection under the Protection of Badgers Act 1992. As a consequence, works close to active setts which would disturb badgers would be licensable, and there are seasonal restrictions associated with such works. Consequently the CEMP would ensure that works that could disturb badgers should not commence during the badger breeding season, which is taken to be from the 1st December to the 30th June.

6.5.1.33 The CEMP would ensure that all setts and an appropriate buffer zone around each sett would be protected from accidental damage and destruction during by being clearly marked out, and enclosed within protective fencing to prevent damage from construction machinery or staff. The fencing would ensure that badgers continue to have access to their foraging habitats. It would also ensure that any works close to the badger setts would also be carried out under close ecological supervision and under licence where necessary to minimise disturbance to badgers as far as possible.

6.5.1.34 Where it is necessary to create trenches or steep-sided pits within the Site they would not be left open overnight; where this is not possible, measures would be put in place to allow badgers and other wildlife that could become trapped to escape. This would include the use of wooden planks or earth slopes to enable safe egress.

6.5.1.35 All of the badger setts located within the Site would be retained within areas of green space. Dense tree and shrub planting close to the setts during construction would also protect these setts from disturbance once the site is developed.

Brown hare

6.5.1.36 To minimise impacts on brown hare, topsoil stripping of arable fields would ideally be timed to avoid the brown hare breeding season (January to October), or when dependent young could be present (March to September). For vegetation clearance that takes place during these times, the CEMP would ensure that pre-construction checks for this species would be undertaken by an experienced ecologist to ensure that measures are put in place to protect young hares if they are present on Site.

Hedgehog

- 6.5.1.37 The measures (above) put in place to safeguard reptiles would also ensure that hedgehogs are protected during site clearance and construction.

CEMP

- 6.5.1.38 A CEMP or similar document would be in place in advance of site clearance to ensure that measures are put in place to protect the environment. The CEMP would adhere to relevant legislation for the protection of the environment, and implement best practice guidelines for works within or near water. Relevant guidance including Pollution Prevention Guidelines prepared by the Environment Agency and literature produced by CIRIA would form the basis for pollution control measures. Specifically, the CEMP would ensure that:

- 1 Appropriate measures are put in place to protect water quality in the watercourses and pond on Site. This would also protect downstream habitats.
- 2 Appropriate measures are put in place to control dust and other emissions that could affect air quality.
- 3 Site compounds, storage facilities and staff facilities are suitably bunded and located in places that would not have an adverse effect on the environment; in particular, the CEMP would ensure that retained habitats and wetland habitats are protected.
- 4 In advance of site clearance, protective fencing is installed to protect ecologically sensitive habitats (the watercourses, pond, mature trees, woodlands and hedgerows) and their associated buffer zones to ensure that they are not subject to accidental damage. The fencing should be extended, as necessary to protect ecologically sensitive features such as badger setts and confirmed bat roosts.
- 5 Haul routes, storage compounds and staff facilities are located away from retained habitats to minimise disturbance to the species they support.
- 6 Pre-construction surveys are carried out by an ecologist to confirm the nature and extent of any ecological constraints in advance of site clearance. This would also ensure that appropriate mitigation measures including licences are in place in advance of site clearance, and confirm that no new constraints have arisen since the publication of the Environmental Statement.
- 7 An ecological clerk of works is in place to oversee site clearance, in particular any works that have the potential to disturb nesting birds, reptiles, badgers, brown hare and/or hedgehog. They would also ensure that the mitigation measures proposed adhere to any best practice guidelines and take account of any changes in legislation that may have occurred.
- 8 To avoid impacts on breeding birds, works close to retained habitats would commence outside of the bird breeding season (i.e. they would commence in the period between the months of September and February, inclusive). Where this is not possible, specialist ecological supervision would be provided to confirm the absence of nesting birds

prior to vegetation removal, and ensure the protection of any confirmed nesting sites. Should the presence of nesting birds be established, buffer zones would be marked out and fenced to ensure the birds are not disturbed and works would cease in the locality until the young birds have fledged. [Note: the area of buffer zones for ground nesting species such as skylark may exceed a 50m radius.]

- 9 The hedgerow translocation is undertaken in accordance with an agreed method statement. They would also ensure that the retained and translocated hedgerows are monitored to ensure that they are managed appropriately.
- 10 In advance of construction, bird nesting boxes are installed in the woodlands, on retained trees and in hedgerows, in suitable locations away from the construction. This would ensure alternative nesting opportunities are provided to mitigate for any loss of nest sites.
- 11 Prior to any removal of hedgerows, pre-construction checks for any species of conservation concern, such as reptiles and hedgehogs, are undertaken. Any features of value to hibernating reptiles would not be disturbed during the reptile hibernation period (October through to March). Should hedgehog(s) be found at this time, they would be moved to a safe location.
- 12 The construction site drainage solutions incorporate measures to ensure that all surface water runoff is balanced and treated and returned to the watercourses at greenfield runoff rates.
- 13 Care is taken with the design of site drainage to prevent unbalance and untreated, silt-laden surface water runoff from entering retained habitats.
- 14 If night-time construction lighting is required, it is kept away from the known bat roosts, the watercourses and the hedgerows, during the period April to November when bats are active.
- 15 The ecological clerk of works would ensure that the mitigation measures are undertaken and that their success is monitored so that remedial action can be undertaken if required. This would include regular checks to make sure that protective fencing is in place etc.

Monitoring

- 6.5.1.39 An ecological clerk of works would be employed to ensure that the ecological protection measures outlined in the CEMP are adhered to. They would also undertake regular monitoring to ensure that the protection measures remain in place for the time that they are required. The ecological clerk of works would report to the site manager and environmental clerk of works to ensure that remedial actions are taken in a timely manner.

6.5.2 Scheme Design and Mitigation of Permanent Operational Effects

Landscape and Habitats Management Plan (LHMP)

- 6.5.2.1 The retained and newly created habitats would be managed to ensure the value to wildlife of the habitat and features is realised. This would also include maintenance of artificial structures such as nest/roost boxes in the areas of green space. Monitoring would form part of this plan to ensure that management is modified if required to ensure that the habitats reach their full wildlife potential. This monitoring would also ensure that remedial action is taken if required to safeguard the retained and newly created habitats. This plan would be produced as part of the reserved matter applications and be subject to agreement with the local planning authority.

Biodiversity Strategy

- 6.5.2.2 The Biodiversity Strategy (Appendix 6J) identifies the measures that would be undertaken to safeguard biodiversity on the NW Bicester Masterplan Site as a whole. This has informed the Framework Plan for this application. The Defra metric (Ref 6-12) has been used to calculate the number of Biodiversity Units that the Masterplan Site supported before development and those that the Masterplan Site would support on completion based on landscaping proposals that would be delivered in the green infrastructure. This has revealed that there would be an increase in the number of biodiversity units associated with the habitat creation on the Masterplan Site. Overall, the NW Masterplan would deliver a net gain in biodiversity as required by planning policy.

Hedgerows

- 6.5.2.3 Once the Site is developed, the context of the hedgerows would have changed as they would no longer be adjacent to arable or grazed farmland, and this would change the bird assemblage. However, all hedgerows would either be retained or translocated; therefore, potential nesting sites for birds would be retained. Given that the hedgerows would be retained within 20 metre-wide corridors of vegetation, with leisure routes within this area, it is anticipated that the invertebrates, amphibians, reptiles, hedgehogs and other fauna associated with the hedgerows would also be retained. The creation of green corridors across the Site would ensure that wildlife would continue to cross the Site and prevent fragmentation/isolation of populations of mobile species. The lighting scheme would be designed to ensure that hedgerows are not subject to high levels of artificial light. (That is they are not subject to light levels greater than 1 lux).
- 6.5.2.4 The LHMP would ensure that the hedgerows and the newly created habitats within their buffers are managed appropriately to maintain and enhance their value to the wildlife that they support (primarily invertebrates, amphibians, reptiles, birds and bats).

Watercourses

- 6.5.2.5 Surface water drainage within the Site during operation would be managed using SuDS. This would involve a combination of gravel-filled channels, swales,

open ditches, underground storage facilities and above ground attenuation basins (some of which would contain water for most of the year). As part of the detailed design, SuDS features within areas of green space would be specifically designed to create habitats of value to wildlife. This would include planting schemes that support native species, including invertebrates, amphibians and reptiles.

- 6.5.2.6 During the operational phase, the bridges would be lit for safety reasons. However, to prevent illumination of the dark corridors the lighting would be shielded or use focused optics. If necessary the lighting column heights would be reduced, and road surface materials would comprise a low-reflective surface. The watercourse, its 60 metre-wide buffer zone, and the leisure routes within the watercourse buffer would not be lit to ensure that the stream channels and their associated tree and shrub vegetation would not be illuminated. That is the light levels from artificial light sources that would reach the stream channel would be no greater than 1 lux.
- 6.5.2.7 The LHMP would ensure that the watercourses and the newly created habitats within its buffer are managed appropriately to maintain and enhance their value to the wildlife that they support (primarily invertebrates, amphibians, reptiles, birds and bats).

Broadleaved woodland

- 6.5.2.8 As part of the Development design the leisure routes and access routes would not be located within the woodlands, to protect them from excessive trampling and disturbance. In addition, there would be no night-time lighting in close proximity to avoid disturbance of nocturnal species. It may be considered appropriate, as part of the detailed design, to create a circular wildlife walk through these woodlands. This path would be appropriately surfaced to protect tree roots with planting and signage used to discourage excessive trampling throughout.
- 6.5.2.9 Bat boxes and bird boxes would be installed on suitable trees within the blocks of broadleaved semi-natural woodland west of Home Farm and the more mature woodland associated with Hawkwell Farm. Additional planting would be undertaken to compensate for those areas which may experience increased levels of disturbance, and to enhance the nature conservation importance of these woodlands for these fauna. The boxes would be installed in advance of site clearance to compensate for the loss of bird nesting habitat, and create opportunities for roosting bats. These boxes would be maintained in accordance with the provisions of the LHMP. This plan would also ensure that the woodlands maintain their importance to nesting birds and foraging bats.

Pond

- 6.5.2.10 As part of the detailed design of the Country Park, it would be possible to create habitats of value to the wildlife (invertebrates, amphibians, birds and bats) which are associated with the pond. This would enhance the value of the pond which is currently surrounded by intensively managed arable land and closely grazed pasture. In addition, new wetland habitats of value to the wildlife associated with the pond would be created within the wetland waste water treatment facility and within the Country Park.

- 6.5.2.11 The LHMP would ensure that the habitats within the Country Park and wetland waste water treatment facility are managed appropriately to maintain and enhance their value to the wildlife that they support (primarily invertebrates, amphibians, reptiles, birds and bats).

Barn owls

- 6.5.2.12 The LHMP would ensure that the barn owl boxes are monitored and maintained when the Site has been developed.

Breeding and wintering birds

- 6.5.2.13 Domestic pets associated with new residents may lead to an increase in predation affecting birds using the adjacent farmland. The off-site mitigation that would be provided to mitigate for the loss of habitat during construction would also mitigate for this impact. Habitats of value to nesting and foraging birds, such as the hedgerows and woodlands would be retained within suitable buffers of semi-natural habitat. This, together with the creation of large areas of open space on the edge of the Site that includes a Country Park, a wetland waste water treatment facility, new areas of woodland and allotments, would reduce the magnitude of this impact on certain species. A swift tower would be constructed within the wetland waste water treatment facility, which would provide nesting habitat for this species. The wetland habitats would also provide suitable foraging habitat for this insectivorous bird.
- 6.5.2.14 The landscaping proposals would ensure that habitat of value to nesting and foraging birds would be created within the Site. The LHMP would ensure that these habitats are managed appropriately to benefit birds, particularly species of conservation concern and Section 41 species.

Bat roosts

- 6.5.2.15 The tree that supported roosting bats would be retained within the stream corridor and woodland buffer. The stream corridors would not be lit so that it would continue to provide dark habitats suitable for roosting, foraging and commuting bats.
- 6.5.2.16 The road and pedestrian/ cycle bridges that cross the stream corridors would need to be lit for safety reasons. However, sensitive lighting design and a low-reflective road surface would prevent light spilling onto the watercourse corridor below, thus ensuring the retention of a continuous dark corridor avoiding impacts on light-sensitive bat species and on prey species (invertebrates). These measures would ensure that the bridges do not represent a barrier to the movement of bats or effect prey biomass.
- 6.5.2.17 The artificial roost sites that would be installed during the construction phase would be maintained and monitored in accordance with the provisions of a LHMP. Similarly this management plan would ensure that the retained and newly created habitats are managed so that the Site continues to support roosting and foraging bats. Where possible, habitat management would focus on maintaining habitats of importance to invertebrates to provide benefits to foraging bats.

Other ecological receptors requiring mitigation

Amphibians

- 6.5.2.18 New ponds would be created within the Development. These ponds would be created within the Country Park and wetland waste water treatment facility. Ponds would also be created as part of the SuDS. These habitats would be beneficial to breeding amphibians. The creation of long-grass habitats in the Country Park, the hedgerow buffers, the watercourse buffer, the woodland buffers and the wetland waste water treatment facility would provide habitat that would be beneficial to foraging amphibians.

Reptiles

- 6.5.2.19 Reptiles would be expected to persist in the parts of the Site where they were recorded prior to Development, namely the railway embankment, the woodland edge, the stream corridors and the hedgerows. New habitats of value to reptiles would be created within the areas of green space including the wetland waste water facility, the Country Park, the burial ground and the allotments. The LHMP would ensure that the retained and newly created habitats within the Site would be managed in a manner that is sympathetic to reptiles.

Badgers

- 6.5.2.20 The badger setts would be retained with an area of open space associated with the stream corridor and woodland. This open space provides a corridor linking the badger setts to the open countryside outside the Site and to other areas of green space within the Site, providing badgers with access to suitable foraging habitat. The landscape planting design would ensure that tree and shrubs are used to screen the setts so that they are less vulnerable to disturbance from the new residents. The landscape planting also provides the opportunity to create habitats of value to foraging badgers, to include short grassland and planting with fruit-bearing trees and shrubs. The LHMP would ensure that the areas around the setts are managed in a manner that is sympathetic to badgers.

Brown hare

- 6.5.2.21 It is considered unlikely that brown hare would remain on Site once it is developed. The off-site mitigation that would be implemented to create habitat for farmland birds would be beneficial to brown hare, providing them with safe refuges and suitable foraging habitat.

Hedgehogs

- 6.5.2.22 Hedgehogs would be expected to persist within the Site once it is developed, as the hedgerows and riparian habitat would be maintained within suitable buffer zones of semi-natural vegetation. Hedgehogs are also likely to benefit from the increased diversity of habitats within the areas of open space and gardens following construction compared to the habitats present on Site prior to Development.

Monitoring

- 6.5.2.23 An ecologist would monitor the retained and newly created habitats to ensure that they provide habitats and features of value to wildlife. In particular it would

be important for the ecologist to ensure that the commitments made in the Environmental Statement are adhered to. Any remedial action should be implemented through the LHMP. The monitoring would continue for the life of the LHMP. The regularity and emphasis of the monitoring would change over time as the habitats become established and the targets for net gain are achieved.

Compensation and enhancements

6.5.2.24 The green infrastructure that forms part of the proposals on Site would lead to the creation of new habitats of benefit to biodiversity. The large areas of green space that have been incorporated into the Development that would provide habitats of benefit to biodiversity are listed below (locations shown in the Green Infrastructure and Landscape Strategy document that accompanies this application). (More detail regarding the habitats that would be created in these areas is provided in the Biodiversity Strategy- Appendix 6J).

- 1 A Country Park
- 2 Wet and dry SuDS features
- 3 A wetland waste water treatment facility
- 4 Woodland habitats

Country Park

6.5.2.25 This would be created on the western edge of the Site, and it would be designed to provide a space for informal recreation but also support habitats of importance to biodiversity. This would include Section 41 habitats such as ponds, lowland meadows, lowland mixed deciduous woodland and hedgerows. Careful design of the Country Park layout would ensure that there would be areas for quiet contemplation that would provide conditions suitable for fauna that are more sensitive to disturbance. The Country Park is linked by open space to the stream corridor to the north. It is also linked to the stream corridor to the east by the waste water wetland treatment facility and a green burial ground. These areas also link the Country Park to the tree and shrub covered railway embankment. Hedgerows provide linkages between the Country Park and other areas of green space across the Site (areas within the built development that are too small to be illustrated on the Framework Plan). It is therefore anticipated that the fauna associated with the retained hedgerows would colonise the new habitats in the Country Park. Native planting would be used to create habitats of benefit to biodiversity and, in particular, the species that are already present on the Site, to include invertebrates such as hairstreak butterflies, birds associated with woodland and scrub, and reptiles, bats and badgers.

Wet and dry SuDS features

6.5.2.26 Two large drainage features would be created at the intersection of the river crossing and between the River Bure and Lord's Lane. These features would provide flood storage capacity and be dry for most of the year. These areas would be designed to support native grassland herbs and shrubs. They would be managed to provide habitats of importance to biodiversity including the

species associated with the hedgerows and stream corridors to which they would be linked.

- 6.5.2.27 There would be numerous above ground SuDS features across the Site. These would include swales, dry attenuation ponds, ephemeral ponds and wet ponds. Not only would these create wetland habitat that, with appropriate design, would support native flora and fauna; they would be located within the green infrastructure and within the green space with the developed areas and contribute to the value of these areas as wildlife corridors. The aim would be to create habitats of value to invertebrates, amphibians, and reptiles, such as grass snakes. Green roofs would also be provided as part of the SuDS strategy.
- 6.5.2.28 The SuDS features have the potential to generate beneficial effects on water quality within the Site, with the potential for benefits to habitats downstream including the River Bure. This would improve the resilience of this feature to impacts associated with climate change (see paragraphs 6.5.2.46 to 6.5.2.49 below).

Waste Water Treatment Facility

- 6.5.2.29 The detail for this facility has yet to be determined. However, it is known that waste water treatment would be required and it is anticipated that it would be dealt with on Site. It is envisaged that an integrated wetland would be created to enable water to be discharged to the existing stream network. Such a wetland facility would provide a range of wetland features and, although the primary function would be to treat waste water, it would also provide habitats that benefit biodiversity, particularly in association with the tertiary treatment before final discharge. This would include Section 41 habitats such as wet woodland and reed bed together with other damp habitats of value to wildlife such as scrub, swamp and damp/marshy grassland. Dry areas associated with the infrastructure buildings and access routes could be planted with native species.
- 6.5.2.30 Most of this area would not be publicly accessible and therefore any habitats created would not be subject to regular human disturbance. It would be located alongside the railway corridor and provide additional habitat for the fauna associated with this corridor. It would also be possible to locate a swift tower within this area. Although it may be necessary to install security lighting around particular buildings, it would not be necessary to illuminate the entirety of this area.
- 6.5.2.31 In the event that a wetland waste water treatment facility is not constructed, then the area would support green space and incorporate habitats of value to biodiversity within its design. This would include the wetland habitats that would be created if the water treatment facility was in place.

Woodland habitats

- 6.5.2.32 Although the detailed design of the open space has not been undertaken, it is likely that blocks of woodland would be created on the western edge to create views from the Development into the more open landscape beyond and provide a screen between the Development and the village of Bucknell. This new

planting would create habitats linkages between the Country Park and the stream corridor and allow for the creation of habitats of value to flora and fauna. The planting would comprise native species to encourage the development of lowland mixed deciduous woodland a Section 41 habitat.

- 6.5.2.33 Although the Site is not within the 'Tusmore and Shelswell Parks with Stoke Lyne Woodlands CTA' the creation of woodland habitat within the Country Park and on the western edge of the Site together with the creation of parkland within the green burial site would contribute to the targets for the CTA. It would create a network of green spaces in proximity to the CTA that would be of benefit to the species that the CTA supports and facilitate the movement of these species through the landscape.

Other habitats of value to biodiversity

- 6.5.2.34 Habitats of value to biodiversity would be created in other areas of green space across the Site, either to maintain and enhance the biodiversity value of a retained habitat, as an incidental result of another site activity, or to enhance the value of the Site for biodiversity. Examples of this are provided below.

- The hedgerow buffers would support long grass habitat to maintain and enhance the value of these features for invertebrates, providing additional foraging resources and places of shelter. Some buffers would be sown with a native plant mix that would be flower-rich so that it would be visually appealing to the local residents as well as providing foraging habitat.
- The buffers to the semi-natural woodland would support scrub and tall grass habitat to provide a soft edge to these areas and provide a screen from noise and visual disturbance. Such planting would also increase the area of habitat suitable for use by foraging birds and bats and nesting birds. Additional scrub planting would be used to screen the badger setts on the edge of the woodland.
- A mosaic of grassland, tall herb, scrub, and woodland habitats would be created in the stream corridors and adjacent areas of green space to create habitats of value to the fauna recorded on the Site. Careful design would also ensure that areas of bankside habitat would be less accessible and remain undisturbed by residents.

Habitats created as an incidental result of another site activity

- 6.5.2.35 Although the primary function of a community farm (or similar facility), allotments, play areas, playing fields, the burial grounds and other areas of open space would not be to provide habitat of value to biodiversity, these areas would nevertheless support a range of fauna. They would provide habitat that would be suitable to support invertebrates, reptiles, birds, bats, hedgehog and badger. If suitable ponds were created in these areas they would also provide habitat for breeding amphibians.
- 6.5.2.36 Areas of regularly mown amenity grass would provide suitable foraging habitat for hedgehog, badger and birds such as starlings. The areas of green space within the developed areas, that are too small to be illustrated on the Framework Plan, would also provide habitat for wildlife in particular invertebrates and birds.

- 6.5.2.37 Similarly, there would be opportunities within the above ground SuDS to create habitat and features of value to biodiversity, both through the use of native planting and through design, particularly if features contain open water which was a scarce habitat on the Site prior to development.

Measures to enhance the biodiversity value of the built environment

- 6.5.2.38 The detailed design of the built development does not form part of the Framework Plan. However, there would be opportunities within the Site to encourage wildlife into the built area. These could include the provision of artificial nest and roost boxes, and/or the incorporation of suitable features into the built design; the use of green/brown/blue roofs, street trees, green walls; and other planting that may not comprise native species but has a structure that provides shelter for fauna; the creation of linked gardens and community gardens that provide significant areas of green space; and the incorporation of native planting within areas of open space and SuDS features.

Offsite mitigation for farmland birds

- 6.5.2.39 Given that the Development within the Site would be phased over a number of years (currently estimated at a 25 year construction programme), it is envisaged that it would be possible to provide mitigation in a similar timeframe to the impacts that are generated. There are tried and tested techniques for creating and enhancing habitats for the benefit of farmland birds; therefore, it is envisaged that such measures could be instigated with a high degree of confidence of achieving success
- 6.5.2.40 The Site is approximately 155 ha in area, largely comprising arable farmland and improved grassland, with small blocks of woodland (8ha), watercourses, a pond, hedgerows and mature trees. Field surveys revealed that the Masterplan Site supported farmland specialist bird species, primarily skylark and yellowhammer, with linnet, starling, stock dove, kestrel and common whitethroat also recorded. The creation of a wide band of open space on the edge of the Site would reduce the likelihood of predation by domestic pets and lead to the creation of habitats of value to some of these species; however, farmland bird habitat would not be retained on Site.
- 6.5.2.41 It is proposed to compensate for the adverse effect on farmland birds by funding habitat improvements off site. Funds would be provided to enhance local habitats for farmland birds through appropriate, proven management regimes to increase the carrying capacity of local habitats. It is considered that such enhancement measures would mitigate for the loss of habitat for farmland birds as a result of the Development. The HLS payments that are targeted specifically at farmland birds aim to provide the three elements that are considered to limit farmland bird numbers 1) safe nesting habitat, 2) summer food and 3) winter food. Measures that have been developed as part of HLS that could be adopted include: the creation of in-field nesting habitat such as skylark plots and beetle banks; the provision of over-wintering seed food as a crop; the provision of bought seed to provide supplementary feeding in winter; the creation of insect-rich foraging habitat such as unharvested fertiliser-free conservation headland and uncropped, uncultivated margins for rare plants on arable land. There are other measures that could be adopted but these would

provide habitat for the three elements in line with Natural England's Farmland Bird Advisory Note (Ref 6-10).

- 6.5.2.42 It is not considered necessary to purchase land specifically for the habitat management, since it is not the lack of farmland that is limiting bird numbers and more the lack of appropriate management. It is proposed to contribute funds to a grant giving body such as the Trust for Oxfordshire's Environment that would guarantee, through a legal agreement, that the money would be used to deliver the proposed benefits for farmland birds in the local area. The detail of the agreement would be set out in a S106 or similar legal agreement that would form part of the permission for each planning application.
- 6.5.2.43 The disturbance that would affect nesting farmland birds would occur during site clearance and therefore it is proposed that the monies would be provided to the grant-giving body at least six months and ideally one year in advance of the impacts occurring i.e. in advance of site clearance for each phase of the development. It is proposed the funds to be provided would be sufficient to enhance 80ha of farmland for farmland birds for a period of 25 years. The payments provided would be in line with the payments provided by HLS (Ref 6-11). An example of an annual payment for improvements on a 100ha site has been provided in Appendix 6J- Biodiversity Strategy.
- 6.5.2.44 It is considered that providing sums that would cover enhancements on 80ha of land would more than compensate for the impacts generated by the development on the Masterplan Site. The RSPB have found that they were able to more than double the number of farmland birds on their Hope Farm Site in Cambridgeshire in a ten-year period by managing their farmland in manner that is beneficial to farmland birds (Source: RSPB website). It is therefore anticipated that enhanced management of 80ha of land would compensate for the loss of the 155 ha site. The provision of grants to local landowners via a grant-giving body would ensure that the monies are provided for appropriate measures and that the measures would be implemented.
- 6.5.2.45 The impact of the Masterplan would be a permanent loss of habitat. The terms of the payments would be subject to legal agreement in accordance with a Section 106 or similar legal agreement as part of the planning agreements.

Climate Change

- 6.5.2.46 The Framework Plan (Drawing number BIMP6 116C) includes within its design elements that would increase the resilience of biodiversity to climate change. Such elements include the maintenance of existing important ecological habitats within the green infrastructure, and the conservation of a variety of habitats. It also includes large areas of green space, where there is potential to increase habitat diversity and the availability of ecological. Retained habitats and newly created habitats would also form linear corridors allowing for the migration of species across the Site and into the wider countryside, allowing them to respond to changing climatic conditions.
- 6.5.2.47 The Framework Plan would also ensure that stream corridors are retained, protected, and the stream channels are given sufficient space to adapt, allowing for the natural processes of erosion and deposition. Retained riparian habitats, together with planting within the buffers associated with these watercourses,

would also assist in soil retention and mitigate damage which may potentially arise from any future flood events.

- 6.5.2.48 The provision of SuDS would also ensure that the water resources within the Site are controlled and maintained for the future. For example, the SuDS would hold back water following heavy rain, therefore allowing the watercourses to cope more effectively with extremes of weather than traditional piped drainage systems. The SuDS also have the potential to improve the quality of the riparian habitats.
- 6.5.2.49 The retention and improvement of the riparian corridor, the hedgerows, the woodland and the pond, together with the creation of interconnected green corridors within the built development would also help to reduce the heating effect created by built development. Planting within the large areas of open space would comprise native species that would thrive in the anticipated future climatic conditions. A mixture of native and non-native species would be selected in the built areas to cope with the stressed environment created when much of the surrounding area comprises hard surfaces.

6.6 Construction Impacts

6.6.1 Overview

- 6.6.1.1 The mitigation measures outlined in section 6.5 have been incorporated into the Development to address the likely ecological impacts of the Development. These impacts are described below.

Hedgerows (including breeding birds, reptiles and hedgehogs)

Habitat loss and fragmentation

- 6.6.1.2 The hedgerows form important wildlife corridors across the Site. Any loss and/or fragmentation would therefore have the potential to impact on the associated species. The retained hedgerows and associated buffer zones would be protected with fencing from accidental damage during site clearance and construction.
- 6.6.1.3 The Framework Plan sought to minimise the number of times that individual hedgerows would be breached. Cumulatively, approximately 1.3 km (15%) of hedgerow length would be removed as a consequence of the Development. Three hedgerows would be removed comprising 580m; a further thirty-three hedgerows would be fragmented by access routes (roads, cycle and pedestrian routes).
- 6.6.1.4 Removal of hedgerow sections during site clearance would result in the temporary loss of nesting and foraging habitat for birds, prior to the regrowth of the translocated hedgerows and the establishment of new areas of planting. This would result in a reduction in breeding success in the species affected. Nest boxes would be provided in the retained hedgerows, woodlands and trees to reduce the magnitude of this impact on nesting birds.

- 6.6.1.5 There is the potential for mortality to reptiles, amphibians and nesting birds should they be present when vegetation clearance takes place. However, as identified in Section 6.5 measures would be implemented as part of the CEMP to ensure that these species/ species groups are protected. It is anticipated that the invertebrates associated with the hedgerows would continue to use these features during site clearance and construction since large areas of the Site would remain undisturbed.
- 6.6.1.6 It is considered that the fauna associated with the hedgerows (invertebrates, amphibians, reptiles, birds and hedgehog) would continue to be able to cross the Site during site clearance and construction. These fauna would be able to utilise the retained hedgerows and the newly-created green corridors once they have been created.
- 6.6.1.7 In the absence of mitigation, the hedgerow loss and fragmentation would have a significant adverse impact on the hedgerow species. However, assuming the success of the mitigation measures outlined in Section 6.5, the magnitude of this negative, certain, direct, reversible (through translocation and new planting creates new green links across the site), long-term impact on hedgerow species would be **Not Significant** on this receptor of **Medium** 'Distinct/ Borough' Importance.

Habitat degradation – pollution

- 6.6.1.8 There is the potential for habitat degradation to occur as a result of polluted surface water runoff entering the hedgerows during construction. Similarly, dust generated during site clearance and construction could affect the plants' ability to grow. In the absence of mitigation, this would have a significant adverse impact on the hedgerow species. However, assuming the success of the mitigation measures outlined in Section 6.5 the magnitude of this negative, certain, direct, reversible (through natural processes or replanting), long-term impact on hedgerow species would be **Not Significant** this receptor of **Medium** 'Distinct/ Borough' Importance.

Species disturbance

- 6.6.1.9 There would be periods when nesting birds, reptiles and hedgehog may be subject to disturbance from nearby construction works within the Site. While all hedgerows and their associated buffers would be protected by fencing, there may be some disturbance during the breeding bird season which may deter the use of the some areas of hedgerow by nesting birds, potentially resulting in a temporarily reduced breeding success of the species recorded on site.
- 6.6.1.10 In the absence of mitigation this disturbance could have a significant adverse impact on the wildlife associated with the hedgerows. However, mitigation would be provided in the form of wide buffers that would be protected with fencing and the provision of bird nest boxes in areas that would not be disturbed. These measures together with the fact that the Development is phased over a period of years that would allow wildlife time to habituate to disturbance would ensure that this negative, certain, direct, reversible (the impact would cease when site clearance and construction works cease), short-term (for the duration of the works in proximately to each hedgerow) impact on

hedgerow species would be **Not Significant** on this receptor of **Medium** 'Distinct/ Borough' Importance.

Species mortality

- 6.6.1.11 There is the potential for mortality to amphibians, reptiles, birds and hedgehogs associated with site clearance. In the absence of mitigation this would have a significant adverse impact on these species. However, the implementation of the CEMP, as outlined in Section 6.5, would ensure that mortality is avoided. Consequently, the impact on hedgerow species of this negative, certain, irreversible, long-term impact would be **Not Significant** on this receptor of **Medium** 'Distinct/ Borough' Importance.

Residual impacts

- 6.6.1.12 Assuming the implementation of effective mitigation described in Section 6.5, it is considered that the residual impact related to construction on hedgerows would be **Not Significant** on this receptor of **Medium** 'Distinct/ Borough' Importance.

Watercourses

Habitat Loss

- 6.6.1.13 Short sections of bank-side habitat would be removed to allow for a new road bridge crossing and a pedestrian/ cycle bridge crossing. Seventy metres of bankside habitat would be lost. The impact of this habitat loss on wildlife associated with the watercourses (invertebrates, reptiles, bats and potentially otters in future) would be negative, certain, direct, irreversible (unless the bridges were removed), long-term. However, the overall footprint of these bridge crossings is relatively small and the wildlife would be able to continue to travel along and use the watercourse. Overall, it is considered that the impact would be **Not Significant** on this receptor of **Medium** 'Distinct/ Borough' Importance.

Habitat degradation – construction phase pollution

- 6.6.1.14 There is the potential for habitat degradation to occur as a result of polluted surface water runoff entering the watercourses during construction. The implementation of standard pollution control measures during construction as outlined in the CEMP (see Section 6.5, above) would ensure the protection of water quality. In the absence on measures to protect water quality the impact on flora and fauna associated with the watercourses would be Significant Adverse. However, the impact would be avoided with the implementation of tried and tested techniques as delivered through the CEMP. Consequently, the impact on species of this negative, certain irreversible, long-term impact would be **Not Significant** on this receptor of **Medium** 'Distinct/ Borough' Importance.

Habitat degradation – fragmentation

- 6.6.1.15 The road crossing and crossing associated with the pedestrian and cycle routes would result in the fragmentation of the stream corridor. It is not envisaged that this would affect the majority of the species associated with the watercourses; most species would continue to follow the narrow stream channel. However, there is the potential that foraging and commuting bats would be disrupted if the

watercourses are lit. The CEMP would ensure that the stream channel is not illuminated during site clearance and construction during the period when bats are active (April to October). This would avoid the potential for adverse impacts on bats.

- 6.6.1.16 Overall it is anticipated that the negative, certain, direct, irreversible (unless the bridge crossing is removed), on species associated with the watercourse would be **Not Significant** on this receptor of **Medium** 'Distinct/ Borough' Importance.

Species disturbance

- 6.6.1.17 The watercourses would be retained within 60 metre-wide corridors that would be fenced in advance of site clearance, this would ensure that the species associated with these features (invertebrates, reptiles and bats) would not be disturbed during site clearance and construction. Although otters could be disturbed at this distance they have not been confirmed to be present on Site.
- 6.6.1.18 Overall it is anticipated that the negative, certain, direct, reversible (the disturbance would cease he works close to the watercourses ceases), on species associated with the watercourse would be **Not Significant** on this receptor of **Medium** 'Distinct/ Borough' Importance.

Residual impacts

- 6.6.1.19 Assuming the implementation of effective mitigation described in Section 6.5, the residual impact on the watercourses, or the associated species during construction would be **Not Significant** on this receptor of **Medium** 'Distinct/ Borough' Importance.

Broadleaved woodland (including breeding birds)

Species disturbance

- 6.6.1.20 There is the potential for disturbance to wildlife associated with the woodlands when site clearance and construction works take place in the vicinity of these habitats. However, these works would not take place within the woodlands and these habitats would be provided with a 10 metre-wide buffer that would be fenced. The works would take place in the mid-Development Phase and it envisaged that the fauna associated with the woodlands, primarily nesting and foraging birds, would become habituated to the noise and visual disturbance created by construction works.
- 6.6.1.21 Bird boxes would have been installed elsewhere within the Site to provide alternative nest sites whilst works take place in the vicinity of the woodlands. Fencing and the provision of buffers associated with the watercourses would ensure that the known badger setts would be screened from the effects of noise and visual disturbance. Similarly, the known bat tree roost would be screened from disturbance by the retained woodland and the watercourse buffers.
- 6.6.1.22 The implementation of the CEMP would ensure that the woodlands would not be lit with artificial lights, thus avoiding any adverse effects on nocturnal wildlife. In addition, the woodlands are located alongside the stream corridor which also would not be lit. Consequently, it is not anticipated that this phase of the Development would have any effect on foraging or roosting bats.

- 6.6.1.23 Overall, it is considered that the negative, certain, direct, reversible (impact ceases when the works cease) medium-term impact of noise and visual disturbance associated with site clearance and construction works would be **Not Significant** on this receptor of **Medium** 'Distinct/ Borough' Importance.

Habitat degradation – construction phase pollution

- 6.6.1.24 Uncontrolled sediment-laden surface water runoff from the construction site would have an adverse effect on woodland habitat if it were to enter these areas. Similarly, large amounts of dust or soil generated during site clearance and construction would have an adverse effect on plant growth. However, the Development would ensure that any adverse effects are avoided with the implementation of pollution control measures through the CEMP.

- 6.6.1.25 Overall, it is considered that the negative, certain, direct, reversible (impact ceases when the works cease); medium-term impact of construction phase pollution would be **Not Significant** on this receptor of **Medium** 'Distinct/ Borough' Importance.

Residual impacts

- 6.6.1.26 Assuming the implementation of effective mitigation described in Section 6.5, it is considered that the residual impact related to construction on these woodlands would be **Not Significant** on this receptor of **Medium** 'Distinct/ Borough' Importance.

Pond

Habitat Loss and fragmentation – construction phase

- 6.6.1.27 The pond would be retained within the Country Park and an area of allotments. Assuming that the appropriate measures are implemented during site clearance, as delivered by the CEMP and identified in Section 6.5 above, it is not anticipated that habitat loss or fragmentation would have any effect on the pond and its associated wildlife.

Habitat degradation – pollution during the construction phase

- 6.6.1.28 Uncontrolled sediment-laden surface water runoff from the construction site and/or large amounts of dust or soil generated during site clearance and construction would have an adverse effect on the pond flora and fauna. However, the Development would ensure that any adverse effects are avoided with the implementation of pollution control measures through the CEMP.
- 6.6.1.29 Overall, it is considered that the negative, certain, direct, reversible (impact ceases when the works cease), long-term (the pond would recover but it is likely to require direct human intervention to do so) impact of construction phase pollution would be **Not Significant** on this receptor of **Medium** 'Distinct/ Borough' Importance.

Residual impacts

- 6.6.1.30 Assuming the implementation of effective mitigation described in Section 6.5, it is considered that the construction phase residual impacts on the pond would be **Not Significant** on this receptor of **Medium** 'Distinct/ Borough' Importance.

Barn owls

Disturbance

- 6.6.1.31 Should construction works be undertaken during the barn owl breeding season (March to August), it is possible that increased human presence in the area, site traffic, noise and lighting could disturb nesting barn owls. Works that take place within 250 metres of the nest boxes have the potential to cause disturbance, and potentially affect breeding success. The implementation of measures in the CEMP would ensure that the barn owl boxes are moved in advance of site clearance to areas that would not be subject to disturbance, thus avoiding any adverse impacts on nesting barn owl. It is therefore not anticipated that the Development would lead to disturbance of barn owls.

Habitat loss

- 6.6.1.32 The Site supported very little habitat that was of particular value to foraging barn owls; however, the Development would result in the loss of grassland leys and cattle-grazed grassland fields, the rough grassy margins and borders which may be part of the confirmed breeding pair of barn owls' home range. However, a large proportion of suitable foraging habitat would remain beyond the Site boundary, including areas immediately to the north and west. Therefore, it is not considered that the Development would remove a significant proportion of barn owl foraging resources.

Residual impacts

- 6.6.1.33 The potential exists for the construction works to disturb nesting barn owls; however, assuming the implementation of effective mitigation described in Section 6.5, the residual impact on barn owls associated with the construction phase would be **Not Significant** on this receptor of **Medium** 'Distinct/ Borough' Importance.

Breeding and wintering birds

Habitat loss

- 6.6.1.34 The arable land and the majority of the improved grassland that was found to be of value to farmland specialist bird species would be lost within the Site. New habitats of value to some of these species would be provided within the areas of open space and in particular the Country Park and the wetland waste water treatment facility; notwithstanding this, there would be a residual impact on farmland birds in the absence of mitigation. As identified in Section 6.5 above, it is therefore proposed to provide mitigation for farmland birds in the form of enhanced habitat management offsite to mitigate for the adverse effects associated with the loss of habitat used by farmland birds.
- 6.6.1.35 Farmland birds would not continue to nest in areas within or close to the construction site. Off-site habitat enhancements would mitigate for this impact. The birds that remain on the Site during site clearance and construction would have become habituated to disturbance. Retaining large buffer zones adjacent to the hedgerows and woodlands would ensure that urban fringe species associated with these habitats would continue to use the Site during construction. The mitigation measures outlined in Section 6.5, above, would

ensure that additional nest sites are provided in areas that would not be disturbed during the phased development. It is anticipated that this would compensate for any disturbance effects on birds associated with the retained habitats.

- 6.6.1.36 In the absence of mitigation, the Development would have a significant adverse impact on breeding and wintering birds and in particular farmland specialist species. However, mitigation is part of the Development design with a CEMP provided to ensure that appropriate measures would be implemented on Site. Therefore the negative, certain, direct, irreversible, impact on breeding and wintering birds associated with habitat loss would be **Not Significant** on this receptor of **Medium** 'Distinct/ Borough' Importance.

Residual impacts

- 6.6.1.37 Assuming the implementation of effective mitigation described in Section 6.5, it is considered that the residual impact on breeding and overwintering birds associated with the construction phase would be **Not Significant** on this receptor of **Medium** 'Distinct/ Borough' Importance.

Bat roosts

Species disturbance

- 6.6.1.38 The confirmed bat roost, in a tree, and other potential tree roosts would be retained within a stream corridor and woodland buffer. Neither the stream corridors nor the woodlands and their associated buffers would be lit during construction. The tree that contains the roost would also be screened from noise and visual disturbance by the retained woodland and the fencing required to protect the woodland and stream habitats. Consequently, it is not anticipated that the confirmed bat roost in the tree would be affected by the site clearance and construction works.
- 6.6.1.39 As indicated previously, the farm buildings that support, or have the potential to support, roosting bats are outside the Site boundary. The roosts and potential roosts in the buildings would be protected from disturbance by the habitats that have been retained adjacent to the buildings (also outside the Development). It is not anticipated that the site clearance and construction works would cause disturbance to the confirmed or potential roosts on the Site and no impacts are predicted.

Habitat loss and fragmentation

- 6.6.1.40 The main commuting and foraging corridor that was associated with the watercourses would be retained and not lit. Bankside habitat would be lost to facilitate the construction of a road bridge and a pedestrian/cycle bridge. The gap created by the pedestrian/cycle bridge would be smaller than the gap that the bats currently cross on the B4100 (the gap between tree canopies on this section of road is 15m). However, the gap created by the road bridge would be 25m and therefore greater than the existing road crossing. The creation of a 25m gap would not necessarily represent a barrier to the movement of bats particularly given the continuation of the stream corridor, but lighting it would affect the movement of light-sensitive species. It is therefore proposed not to illuminate the stream corridors during site clearance and construction.

- 6.6.1.41 The arable fields and grassland habitats which would be lost under the Development footprint were not considered to be of particular value to the bat species recorded during the activity and emergence surveys, and green corridors including dark vegetated links would be retained across the Site to provide links to suitable foraging habitat outside the Site boundary. The removal of hedgerows to create gaps for access roads would not have an impact on the confirmed bat roost in the tree, as this tree is not in close proximity to any of the removed sections of hedgerows.
- 6.6.1.42 It is not considered likely that the loss of low value arable land and improved grassland or the fragmentation of the hedgerow network would have a significant impact on the local bat population. Mitigation measures to avoid impacts associated with fragmentation of the stream corridor would also ensure that impacts on bats are avoided.

Residual impacts

- 6.6.1.43 Assuming the implementation of effective mitigation described in Section 6.5, it is considered that the residual impact on bat roost related to construction would be **Not Significant** on this receptor of **Medium** 'Distinct/ Borough' Importance.

Impacts on Other Ecological Receptors

Amphibians

- 6.6.1.44 The amphibian populations on Site have not been considered sufficiently important to be material in decision-making in their own right; nevertheless, there is the potential (low) risk of encountering great crested newts in the area that would contain the Country Park. Great crested newts are fully protected under both UK and European legislation (The Wildlife and Countryside Act and Habitats Directive). If the arable fields remain ploughed in advance of site clearance then the risk of encountering great crested newts would be low. However, if the fields are left fallow or sown with grass then there may be a greater risk of encountering great crested newts during site clearance.
- 6.6.1.45 In advance of site clearance, ecological surveys would be undertaken to confirm whether ground conditions have changed sufficiently for site clearance works associated with the Country Park to take place under licence to safeguard the off-site great crested newt population.

Reptiles

- 6.6.1.46 There is the potential risk of killing and/or injuring reptiles during the construction phase of the Development, where potentially suitable habitat for these species is removed to create the access roads. The reptile populations on Site have not been considered sufficiently important to be material in decision making in their own right; nevertheless, reptiles are protected from killing or injury under the Wildlife and Countryside Act, 1981 (as amended). For this reason, the measures outlined in Section 6.5 would be taken to avoid the incidental mortality, of reptiles during site clearance and construction.

Badgers

- 6.6.1.47 There would be some loss and fragmentation of foraging habitat for badgers within the Site, and badgers may be disturbed by construction activities. The badger population of Site has not been considered sufficiently important to be material in decision making; nevertheless, mitigation measures outlined in section 6.5 would be implemented to ensure compliance with the Protection of Badgers Act.

Brown hares

- 6.6.1.48 There would be a loss of habitat that has the potential to support brown hare. The Site is not considered to be sufficiently important for brown hare to be material in decision making. Nevertheless, mitigation measures have been provided, as outlined in Section 6.5, to ensure that there is no harm to brown hare since they are a Section 41 species and therefore measures should be put in place to safeguard this species.

Hedgehogs

- 6.6.1.49 The Site is not considered to be sufficiently important for hedgehog to be material in decision-making. Nevertheless, mitigation measures have been provided, as outlined in Section 6.5, to ensure that there is no harm to hedgehogs since they are a Section 41 species.

6.7 Permanent Operational Impacts

6.7.1 Impacts on Key Ecological Receptors

Hedgerows (including breeding birds, reptiles and hedgehogs)

Habitat degradation - context

- 6.7.1.1 Following construction, the context of the hedgerows would have changed as they would no longer be adjacent to arable or grazed farmland, which may change the nesting locations of bird species. Nevertheless, it is anticipated that birds nesting in the hedgerows would become habituated to the noise and visual disturbance associated with the Development once built. It is predicted that there would be predation associated with domestic cats; however research published by RSPB (Ref 6-9) has shown that this would be compensated for by a boost in numbers associated with artificial nest sites and feeding associated with the new residents. The hedgerows would no longer support farmland birds, as a result of their change in setting; however, they would provide suitable nesting and foraging habitat for birds associated with built development and the urban fringe. These would include species such as house sparrow, dunnock, song thrush and mistle thrush that are listed as a Section 41 species.
- 6.7.1.2 The lighting scheme has the potential to affect nocturnal fauna. Lighting would be required close to many hedgerows; however, the careful placing of lighting columns and the use of focused optics would ensure that the hedgerow trees and shrubs are not illuminated throughout the Site. This would provide nocturnal species and invertebrates with safe places of shelter. It is considered that the change in the setting of the hedgerows would not have an impact on

the invertebrate assemblage that the hedgerows support since habitats of value to invertebrates would be created in the hedgerow buffers.

- 6.7.1.3 The hedgerows and their associated buffers would be managed in accordance with a LHMP to ensure that they provide habitat suitable for the fauna that were recorded on site prior to development, in particular nesting birds (non-farmland specialists), mammals and invertebrates, including the hair-streak butterflies. The management would also ensure that the hedgerows are suitable for the new species that would be attracted to the site (for example, garden birds). Bats would continue to be able to forage and commute across the Site using the dark corridors. Badgers would utilise the network of green space.
- 6.7.1.4 The change in context would have an impact on lead to the loss of habitat used by farmland specialist bird species. However, if managed in accordance with a LHMP they would continue to support a diverse and valuable fauna. Overall it is considered that the negative, certain, direct, irreversible, long term, impact of the change in context of the hedgerows would have a significant adverse impact on birds. For this reason offsite mitigation has been provided. However, for other hedgerow fauna the impact would be **Not Significant** on this receptor of **Medium** 'Distinct/ Borough' Importance.

Residual impacts

- 6.7.1.5 It is anticipated that the residual impact on the hedgerow network associated with the operational impacts would be **Not Significant**. In time, the habitat creation within the green infrastructure and the built development, combined with appropriate management of these features in accordance with a LHMP, would be beneficial to Hedgerows (including breeding birds, reptiles and hedgehogs) and their other associated species. In the long-term the enhanced management of the hedgerows and the creation of new habitats to benefit biodiversity alongside these features would have a beneficial impact on biodiversity including bird Section 41 species.

Watercourses

Habitat degradation – operation phase pollution

- 6.7.1.6 There is the potential for habitat degradation to occur as a result of polluted surface water runoff entering the watercourses when the Site has been developed. The SuDS that form part of the Development would ensure that water quality and quantity within the watercourses is protected, and therefore no impact is predicted on watercourses associated with pollution.

Habitat degradation – public access and other disturbance

- 6.7.1.7 The riparian habitat along these watercourses provides a dark link between the St Laurence Church roost site to the north, and suitable foraging habitat to the west of the Site; therefore, lighting could prevent bats from reaching foraging areas, thereby having a detrimental impact on the local population. To avoid this impact, the watercourses and the leisure routes within the watercourse buffers would not be lit. Similarly, as outlined in Section 6.5, a sensitive lighting design would be used at the road bridge crossing to ensure that the stream channel is not illuminated.

- 6.7.1.8 There is the potential that the new residents could cause disturbance to wildlife associated with the stream channel. It is considered unlikely that they would have an adverse effect of the bat roost in the tree or other potential bat roosts. The use of thorny shrubs and other landscape planting would ensure that the badgers occupying their setts would not be disturbed. Foraging bats would be expected to continue to use these features at night. The birds using the watercourses would either become habituated to human disturbance or move to the areas green space that would be subjected to lower levels of human disturbance. Otter have not been recorded on Site, and were they to use the Site in future, it is likely that they would travel through the Site rather than use a lying-up site due to the scarcity of suitable foraging habitat.
- 6.7.1.9 The value of the watercourse for some species would be enhanced with the creation of new habitats of benefit to wildlife within the stream corridor. There may also be an improvement in water quality associated with the SuDS. The retained and newly created habitats would be managed in accordance with the LHMP that would ensure that they provide benefits to wildlife.
- 6.7.1.10 It is considered that the adverse effects associated with pressures created by the new residents, would be balanced by the habitat creation that would be delivered by the landscaping proposal.
- 6.7.1.11 Overall, the impact of public access and disturbance on watercourses and their associated fauna would be neutral (neither adverse nor beneficial) in the short term.

Residual impacts

- 6.7.1.12 Assuming the implementation of effective mitigation described in Section 6.5, it is considered that during operation the residual impact on the watercourses and their associated species would be **Not Significant**. The creation of diverse semi-natural habitats within the riparian corridor as part of the detailed design would ensure that in time there would be a beneficial effect on some bird species, particularly since the watercourses and their bankside vegetation are currently confined by intensive agriculture. In the long-term, the Development would have a **Significant Beneficial** effect on the watercourses and their associated species.

Broadleaved woodland (including breeding birds)

Habitat degradation – public access (trampling)

- 6.7.1.13 There is the potential for activities associated with the new residents to cause habitat degradation associated with trampling. To minimise such impacts, the leisure routes avoid the areas of semi-natural woodland. The detailed design could include the creation of wildlife walk in the woodlands. In the event that such a walk is created it would be appropriately surfaced with the use of strategic tree and shrub planting, log piles and signage to control access to these habitats.
- 6.7.1.14 It is considered that the implementation of the LHMP linked to monitoring would ensure that the value of the woodland habitats would be maintained in the

longer-term. Consequently, there would be no impact on broadleaved woodland associated with public access.

Species disturbance - noise and visual disturbance

- 6.7.1.15 Whilst noise and visual disturbance would be expected to affect bird breeding success, there are a number of factors that would be likely to boost bird numbers including those associated with the woodlands. This would include the installation of nest boxes across the Site, the supplementary feeding provided by the new residents, and the creation of new habitats of value to nesting and foraging birds across the Site as a whole and in close proximity to the woodland.
- 6.7.1.16 It is not anticipated that disturbance associated with public access would have any effect on bats and badgers, since both would be retained within the buffer vegetation that would be provided for the watercourse and woodland. Dense planting within the buffer would ensure that both the confirmed roost and the sett would be protected. Retaining a corridor of vegetation that links the woodland to the wider countryside and green spaces within the Site would ensure that bats and badgers continue to have access to suitable foraging habitat.
- 6.7.1.17 Overall, it is considered that the adverse effects on birds associated with noise and visual disturbance created by the Development would be balanced by the habitat creation. The impact of noise and visual disturbance on bats and badgers associated with the broadleaved woodland would be neutral (neither adverse nor beneficial) in the short term.

Residual impacts

- 6.7.1.18 Assuming the implementation of effective mitigation described in Section 6.5, it is considered that the residual impact related to operation on these woodlands would be **Not Significant** on this receptor of **Medium** 'Distinct/ Borough' Importance, in the short term. In the long term, the improved habitat management and habitat creation close to the woodland would be expected to lead to a **Significant Beneficial** impact for woodland bird species that are also associated with scrub and gardens, this would include Section 41 species such as song thrush, house sparrow and mistle thrush. The replacement of low-grade arable land with more diverse habitat as part of the green infrastructure would also be beneficial to bats and badgers, but this benefit would be **Significant Beneficial** in the long-term once the new planting has matured (i.e. once the invertebrate numbers have been boosted and trees and shrubs bear fruit).

Pond

Habitat loss and fragmentation – operation phase

- 6.7.1.19 The pond would be retained within green space associated with the Country Park and allotments, thus avoiding any potential for habitat loss and fragmentation. This change in setting would be beneficial to the wetland plants, invertebrates and amphibians associated with the pond, which is currently receives nutrient-rich runoff from the agricultural fields. The impact of habitat loss associated with the pond would be neutral (neither adverse nor beneficial) in the short term.

Habitat degradation – pollution during the operation phase

- 6.7.1.20 There is the potential for habitat degradation to occur as a result of polluted surface water runoff entering the pond from adjacent areas of residential development. The detailed design of the SuDS would protect the pond when the Site is occupied. Although the pond is likely to receive surface water runoff, care would be taken to ensure that it receives water that has been screened first so that pollutants and sediments have been removed to protect water quality in this feature. The impact of pollution on the pond would be neutral (neither adverse nor beneficial) in the short term.

Habitat creation

- 6.7.1.21 New habitats would be created within the adjacent Country Park. This would include new ponds of value to the invertebrates and amphibians associated with the pond. The LHMP would ensure that the pond and the semi-natural habitats within the Country Park are managed to benefit wildlife. These measures would ensure that the value of the pond for wildlife is enhanced. The impact of habitat creation on the pond and its associated flora and fauna would be beneficial, certain, direct, irreversible (it is unlikely that the Country Park would be removed) and long-term (it would continue indefinitely).

Residual impacts

- 6.7.1.22 Assuming the implementation of effective mitigation described in Section 6.5, it is considered that the residual impact related to the operational phase on ponds would be **Significant Beneficial** on this receptor of **Medium** 'Distinct/ Borough' Importance.

Barn owls

Disturbance – operation phase

- 6.7.1.23 The barn owl boxes would be moved prior to site clearance as increased public use of areas within the vicinity of the nest boxes, and noise and light impacts from the Development, would be likely to disturb nesting barn owls. It is therefore not anticipated that there would be any impact on barn owls associated with the operational phase of the development.

Residual impacts

- 6.7.1.24 Assuming the implementation of effective mitigation described in Section 6.5, and that the nest boxes are moved to areas that would not be subject to disturbance, the residual impact on barn owls would be **Not Significant** on this receptor of **Medium** 'Distinct/ Borough' Importance.

Breeding and wintering birds

Increased predation

- 6.7.1.25 It is anticipated that the creation of significant areas of green space that would include the creation of woodland, species-rich scrub, a range of grassland types and new wetland habitats would be beneficial to a range of bird species. The provision of artificial nest sites and supplementary feeding from local residents, would lead to an increase in the number of urban fringe species that could

include species of conservation concern and Species of Principal Importance like song thrush, mistle thrush, house sparrow, bullfinch, dunnock and starling.

- 6.7.1.26 Domestic pets associated with new residents may lead to an increase in predation of birds using the adjacent farmland. As detailed in Section 6.5, the off-site habitat creation and enhancements would bolster local farmland bird populations and compensate for any increases in predation as a result of the Development.
- 6.7.1.27 Overall, the increase in predation due to domestic pets on breeding and wintering birds would be neutral (neither adverse nor beneficial) in the short term.

Species disturbance – noise and visual disturbance

- 6.7.1.28 It is anticipated that birds resident within both the built areas and the areas of open space on Site would become habituated to the noise and visual disturbance associated with the Development. Within the Development there would be areas that are less regularly disturbed this would include: areas within the Country Park; green burial sites; the wetland waste water treatment facility; and areas of woodland planting on the western edge of the Site. This would ensure that habitats are available to species that are less tolerant to human disturbance. As identified above, the Development would lead to the creation of new habitats of value to nesting and foraging birds and the establishment of a large number of artificial nesting sites. In addition, although residents would have access to the retained blocks of woodland, the pedestrian and cycle paths avoid these habitats to reduce disturbance to woodland birds.
- 6.7.1.29 Overall, the impact of noise and visual disturbance on breeding and wintering birds would be neutral (neither adverse nor beneficial) in the short term.

Residual impacts

- 6.7.1.30 Assuming the implementation of effective mitigation described in Section 6.5, it is considered that the impact on breeding and wintering bird species associated with the operational phase would be **Not Significant** in the short term on this receptor of **Medium** 'Distinct/ Borough' Importance.. In the long term, the improved habitat management and habitat creation across the Site would be expected to have a **Significant Beneficial** impact on breeding and wintering birds. (More information regarding the habitats created on Site is provided in the Biodiversity Strategy – Appendix 6J for more details).

Bat roosts

Species disturbance

- 6.7.1.31 There is the potential for lighting to disrupt the behaviour of bat species. However, dark corridors have been provided within the Framework Plan to ensure that bats continue to have access to their foraging areas. In addition, neither the confirmed bat roost in the tree nor the farm buildings (that are outside the Development boundary) would be lit. As outlined in Section 6.5, the lighting associated with the road bridge would ensure that the stream channel would not be illuminated.

- 6.7.1.32 Overall, the impact of lighting on bats associated with the operational phase of the Development would be neutral (neither adverse nor beneficial) in the short term.

Residual impacts

- 6.7.1.33 Assuming the implementation of effective mitigation described in Section 6.5, the residual impact on bat roosts would be **Not Significant**. The creation of significant areas of unlit open space, that have the potential to support a diverse range of semi-natural habitats, would enhance the value of the Site for invertebrates and thus the bats that feed on them. The provision of artificial roost sites within the open space and in the built areas would also lead to the creation of more sites potentially suitable for use by roosting bats in the longer-term. Overall, the Development could have a **Significant Beneficial** impact on some species of bats, in particular pipistrelle bats, as a result of the creation of new roost sites and as the new habitats mature.

Impacts on Other Ecological Receptors

Amphibians

- 6.7.1.34 No operational phase impacts on amphibians are predicted. Amphibians would benefit from the habitat creation across the Site.

Reptiles

- 6.7.1.35 No operational phase impacts on reptiles are predicted. Reptiles would benefit from the habitat creation across the Site.

Badgers

- 6.7.1.36 No operational phase impacts on badgers are predicted. Underpasses for badgers and badger-resistant fencing are not considered necessary along the new access roads within the Site due to the relatively low predicted speed of the traffic in proximity to the known setts. Badgers are more likely to continue to forage along the river corridors travelling under the bridges to access suitable foraging habitat rather than crossing the roads.

Brown hares

- 6.7.1.37 No operational phase impacts on Brown hares are predicted. Brown hares would not be expected to use The Site once it is developed, due to disturbance from increased public use of this area, in particular, the exercising of dogs.

Hedgehogs

- 6.7.1.38 No operational phase impacts on hedgehogs are predicted. Hedgehogs would benefit from the habitat creation across the Site.

6.8 Cumulative Impacts

- 6.8.1.1 The Development is part of a large-scale mixed use development on the wider Masterplan Site for NW Bicester. In addition to the substantial areas of open space that would be created as part of the Development, further areas of open space would be created south of the railway line (Application 2). It is also

proposed to create underpasses beneath the railway line for pedestrian/cycleway and new roads. These additional areas of open space would lead to the creation of habitats of value to biodiversity, in particular in association with the proposed nature reserve. The Masterplan has sought to ensure that the bat foraging corridors and commuting routes are maintained and that other wildlife, such as great crested newts that are present in the area south of the railway, would be safeguarded. The development of Application 1 (North of Railway) and Application 2 (South of Railway) would lead to the loss of habitats used by farmland birds and again off-site mitigation would be provided to ensure that there is no loss of biodiversity. Overall, development of the wider Masterplan has sought to ensure that the most valuable habitats are retained within suitable buffers, that wildlife corridors are provided that would enable both wildlife and people to cross the Masterplan Site safely. Overall, the wider Masterplan should lead to a development that would result in a net gain in biodiversity and no adverse impacts should arise as a result of the Masterplan.

- 6.8.1.2 The only exception arises from the cumulative impacts of NO_x for operational road traffic and Energy Centre emissions impacts on annual mean NO_x concentrations at Ardley Cutting & Quarry SSSI (scoped out of Ecological Impact Assessment). However, the increase in NO_x concentrations are predicted to be under the DMRB threshold for significance. The Air Quality Assessment concludes in paragraph 8.9.1.7 that cumulative impacts would not be any greater to those associated with the current proposal. This is as a result of the high pollutant levels at these locations due to the proximity of the M40.
- 6.8.1.3 Other developments of relevance to this assessment are detailed in Tables 17-1 and 17-2. The closest of these are two housing developments: a proposal for 200 dwellings at Caversfield, along Fringford Road approximately 300m from the Site; and the other, for 197 dwellings at RAF Bicester, Caversfield, which is currently under construction.
- 6.8.1.4 Assuming the effective implementation of the mitigation measures outlined in section 6.5, there would be no residual impacts on habitats and species present within the Site. New residents associated with the consented and Development would have access to the areas of green space that would be created within the site. In particular, they are likely to gain access to the Country Park. They may also make use of the leisure routes and new facilities on the site. The areas of open space that would be created would be designed to ensure that there are parts of the site that would remain undisturbed and areas that are significantly robust to cope with human generated disturbance. No adverse effects on sites of nature conservation importance offsite are predicted as results of the Development. It is not predicted that cumulative impacts on these sites would arise as a result of the Development and the consented schemes. It is not envisaged that the developments listed in Tables 17-1 and 17-2 would lead to any additional direct or indirect impacts on the habitats and species associated within the Site.

6.9 Summary

- 6.9.1.1 The Ecology chapter has been informed by desk studies, the results of detailed and targeted ecological field surveys and consultations with the Eco-

development's Biodiversity team, comprising representatives from the statutory nature conservation organisations, the local authorities and the local wildlife trust. The results of this work has influenced the Framework Plan to reduce impacts on wildlife and habitats, and to produce a design that incorporates habitat enhancement and creation measures that would result in a proposal that leads to a net gain in biodiversity, as required by statutory planning policies. The Development would have no direct or indirect impacts on designated sites of nature conservation importance.

- 6.9.1.2 The field surveys revealed that the Site comprised arable fields and improved grassland. There were two small areas of broadleaved semi-natural woodland in the north-east of the site, used by foraging bats and supporting three barn owl nest boxes. The barn owl nest boxes within the Site would be relocated to suitable habitat outside the Development to minimise future disturbance.
- 6.9.1.3 There are three watercourses within the Site: the River Bure, and two tributaries. These watercourses are seasonally dry, only holding water in the winter months and during periods of high rainfall at other times of the year. Badger setts were recorded within the Site, and one bat roost was confirmed within a tree. Further bat roosts were identified within the survey area, but outside of the Site. Species-rich hedgerows form the field boundaries, and these features together with the watercourse corridors were found to be used by foraging bats. The watercourses were also found to be used by commuting bats. Soprano pipistrelle, Leisler's bat, noctule, and an undetermined *Myotis* bat were recorded; however, the majority of passes recorded within the Site were of common pipistrelle.
- 6.9.1.4 Care has been taken to ensure that the number of watercourse crossings has been reduced so that there is only one new road crossing and one crossing for the pedestrian/cycle network. Sensitive lighting would be used on the bridges to ensure that dark corridors are retained to avoid disturbance to nocturnal species such as bats and badgers. Careful lighting design would also be used close to the hedgerows in order to maintain their value to wildlife.
- 6.9.1.5 Several uncommon invertebrate species were recorded within the Site, but most of the area supported few invertebrates. Small numbers of common lizards and grass snake were recorded on the field boundaries and it is likely that hedgehogs may also use these features. The Site was found to support eight bird species typically associated with the farmland habitats. Small numbers of birds were recorded nesting in the hedgerows, and the arable fields were also found to be of some value to ground nesting birds.
- 6.9.1.6 The Framework Plan (Drawing number BIMP6 116C) has ensured that the hedgerows are retained as far as possible. Where it is necessary to breach these features to provide access, or remove longer sections, the affected areas would be dug up and replanted nearby within the areas of open space. This would ensure that the hedgerow network is retained and that there is no net loss. All hedgerows would be retained with an appropriate buffer zone of semi-natural habitat.
- 6.9.1.7 The pond within the Site would be retained within the Country Park, with new habitats of value to the flora and fauna associated with the pond created within

the Country Park. New habitats of value to wildlife would be created within a County Park, sustainable drainage features, areas of woodland and a wetland waste water treatment facility. Large numbers of trees and shrubs would also be planted within the areas of open space including the residential areas. Whilst their primary function is to provide an attractive environment for people, this planting would also provide habitats for wildlife and help to offset impacts of climate change. Similarly, although the primary function of the allotments and other food growing areas is for the benefit of the residents, they would also contain habitats and features of value to wildlife. Bird nest boxes and boxes for roosting bats would also be provided as part of the Development. These features would be located on and within buildings and trees in areas that have ready access to suitable foraging areas for these species, and where they can also be accessed for maintenance.

6.9.1.8 A Construction Environmental Management Plan would be produced to ensure that the retained habitats and species recorded within the Site are protected during site clearance and construction. A Landscape and Habitats Management Plan would be produced to ensure that the retained and newly created habitats are managed to benefit wildlife in the long-term. Implement of this plan would be monitored and remedial action taken as required where defects are identified. Monitoring would also take place to ensure that water quality within the watercourses is protected during construction.

6.9.1.9 It would not be possible to compensate for the loss of habitats used by farmland birds and habitats off site would be enhanced to benefit these species. The measures provided within the Development and the habitat enhancements offsite would ensure that there is a net gain in biodiversity as required by statutory planning policies.

Table 6-6 Ecology Impact Summary Table

Impact description	Temporary/Permanent	Significance rating
Habitat loss, fragmentation and pollution from dust and sediment laden water during site clearance and construction (hedgerows and watercourses). Mitigation measures: Standard pollution control measures implemented to protect habitats from dust and control surface water runoff. Hedgerows translocated and new linkages created across the Site, thus in the long term no loss or fragmentation of habitat. Watercourse bridges designed to maintain habitat linkages. New buffer habitats created to maintain value of these habitats for wildlife. Protective fencing to protect retained habitats during site clearance and construction. Monitoring undertaken through the CEMP to ensure habitats protected.	Permanent	Not Significant following mitigation
Disturbance to hedgerow, watercourse and woodland wildlife during site clearance and construction. Mitigation measures: Fauna moved to areas that would not be subject to disturbance during each phase of the Development, Bird nest	Temporary	Not Significant following mitigation

boxes provided in areas not subject to disturbance. Construction phase light to avoid illumination of the hedgerows, watercourses and woodlands and their associated buffers. Protective fencing to screen fauna from disturbance.		
Mortality to hedgerow fauna during site clearance. Mitigation measures put in place to safeguard fauna.	Permanent	Not Significant following mitigation
Pollution affecting pond and woodlands during construction. Standard pollution control measures implemented to protect retained habitats.	Temporary	Not Significant following mitigation
Habitat loss and fragmentation of habitats around the pond during construction. Mitigation measures: Pond retained within the Country Park leading to the creation of new habitats of benefit to pond fauna.	Permanent	Not Significant following mitigation
Pond, degradation of habitat through pollution during construction. Mitigation measures: Standard pollution control measures implemented to protect retained habitats.	Permanent	Not Significant following mitigation
Habitat loss and fragmentation of bat commuting routes and foraging corridors during construction. Mitigation measures: Dark corridors maintained to safeguard known roosts and provide access to foraging habitats.	Permanent	Not Significant following mitigation
Disturbance to barn owls during construction and once the Development is operational. Mitigation measures: Nest boxes moved to locations protected from disturbance with access provided to suitable offsite foraging habitat.	Permanent	Not Significant following mitigation
Loss of barn owl foraging habitat during construction. Mitigation measures: The majority of the owl's foraging habitat is outside the Site boundary and therefore unaffected by the Development.	Permanent	Not Significant following mitigation
Loss of bird nesting and foraging habitat during construction. Mitigation measures: Nest boxes provided and new habitats created to benefit certain species of nesting birds. Monies provided for habitat enhancement offsite for farmland birds.	Permanent	Not Significant following off-site mitigation
Disturbance to woodland flora and fauna once the Development is operational. Mitigation measures: Habitat retained in association with stream corridors, with new buffer habitats created to benefit woodland species. New woodland created within the Country Park and along the western boundary of benefit to woodland species. Some species, such as garden birds, associated with the woodland would benefit from the garden	Permanent	Not Significant following mitigation

habitats and supplementary feeding provided by new residents. Woodland not illuminated, access routes avoid the retained woodlands.		
Disturbance to hedgerow and watercourse wildlife once the Site is operational. Mitigation measures: Habitats retained within wide buffers supporting semi-natural habitats. New nesting opportunities and places of shelter created within the green infrastructure and within gardens. Sensitive lighting design to reduce disturbance to wildlife. New habitats of benefit to fauna associated with the hedgerows and watercourses created within the green infrastructure. Leisure routes designed to safeguard retained habitats and reduce disturbance to fauna.	Permanent	Not Significant following mitigation
Pollution of watercourse and pond habitats once the Development is operational. Mitigation measures: SuDS designed to protect water quality within these habitats. New wetland habitats created close to these retained habitats to benefit wetland species.	Permanent	Not Significant following mitigation
Improvements in water quality within the watercourses once the Development is operational. Mitigation measures: SuDS designed to improve water quality and quantity within the watercourses.	Permanent	Significant Beneficial following mitigation
Predation of bird populations in adjacent farmland. Mitigation measures: Supplementary feeding from new residents would benefit some species. Monies provided for offsite habitat enhancements for farmland specialist species.	Permanent	Not Significant following offsite mitigation
Disturbance to nesting birds once the Site is operational. Mitigation measures: New nest sites provided in the form of artificial boxes and within newly created habitats to mitigate for this impact. Parts of Site less regularly disturbed and buffers provided alongside retained habitats.	Permanent	Not Significant following mitigation
Disturbance to bat roosts during construction and once Site operational. Mitigation measures: Bat roosts retained within buffer habitat supporting semi-natural habitats, dark corridors maintained to provide access to suitable foraging habitats. New habitats of value to foraging bats created within the green infrastructure. Sensitive lighting design to ensure that dark corridor maintained and illumination of retained hedgerows minimised.	Permanent	Not Significant following mitigation
Habitat creation within the corridors of the watercourses, alongside the woodlands adjacent to the pond	Permanent	Significant Beneficial dependent on detailed design

Habitat creation to benefit breeding and wintering birds	Permanent	Significant Beneficial dependent on detailed design and off-site mitigation
Habitat creation to benefit bats	Permanent	Significant Beneficial dependent on detailed design
New habitats of value to biodiversity including Section 41 habitats created within the green infrastructure include lowland mixed deciduous woodland, ponds, lowland meadow, wet woodland and reed bed. Other habitats of value to biodiversity created include scrub, damp/marshy grassland, species-rich grassland, short grassland, swamp, and green roofs. The HLMP would ensure that these habitats are managed to benefit biodiversity.	Permanent	Significant Beneficial dependent on detailed design

7 Flood Risk and Hydrology

7.1 Introduction

7.1.1.1 This section considers the surface water environment, with some consideration to the interaction between surface water and groundwater. This section should be read in conjunction with Chapter 11 (Contaminated Land) and the Flood Risk Assessment and Drainage Strategy contained within Appendix 7A.

7.1.1.2 The surface water environment has been considered from the following perspectives:

- As a potential source of flood risk
- The potential for the Development to increase flood risk elsewhere
- As a potential pathway and/or receptor of impacts.

7.1.1.3 Potential adverse and beneficial impacts are considered during the construction and operational phases and mitigation measures are proposed where significant impacts are predicted.

7.2 Regulatory and Policy Framework

7.2.1.1 This impact assessment has been undertaken in accordance with current international and national legislation, and national, regional and local plans and policies relating to nature conservation in the context of the Development. A summary of the relevant legislation and policies, the requirements of these policies and the Development response has been provided in Table 7-1 below.

Table 7-1 Flood Risk and Hydrology Regulatory and Policy Framework

Policy/Legislation	Summary of Requirements	Development Response
National Planning Policy Framework (NPPF) and Planning Policy Statement (PPS) 25 Practice Guide	NPPF sets out Government policy on development and flood risk. Its aims are to ensure that flood risk is taken into account at all stages in the planning process to avoid inappropriate development in areas at risk of flooding, and to direct development away from areas of highest risk. Where new development is, exceptionally, necessary in such areas, policy aims to make it safe, without increasing flood risk elsewhere, and, where possible, reducing flood risk overall. The PPS25 Practice Guide is still in use to support the NPPF.	A Flood Risk Assessment (FRA) has been carried out in accordance with NPPF for the Project. The FRA concluded the Site can be developed safely, without exposing the Development to an unacceptable degree of flood risk or increasing the flood risk to third parties. The FRA is contained within Appendix 7-1.
The Water Framework	The Directive provides a	The Development will aim to attain the

Policy/Legislation	Summary of Requirements	Development Response
Directive (2000/60/EEC)	framework for the protection of surface (fresh) water, estuaries, coastal water and groundwater. The objectives of the Directive are to enhance the status, and prevent further deterioration, of aquatic ecosystems, promote the sustainable use of water, reduce pollution of water (especially by 'priority' and 'priority hazardous' substances) and ensure progressive reduction of groundwater pollution. Among the main features of the Directive are that all inland and coastal waters within defined river basin districts must reach at least good status by 2015.	highest achievable level of water quality standards. This will be achieved with the incorporation of Sustainable Drainage Systems (SUDS) into the design to improve the quality of the runoff from the Site. The Drainage Strategy is contained within Appendix 7-2.
The Flood and Water Management Act 2010	The Flood and Water Management Act 2010 provides better, more comprehensive management of flood risk for people, homes and businesses.. The Flood and Water Management Act encourages the use of sustainable drainage in new developments and re-developments.	Through the preparation of the FRA and the Drainage Strategy, the Development has incorporated SUDS into the design. It has been concluded that the Development will not be exposed to an unacceptable degree of flood risk or increase the flood risk to third parties.

7.3 Methodology

7.3.1 General Approach

- 7.3.1.1 The approach outlined below has been followed in preparing the Flood Risk and Hydrology chapter of the Environmental Statement (ES).
- 7.3.1.2 The assessment of adverse environmental impacts that could be associated with the surface water environment has been undertaken in accordance with Statutory Guidance and best practice. The baseline conditions have been established through the undertaking of a desk study.
- 7.3.1.3 A Flood Risk Assessment has been undertaken to identify potential sources of flood risk in relation to the Development. An initial conceptual drainage strategy has been completed to provide a preliminary assessment of the runoff rates and storage requirements within the Site and to inform the surface water drainage strategy.

7.3.1.4 To minimise the impact of new development on flood risk, the NPPF requires that the surface water drainage arrangements for any development site are such that the volumes and peak flow rates leaving the site post-development are no greater than those under existing conditions. As the Site is almost entirely greenfield in its pre development state, the Drainage Strategy is based on the principle of attenuating any additional post development runoff to equivalent greenfield rates.

7.3.2 Consultation

7.3.2.1 The Environment Agency has been consulted in November 2013 via telephone and email to gather the baseline data that has informed this Chapter, the associated Flood Risk Assessment and Conceptual Drainage Strategy. Oxfordshire County Council has been consulted to inform the Surface Water Drainage Strategy and relevant views expressed by Natural England have also been considered.

7.3.3 The Study Area

7.3.3.1 The study area consists of the proposed Site for Application 1, along with the catchment area of the two tributaries to the River Bure, to which the Site drains, downstream to the mainline railway crossing in Bicester. The study area was agreed with the statutory consultees.

7.3.3.2 The study area has been extended beyond the boundary of the Site to include an area of the Bure catchment downstream, to ensure that the assessment of potential impacts on downstream water quality and flood risk to downstream third party lands is included. Baseline data has been gathered for the defined study area. However, where information is not available from within the study area, the best available information from outside the study area have been utilised where appropriate.

7.3.3.3 Consultation with Natural England highlighted a hydrological link between the Site and Wendlebury Meads and Mansmoor Closes SSSI. The study area was therefore extended to include this site.

7.3.4 Methodology for Establishing Baseline Conditions

Establishing the Existing Baseline

7.3.4.1 Flood risk from a wide range of sources has been assessed and is reported in the FRA (Appendix 7-1, Volume 3). To inform this FRA a hydraulic model was developed representing the River Bure and three of its key tributaries which flow through the Site. The hydraulic model was developed in ISIS (Ref 7-4), an industry standard hydraulic modelling package. Flow hydrographs were estimated using UK Best Practice Flood Estimation Handbook (FEH) (Ref 7-5) techniques.

7.3.4.2 An assessment of the potential for water quality impacts has been undertaken using published information for local watercourses.

7.3.4.3 In order to establish baseline conditions at the Site, the following data have been utilised:

- Hydrological data for the River Bure derived from the FEH CD-ROM v3 (Ref 7-6)
- Hydrological data from the Environment Agency's River Bure model.
- Information on ground conditions from the NW Bicester development-Phase 1 Desk Study, (Hyder Consulting, July 2010)
- Water quality data from the Environment Agency collected for the Town Brook, downstream of the Site within Bicester (Ref 7-8).
- Environment Agency online data sets accessed via <http://maps.environment-agency.gov.uk/wiyby>.
- Information on private water supplies, provided in response to a request to Cherwell District Council Environmental Health team (September 2013).
- Abstraction license data, water quality data and WFD monitoring data, provided in response to a request to the Environment Agency (July 2013).

Forecasting the Future Baseline (“Without Development” Scenario)

7.3.4.4 Legislative drivers, such as the WFD have been considered when assessing the future baseline. In addition the potential impact of climate change on increased rainfall and river flows has also been considered. There are four consented developments in the vicinity of the Site (South West Bicester -06/00967/OUT, Bicester Business Park - 07/01106/OUT, Fringford Road - 13/01056/OUT and RAF Bicester - new houses in Caversfield), and the potential impacts of these developments have been considered when forecasting the future baseline.

Defining the importance/value of resource

7.3.4.5 The criteria used to assess potential impacts on the water environment are outlined below. These have been used to define the significance of the impacts associated with the Site on the Bure and other features of the water environment within the study area. The method comprises the following stages and is based on guidance set out in the Design Manual for Roads and Bridges (DMRB) Volume 11: Environmental Assessment (Ref 7-9):

- Assessment of baseline environmental importance (value)
- Assessment of impact magnitude
- Assessment of significance of effects

7.3.4.6 Key water resources/receptors within the study area have been assigned a value / importance based upon the criteria contained within Table 7-2.

Table 7 -2 Determining the Importance / Value of Resource

Value / Importance	Typical Descriptors	Typical Example	
Very High	Attribute has a high quality and rarity on a regional or national scale.	Surface Waters	EC Designated Salmonid / Cyprinid fishery River Quality Objective (RQO) River Ecosystem Class RE1. Watercourse achieving WFD Class 'High'. Site protected under EU or UK wildlife legislation (SAC, SPA, SSSI, Ramsar site) Supports a public potable water supply to a large community
		Groundwater	Principal aquifer providing a regionally important resource or supporting a site protected under wildlife legislation Source Protection Zone (SPZ) I
		Flood Risk	Designated washland or a large and active floodplain where there is high potential for flooding of a large number (> 100) of residential properties and infrastructure
High	Attribute has a high quality and rarity on a local scale.	Surface Waters	Watercourse achieving WFD Class 'Good' Major Cyprinid Fishery Species protected under EU or UK wildlife legislation
		Groundwater	Secondary A aquifer providing locally important resource or supporting river ecosystem SPZII
		Flood Risk	Flood plain or defence protecting between 1 and 100 residential properties or industrial premises from flooding.
Medium	Attribute has a medium quality and rarity on a local scale.	Surface Waters	Watercourse achieving WFD Class 'Moderate'
		Groundwater	Secondary B aquifer providing water for agricultural or industrial use with limited connection to surface water SPZII
		Flood Risk	Flood plain or defence protecting 10 or fewer industrial properties from flooding
Low	Attribute has a low quality and rarity on a local scale.	Surface Waters	Watercourse that is not a fishery, achieving WFD Class 'Poor'
		Groundwater	Non-productive strata
		Flood Risk	Flood plain with limited constraints and low probability of flooding of residential and industrial properties.

Source: (DMRB Volume 11 Section 3 Part 10 (HD 45/09) -)

7.3.5 Methodology for Assessing Impacts

7.3.5.1 The magnitude of impacts on the baseline condition is then assessed considering criteria on the scale/extent of change and the nature and duration of the impacts, as shown in Table 7-3.

Table 7-3 Assessing Magnitude of Impact

Magnitude of Potential Impact		Criteria
Major	Adverse	Results in loss of attribute and/or quality and integrity of the attribute
	Beneficial	Results in major improvement of attribute quality.
Moderate	Adverse	Results in effect on integrity of attribute, or loss of part of attribute.
	Beneficial	Results in moderate improvement of attribute quality.
Minor	Adverse	Results in some measurable change in attribute's quality or vulnerability.
	Beneficial	Results in some beneficial effect on attribute or a reduced risk of negative effect occurring.
Negligible		Results in effect on attribute, but of insufficient magnitude to affect the use or integrity.

Source: (HA 45/09) *Magnitude of impacts can be positive or negative

7.3.5.2 The overall significance of the identified impacts is then assessed using a matrix which correlates the importance of the receptor/attribute against the magnitude of the impact. The matrix is reproduced in Table 7-4.

Table 7-4 Criteria for estimating the significance of effects on water features

		MAGNITUDE OF IMPACT			
		Negligible	Minor	Moderate	Major
IMPORTANCE OF ATTRIBUTE	Very High	Neutral	Moderate/Large	Large/Very Large	Very Large
	High	Neutral	Slight/Moderate	Moderate/Large	Large/Very Large
	Medium	Neutral	Slight	Moderate	Large
	Low	Neutral	Neutral	Slight	Slight/Moderate

Where a choice of two significance criteria is given in Table 7-4, professional judgement has been used to decide on the overall significance of impacts.

7.3.6 Limitations and Assumptions

7.3.6.1 This assessment has been based on a desk based assessment using data which was readily available at the time.

7.4 Description of the Baseline Conditions

7.4.1 Existing Baseline

Water Environment Features

7.4.1.1 The water environment features and their associated importance are listed in Table 7-5 below:

Table 7-5 - Water Environment Features

Feature	Attribute	Quality	Importance
River Bure, associated tributaries and ponds	Recreation	Downstream of the Site there is a green river corridor and park land on the banks of the Bure. This can be considered as being rare on the local (Bicester) scale.	High
	Dilution and removal of waste products	There are permitted discharges to the Bure and its tributaries, however, these are for low volumes of effluent, which do not require significant dilution, until the Bicester sewage treatment works discharge, located downstream of Bicester.	Medium
	Biodiversity	The River Bure and tributaries do not support flowing water in the summer months and are therefore considered to be of limited value to aquatic invertebrates (including white-clawed crayfish), water voles and otters. However, these features provide a wildlife corridor of value to foraging and commuting bats.	Medium
	Conveyance/s storage of flow	There are four watercourses, which are typically subject to ephemeral flow regimes, within the study area and a number of ponds and drainage ditches.	High
Floodplain	Conveyance of flow	Within the study area the narrow flood plain associated with the Bure provides attenuation and reduces the magnitude of the flooding within Bicester.	High
Groundwater	Water supply/quality	The Site is underlain by a Principal bedrock aquifer and localised superficial deposits are classified as a Secondary Aquifer. There are no groundwater source protection zones (SPZ) in the study area.	High
Springs	Water supply/quality	There are springs within the Site, which are likely to support baseflow to the tributaries of the Bure that flow through the site and feed the existing ponds within the Site.	Medium

Surface Water

7.4.1.2 Based on LiDAR data supplied by Environment Agency Geomatics in September 2013, the Site slopes predominantly from north west to south east with elevations ranging from around 92mAOD to 78mAOD.

7.4.1.3 Within the Site there are several water features, namely: the Bure and its associated tributaries, field drains, ponds and springs. The Bure (designated a

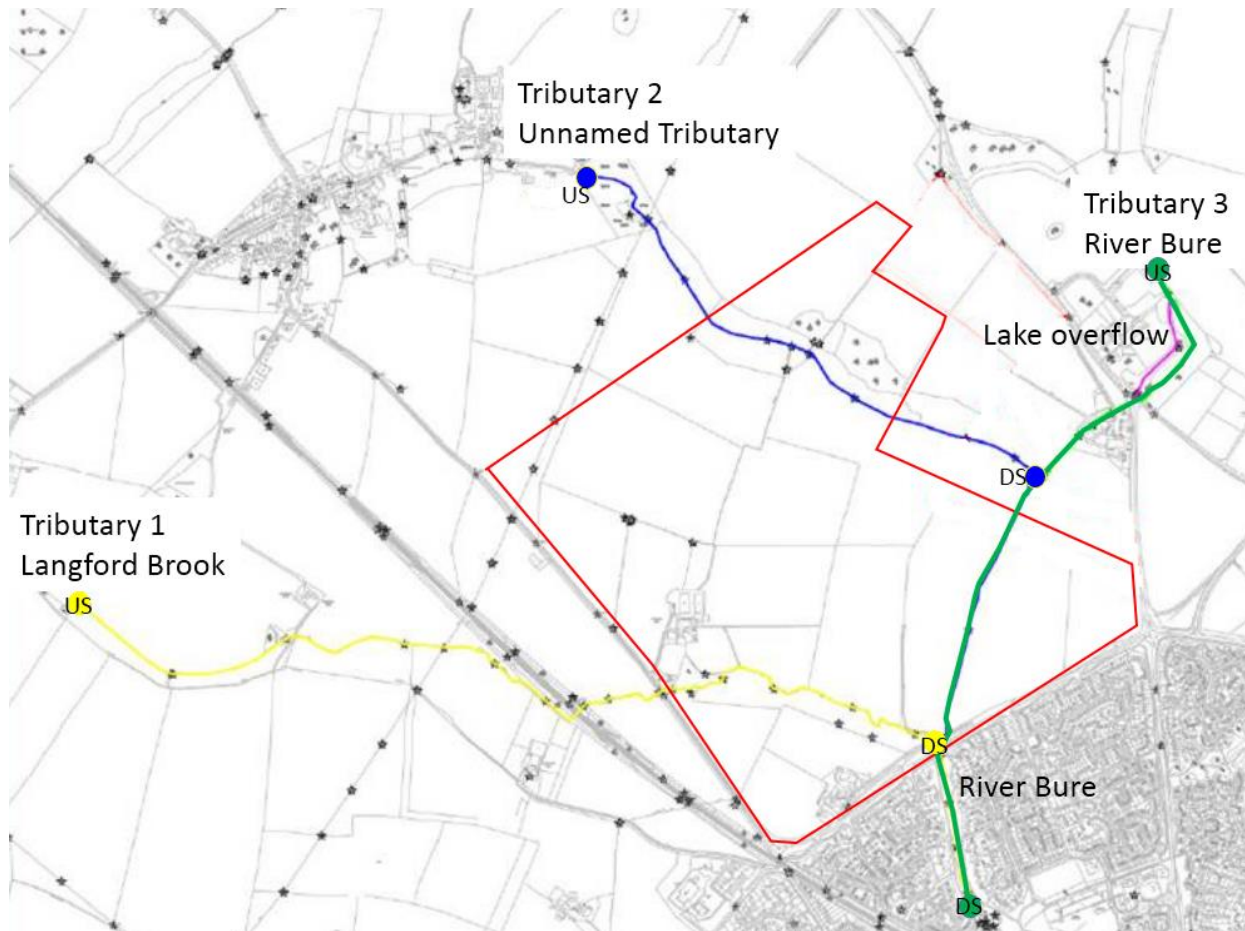
main river south of the railway) flows in a southerly direction from Watergate Farm to a culvert beneath the A4095. Downstream of the culvert it flows in an open channel between Lucerine Avenue and Purslane Drive.

- 7.4.1.4 A tributary flows in an easterly direction from Bucknell which converges with the Bure downstream of Home Farm, and the Langford Brook (an ordinary watercourse) flows in an easterly direction from Crowmarsh Farm which converges with the Bure at the A4095 culvert.
- 7.4.1.5 There are ponds within the Site, in the vicinity of Hawkwell Farm. In addition to these most prominent water features, are a number of ditch features which drain individual fields and feed in to the network.
- 7.4.1.6 The existing site is predominantly greenfield in nature, encompassing a number of small farms and associated access. Surface water runoff across the Site flows largely at greenfield rates to the Bure and its tributaries, according to the local topography, with the potential for localised ponding to occur in low lying areas.

Fluvial Flood Risk

- 7.4.1.7 Flood risk is considered in more detail in the Flood Risk Assessment report that has been prepared for the Site (Appendix 7-1, Volume 3). The Site drains to the River Bure and its tributaries, which flow through the Site before their confluence into a single channel at the A4095 Lord's Lane. The River Bure then flows into Bicester in a south-easterly direction. The River Bure is a tributary of the Ray, Cherwell and ultimately the Thames.
- 7.4.1.8 Flood risk to the proposed Site from the River Bure displayed on the online EA flood maps (Ref 7-10) is based upon a coarse DTM and JFLOW modelling and these maps are not considered suitable to delineate the flood plain in sufficient detail to inform a FRA in support of a planning application. Therefore, a hydraulic model has been constructed to confirm the floodplain extents across the Site.
- 7.4.1.9 An unsteady state ISIS model of the River Bure and associated tributaries and floodplains was constructed and is described more fully in the FRA (Appendix 7-1). The model contains three watercourses and an outflow to the lake located at Caversfield House, as summarised in Figure 7-1.

Figure 7-1 - Watercourses represented in the model (the site is indicated by the redline boundary US- upstream extents and DS- downstream extents)



- 7.4.1.10 Drawing 7-1 of Volume 2 shows the modelled flood extent across the Site for the 100-year and 1,000-year events (i.e. Flood Zones 3 and 2 respectively). This shows that fluvial flooding occurs predominantly on the flatter land around the confluence between the River Bure and the northernmost of the tributaries. Away from the confluence, flooding is confined to the relatively narrow valley of the watercourse.
- 7.4.1.11 Drawing 7-1 of Volume 2 also shows that the flooding only impacts on green space within the Site, and no buildings or roads are affected by flood water. Where the bridges are required, these would be designed to cause no constriction to flow, and therefore would not increase flood risk to the Development. Built development within the Site would therefore be placed entirely within Flood Zone 1, as is required for an eco-development.
- 7.4.1.12 The model predicts that floodwater is generally confined to the valleys in which the watercourses flow, with ponding occurring at confluences and upstream of constricting structures. The model does not predict any overland flow occurring.
- 7.4.1.13 The model results have confirmed that the Site is predominantly located within the Low Flood Risk Zone (Zone 1), with small areas of Medium and High risk restricted to areas immediately adjacent to the watercourse corridors. All Development has been located within the areas of Low risk, and therefore the development is considered to be at low risk of flooding from fluvial sources.

Surface Water Flood Risk

- 7.4.1.14 A direct rainfall model was produced in TUFLOW to represent the existing surface water flow paths across the Site. Full details of the surface water model development are outlined in the FRA within Appendix 7-1.
- 7.4.1.15 Surface water model results demonstrate that the key surface water flow routes within the Site follow the existing channels of the River Bure, its tributaries and also existing drainage ditches. Where additional key surface water flow routes have been identified, these predominantly fall within green corridors and have been used to define the location of proposed detention basins, ponds and swales as part of the Drainage Strategy (Appendix 7-2).

Groundwater Flood Risk

- 7.4.1.16 The SFRA and PFRA indicate some potential for groundwater flooding in the area. However, the currently available ground investigation (discussed in Chapter 11) suggests that the risk of groundwater flooding to the Site is likely to be small.

Water Quality

- 7.4.1.17 The Water Framework Directive (WFD) sets standards for water quality in rivers, estuaries, coastal waters and aquifers. River Basin Management Plans aim to protect and improve the water environment by identifying the main issues within a catchment, and outlining the means of achieving the targets set by the Directive.

Surface Water Quality

- 7.4.1.18 Data has been collected from the Thames River Basin Management Plan (Ref 7-11) to define the existing water quality of the River Bure within the study area where, under the WFD, the Bure is referred to as the Town Brook. Available water quality data is presented in Table 7-6 below:

Table 7-6 WFD Data

Parameter	Value
Waterbody ID	GB106039030150
Waterbody Name	Town Brook at Bicester
Management Catchment	Cherwell
River Basin District	Thames
Typology Description	Low, Small, Calcareous
Hydromorphological Status	Heavily Modified
Current Ecological Quality	Moderate Potential
Current Chemical Quality	Does Not Require Assessment
2015 Predicted Ecological Quality	Moderate Potential
Status Objective (Overall):	Good by 2027
2015 Predicted Chemical Quality	Does Not Require Assessment

Parameter	Value
Overall Risk	At Risk
Protected Area	Yes

- 7.4.1.19 The Town Brook is classified as a Heavily Modified Waterbody, as a result of urbanisation, with a target to achieve Good Ecological Potential. The waterbody is considered to currently achieve Moderate Ecological Potential, limited by the supporting element Phosphate, with a target to achieve Good Ecological Potential by 2027. The chemical status of this waterbody does not require assessment under the WFD, which means that priority substances and other specific pollutants are not discharged into this waterbody in significant quantities.
- 7.4.1.20 The WFD requires no deterioration in the current status of the water body. It also includes an objective to ‘aim to improve’ any water body that is not presently a Good Status or Potential and defines how this should be achieved through the establishment of environmental objectives and ecological targets for surface waters.
- 7.4.1.21 Water quality within the study area is significant, as impacts could be discernable at the Wendlebury Meads and Mansmoor Closes SSSI, located seven kilometres downstream. There are also other SSSIs within 10km of the Site and of these, Otmoor SSSI is likely to be hydrologically linked to the Site.

Groundwater Quality

- 7.4.1.22 The WFD groundwater underlying the study area is named the Bicester-Otmoor Cornbrash. Its current chemical quality is classified as Poor, failing its WFD status objective of Good, but with no apparent upward chemical trend. The quantitative quality of this groundwater body, which considers factors such as the impacts of abstraction and the water balance, is classified as Good and the target has been set to achieve Good overall status by 2027.

Water Supply

- 7.4.1.23 A Detailed Water Cycle Study (WCS) has been prepared for the Site, to ensure that the impacts of the development on water resources and the potable supply infrastructure are understood and mitigated. The statutory water undertaker for the area, Thames Water Utilities Ltd (TWUL), has submitted a 25 year resource development and demand management strategy for approval by its regulators, which would be accompanied by its own Strategic Environmental Assessment.
- 7.4.1.24 Bicester is located within the catchment area of the River Ray (Oxfordshire). The main drinking water supply for Bicester is not sourced from within the catchment. Instead it is supplied from the Farnham Reservoir. Farnham Reservoir is approximately 22km from Bicester, and receives its water from the River Thames. Any future development would increase the demand for water, which would impact on the River Thames.
- 7.4.1.25 Bicester is covered by the Cherwell Catchment Abstraction Management Strategy (CAMS), and is located in an area designated as “No water available”.

This means that no water is available for further licensing at low flows, although water may be available at higher flows with appropriate restrictions. Any large scale new development could lead to an increase in consumption, and could put pressure on the supply (increasing the demand for water and the higher volumes of water being abstracted can be a major factor in causing low flows). Improving water efficiency within the Development would help to mitigate some of these impacts, by reducing water consumption per head.

- 7.4.1.26 This (currently draft) plan illustrates the demand management options TWUL intend to utilise in and around the Bicester area to avoid a supply demand deficit, and sustainably manage water resources. The Detailed WCS confirms that the potable water use from the Development is well within the assumptions made by TWUL.
- 7.4.1.27 The Detailed WCS (Appendix 7-3) sets out water efficiency measures (such as the installation of water-efficient appliances) to reduce the potable water demand from the Development in line with the Code for Sustainable Homes Levels 3/4 (105 litres/head/day).
- 7.4.1.28 In addition, the Detailed WCS has tested a range of property and neighbourhood level water reuse options (including rainwater harvesting and greywater recycling) to provide a non-potable supply to the Development, and hence limit the potable water demand to less than 80 litres/head/day. This level of demand is in line with the Code for Sustainable Homes Levels 5/6 and therefore assists with moving the development towards the aspiration of water neutrality.
- 7.4.1.29 As part of the Detailed WCS, these options are being discussed with potential suppliers to ascertain their technical feasibility, economic viability and sustainability. It is considered that economically viable arrangements are available in the market to offer a separately piped non-potable supply to the developments, sourced from combinations of either locally collected rainwater, greywater, or reclaimed wastewater.
- 7.4.1.30 These measures would ensure that the impact of the Site on water resources is minimised.

Waste Water

- 7.4.1.31 The Detailed WCS also considers the impact of wastewater discharges on the existing drainage infrastructure, and the receiving water environment. Early indications are that it is likely that there is insufficient capacity within TWUL's existing infrastructure to service a large development, requiring the provision of additional off-site sewerage infrastructure to transmit flows to the existing TWUL Wastewater Treatment Works (WwTW) in Bicester. However, this infrastructure could be provided via a well-understood requisitioning process under the provisions of the Water Industry Act. The commercial viability of such an option is being explored with TWUL.
- 7.4.1.32 In addition, ongoing consultation with the Environment Agency and TWUL is underway to appraise the feasibility of treating and discharging the new foul water from the NWB Masterplan site at Bicester WwTW, taking account of other proposed development in the town, existing hydraulic and process capacity,

planned capacity upgrades, and the water quality constraints imposed via the Urban Wastewater Treatment Directive and WFD.

Recreation

- 7.4.1.33 There are no water-based recreational facilities in the Site area itself and public access to the River Bure is currently limited.

7.4.2 Future Baseline

- 7.4.2.1 Legislative drivers, such as the WFD are likely to yield improvements in future surface and groundwater quality. The potential impact of climate change on increased rainfall and river flows has the potential to increase the risk of flooding over time. The Flood Zone classification of the Site however is likely to remain unchanged, with the majority of the site remaining in the low risk flood zone (from rivers and the sea), due to the site topography.
- 7.4.2.2 Climate change could make summers hotter and drier, and increase the risk of more frequent and severe droughts, exacerbating pressures on water within the Thames region. This, combined with high water use and growth, could put additional pressure on water supplies. As the new Development is incorporating water efficiency measures this should help to mitigate potential impacts of climate change.
- 7.4.2.3 There are four consented developments in the vicinity of the Site (South West Bicester -06/00967/OUT, Bicester Business Park - 07/01106/OUT, Fringford Road - 13/01056/OUT and RAF Bicester - new houses in Caversfield). If unmitigated there is the potential for the developments to increase the flood risk to the Site though the increase in impermeable area, which could generate increased runoff. In particular, developments in the vicinity of Caversfield and Fringford Road could have an adverse impact on the quantity and quality of runoff entering the Site if mitigation measures are not in place to manage surface water runoff.

7.5 Design and Mitigation

7.5.1 Construction Approach and Mitigation of Short-Term Construction Effects

- 7.5.1.1 During the construction phase, a Construction Environmental Management Plan (CEMP) would be prepared and implemented based upon Environment Agency (Ref 7-12) and CIRIA 2001 (Ref 7-13) guidance. This would set out method statements and protocols for activities such as excavation, storage of fuels, chemicals and oils, pollution control, and emergency contingency to ensure that best practice is employed and the water environment is safeguarded. Examples of these best practice methods include:
- Soil stripping managed to ensure the minimum area of exposed soil at any one time
 - Provision made for water treatment to remove sediment before discharge to a surface water feature

- Careful planning of materials storage and use to prevent accidental release of oils and other harmful contaminants
- Regular monitoring to ensure pollution control measures are successful in managing water quality impacts
- Design and installation of watercourse crossings to minimise flood risk effects
- Waste management to avoid littering/ release of items which could cause blockages of bridges and culverts downstream
- Management of groundwater, including dewatering
- Control of potential contaminants which could harm groundwater

7.5.2 Scheme Design and Mitigation of Permanent Operational Effects

- 7.5.2.1 The Development would avoid the floodplain and there would be no change in the flood storage capacity of existing watercourse channels. The potential impacts arising from construction of built environment on an essentially greenfield site would be managed using SuDS techniques, and are described in the Drainage Strategy Report (Ref 7-2). The widespread use of Sustainable Drainage Systems (SuDS) and rainwater harvesting would provide sustainable storm water management ensuring that flood risk is reduced for areas downstream.
- 7.5.2.2 Additional site specific ground investigations would provide the information necessary to quantify and inform the risk of groundwater flooding to the site and identify the need for any additional mitigation measures during the detailed design stage.
- 7.5.2.3 A conceptual surface water drainage strategy has been developed based on the principle of attenuating any additional post development runoff to equivalent greenfield rates to ensure that there is no increase in flood risk as a result of the development. The drainage strategy incorporates a suite of sustainable drainage techniques, with the aim of managing rainwater runoff close to its source, reducing flood risk and improving water quality.
- 7.5.2.4 The SuDS systems would comprise chains of linked SuDS components which complement one another, such as: rain gardens, swales, permeable paving with storage, ponds and ditches. Attenuation measures would be located both amongst the built up areas at source, and within the public open spaces adjacent to the development areas. Building layouts and road geometry would also be located to appropriate locations within the natural topography to allow surface flow to be routed away from sensitive receptors. A variety of storage structures would be used, to provide attenuation storage, including ponds, basins and cellular storage.
- 7.5.2.5 The use of SUDS promotes good water quality standards and would also allow the creation of new wildlife spaces incorporating wetlands, ponds and a variety of vegetation, creating valuable open amenity areas whilst enhancing the local water environment. A variety of methods are proposed to be employed for

different sources of runoff to remove hydrocarbons, metals, sediments and other impairments on water quality. Pre-treatment would be utilised to supplement filtration, bioremediation, detention and vegetative uptake processes.

- 7.5.2.6 To mitigate impacts on the waste water network and water use innovative local treatment options are also being appraised in consultation with suppliers to identify if the treated effluent can be viably utilised as a local non-potable water resource, to assist in achieving CDC Policy Bicester 1, and moving the development towards the aspiration of water neutrality. To inform this approach, indicative environmental permit water quality standards are being determined in partnership with the Environment Agency, to ensure that any local effluent discharge would be compliant with the WFD, and explore if a phased permitting approach would allow environmental and financial risks to be minimised. Consultation with a range of suppliers suggests that the advanced treatment required is technically feasible, and that the integration of tertiary treatment processes with wetland treatment of surface water run-off offers opportunities to further enhance sustainability and amenity benefits.
- 7.5.2.7 Any water efficiency measures implemented within the Development are therefore likely to have a positive impact on the River Thames, by reducing pressures from water abstraction.

7.6 Construction Impacts

7.6.1 Overview

Recreation

- 7.6.1.1 There are no water-based recreational facilities in the Site area itself and public access to the River Bure is currently limited. During the construction phase of the Development there would be no direct impacts on existing riverside recreational activities or users. Pollution control measures during construction would minimise the potential for indirect effects on downstream users of the River Bure Park. The magnitude of the impact on recreation is therefore judged to be **Negligible**, with an overall significance that is classified as **Neutral**.

Dilution and Water Quality

- 7.6.1.2 Implementation of the CEMP would provide a means by which impacts on the water quality of the surface water features and groundwater would be minimised. Any residual impact would be limited and local and it is considered that no detriment to water quality would be discernable at the Wendlebury Meads and Mansmoor Closes SSSI, located seven kilometres downstream. There are also other SSSIs within 10km of the Site and of these, Otmoor SSSI is likely to be hydrologically linked to the Site; however, the implementation of standard measures to protect water quality and run-off rates within the Site would ensure that no adverse effects on this SSSI would arise. Given the small size of the receiving watercourses on site (hence the limited potential for dilution of contaminants), the potential magnitude of residual impacts upon these receptors is considered to be **Minor**, with an overall significance that is classified as **Slight Adverse**.

Flood Risk

- 7.6.1.3 The CEMP would set out measures to minimise the potential flood risk impacts of the Development, both on-site and to downstream areas. Following implementation of mitigation measures, the magnitude of the impact would be **Minor** and the overall significance of effect on the conveyance and flood risk features of the water environment is **Slight Adverse**.

Groundwater

- 7.6.1.4 There is a Secondary A bedrock aquifer underlying the Site but there are no SPZs in the study area. The Development is unlikely to pose a high risk to groundwater quality, or flow dynamics as there is an intervening soil and unsaturated zone which could dilute any releases of contaminants arising during the construction phase. Furthermore, measures detailed in the CEMP would be implemented to safeguard groundwater. The superficial aquifer would be at greater risk of contamination, but is very limited in extent and restricted to areas adjacent to the watercourse channels where construction works would be very limited.
- 7.6.1.5 The magnitude of the residual impacts on groundwater resources during the construction phase is therefore considered to be **Negligible**, with an overall significance that is classified as **Neutral**.

7.7 Permanent Operational Impacts

Recreation

- 7.7.1.1 Currently, there is no direct access for the public to the River Bure and its tributaries through the site. During the operational phase of the development the Bure would become a key landscape feature and there would be public stream-side access for activities such as cycling, walking and jogging. In addition, existing features such as ponds would be enhanced to provide increased value for biodiversity and to provide a resource for education and recreation.
- 7.7.1.2 This would result in an impact with a magnitude that is judged as **Major Beneficial** and an overall significance that is classified as **Large Beneficial**.

Water Quality

- 7.7.1.3 SUDS would be installed to manage impacts arising from surface water drainage once the development is operational. The SUDS systems would provide treatment to surface runoff and enhance infiltration and provide an increase in low flow contributions to the on-site watercourses. Both of these impacts would be beneficial.
- 7.7.1.4 However, the magnitude of any impact on dilution and water quality is judged to be **Minor** and localised with a resultant **Slight Beneficial** significance of effect.

Flood Risk

- 7.7.1.5 Although the development itself is located in areas of relatively low flood risk, there are some limited areas of flood risk downstream in Bicester so any

increase in peak flows in the River Bure could have an impact on flood risk downstream. The drainage strategy utilising SUDS measures would ensure that surface water runoff from the Development is maintained at or below greenfield rates.

- 7.7.1.6 The hydraulic modelling undertaken to inform the Flood Risk Assessment has delineated the floodplain and has shown that no development is to occur within the predicted localised areas of floodplain. There would therefore be no loss of floodplain up to and including the 1 in 1,000 year event.
- 7.7.1.7 As a result of the design, the Development would result in a **Negligible** magnitude of impact on flood risk, which would therefore have a **Neutral** significance of effect.

Groundwater

- 7.7.1.8 Following installation of the SUDS drainage strategy, the magnitude of impacts on groundwater resources arising from the development is predicted to be **Negligible**. The significance of effects on the underlying groundwater resources is therefore considered to be **Neutral**.

7.8 Cumulative Impacts

- 7.8.1.1 Development of the Site, together with other sites in the Bicester wastewater treatment works (WWTW) catchment area, has the potential to result in a cumulative excessive demand on the treatment capacity of the works and/or the ability of the receiving watercourses to dilute resulting discharges of effluent. Further work is underway to assess the treatment requirement. Alternative on-site measures to treat effluent from the NW Bicester development are also being considered and these may become available to the Site in the future. If these become available there would be no cumulative impacts arising from the Site on the Bicester wastewater treatment works, otherwise the infrastructure modelling currently underway would assess the need for an infrastructure upgrade. It is considered that upgrading the infrastructure at the WWTW would provide sufficient mitigation to manage any cumulative impacts.
- 7.8.1.2 Similarly, the cumulative impacts of the Development (Application 1 North of Railway) with Application 2 (South of Railway), and the Exemplar Site may be significant in terms of water supply. However there is an aspiration to attain water neutrality, i.e. reducing overall demand to allow new development within the existing supply, and Thames Water has a long term water supply strategy to ensure demand can be met without harm to the environment. Therefore, there could be minor cumulative effects arising from this development and others planned in the area. The development of the Site would not have any other permanent adverse effects on the water environment.

7.9 Water Framework Directive Compliance

The Water Framework Directive

- 7.9.1.1 This section considers the effect of the Development on the objectives of the Water Framework Directive, in the water bodies designated under this legislation adjacent to the Development.
- 7.9.1.2 The Water Framework Directive (WFD) (2000/60/EC) was given effect in the UK by the Water Environment (Water Framework Directive) (England and Wales) Regulations 2003.
- 7.9.1.3 The WFD was put in place to:
- Enhance the status, and prevent further deterioration of aquatic ecosystems and associated wetlands which depend on the aquatic ecosystems
 - Promote the sustainable use of water
 - Reduce pollution of water, especially by 'priority' and 'priority hazardous' substances
 - Ensure progressive reduction of groundwater pollution¹
- 7.9.1.4 The WFD sets the objectives for all water bodies in Europe classified under the WFD and the requirement that they should reach at least good status (or potential) by 2015. This date has been extended to 2027 in respect of a large number of water bodies. Around 20% of water bodies in England in Wales are currently meeting the objective.
- 7.9.1.5 The WFD requires member states to establish river basin districts and, for each, a management plan. In England, WFD-related actions are managed through the River Basin Management Plan (RBMP) process. For the proposed scheme, the relevant RBMP is the Thames RBMP. The first Thames RBMP was published by the Environment Agency in 2009 and is currently being updated for publication in 2015.
- 7.9.1.6 The WFD has important implications for planning works that may affect relevant water bodies. The EA, as the statutory body charged with the responsibility of ensuring compliance with the WFD, has to take account of the WFD when considering planning applications. This has the effect of controlling such development to circumstances where it does not cause deterioration in water body status (ideally, such development should improve the status of the affected water bodies).
- 7.9.1.7 If it was assessed that the Development would result in an adverse effect on a water body, which could cause a deterioration in its WFD status or could prevent actions which are required to raise the WFD status of the water body (as identified in the RBMP), then a further assessment should be made of the possible mitigation measures which may be incorporated in to the Development under Article 4.7 of the WFD. The provision of sustainable human development activities do not in their own right justify deviation from the WFD – the EA would

¹ <http://ec.europa.eu/environment/water/water-framework/>

have to be able to justify that all practicable steps were taken to mitigate the adverse impact, and that this was reflected in the RBMP².

7.9.1.8 The Water Environment (Water Framework Directive) (England and Wales) Regulations 2003 also place a duty on the Planning Authority to exercise their functions with regard to the objectives of the relevant RBMP. It is therefore relevant that the RBMP and WFD objectives are considered through the planning process.

7.9.1.9 This Section assesses the potential impact the Development would have on the existing water bodies, to provide assurance to the EA and the Planning Authority that the Development shall not be detrimental to the water bodies achieving the objectives of the RBMP, and hence shall not have an adverse impact with respect to the WFD.

Water bodies

7.9.1.10 The study area for the identification of relevant water bodies is considered to be the boundary of the development itself, the underlying groundwater body and the downstream receiving surface water bodies as described below.

7.9.1.11 The development is within the catchment of water body Town Brook at Bicester (River water body). The two further water bodies with the potential to be directly impacted by the Development are:

- Langford Brook (Bicester to Ray inc Gagle Brook) (River water body); and
- Bicester-Otmoor Cornbrash (Groundwater body)

7.9.1.12 Downstream of the Langford Brook (Bicester to Ray inc Gagle Brook) the water body converges with the Oxon Ray. Whilst the water bodies within the development site do contribute to this water body, the Oxon Ray also receives contributions from a large rural catchment with pockets of urbanisation and associated point discharges. It is therefore considered appropriate that this assessment focusses on those water bodies which have the potential to be directly impacted by the Development, with the understanding that any proposal to maintain and improve these waterbodies is highly likely to be advantageous for those further downstream.

7.9.1.13 The ecological status, as assessed by the EA, of these water bodies is outlined in Table 7-7 below, and the various elements that define the status of the waterbodies, with failures highlighted in **red** (Source: Thames River Basin Management Plan (2009)).

² Water Framework Directive (2000/60/EC) Article 4.7

Table 7-7 Ecological Status of Waterbodies

Water Body ID	Water Body Name	2011 Ecological Status / Potential	Ecological Quality Elements assessed (including biological, physio-chemical and hydro morphological quality)
GB106039030150	Town Brook at Bicester (River water body)	Moderate Potential	Ammonia (Phys-Chem) – High Dissolved Oxygen – Good pH – High <u>Phosphate – Poor</u> Temperature – High Ammonia – High Quantity and Dynamics of Flow – Supports Good <u>Mitigation Measures Assessment - Moderate</u>
GB106039030140	Langford Brook (Bicester to Ray inc Gagle Brook) (River water body)	Poor Status	Invertebrates – Good Ammonia (Phys-Chem) – High Dissolved Oxygen – Good pH – High <u>Phosphate – Poor</u> Temperature – High Ammonia – High Quantity and Dynamics of Flow – Supports Good Morphology – Supports Good
GB40602G600800	Bicester-Otmoor Cornbrash (Groundwater body)	Poor (2009)	Impact on Wetlands (Quantitative) - Good Impact on Surface Water (Quantitative)– Good Saline Intrusion (Quantitative) – Good Water Balance (Quantitative)

			<p>– Good</p> <p>Drinking Water Protected Area (Chemical)– Good</p> <p>General Chemical Test (Chemical) – Good</p> <p>Impact on Wetlands (Chemical) – Good</p> <p><u>Impact on Surface Waters (Chemical) – Poor</u></p> <p>Saline Intrusion (Chemical) – Good</p>
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7.9.1.14 The key aspects of the Development that could potentially affect achievement of the WFD objectives in these water bodies are assessed in Table 7-8:

Table 7-8 Assessment of key aspects of the Development under the WFD

Aspect of the Development that could potentially affect WFD objectives	Assessment of the effect of the Development
<p>Physical modification of the water bodies from construction of the Development – potential to have an adverse impact on hydro morphology unless suitable mitigation measures are incorporated</p>	<p>The Development, as part of the overall Masterplan, has been designed with landscape as the key driver to the layout of the site. Care has been taken to preserve and enhance water courses within the development and for the natural landscape to be accessible for residents to enjoy.</p> <p>Short sections of bank-side habitat along the Town Brook at Bicester would be removed to allow for a new road bridge crossing and a pedestrian/ cycle bridge crossing, totalling approximately 70 m metres of impacted bankside habitat across the two crossings. Whilst the impact of this habitat loss would affect habitats and species in the watercourse in the direct vicinity, the overall footprint of these bridge crossings in relation to the length of the water body (approximately 4 km) is relatively small and the ecological connectivity within the watercourse would remain. Depending on on-site design considerations it may be appropriate for some of the engineering works at these crossings to incorporate green construction techniques. Any impact would on balance be mitigated by providing enhancements to the water environment along the remainder of the water body within the Development area in line with the desired mitigation measures (discussed in the Section below).</p> <p>A 60 metre-wide corridor would be fenced along the entire length of the water body that falls within the Development boundary in advance of site clearance and this would ensure</p>

	<p>that the habitats and species associated with the water body, and natural channel, would not be disturbed during site clearance and construction.</p>
<p>Extraction of water for consumptive use by the Development, causing reduced water levels in the water bodies and wider catchment;</p>	<p>The Thames RBMP contains an action (TH0440) that requests local authorities to seek the use of water efficiency standards (that exceed extant Buildings Regulations) in new residential development, and BREEAM standards for non-residential development where local evidence supports the need.</p> <p>By promoting water efficiency the demand for water can be reduced, and leave more water available for the environment. This would inevitably contribute towards the progress of achieving Good Ecological Status, and help to ensure that there is no deterioration in Ecological Status as population and demand for water increases.</p> <p>The main drinking water supply in Bicester is already sourced from outside of the River Ray's catchment area. Any future development would increase the demand for water, which would impact on the River Thames. The implementation of water efficiency measures can help curb that demand.</p> <p>TWUL are in the process of finalising their 25 year plan to manage the water resources and potable water demand across the wider area, whilst mitigating climate change risks and ensuring best value for their customers. The growth of water use at Bicester has been accounted for within these plans, and the exemplary potable water usage design standards proposed for both the residential and non-residential development would mean that the increase in demand is less than that accounted for by TWUL.</p> <p>In order to achieve the above mentioned reductions in potable water demand, the Development shall incorporate best practice water efficiency measures, and provide a reclaimed source of non-potable water to substitute with potable water used for toilet flushing and laundry.</p> <p>The use of on-site abstraction from the underlying groundwater aquifer is also being considered as part of the water supply strategy across the wider Masterplan site. Any such strategy would only be promoted following further investigation and consultation with the EA, with reference to the Catchment Abstraction Management Strategy and the RBMP, to ensure it is not detrimental to the quantity assessment of the underlying groundwater body.</p>
<p>Contamination of water bodies from pollutant runoffs during construction of the Development;</p>	<p>The implementation of best practice pollution control measures during the construction phase of the development would be outlined in the CEMP to ensure the protection of water quality during construction.</p>

<p>Contamination of water bodies from pollutant runoffs during the operation of the Development;</p>	<p>There is the potential for polluted surface water runoff to enter the water body when the Site has been developed. However, the SuDS proposed as part of the Development (as set out in the Surface Water Drainage Strategy for both the Masterplan and Application 1) would ensure that water quality within the watercourses is protected via a multiple stage SuDS train to trap and treat possible pollutants arising from developed areas.</p> <p>Additionally, the wastewater strategy emerging via the Masterplan and Application 1 Water Cycle Study is being developed with technical input from the EA to ensure that any on-site requirement to discharge effluent is sufficiently regulated to protect water quality in line with the requirements of the WFD.</p>
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7.9.1.15 In addition to this assessment, the value of the Town Brook at Bicester river water body for habitats and species would be enhanced as a result of the Development, with the creation of new habitats of benefit to wildlife within the stream corridor. There may also be an improvement in water quality associated with the SuDS to be implemented, as this can lead to a decrease in diffuse pollutant from the previously rural land. The retained and newly created habitats would be managed in accordance with the Landscape and Habitats Management Plan that would ensure that they provide benefits to wildlife.

7.9.1.16 It is considered that the adverse effects associated with pressures created by the new residents, would be balanced by the habitat creation that would be delivered by the landscaping proposal.

Mitigation Measures Assessment

7.9.1.17 Where a water body is designated as ‘Heavily Modified’ or ‘Artificial’ due to the existing historical physical modification of the channel, a number of measures are set that can enable the water body to achieve good ecological potential, where it cannot achieve good ecological status due to its modified nature. Good ecological potential is a lesser standard, which is specifically used to assess Heavily Modified or Artificial water bodies.

7.9.1.18 Information in Appendix B of the Thames RBMP suggests that there are a number of mitigation measures for the Town Brook at Bicester water body (the only Heavily Modified water body in the study area) that are, or could be, implemented to enable the water body to meet its objective under the WFD. The mitigation measures are considered below, in relation to the Development:

- Where potential conflicts between the Development and maintenance or implementation of the RBMP mitigation measures occur, these are highlighted in red;
- Where mitigation measures are supported by the Development, these are shown in green; and

- Mitigation measures which are not affected or are not relevant to the Development are shown by ~~strike through~~:
 - Appropriate techniques (invasive species) **In Place**. *The Development will involve the removal and/or containment of invasive species.*
 - Educate landowners on sensitive management practices (urbanisation) **Not In Place**. *The Development will include a community farm which will serve as a base from which to educate the local community and allotment users as to sensitive land management practices.*
 - Retain marginal aquatic and riparian habitats (channel alteration) **Not In Place**. *Marginal aquatic habitats, apart from a small, 70m length, will be retained and in places enhanced.*
 - Preserve and where possible enhance ecological value of marginal aquatic habitat, banks and riparian zone **Not In Place**. *The ecological value of habitats in the water body will be enhanced through the enhancement proposals.*
 - ~~Alteration of channel bed (within culvert)~~ **Not In Place**. *The Development will not compromise the achievement of this measure.*
 - Re-opening existing culverts **Not In Place**. *The Development will incorporate existing culverts/ farm access bridges in to the wet corridor design to assist with public access and amenity, hence will prevent these from being opened in the future – however the existing culverted lengths are relatively short compared to the total water body length, hence the impact is considered negligible.*
 - Increase in-channel morphological diversity **Not In Place**. *The Development may increase the in-channel morphological diversity with the habitat enhancements proposed. Limited impacts may occur adjacent to new proposed road and pathway crossing points for engineering/safety reasons, but these are considered minor in relation to the length of the waterbodies.*
 - Preserve and, where possible, restore historic aquatic habitats **Not In Place**. *The ecological value of habitats in the water body will be enhanced through the enhancement proposals*
 - Removal of hard bank reinforcement / revetment, or replacement with soft engineering solution **Not In Place**. *The addition of a 70m length of modified bank (total across two separate crossings) may inhibit the future achievement of removal of all the hard bank reinforcement within the channel, however this addition is considered to be minor in the context of the wider water body. The actual proportion of hard bank added may be minimised where practicable by adopting green construction techniques.*

Conclusion

- 7.9.1.19 From this preliminary assessment, it is concluded that the Development is unlikely to inhibit the achievement of the objectives of the WFD water bodies within the immediate vicinity of the Development and within the wider catchment.

7.10 Summary

- 7.10.1.1 This assessment has concluded that development of the Site could be undertaken without increasing construction or operational phase flood risk (from fluvial and surface water sources) to the development Site itself or downstream areas. This would be achieved through locating all new build development in Flood Zone 1 and maintaining surface water runoff at rates that equal or better

existing greenfield rates, through the implementation of SuDS measures. The current Surface Water Drainage Strategy seeks to provide attenuation at source, infiltration and treatment of surface water runoff through the SuDS management train and would result in a likely improvement in runoff quality compared to the existing scenario, when agricultural activities influence runoff quality.

7.10.1.2 There is currently no access to water-based recreation along the Bure as it flows through the Site, but this will be transformed by the development proposals, which sets the watercourse as a key landscape feature and asset, providing numerous riverside recreational opportunities.

7.10.1.3 The likely effects of the Development are summarised in Table 7-9 below.

Table 7-9 Flood Risk and Hydrology Impact Summary Table

Receptor/Water Feature	Importance	Significance of Effect with Mitigation
Recreation	High	Neutral (Construction) Large Beneficial (Operation)
Dilution and Water Quality	Medium	Slight Adverse (Construction) Slight Beneficial (Operational)
Conveyance and Flood Risk	High	Slight Adverse (Construction) Neutral (Operation)
Groundwater	High	Neutral (Construction and Operation)

8 Air Quality

8.1 Introduction

8.1.1.1 This Chapter assesses the Development's potential to cause air quality impacts during both the construction and operational phases. These may include fugitive dust emissions associated with construction works, road vehicle exhaust emissions from traffic generated during the operational phase and operational emissions from on-site energy production in the Energy Centre and associated Combined Heat and Power (CHP) plant and back up gas boilers.

8.2 Regulatory and Policy Framework

8.2.1.1 This impact assessment has been undertaken in accordance with current international and national legislation, and national, regional and local plans and policies relating to air quality in the context of the proposed Development. A summary of the relevant legislation and policies, the requirements of these policies and the proposed Development response has been provided in Table 8-1.

Table 8-1 Air Quality Regulatory and Policy Framework

Policy/Legislation	Summary of Requirements	Development Response
Air Quality (England) Regulations (2000) (Ref 8-1)	Provides Air Quality Objectives (AQOs) for seven pollutants (as outlined in Table 8-). These are used by Local Authorities (LAs) when undertaking their duties in accordance with the Environment Act (1995)	Assessment of potential increases in pollution concentrations against the relevant AQOs as defined in the Air Quality (England) Regulations (2000) (Ref 8-1)
Air Quality (England) (Amendment) Regulations (2002) (Ref 8-2)	Amends the relevant AQOs for benzene and carbon monoxide	The most recent AQOs have been considered throughout this assessment
Air Quality Standards Regulations (2010) (Ref 8-3)	Transposes the European Union (EU) Air Quality Directive (2008/50/EC) into UK law. Air Quality Limit Values (AQLVs) were published in these regulations for seven pollutants, in addition to Target Values for an additional five pollutants (as outlined in Table 8-)	Assessment of potential increases in pollution concentrations against the relevant AQLVs as defined in the Air Quality Standards Regulations (2010) (Ref 8-3)
Environment Act (1995) (Ref 8-4)	Requires UK government to produce a national Air Quality Strategy (AQS) which contains standards, Air Quality Objectives (AQOs) and	Consideration has been given to the potential impacts on the AQOs and AQMs in the vicinity of the Site

	<p>measures for improving ambient air quality and defines Local Air Quality Management (LAQM). This requires LAs to assess air quality within their area of jurisdiction on a periodic basis. Any location where the relevant standards are not achieved must be declared an Air Quality Management Area (AQMA). For each AQMA the LA is required to produce an Air Quality Action Plan (AQAP), the objective of which is to reduce pollutant concentrations in pursuit of the AQOs</p>	
<p>National Planning Policy Framework (NPPF) (Ref 8-5)</p>	<p>Sets out the Government's core policies and principles with respect to land use planning, including air quality. Includes the following:</p> <p>"The planning system should contribute to and enhance the natural and local environment by: [...]</p> <p>Preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water or noise pollution or land instability"</p> <p>"Planning policies should sustain compliance with and contribute towards EU limit values or national objectives for pollutants, taking into account the presence of Air Quality Management Areas and the cumulative impacts on air quality from individual sites in local areas. Planning decisions should ensure that any new development in Air Quality Management Areas is consistent with the local air quality action plan."</p>	<p>This assessment considers the potential air quality impacts as a result of the Development</p>
<p>Environmental Protection Act (1990) (Ref 8-6)</p>	<p>Sets out the main requirements with respect to dust control from industrial or trade premises not regulated under</p>	<p>This assessment considers potential dust impacts during the construction phase of the proposed Development</p>

	the Environmental Permitting (England and Wales) Regulations (2010) (Ref 8-7)	
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8.2.1.2 Table 8-2 shows the AQOs for pollutants considered within this assessment. These were selected to represent the most significant species likely to be emitted as a result of the Development. It should be noted that the AQOs are generally in line with the AQLVs, although the requirements for compliance vary slightly.

Table 8-2 Air Quality Objectives

Pollutant	Air Quality Objectives	
	Concentration ($\mu\text{g}/\text{m}^3$)	Averaging Period
Nitrogen dioxide (NO_2)	200	1-hour average; not to be exceeded more than 18 times a year
	40	Annual average
Particulate matter with an aerodynamic diameter of less than $10\mu\text{m}$ (PM_{10})	50	24-hour mean; not to be exceeded more than 35 times a year
	40	Annual mean

8.2.1.3 Table 8-3 shows the critical levels for pollutants considered within this assessment.

Table 8-3 Critical Levels

Pollutant	Critical Level	
	Concentration ($\mu\text{g}/\text{m}^3$)	Averaging Period
Oxides of nitrogen (NO_x)	30	Annual mean

8.2.2 Critical Loads and Levels

8.2.2.1 A critical load is defined by the UK Air Pollution Information System (APIS) as:

"A quantitative estimate of exposure to deposition of one or more pollutants, below which significant harmful effects on sensitive elements of the environment do not occur, according to present knowledge. The exceedence of a critical load is defined as the atmospheric deposition of the pollutant above the critical load."

8.2.2.2 A critical level is defined as:

"Threshold for direct effects of pollutant concentrations according to current knowledge. Exceedence of a critical level is defined as the atmospheric concentration of the pollutant above the critical level."

- 8.2.2.3 A critical load refers to deposition of a pollutant, while a critical level refers to pollutant concentrations in the atmosphere (which usually have direct effects on vegetation or human health).
- 8.2.2.4 When pollutant loads (or concentrations) exceed the critical load or level it is considered that there is a risk of harmful effects. The excess over the critical load or level is termed the exceedence. A larger exceedence is often considered to represent a greater risk of damage.
- 8.2.2.5 Maps of critical loads and levels and their exceedences have been used to show the potential extent of pollution damage and aid in developing strategies for reducing pollution. Decreasing deposition below the critical load is seen as means for preventing the risk of damage. However, even a decrease in the exceedence may infer that less damage would occur.
- 8.2.2.6 Critical loads have been designated within the UK based on the sensitivity of the receiving habitat and have been reviewed for the purpose of this assessment.

8.3 Methodology

8.3.1 General Approach

- 8.3.1.1 The Development has the potential to cause air quality impacts during the construction and operational phases. These can be summarised as:
- Construction phase: impacts as a result of dust emissions from demolition, earthworks, construction and trackout;
 - Operational phase: impacts as a result of NO₂ and PM₁₀ emissions generated by traffic travelling to and from the Site; and,
 - Operational phase: impacts as a result of NO_x emissions from the proposed Energy Centre.
- 8.3.1.2 Potential impacts have been assessed in accordance with the following methodology which is based upon the Institute of Air Quality Management (IAQM) document 'Guidance on the Assessment of Dust from Demolition and Construction' (Ref 8-8) and Environmental Protection UK (EPUK) 'Development Control: Planning for Air Quality (2010 update)' (Ref 8-9).
- 8.3.1.3 It should be noted that road vehicle exhaust and Energy Centre emissions have been combined when considering potential impacts in order to ensure cumulative changes in NO_x and NO₂ concentrations were analysed.

8.3.2 Consultation

- 8.3.2.1 The Environmental Protection Officer at Cherwell District Council (CDC), Sean Gregory, was contacted to obtain the district's latest monitoring data.

8.3.3 The Study Area

Construction Dust

- 8.3.3.1 Dust impacts have been assessed within 350m from the site boundary and 100m from the construction vehicle route up to 500m from the site entrance, as required by the IAQM assessment methodology (Ref 8-8).

Operational Emissions

- 8.3.3.2 Impacts on NO₂ and PM₁₀ concentrations as a result of emissions from additional road traffic generated by the Development and releases from the Energy Centre have been assessed over the area National Grid Reference (NGR): 454500, 221000 to 460500, 226500. This was defined based on the extents of the provided traffic data, locations of sensitive receptors and anticipated emission dispersion from the relevant pollutant sources. Reference should be made to Drawing 8-12 for a map of the operational emissions assessment extents.

8.3.4 Methodology for Establishing Baseline Conditions

Establishing the Existing Baseline

- 8.3.4.1 Baseline air quality conditions in the vicinity of the Site have been defined from a number of sources. These include:
- Review of CDC LAQM reports;
 - Review of the Department for Food, Environment and Rural Affairs (DEFRA) LAQM website (<http://www.defra.gov.uk/environment/quality/air/air-quality/laqm/>); and,
 - Review of the Air Pollution Information System (APIS) website (www.apis.ac.uk).
- 8.3.4.2 Review of Ordnance Survey mapping and aerial photography available via GoogleEarth was also undertaken in order to identify sensitive receptor locations around the Development.

Forecasting the Future Baseline (“Without Development” Scenario)

- 8.3.4.3 Although it is anticipated that PM₁₀ concentrations would reduce in the future, there is some uncertainty in regards the magnitude of change. As such, existing background data was utilised with the outputs of a dispersion modelling assessment of road vehicle exhaust emissions should the Development not proceed to predict annual mean PM₁₀ concentrations during the opening year of 2031. Although this is likely to over-predict actual concentrations during the operation of the Development, the approach was considered to provide a robust and suitable assessment scenario.
- 8.3.4.4 There is current uncertainty over NO₂ concentrations within the UK, with roadside levels not reducing as previously expected due to the implementation

of new vehicle emission standards. The Highways Agency's Interim Advice Note 170/12 (Ref 8-10) considers that currently published future NO_x and NO₂ projections may be too pessimistic and advises a Gap Analysis Method for the prediction of future year conditions. This was utilised along with the associated spreadsheet (version 1.1) to predict future year annual mean NO₂ concentrations based on a dispersion modelling assessment of road vehicle exhaust emissions during the base year, projected base year and Development opening year should the proposals not proceed, as well as background monitoring data from the LA. This process is discussed further in Appendix 8A.

Defining the importance/ sensitivity of resource

- 8.3.4.5 The sensitivity of the local environment to potential dust impacts has been assessed using the criteria outlined in the following tables. This has been reproduced from the IAQM document 'Guidance on the Assessment of Dust from Demolition and Construction' (Ref 8-8).

Table 8-4 Determining the Importance / Sensitivity of Resources - Construction Dust

Sensitivity of resource or receptor	Examples	
	Human Receptors	Ecological Receptors
High	<ul style="list-style-type: none"> • Users expect of high levels of amenity • High aesthetic or value property • People expected to be present continuously for extended periods of time • Locations where members of the public are exposed over a time period relevant to the AQO for PM₁₀ e.g. residential properties, hospitals, schools and residential care homes 	<ul style="list-style-type: none"> • Internationally or nationally designated site e.g. Special Area of Conservation (SAC)
Medium	<ul style="list-style-type: none"> • Users would expect to enjoy a reasonable level of amenity • Aesthetics or value of their property could be diminished by soiling • People or property wouldn't reasonably be expected to be present here continuously or regularly for extended periods as part of the normal pattern of use of the land e.g. parks and places of work 	<ul style="list-style-type: none"> • Nationally designated site e.g. Sites of Special Scientific Interest (SSSI)
Low	<ul style="list-style-type: none"> • Enjoyment of amenity would not reasonably be expected • Property would not be expected to be diminished in appearance • Transient exposure, where people would only be expected to be present for limited periods. e.g. public footpaths, playing fields, shopping streets, playing fields, farmland, footpaths, short term car park and roads 	<ul style="list-style-type: none"> • Locally designated site e.g. Local Nature Reserve (LNR)

8.3.4.6 The guidance also provides the following factors to consider when determining the sensitivity of an area to potential dust impacts during the construction phase:

- Any history of dust generating activities in the area;
- The likelihood of concurrent dust generating activity on nearby sites;
- Any pre-existing screening between the source and the receptors;
- Any conclusions drawn from analysing local meteorological data which accurately represent the area; and if relevant the season during which works would take place;
- Any conclusions drawn from local topography;

- Duration of the potential impact, as a receptor may become more sensitive over time; and,
- Any known specific receptor sensitivities which go beyond the classifications given in the document.

8.3.4.7 These factors were considered in the undertaking of this assessment.

8.3.4.8 The sensitivity of the area to dust soiling effects on people and property was subsequently determined based on the criteria shown in Table 8-5.

Table 8-5 Sensitivity of the Area to Dust Soiling Effects on People and Property

Receptor Sensitivity	Number of Receptors	Distance from Source (m)			
		Less than 20	Less than 50	Less than 100	Less than 350
High	More than 100	High	High	Medium	Low
	10 - 100	High	Medium	Low	Low
	1 - 10	Medium	Low	Low	Low
Medium	More than 1	Medium	Low	Low	Low
Low	More than 1	Low	Low	Low	Low

8.3.4.9 Table 8-6 outlines the sensitivity of the area to human health impacts.

Table 8-6 Sensitivity of the Area to Human Health Impacts

Receptor Sensitivity	Annual Mean PM ₁₀ Conc.	Number of Receptors	Distance from Source (m)				
			Less than 20	Less than 50	Less than 100	Less than 200	Less than 350
High	Greater than 32µg/m ³	More than 100	High	High	High	Medium	Low
	28 - 32µg/m ³	10 - 100	High	High	Medium	Low	Low
	24 - 28µg/m ³	1 - 10	High	Medium	Low	Low	Low
	Less than 24µg/m ³	More than 100	High	Low	Medium	Low	Low
Medium	-	More than 10	High	Medium	Low	Low	Low
	-	1 - 10	Medium	Low	Low	Low	Low
Low	-	More than 1	Low	Low	Low	Low	Low

8.3.4.10 Table 8-7 outlines the sensitivity ecological receptors to potential construction dust impacts.

Table 8-7 Sensitivity of the Area to Ecological Impacts

Receptor Sensitivity	Distance from Source	
	Less than 20	Less than 50
High	High	Medium
Medium	Medium	Low
Low	Low	Low

8.3.4.11 The sensitivity of human receptors to operational road traffic exhaust and Energy Centre emission impacts has not been defined in accordance with the EPUK 'Development Control: Planning for Air Quality (2010 update)' (Ref 8-9) guidance document.

8.3.4.12 The sensitivity of ecological receptors to operational road traffic exhaust and Energy Centre emission impacts has been assessed using the criteria provided in Table 8-8. It is noted that these are different to the defined sensitivities to potential dust impacts due to the variations in significance associated with different pollutants.

Table 8-8 Ecological Receptor Sensitivity - Operational Emissions

Sensitivity	Criteria
Very high	Ecological designations of very high importance and rarity, international scale and very limited potential for substitution (e.g. Ramsar sites, SACs and Special Protection Areas (SPA))
High	Ecological designations of high importance and rarity, national scale and limited potential for substitution (e.g. SSSIs and National Nature Reserves (NNRs))
Medium	Ecological designations with medium importance and rarity, regional scale and limited potential for substitution
Low	Ecological designations with low importance and rarity, local scale (e.g LNRs)

8.3.5 Methodology for Assessing Impacts

Construction Phase Assessment

8.3.5.1 There is the potential for fugitive dust emissions to occur as a result of construction phase activities. These have been assessed in accordance with the methodology outlined within the IAQM document 'Guidance on the Assessment of Dust from Demolition and Construction' (Ref 8-8).

8.3.5.2 Activities on the proposed construction site have been divided into four types to reflect their different potential impacts. These are:

- Demolition;

- Earthworks;
- Construction; and
- Trackout (the transport of dust and dirt onto the public road network where it may then be resuspended).

8.3.5.3 The potential for dust emissions is assessed for each activity that is likely to take place and considers three separate dust effects:

- Annoyance due to dust soiling;
- Harm to ecological receptors; and,
- The risk of health effects due to a significant increase in exposure to PM₁₀.

8.3.5.4 The assessment steps are detailed below.

Step 1

8.3.5.5 Step 1 screens the requirement for a more detailed assessment. Should sensitive receptors be identified within 350m of the site boundary or 100m of the construction vehicle route up to 500m from the site entrance then the assessment proceeds to Step 2. Should sensitive receptors not be present within the relevant distances then neutral impacts would be expected and further assessment is not necessary.

Step 2

8.3.5.6 Step 2 assesses the risk of potential dust impacts. A site is allocated to a risk category based on two factors:

- The scale and nature of the works, which determines the magnitude of dust arising as: small, medium or large (Step 2A); and,
- The sensitivity of the area to dust impacts, which can be defined as low, medium or high sensitivity (Step 2B).

8.3.5.7 The two factors are combined in Step 2C to determine the risk of dust impacts without mitigation applied.

8.3.5.8 Step 2A defines the potential magnitude of dust emission through the construction phase. The relevant criteria are summarised in Table 8-9.

Table 8-9 Construction Dust - Magnitude of Emission

Magnitude	Activity	Criteria
Large	Demolition	<ul style="list-style-type: none"> • Total building volume greater than 50,000m³ • Potentially dusty construction material (e.g. concrete) • On-site crushing and screening • Demolition activities greater than 20m above ground level
	Earthworks	<ul style="list-style-type: none"> • Total site area greater than 10,000m² • Potentially dusty soil type (e.g. clay, which will be prone to suspension when dry due to small particle size) • More than ten heavy earth moving vehicles active at any one time

		<ul style="list-style-type: none"> • Formation of bunds greater than 8m in height • More than 100,000 tonnes of material moved
	Construction	<ul style="list-style-type: none"> • Total building volume greater than 100,000m³ • Piling • On site concrete batching • Sandblasting
	Trackout	<ul style="list-style-type: none"> • More than 100 Heavy Duty Vehicle (HDV) trips per day • Potentially dusty surface material (e.g. high clay content) • Unpaved road length greater than 100m
Medium	Demolition	<ul style="list-style-type: none"> • Total building volume 20,000m³ to 50,000m³ • Potentially dusty construction material • Demolition activities 10m to 20m above ground level
	Earthworks	<ul style="list-style-type: none"> • Total site area 2,500m² to 10,000m² • Moderately dusty soil type (e.g. silt) • Five to ten heavy earth moving vehicles active at any one time • Formation of bunds 4m to 8m in height • Total material moved 20,000 tonnes to 100,000 tonnes
	Construction	<ul style="list-style-type: none"> • Total building volume 25,000m³ to 100,000m³ • Potentially dusty construction material (e.g. concrete) • Piling • On site concrete batching
	Trackout	<ul style="list-style-type: none"> • 25 to 100 HDV trips per day • Moderately dusty surface material (e.g. high clay content) • Unpaved road length 50m to 100m
Small	Demolition	<ul style="list-style-type: none"> • Total building volume under 20,000m³ • Construction material with low potential for dust release (e.g. metal cladding or timber) • Demolition activities less than 10m above ground level
	Earthworks	<ul style="list-style-type: none"> • Total site area less than 2,500m² • Soil type with large grain size (e.g. sand) • Less than five heavy earth moving vehicles active at any one time • Formation of bunds less than 4m in height • Total material moved less than 10,000 tonnes • Earthworks during wetter months
	Construction	<ul style="list-style-type: none"> • Total building volume less than 25,000m³ • Construction material with low potential for dust release (e.g. metal cladding or timber)
	Trackout	<ul style="list-style-type: none"> • Less than twenty five HDV trips per day • Surface material with low potential for dust release • Unpaved road length less than 50m

8.3.5.9 Step 2C combines the dust emissions magnitude with the sensitivity of the area to determine the risk of unmitigated impacts. Table 8-10 outlines the risk category from demolition.

Table 8-10 Dust Risk Category from Demolition

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

8.3.5.10 Table 8-11 outlines the dust risk category from earthworks and construction activities.

Table 8-11 Dust Risk Category from Earthworks and Construction

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

8.3.5.11 Table 8-12 outlines the dust risk category from trackout.

Table 8-12 Dust Risk Category from Trackout

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

Step 3

8.3.5.12 Step 3 requires the identification of site specific mitigation measures within the IAQM guidance (Ref 8-9) to reduce potential dust impacts based upon the relevant risk categories identified in Step 2. For sites with negligible risk, mitigation measures beyond those required by legislation are not required. However, additional controls may be applied as part of good practice.

Step 4

8.3.5.13 Once the risk of dust impacts has been determined and the appropriate mitigation measures identified, the final step is to determine the significance of

any residual impacts. For almost all construction activity, the aim should be to control effects through the use of effective mitigation. Experience shows that this is normally possible. Hence the residual effect would normally be 'not significant'. This has been described as neutral within this report to provide continuity between assessment terminologies.

- 8.3.5.14 The determination of significance relies on professional judgement and reasoning should be provided as far as practicable. This has been considered throughout the assessment when defining predicted impacts. The IAQM guidance (Ref 8-9) suggests the provision of details of the assessor's qualifications and experience. These can be provided upon request.

Operational Emissions

- 8.3.5.15 The Development has the potential to impact on existing air quality during the operational phase as a result of road traffic emissions of NO₂ and PM₁₀ and Energy Centre emissions of NO_x. Potential impacts have been defined by predicting pollutant concentrations at sensitive locations using dispersion modelling. Reference should be made to Appendix 8A for assessment input data and a detailed methodology.
- 8.3.5.16 Receptors potentially sensitive to traffic exhaust emissions were considered in two categories;
- Human sensitive receptors; and,
 - Ecological sensitive receptors.
- 8.3.5.17 These were assessed in accordance with the methodology outlined in the following Sections.

Human Sensitive Receptors

- 8.3.5.18 Human receptors potentially sensitive to operational road traffic exhaust and Energy Centre emissions were identified within the vicinity of the Site. DEFRA guidance LAQM.TG(09) (Ref 8-11) provides the following examples of where annual mean AQOs should apply:
- Residential properties;
 - Schools;
 - Hospitals; and,
 - Care homes.
- 8.3.5.19 These were considered during the selection of receptor locations.
- 8.3.5.20 The magnitude of change in pollutant concentrations was defined based on the criteria outlined in Table 8-13.

Table 8-13 Operational Emissions - Magnitude of Change

Magnitude of Change	Change in Pollutant Level as Proportion of Annual Mean Concentration (%)
Large	Greater than 10

Medium	5 - 10
Small	1 - 5
Imperceptible	Less than 1

8.3.5.21 Impact significance was defined based on the interaction between predicted annual mean concentration with the Development in place and the magnitude of change, as outlined in Table 8-14.

Table 8-14 Operational Emissions - Significance of Impact

Absolute Concentration in Relation to Objective/Limit Value	Magnitude of Change		
	Small	Medium	Large
Above Objective/Limit Value With Scheme (>40µg/m ³)	Slight	Moderate	Substantial
Just Below Objective/Limit Value With Scheme (36-40µg/m ³)	Slight	Moderate	Moderate
Below Objective/Limit Value With Scheme (30-36 µg/m ³)	Negligible	Slight	Slight
Well Below Objective/Limit Value With Scheme (<30 µg/m ³)	Negligible	Negligible	Slight

Note: Any 'imperceptible' changes in pollutant concentrations are considered to be an impact of Negligible significance.

8.3.5.22 Any increases in pollutant concentrations would be considered an 'adverse' impact, whilst reductions would be considered 'beneficial'.

8.3.5.23 Following the prediction of impacts at discrete receptor locations the EPUK document (Ref 8-9) provides guidance on determining the overall air quality impact significance of the operation of a development. The following factors are identified for consideration by the assessor:

- Number of properties affected by significant air quality impacts and a judgement on the overall balance;
- Where new exposure is introduced into an existing area of poor air quality, then the number of people exposed to levels above the objective or limit value will be relevant;
- The magnitude of changes and the descriptions of the impacts at the receptors;

- Whether or not an exceedence of an objective or limit value is predicted to arise in the study area where none existed before or an exceedence area is substantially increased;
- Whether or not the study area exceeds an objective or limit value and this exceedence is removed or the exceedence area is reduced; and,
- The extent to which an objective or limit value is exceeded e.g. an annual mean NO₂ concentration of 41µg/m³ should attract less significance than an annual mean of 51µg/m³.

8.3.5.24 These factors were considered and an overall significance determined for the impact of operational phase road traffic emissions. It should be noted that the determination of significance relies on professional judgement and reasoning should be provided as far as practicable. This has been considered throughout the assessment when defining predicted impacts. The EPUK guidance (Ref 8-9) suggests the provision of details of the assessor's qualifications and experience. These can be provided upon request.

Ecological Sensitive Receptors

8.3.5.25 Road vehicle exhaust and Energy Centre emissions associated with operation of the Development have the potential to result in variations in NO_x concentrations and nitrogen deposition rates at ecological designations. The magnitude of change and impact significance was assessed using the criteria outlined in Table 8-13 and Table 8-14, whilst the sensitivity of the receptor was defined using Table 8-8.

8.3.6 Limitations and Assumptions

8.3.6.1 A number of assumptions have been made to inform the assessment. These are detailed in the relevant Sections and Appendix 8A and include:

- The soil type on site is potentially dusty;
- The unpaved construction road length will be greater than 100m;
- The accuracy of estimates of background pollutant concentrations;
- Uncertainties in source activity data such as traffic flows and emission factors;
- Variations in meteorological conditions between the Site and observation station;
- Overall dispersion model limitations;
- Uncertainties associated with pollutant monitoring data, including analyser locations;
- The Energy Centre would operate at maximum load 24-hours per day, 365-days per year; and,
- The standby boilers would only operate when periods when the CHP engines are not operational and would have lower emission rates due to their lesser power rating.

8.4 Description of the Baseline Conditions

8.4.1 Existing Baseline

8.4.1.1 Existing air quality conditions in the vicinity of the Site were identified in order to provide a baseline for the assessment. These are detailed in the following Sections.

Local Air Quality Management

8.4.1.2 As required by the Environment Act (1995) (Ref 8-4), CDC has undertaken Review and Assessment of air quality within their area of jurisdiction. This process has indicated that annual mean concentrations of NO₂ are above the AQO at locations of relevant exposure. As such, one AQMA has been declared at Hennef Way, Banbury, which is located approximately 20km north-west of the Site.

8.4.1.3 Although traffic data was not available to describe flows within the Banbury AQMA, due to the distance between the Site and the designation, it is not anticipated that the proposals would result in significant air quality impacts at this location. As such, this AQMA has not been considered further in the context of this assessment.

8.4.1.4 CDC has also identified three additional areas where AQMAs should be declared due to exceedences of the annual mean AQO for NO₂. These include:

- Horsefair/North Bar, Banbury;
- Kings End/Queens Avenue, Bicester; and,
- Bicester Road, Kidlington.

8.4.1.5 The proposed AQMA at Kings End/Queens Avenue, Bicester, is approximately 1.5km south-east of the Development. Potential impacts on annual mean NO₂ concentrations within this sensitive area have been considered within this chapter.

8.4.1.6 The proposed Horsefair/North Bar AQMA and Bicester Road AQMA are approximately 19.6km and 12.5km from the Development. Although traffic data was not available to describe flows within these locations, due to the distance between the Site and the proposed designations, it is not anticipated that the proposals would result in significant air quality impacts at these positions. As such, these proposed AQMAs have not been considered further in the context of this assessment.

8.4.1.7 CDC has concluded that concentrations of all other pollutants considered within the Air Quality Strategy (Ref 8-12) are below the relevant AQOs and as such no further AQMAs have been declared to date.

Air Quality Monitoring

8.4.1.8 Monitoring of pollutant concentrations is undertaken by CDC using passive diffusion tubes throughout their area of jurisdiction. Review of the most recent LAQM Progress Report (Ref 8-13) indicated ten monitoring locations in the

vicinity of the site. Results are shown in Table. Exceedences of the AQO are highlighted in **bold**. Reference should be made to Drawing 8-1 for a map of the monitoring locations.

Table 8-15 NO₂ Diffusion Tube Monitoring Results

Site	Type	Annual Mean Concentration (µg/m ³)			
		2011	2012	2013	
1	Villiers Road	Urban Background	19.0	20.5	19.8
2	Kings End West	Kerbside	30.1	31.1	29.1
3	Kings End South	Roadside	49.5	49.0	48.5
4	Kings End North	Roadside	43.9	46.0	35.8
5	Field Street	Kerbside	42.9	41.6	38.6
6	North Street	Kerbside	46.1	45.6	42.7
7	Queens Avenue/Kings End	Kerbside	42.9	45.0	41.0
8	Market Square	Kerbside	35.7	45.6	37.1
9	Tamarisk Gardens	Urban Background	22.3	17.6	17.4
10	Causeway	Kerbside	-	-	23.1

8.4.1.9 As indicated in Table 8-15, annual mean NO₂ concentrations were above the AQO at six of the diffusion tube locations in recent years. This is to be expected due to their roadside and kerbside locations in an area proposed to be designated as an AQMA.

Background Pollutant Concentrations

8.4.1.10 Predictions of background pollutant concentrations on a 1km by 1km grid basis have been produced by DEFRA for the entire of the UK to assist Local Authorities in their Review and Assessment of air quality. The proposed Development is located in grid square NGR: 456500, 224500. Data for this location was downloaded from the DEFRA website (Ref 8-14) for the purpose of this assessment and is summarised in Table 8-16 for the base year, current year and development opening year.

Table 8-16 Predicted Background Concentrations

Pollutant	Predicted Background Concentration (µg/m ³)		
	2013	2014	2031
NO _x	15.95	15.42	10.52
NO ₂	11.66	11.32	7.92
PM ₁₀	18.15	17.95	16.80

Sensitive Receptors

8.4.1.11 A sensitive receptor is defined as any location which may be affected by changes in air quality as a result of a development. These have been defined for construction dust and operational emission impacts in the following Sections.

Construction Dust

8.4.1.12 Receptors sensitive to potential dust impacts during demolition, earthworks and construction were identified from a desk-top study of the area up to 350m from the Development boundary. These are summarised in Table 8-17.

Table 8-17 Demolition, Earthworks and Construction Dust Sensitive Receptors

Distance from Site Boundary (m)	Approximate Number of Residential Receptors	Approximate Number of Ecological Receptors
Less than 20	10 - 100	1
20 - 50	10 - 100	1
50 - 100	10 - 100	-
100 - 350	Over 100	-

8.4.1.13 Reference should be made to Drawing 8-2 for a graphical representation of demolition, earthworks and construction dust sensitive locations.

8.4.1.14 Receptors sensitive to potential dust impacts from trackout were identified from a desk-top study of the area up to 100m from the road network within 500m of the site access. These are summarised in Table 8-18. It is anticipated that construction traffic would use the A41/Vendee Drive from the M40 Junction 9 and the A421 around the east of Bicester, as described in Chapter 3.

Table 8-18 Trackout Dust Sensitive Receptors

Distance from Site Boundary (m)	Approximate Number of Residential Receptors	Approximate Number of Ecological Receptors
Less than 20	1 - 10	1
20 - 50	10 - 100	1
50 - 100	Over 100	-

8.4.1.15 Reference should be made to Drawing 8-3 for a graphical representation of trackout dust sensitive receptor locations. As indicated in Table 8-18, there are a number of sensitive receptors in the vicinity of the local highway network that may be affected by trackout dust.

8.4.1.16 A number of additional factors have been considered when determining the sensitivity of the surrounding area. These are summarised in Table 8-19.

Table 8-19 Additional Area Sensitivity Factors

Guidance	Comment
Whether there is any history of dust generating activities in the area	The Site is located in a residential/ agricultural area. Dust generation may have historically occurred as a result of wind-blown emissions from fields
The likelihood of concurrent dust generating activity on nearby sites	Concurrent construction of the Exemplar site, as well as Application 2 and A4095 NW Strategic Link Road, could result in impacts associated with cumulative dust generation
Pre-existing screening between the source and the receptors	The Site is bound by vegetation to the west, providing a natural protective screen. Other boundaries are predominantly open
Conclusions drawn from analysing local meteorological data which accurately represent the area: and if relevant the season during which works will take place	The wind direction is predominantly from the south-west of the Development, as shown in Drawing 8-11. As such, receptors to the north-east of the Site would be most affected by dust emissions
Conclusions drawn from local topography	The land use in close proximity to the Site is residential to the south and east and agricultural to the north and west. The terrain is predominantly flat. As such, receptors to the south and east of the Site are most likely to be affected by construction dust emissions
Duration of the potential impact, as a receptor may become more sensitive over time	Currently it is unclear as to the duration of the construction phase. However, it will extend over a significant period
Any known specific receptor sensitivities which go beyond the classifications given in the document.	No specific additional receptor sensitivities identified during the baseline

8.4.1.17 Based on the criteria shown in Table 8-18, the sensitivity of the receiving environment to potential dust soiling impacts is considered to be high. This is because users would expect to enjoy a reasonable level of amenity, aesthetics or value of their property could be diminished by soiling and people would be expected to be present for extended periods of time e.g. residential properties.

8.4.1.18 The sensitivity of the receiving environment to specific dust impacts is shown in Table 8-20.

Table 8-20 Sensitivity of the Surrounding Area to Specific Dust Impacts

Potential Impact	Sensitivity of Surrounding Area			
	Demolition	Earthworks	Construction	Trackout
Dust Soiling	High	High	High	Medium
Human Health	Low	Low	Low	Low
Ecological	Medium	Medium	Medium	Medium

Operational Phase Emissions - Human Receptors

8.4.1.19 Human receptors sensitive to potential road vehicle exhaust and Energy Centre emission impacts were identified from a desk top study and are summarised in Table 8-21. Reference should be made to Drawing 8-4 for a map of operational phase emission human receptor locations.

Table 8-21 Operational Phase Emissions - Human Sensitive Receptors

Receptor		NGR (m)	
		X	Y
R1	Residential - Ardley Road, Bucknell	455941	225647
R2	Residential - Bicester Road, Bucknell	455952	225569
R3	Residential - Middleton Road, Bucknell	455770	225504
R4	Residential - Swallofield Farm	455191	224952
R5	Residential - Lovelynch House	455426	223131
R6	Residential - A4095, Chesterton	455756	221656
R7	Residential - B4100, Watergate Lodge	457252	226297
R8	Residential - Fringford Road, Old School Close	458643	225146
R9	Residential - Fringford Road, Bricknells Farm	458448	224757
R10	Residential - A4421	459464	225338
R11	Residential - A4421, Harmon Close	459211	224880
R12	Residential - Pine Close	458936	224316
R13	Residential - Juniper Gardens	458208	224460
R14	Residential - Mullein Road	458144	224415
R15	Residential - Trefoil Drive	457402	224005
R16	Residential - Goldsmith Close	457188	223851
R17	Residential - Chaucer Close	456961	223612
R18	Kings Meadow School	457050	223408
R19	Residential - Wensum Crescent	456619	223133
R20	Residential - Isis Avenue	456435	222804
R21	Residential - Shannon Road	456924	222626
R22	Residential - St Marys Close	457521	222372
R23	Bicester Community Hospital	457982	222342
R24	Brookside Primary School	458023	223008
R25	Residential - North Street	458276	222932
R26	Residential - Manor Farm	460386	222898
R27	Residential - Bucknell Road	458195	222841
R28	Residential - Queens Crescent	458099	222604
R29	Residential - Kings End	458024	222469
R30	Residential - Kestrel Way	459190	221258

R31	Residential - Shearwater Drive	459972	221840
R32	Residential - Sunderland Drive	459384	224033
R33	Residential - Derwent Road	456772	223360

8.4.1.20 The human sensitive receptors identified in Table 8-21 represent worst case locations. However, this is not an exhaustive list and there may be other locations within the vicinity of the Site that may experience air quality impacts as a result of the Development that have not been individually identified above.

Operational Phase Emissions - Ecological Receptors

8.4.1.21 Ecological receptors sensitive to potential road vehicle exhaust and Energy Centre emission impacts were identified from a desk top study and are summarised in Table 8-22. Reference should be made to Drawing 8-4 for a map of operational phase ecological receptor locations.

Table 8-22 Operational Phase Emissions - Ecological Receptors

Receptor		NGR (m)	
		X	Y
ER1	Ardley Cutting and Quarry SSSI	454952	225914
ER2	Ardley Cutting and Quarry SSSI	454987	225887
ER3	Ardley Cutting and Quarry SSSI	455576	225321
ER4	Ardley Cutting and Quarry SSSI	455585	225308
ER5	Bure Park LNR	457623	224175

8.4.1.22 It should be noted that during the desk-top study, Ardley Trackways SSSI was also identified as a statutory designation in the vicinity of the Development. However, as this is a geological site, it is not considered sensitive to potential air quality impacts and so has not been assessed further within this chapter.

8.4.1.23 The ecological sensitive receptors identified in Table 8-22 represent worst-case locations and were selected based on the closest point of the designation to each relevant road link. However, this is not an exhaustive list and there may be other locations within the vicinity of the site that may experience air quality impacts as result of the Development that have not been individually identified above.

8.4.1.24 Existing nitrogen deposition rates and critical loads for each ecological receptor location are shown in Table 8-23.

Table 8-23 Baseline Ecological Receptor Conditions

Receptor	Nitrogen Deposition (kgN/ha/yr)		
	Baseline	Critical Load	
		Min	Max

ER1	24.57	15	25
ER2	24.57	15	25
ER3	24.57	15	25
ER4	24.57	15	25
ER5	24.57	10	20

8.4.1.25 As indicated in Table 8-23, nitrogen deposition is high at all receptor locations, with exceedences of the minimum critical loads as a baseline condition.

8.4.1.26 Ecological receptor sensitivity was defined based upon the methodology outlined in Table 8-8. These are detailed with Table 8-24.

Table 8-24 Operational Phase Emissions - Ecological Receptor Sensitivity

Receptor		Sensitivity
ER1	Ardley Cutting and Quarry SSSI	High
ER2	Ardley Cutting and Quarry SSSI	High
ER3	Ardley Cutting and Quarry SSSI	High
ER4	Ardley Cutting and Quarry SSSI	High
ER6	Bure Park LNR	Low

8.4.2 Future Baseline

8.4.2.1 Future baseline conditions have been predicted through dispersion modelling as detailed previously. Concentrations and deposition rates at the receptor locations are detailed in the assessment Sections below.

8.5 Design and Mitigation

8.5.1 Construction Approach and Mitigation of Short-Term Construction Effects

8.5.1.1 The IAQM guidance (Ref 8-8) provides a number of potential mitigation measures to reduce impacts during the construction phase. These measures have been adapted for the Development as summarised in Table 8-25. These may be reviewed prior to the commencement of construction works and incorporated into a Construction Environmental Management Plan if required by the LA.

Table 8-25 Fugitive Dust Mitigation Measures

Issue	Control Measure
Communications	<ul style="list-style-type: none"> Develop and implement a Stakeholder Communications Plan that includes community engagement Display the name and contact details of person(s) accountable for air

	<p>quality and dust issues on the site boundary</p> <ul style="list-style-type: none"> • Display the head or regional office contact information • Develop and implement a Dust Management Plan (DMP), which may include measures to control other emissions, approved by the LA
Site Management	<ul style="list-style-type: none"> • Record all dust and air quality complaints • Record any exceptional incidents that cause dust/or air emissions, and the action taken to resolve the situation
Monitoring	<ul style="list-style-type: none"> • Undertake daily on-site and off-site inspection to monitor dust. • Carry out regular site inspections to monitor compliance with the DMP • Increase frequency of site inspections when activities with a high potential to produce dust are being carried out
Preparing and Maintaining the Site	<ul style="list-style-type: none"> • Plan site layout so that machinery and dust causing activities are located away from receptors, as far as is possible • Fully enclose site or specific operations where there is a high potential for dust production and the site as activities for an extensive period • Avoid site runoff of water or mud • Use dust as water suppressant where applicable • Remove materials that have a potential to produce dust from site as soon as possible • Cover, seed or fence stockpiles to prevent wind whipping
Operating Vehicle/ Machinery and Sustainable Travel	<ul style="list-style-type: none"> • All vehicles to switch of engines - no idling vehicles • Avoid the use of diesel or petrol powered generators where practicable • Impose a maximum-speed-limit of 15mph on surfaced and 10mph on un-surfaced haul roads and work areas • Produce a Construction Logistics Plan to manage deliveries • Implement a Travel Plan that supports and encourages sustainable travel
Operations	<ul style="list-style-type: none"> • Cutting equipment to use water as dust suppressant or suitable local extract ventilation • Use enclosed chutes and covered skips • Minimise drop heights • Ensure equipment is readily available on site to clean any spillages
Waste Management	<ul style="list-style-type: none"> • No bonfires
Earthworks and Construction	<ul style="list-style-type: none"> • Re-vegetate earthworks and exposed areas • Use Hessian, mulches or trackifiers where it is not possible to re-vegetate • Only remove the cover in small areas during work and not all at once • Avoid scabbling • Ensure sand and other aggregates are stored and not able to dry out • Ensure bulk cement and other fine power materials are delivered and stored to prevent escape

Trackout	<ul style="list-style-type: none"> • Use water-assisted dust sweeper on the access and local roads • Avoid dry sweeping of large areas • Ensure vehicles entering and leaving sites are covered to prevent escape of materials • Inspect on-site routes for integrity, instigate necessary repairs and record in site log book • Implement a wheel washing system at a suitable location near site exit • Access gates 10m from receptors where possible
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8.5.2 Scheme Design and Mitigation of Permanent Operational Effects

8.5.2.1 A suitable stack for dispersion of NO_x emissions from the Energy Centre has been included within the proposals in order to control operational air quality impacts to an acceptable level.

8.5.2.2 A Travel Plan has been produced to promote sustainable transport modes and reduce single-occupancy vehicle trips. Reference should be made to Chapter 16 for further details of the Transport Assessment and associated Travel Plan.

8.6 Construction Impacts

8.6.1.1 During the construction phase of the proposed Development there is the potential for air quality impacts as a result of fugitive dust emissions. These are assessed below.

8.6.2 Step 1

8.6.2.1 The undertaking of activities such as demolition, excavation, ground works, cutting, construction, concrete batching and storage of materials has the potential to result in fugitive dust emissions throughout the construction phase. Vehicle movements both on-site and on the local road network also have the potential to result in the re-suspension of dust from haul road and highway surfaces.

8.6.2.2 The potential for impacts at sensitive locations depends significantly on local meteorology during the undertaking of dust generating activities, with the most significant effects likely to occur during dry and windy conditions.

8.6.2.3 The desk-study undertaken to inform the baseline identified a number of sensitive receptors within 350m of the site boundary. As such, a detailed assessment of potential dust impacts has been undertaken.

8.6.3 Step 2

Demolition

8.6.3.1 Demolition would involve the removal of existing buildings at the Site. It is anticipated that the volume of building to be demolished is likely to be less than

20,000m³. As such, the magnitude of potential dust emissions from demolition activities is considered small, in accordance with the criteria outlined in Table 8-9.

8.6.3.2 Table 8-20 indicates the sensitivity of the area to dust soiling effects on people and property is high. In accordance with the criteria outlined in Table 8-10, the Development is considered to be medium risk for dust soiling as a result of demolition activities.

8.6.3.3 Table 8-20 indicates the sensitivity of the area to human health is low. In accordance with the criteria outlined in Table 8-10, the Development is considered to be negligible risk for human health as a result of demolition activities.

8.6.3.4 Table 8-20 indicated the sensitivity of the area to ecological impacts is medium. In accordance with the criteria outlined in Table 8-10, the Development is considered to be a low risk site for ecological impacts as a result of demolition activities.

Earthworks

8.6.3.5 Earthworks would primarily involve excavating material, haulage, tipping and stockpiling, as well as site levelling and landscaping. The Site covers an area greater than 10,000m². In accordance with the criteria outlined in Table 8-9, the magnitude of potential dust emissions from earthworks is therefore large.

8.6.3.6 Table 8-20 indicates the sensitivity of the area to dust soiling effects on people and property is high. In accordance with the criteria outlined in Table 8-11, the Development is considered to be high risk for dust soiling as a result of earthworks activities.

8.6.3.7 Table 8-20 indicates the sensitivity of the area to human health is low. In accordance with the criteria outlined in Table 8-11, the Development is considered to be low risk for human health as a result of earthwork activities.

8.6.3.8 Table 8-20 indicated the sensitivity of the area to ecological impacts is medium. In accordance with the criteria outlined in Table 8-11, the Development is considered to be a medium risk site for ecological impacts as a result of earthworks activities.

Construction

8.6.3.9 Due to the size of the Site, the total building volume is likely to be greater than 100,000m³. In accordance with the criteria outlined in Table 8-9, the magnitude of potential dust emissions from construction is therefore high.

8.6.3.10 Table 8-20 indicates the sensitivity of the area to dust soiling effects on people and property is high. In accordance with the criteria outlined in Table 8-11, the Development is considered to be high risk for dust soiling as a result of construction activities.

- 8.6.3.11 Table 8-20 indicates the sensitivity of the area to human health is low. In accordance with the criteria outlined in Table 8-11, the Development is considered to be low risk for human health as a result of construction activities.
- 8.6.3.12 Table 8-20 indicated the sensitivity of the area to ecological impacts is medium. In accordance with the criteria outlined in Table 8-11, the Development is considered to be a medium risk site for ecological impacts as a result of construction activities.

Trackout

- 8.6.3.13 Information on the number of HDV trips to be generated during the construction phase of the Development was not available from the transport consultants at the time of assessment.
- 8.6.3.14 Based on the Site area, it is anticipated that the unpaved road length is likely to be greater than 100m. In accordance with the criteria outlined in Table 8-9, the magnitude of potential dust emissions from trackout is therefore large.
- 8.6.3.15 Table 8-20 indicates the sensitivity of the area to dust soiling effects on people and property is medium. In accordance with the criteria outlined in Table 8-12, the Development is considered to be medium risk for dust soiling as a result of trackout activities.
- 8.6.3.16 Table 8-20 indicates the sensitivity of the area to human health is low. In accordance with the criteria outlined in Table 8-12, the Development is considered to be low risk for human health as a result of trackout activities.
- 8.6.3.17 Table 8-20 indicated the sensitivity of the area to ecological impacts is medium. In accordance with the criteria outlined in table 8-12, the Development is considered to be a medium risk site for ecological impacts as a result of construction activities.

Summary of the Risk of Dust Effects

- 8.6.3.18 A summary of the potential risk from each dust generating activity is provided in Table 8-26.

Table 8-26 Summary of Potential Unmitigated Dust Risks

Potential Impact	Risk			
	Demolition	Earthworks	Construction	Trackout
Dust Soiling	Medium	High	High	Medium
Human Health	Negligible	Low	Low	Low
Ecological	Low	Medium	Medium	Medium

- 8.6.3.19 As indicated in Table 8-26, the potential risk of dust soiling is high from earthworks and construction and medium from demolition and trackout. The potential risk of human health impacts is low for earthworks, construction and trackout and negligible for demolition. The potential risk to ecological areas is

low for demolition and medium for earthworks, construction and trackout activities.

- 8.6.3.20 It should be noted that the potential for impacts depends significantly on the distance between the dust generating activity and receptor location. Risk has been predicted based on a worst-case scenario of works being undertaken at the Site boundary closest to each sensitive area. Therefore, actual risk is likely to be lower than that predicted during the majority of the construction phase.

8.6.4 Step 3

- 8.6.4.1 Mitigation options for the Site have previously been summarised in Table 8-25.

8.6.5 Step 4

- 8.6.5.1 Assuming the relevant mitigation measures are implemented, the residual impact from all dust generating activities is predicted to be neutral, in accordance with IAQM guidance (Ref 8-8).
- 8.6.5.2 As the assessment of potential dust impacts has been undertaken using worst-case assumptions and in accordance with IAQM guidance (Ref 8-8), confidence in this prediction is high.

8.7 Permanent Operational Impacts

- 8.7.1.1 Additional vehicle movements associated with the operation of the proposed Development would generate exhaust emissions on the local and regional road networks. Additionally, atmospheric emissions from the Energy Centre may cause air quality impacts in the vicinity of the Site. An assessment was therefore undertaken using dispersion modelling in order to quantify potential changes in pollutant concentrations at sensitive locations.

- 8.7.1.2 The assessment considered the following scenarios:

- Do-minimum; and,
- Do-something.

- 8.7.1.3 The "do-minimum" (i.e. without Development) scenario was representative of baseline traffic data for 2031. The "do-something" scenario was representative of baseline traffic data for 2031 in addition to predicted operational traffic associated with the Development and emissions from the Energy Centre.

8.7.2 Human Receptors

Nitrogen Dioxide

- 8.7.2.1 Annual mean NO₂ concentrations were predicted for each scenario and are summarised in Table 8-27. It should be noted that the do-something results include the NO₂ contribution from both road traffic and Energy Centre emissions. Reference should be made to Drawing 8-5 and 8-6 for graphical representations of predicted NO₂ concentrations.

Table 8-27 Predicted Annual Mean NO₂ Concentrations - Operational Phase

Receptor		Predicted 2031 Annual Mean NO ₂ Concentration (µg/m ³)			Predicted Change as a Proportion of the AQO (%)
		Do-Min	Do-Some	Change	
R1	Residential - Ardley Road, Bucknell	15.23	15.35	0.12	0.31
R2	Residential - Bicester Road, Bucknell	15.25	15.61	0.37	0.91
R3	Residential - Middleton Road, Bucknell	15.05	15.27	0.22	0.54
R4	Residential - Swallofield Farm	17.92	18.20	0.28	0.70
R5	Residential - Lovelynych House	16.33	16.37	0.04	0.10
R6	Residential - A4095, Chesterton	17.98	18.09	0.11	0.28
R7	Residential - B4100, Watergate Lodge	17.14	17.24	0.10	0.25
R8	Residential - Fringford Road, Old School Close	14.39	14.65	0.26	0.66
R9	Residential - Fringford Road, Bricknells Farm	14.62	15.01	0.38	0.96
R10	Residential - A4421	17.16	17.36	0.20	0.49
R11	Residential - A4421, Harmon Close	15.86	16.07	0.21	0.53
R12	Residential - Pine Close	18.45	18.77	0.33	0.82
R13	Residential - Juniper Gardens	20.66	21.26	0.60	1.50
R14	Residential - Mullein Road	17.25	17.87	0.61	1.53
R15	Residential - Trefoil Drive	16.55	17.39	0.85	2.12
R16	Residential - Goldsmith Close	17.49	17.98	0.49	1.22
R17	Residential - Chaucer Close	17.26	17.49	0.23	0.58
R18	Kings Meadow School	14.42	14.61	0.19	0.47
R19	Residential - Wensum Crescent	18.04	18.02	-0.03	-0.06
R20	Residential - Isis Avenue	19.08	19.01	-0.07	-0.19
R21	Residential - Shannon Road	15.55	15.77	0.21	0.53
R22	Residential - St Marys Close	16.67	16.79	0.12	0.31
R23	Bicester Community Hospital	24.89	25.23	0.34	0.86
R24	Brookside Primary School	14.90	15.02	0.13	0.32
R25	Residential - North Street	30.47	31.08	0.61	1.53
R26	Residential - Manor Farm	16.31	16.35	0.04	0.10
R27	Residential - Bucknell Road	23.13	23.49	0.36	0.90
R28	Residential - Queens Crescent	22.45	22.74	0.28	0.71
R29	Residential - Kings End	22.59	22.87	0.28	0.70

R30	Residential - Kestrel Way	22.72	22.92	0.20	0.51
R31	Residential - Shearwater Drive	16.17	16.26	0.09	0.21
R32	Residential - Sunderland Drive	16.78	16.90	0.12	0.30
R33	Residential - Derwent Road	16.44	16.38	-0.06	-0.15

8.7.2.2 As indicated in Table 8-27, predicted NO₂ concentrations were below the AQO at all receptors in both scenarios considered. It should be noted that pollution levels are predicted to reduce at some locations due to variations in traffic flow as a result of the proposals.

8.7.2.3 Predicted impacts on annual mean NO₂ concentrations at the sensitive receptor locations are summarised in Table 8-28. These were calculated based on the criteria shown in Table 8-13 and Table 8-14.

Table 8-28 Predicted Annual Mean NO₂ Impacts - Operational Phase

Receptor		Magnitude of Change	Predicted Concentration	Significance of Impact
R1	Residential - Ardley Road, Bucknell	Imperceptible	Well Below Objective	Negligible
R2	Residential - Bicester Road, Bucknell	Imperceptible	Well Below Objective	Negligible
R3	Residential - Middleton Road, Bucknell	Imperceptible	Well Below Objective	Negligible
R4	Residential - Swallofield Farm	Imperceptible	Well Below Objective	Negligible
R5	Residential - Lovelynych House	Imperceptible	Well Below Objective	Negligible
R6	Residential - A4095, Chesterton	Imperceptible	Well Below Objective	Negligible
R7	Residential - B4100, Watergate Lodge	Imperceptible	Well Below Objective	Negligible
R8	Residential - Fringford Road, Old School Close	Imperceptible	Well Below Objective	Negligible
R9	Residential - Fringford Road, Bricknells Farm	Imperceptible	Well Below Objective	Negligible
R10	Residential - A4421	Imperceptible	Well Below Objective	Negligible
R11	Residential - A4421, Harmon Close	Imperceptible	Well Below Objective	Negligible
R12	Residential - Pine Close	Imperceptible	Well Below Objective	Negligible
R13	Residential - Juniper Gardens	Small	Well Below Objective	Negligible

R14	Residential - Mullein Road	Small	Well Below Objective	Negligible
R15	Residential - Trefoil Drive	Small	Well Below Objective	Negligible
R16	Residential - Goldsmith Close	Small	Well Below Objective	Negligible
R17	Residential - Chaucer Close	Imperceptible	Well Below Objective	Negligible
R18	Kings Meadow School	Imperceptible	Well Below Objective	Negligible
R19	Residential - Wensum Crescent	Imperceptible	Well Below Objective	Negligible
R20	Residential - Isis Avenue	Imperceptible	Well Below Objective	Negligible
R21	Residential - Shannon Road	Imperceptible	Well Below Objective	Negligible
R22	Residential - St Marys Close	Imperceptible	Well Below Objective	Negligible
R23	Bicester Community Hospital	Imperceptible	Well Below Objective	Negligible
R24	Brookside Primary School	Imperceptible	Well Below Objective	Negligible
R25	Residential - North Street	Small	Below Objective	Negligible
R26	Residential - Manor Farm	Imperceptible	Well Below Objective	Negligible
R27	Residential - Bucknell Road	Imperceptible	Well Below Objective	Negligible
R28	Residential - Queens Crescent	Imperceptible	Well Below Objective	Negligible
R29	Residential - Kings End	Imperceptible	Well Below Objective	Negligible
R30	Residential - Kestrel Way	Imperceptible	Well Below Objective	Negligible
R31	Residential - Shearwater Drive	Imperceptible	Well Below Objective	Negligible
R32	Residential - Sunderland Drive	Imperceptible	Well Below Objective	Negligible
R33	Residential - Derwent Road	Imperceptible	Well Below Objective	Negligible

8.7.2.4 As indicated in Table 8-28, the significance of impacts as a result of the Development was predicted to be negligible at all receptor locations. It should be noted that the predicted change in pollutant concentrations was based on

emissions associated with both road traffic and the Energy Centre and therefore provides a robust assessment scenario.

Particulate Matter

8.7.2.5 Annual mean PM₁₀ concentrations were predicted for each scenario and are summarised in Table 8-29. Reference should be made to Drawing 8-8 and 8-9 for graphical representations of predicted PM₁₀ concentrations.

Table 8-29 Predicted Annual Mean PM₁₀ Concentrations - Operational Phase

Receptor		Predicted 2031 Annual Mean PM ₁₀ Concentration (µg/m ³)			Predicted Change as a Proportion of the AQO (%)
		Do-Min	Do-Some	Change	
R1	Residential - Ardley Road, Bucknell	16.70	16.73	0.02	0.06
R2	Residential - Bicester Road, Bucknell	16.67	16.72	0.05	0.12
R3	Residential - Middleton Road, Bucknell	16.61	16.70	0.08	0.21
R4	Residential - Swallofield Farm	17.13	17.24	0.11	0.28
R5	Residential - Lovelynych House	16.95	16.92	-0.03	-0.07
R6	Residential - A4095, Chesterton	17.36	17.39	0.03	0.08
R7	Residential - B4100, Watergate Lodge	17.18	17.20	0.02	0.05
R8	Residential - Fringford Road, Old School Close	16.53	16.53	0.01	0.01
R9	Residential - Fringford Road, Bricknells Farm	16.55	16.56	0.01	0.02
R10	Residential - A4421	17.23	17.25	0.02	0.06
R11	Residential - A4421, Harmon Close	16.89	16.90	0.02	0.04
R12	Residential - Pine Close	17.05	17.09	0.04	0.10
R13	Residential - Juniper Gardens	17.29	17.32	0.02	0.06
R14	Residential - Mullein Road	16.89	16.91	0.02	0.05
R15	Residential - Trefoil Drive	16.96	16.92	-0.04	-0.09
R16	Residential - Goldsmith Close	16.93	16.91	-0.02	-0.06
R17	Residential - Chaucer Close	17.18	17.13	-0.04	-0.11
R18	Kings Meadow School	16.50	16.51	0.01	0.02
R19	Residential - Wensum Crescent	17.44	17.36	-0.07	-0.18
R20	Residential - Isis Avenue	17.20	17.16	-0.03	-0.09
R21	Residential - Shannon Road	16.68	16.71	0.03	0.08
R22	Residential - St Marys Close	17.03	17.06	0.03	0.08
R23	Bicester Community Hospital	17.89	17.96	0.06	0.15

R24	Brookside Primary School	16.55	16.56	0.01	0.04
R25	Residential - North Street	18.25	18.34	0.09	0.23
R26	Residential - Manor Farm	16.71	16.71	0.01	0.01
R27	Residential - Bucknell Road	17.53	17.59	0.06	0.15
R28	Residential - Queens Crescent	17.59	17.64	0.05	0.12
R29	Residential - Kings End	17.59	17.64	0.05	0.13
R30	Residential - Kestrel Way	17.66	17.70	0.04	0.11
R31	Residential - Shearwater Drive	16.99	17.02	0.03	0.07
R32	Residential - Sunderland Drive	17.05	17.06	0.01	0.03
R33	Residential - Derwent Road	17.03	16.98	-0.04	-0.11

8.7.2.6 As indicated in Table 8-29, predicted PM₁₀ concentrations were below the relevant AQO at all receptor locations for both scenarios considered. It should be noted that pollution levels are predicted to reduce at some locations due to variations in traffic flow as a result of the proposals.

8.7.2.7 Predicted impacts on annual mean PM₁₀ concentrations at the sensitive receptor locations are summarised in Table 8-30. These were calculated based on the criteria shown in Table 8-13 and Table 8-14.

Table 8-30 Predicted Annual Mean PM₁₀ Concentrations - Operational Phase

Receptor		Magnitude of Change	Predicted Concentration	Significance of Impact
R1	Residential - Ardley Road, Bucknell	Imperceptible	Well Below Objective	Negligible
R2	Residential - Bicester Road, Bucknell	Imperceptible	Well Below Objective	Negligible
R3	Residential - Middleton Road, Bucknell	Imperceptible	Well Below Objective	Negligible
R4	Residential - Swallofield Farm	Imperceptible	Well Below Objective	Negligible
R5	Residential - Lovelynych House	Imperceptible	Well Below Objective	Negligible
R6	Residential - A4095, Chesterton	Imperceptible	Well Below Objective	Negligible
R7	Residential - B4100, Watergate Lodge	Imperceptible	Well Below Objective	Negligible
R8	Residential - Fringford Road, Old School Close	Imperceptible	Well Below Objective	Negligible
R9	Residential - Fringford Road, Bricknells Farm	Imperceptible	Well Below Objective	Negligible
R10	Residential - A4421	Imperceptible	Well Below	Negligible

			Objective	
R11	Residential - A4421, Harmon Close	Imperceptible	Well Below Objective	Negligible
R12	Residential - Pine Close	Imperceptible	Well Below Objective	Negligible
R13	Residential - Juniper Gardens	Imperceptible	Well Below Objective	Negligible
R14	Residential - Mullein Road	Imperceptible	Well Below Objective	Negligible
R15	Residential - Trefoil Drive	Imperceptible	Well Below Objective	Negligible
R16	Residential - Goldsmith Close	Imperceptible	Well Below Objective	Negligible
R17	Residential - Chaucer Close	Imperceptible	Well Below Objective	Negligible
R18	Kings Meadow School	Imperceptible	Well Below Objective	Negligible
R19	Residential - Wensum Crescent	Imperceptible	Well Below Objective	Negligible
R20	Residential - Isis Avenue	Imperceptible	Well Below Objective	Negligible
R21	Residential - Shannon Road	Imperceptible	Well Below Objective	Negligible
R22	Residential - St Marys Close	Imperceptible	Well Below Objective	Negligible
R23	Bicester Community Hospital	Imperceptible	Well Below Objective	Negligible
R24	Brookside Primary School	Imperceptible	Well Below Objective	Negligible
R25	Residential - North Street	Imperceptible	Well Below Objective	Negligible
R26	Residential - Manor Farm	Imperceptible	Well Below Objective	Negligible
R27	Residential - Bucknell Road	Imperceptible	Well Below Objective	Negligible
R28	Residential - Queens Crescent	Imperceptible	Well Below Objective	Negligible
R29	Residential - Kings End	Imperceptible	Well Below Objective	Negligible
R30	Residential - Kestrel Way	Imperceptible	Well Below Objective	Negligible
R31	Residential - Shearwater Drive	Imperceptible	Well Below Objective	Negligible

R32	Residential - Sunderland Drive	Imperceptible	Well Below Objective	Negligible
R33	Residential - Derwent Road	Imperceptible	Well Below Objective	Negligible

8.7.2.8 As indicated in Table 8-30, predicted impacts on annual mean PM₁₀ concentrations as a result of the Development were predicted to be negligible at all receptor locations.

Overall Impact Significance

8.7.2.9 The overall significance of operational phase emission impacts on human receptors was determined as negligible. This was based on the most significant predicted impact at discrete receptor locations and the considerations outlined previously. Further justification is provided in Table 8-31.

Table 8-31 Overall Operational Phase Emission Impact Significance - Human Receptors

Guidance	Comment
Number of properties affected by slight, moderate or substantial air quality impacts and a judgement on the overall balance	Air quality impacts were predicted to be negligible at all receptor locations. These represent worst-case locations and therefore it is unlikely that any other sensitive receptors would be significantly affected by the proposed Development
Where new exposure is introduced into an existing area of poor air quality, then the number of people exposed to levels above the objective or limit value will be relevant	The Development includes the provision of residential units. As shown in Drawing 8-6 and 8-9, pollutant concentrations at these locations are predicted to be below the relevant AQOs during the operational phase. As such, new receptors will not be introduced to poor air quality
The magnitude of changes and the descriptions of the impacts at the receptors	A small increase in annual mean NO ₂ concentrations was predicted at five receptors. However, these were considered to be of negligible significance due to the magnitude of predicted concentrations at the relevant locations An imperceptible increase in annual mean PM ₁₀ concentrations was predicted at all receptor locations. As such, the resultant impact significance was negligible
Whether or not an exceedence of an objective or limit value is predicted to arise in the study area where none existed before or an exceedence area is substantially increased	There were no predicted exceedences of the annual mean AQOs for NO ₂ or PM ₁₀ at any receptor location either with or without the Development
Whether or not the study area exceeds an objective or limit value and this exceedence is removed or the exceedence area is reduced	There were no predicted exceedences of the annual mean AQOs for NO ₂ or PM ₁₀ at any receptor location either with or without the Development
The extent to which an objective or limit value is exceeded e.g. an annual mean NO ₂ concentration	There were no predicted exceedences of the annual mean AQOs for NO ₂ or PM ₁₀ at any

of 41µg/m ³ should attract less significance than an annual mean of 51µg/m ³	receptor location either with or without the Development
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8.7.2.10 As the assessment of potential impacts resulting from operational phase emissions has been undertaken using dispersion modelling, adopted worst-case assumptions and was in accordance with the EPUK guidance document (Ref: 8-9), confidence in this prediction is high.

8.7.3 Ecological Receptors

Oxides of Nitrogen

8.7.3.1 Annual mean NO_x concentrations were predicted at the ecological receptors for each scenario and are summarised in Table 8-32. Exceedences of the critical level are shown in **bold** text. It should be noted that the do-something results include the NO_x contribution from both road traffic and Energy Centre emissions.

Table 8-32 Predicted Annual Mean NO_x Concentrations - Operational Phase

Receptor		Predicted 3031 Annual Mean NO _x Concentration (µg/m ³)			Predicted Change as a Proportion of Critical Level (%)
		Do-Min	Do-Some	Change	
ER1	Ardley Cutting and Quarry SSSI	30.52	30.71	0.19	0.63
ER2	Ardley Cutting and Quarry SSSI	39.98	40.19	0.21	0.69
ER3	Ardley Cutting and Quarry SSSI	19.97	20.39	0.42	1.39
ER4	Ardley Cutting and Quarry SSSI	19.98	20.54	0.56	1.86
ER5	Bure Park LNR	19.36	19.99	0.64	2.12

8.7.3.2 As indicated in Table 8-32, NO_x concentrations were predicted to exceed the critical level at receptors ER1 and ER2 in both scenarios. This is as a result of the high pollutant levels at these locations due to the proximity of the M40.

8.7.3.3 Predicted impacts on annual mean NO_x concentrations at the ecological receptors are summarised in Table 8-33.

Table 8-33 Predicted Annual Mean NO_x Impacts - Operational Phase

Receptor		Magnitude of Change	Receptor Sensitivity	Significance of Impact
ER1	Ardley Cutting and Quarry SSSI	Imperceptible	High	Negligible
ER2	Ardley Cutting and Quarry SSSI	Imperceptible	High	Negligible
ER3	Ardley Cutting and Quarry SSSI	Small	High	Slight
ER4	Ardley Cutting and Quarry SSSI	Small	High	Slight

ER5	Bure Park LNR	Small	Low	Negligible
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8.7.3.4 As indicated in Table 8-33, the significance of impacts as a result of the Development was predicted to be negligible at three receptors and slight adverse at two locations. It should be noted that the relevant critical level was not predicted to be exceeded at the two locations where slight adverse impacts were predicted. Additionally, the Highways Agency's Design Manual for Roads and Bridges (DMRB) guidance (Ref 8-15) indicates that increases in annual mean NO_x concentrations at ecological designations of less than 2µg/m³ are not considered significant and can be screened out of an assessment. As such, the predicted impacts are considered acceptable in the context of the Development.

Nitrogen Deposition

8.7.3.5 Annual nitrogen deposition rates were predicted at the ecological receptors for each scenario and are summarised in Table 8-34. It should be noted that the do-something results include the nitrogen deposition contribution from both road traffic and Energy Centre emissions.

Table 8-34 Predicted Annual Nitrogen Deposition Rates - Operational Phase

Receptor		Predicted 2031 Annual Nitrogen Deposition (kgN/ha/yr)			Predicted Change as a Proportion of Critical Load (%)	
		Do-Min	Do-Some	Change	Minimum Critical Load	Maximum Critical Load
ER1	Ardley Cutting and Quarry SSSI	27.42	27.45	0.021	0.14	0.09
ER2	Ardley Cutting and Quarry SSSI	30.60	30.62	0.024	0.16	0.10
ER3	Ardley Cutting and Quarry SSSI	26.80	26.84	0.036	0.24	0.14
ER4	Ardley Cutting and Quarry SSSI	26.80	26.85	0.047	0.31	0.19
ER5	Bure Park LNR	26.95	27.05	0.103	1.03	0.51

8.7.3.6 As indicated in Table 8-34, nitrogen deposition rates were predicted to exceed the critical levels at receptors ER1, ER2 and ER5 in both scenarios. This is due to the high baseline deposition rates at these locations, which is indicative of much of the UK.

8.7.3.7 Predicted impacts on nitrogen deposition rates at the ecological receptors are summarised in Table 8-35.

Table 8-35 Predicted Annual Nitrogen Deposition Impacts - Operational Phase

Receptor		Magnitude of Change	Receptor Sensitivity	Significance of Impact
ER1	Ardley Cutting and Quarry SSSI	Imperceptible	High	Negligible
ER2	Ardley Cutting and Quarry SSSI	Imperceptible	High	Negligible
ER3	Ardley Cutting and Quarry SSSI	Imperceptible	High	Negligible
ER4	Ardley Cutting and Quarry SSSI	Imperceptible	High	Negligible
ER5	Bure Park LNR	Small	Low	Negligible

8.7.3.8 As indicated in Table 8-33, the significance of impacts on annual nitrogen deposition as a result of the Development was predicted to be negligible at all ecological receptors.

8.8 Cumulative Impacts

8.8.1 Construction Impacts

8.8.1.1 The Bicester Eco Development is split into four phases: Exemplar Site, Application 1 (North of Railway Line), Application 2 (South of Railway Line) and A4095 NW Strategic Link Road. Should the construction phase programmes overlap then there is the potential for increases in dust impacts at sensitive locations in the vicinity of the site. However, these may only occur if significant dust generating activities are undertaken within 350m of each other. Given the size of the Site it is not anticipated these conditions would occur on a regular basis. Additionally, suitable mitigation for each development phase would be implemented to control emissions at source. As such, the cumulative air quality impacts associated with fugitive dust emissions during construction are considered to be of neutral significance.

8.8.2 Permanent Operational Impacts

8.8.2.1 Additional vehicle movements associated with the operation of other committed and proposed developments would generate exhaust emissions on the local and regional road networks. Additionally, atmospheric emissions from the Energy Centres associated with both Application 1 and Application 2 may cause air quality impacts in the vicinity of the Site. An assessment was therefore undertaken using dispersion modelling in order to quantify potential changes in pollutant concentrations as a result of cumulative atmospheric emissions.

8.8.2.2 The assessment considered the following scenarios:

- Do-minimum; and,
- Cumulative.

8.8.2.3 The "do-minimum" (i.e. without Development) scenario was representative of baseline traffic data for 2031. The "do-something" scenario was representative of baseline traffic data for 2031 in addition to anticipated variations in traffic

flows as a result of the proposed Development and other committed developments, as well as emissions from the two Energy Centres.

8.8.2.4 Potential impacts are predicted for human and ecological receptors in the following sections.

Human Receptors

Nitrogen Dioxide

8.8.2.5 Annual mean NO₂ concentrations were predicted for each scenario and are summarised in Table 8-36. Reference should be made to Drawing 8-7 for a graphical representation of predicted NO₂ concentrations.

Table 8-36 Predicted Cumulative Annual Mean NO₂ Concentrations - Operational Phase

Receptor		Predicted 2031 Annual Mean NO ₂ Concentration (µg/m ³)			Predicted Change as a Proportion of the AQO (%)
		Do-Min	Cumulative	Change	
R1	Residential - Ardley Road, Bucknell	15.23	15.48	0.26	0.64
R2	Residential - Bicester Road, Bucknell	15.25	16.11	0.86	2.15
R3	Residential - Middleton Road, Bucknell	15.05	15.56	0.50	1.26
R4	Residential - Swallofield Farm	17.92	18.60	0.68	1.69
R5	Residential - Lovelynych House	16.33	16.83	0.50	1.24
R6	Residential - A4095, Chesterton	17.98	18.24	0.26	0.65
R7	Residential - B4100, Watergate Lodge	17.14	17.33	0.19	0.48
R8	Residential - Fringford Road, Old School Close	14.39	14.73	0.35	0.86
R9	Residential - Fringford Road, Bricknells Farm	14.62	15.11	0.49	1.22
R10	Residential - A4421	17.16	17.49	0.33	0.81
R11	Residential - A4421, Harmon Close	15.86	16.18	0.32	0.80
R12	Residential - Pine Close	18.45	19.08	0.64	1.59
R13	Residential - Juniper Gardens	20.66	21.53	0.88	2.19
R14	Residential - Mullein Road	17.25	18.12	0.86	2.15
R15	Residential - Trefoil Drive	16.55	17.59	1.04	2.60
R16	Residential - Goldsmith Close	17.49	18.38	0.90	2.24
R17	Residential - Chaucer Close	17.26	18.52	1.26	3.16
R18	Kings Meadow School	14.42	15.14	0.72	1.80

R19	Residential - Wensum Crescent	18.04	18.18	0.14	0.34
R20	Residential - Isis Avenue	19.08	19.03	-0.05	-0.13
R21	Residential -Shannon Road	15.55	16.09	0.54	1.35
R22	Residential - St Marys Close	16.67	16.95	0.28	0.71
R23	Bicester Community Hospital	24.89	25.69	0.80	2.01
R24	Brookside Primary School	14.90	15.16	0.26	0.65
R25	Residential - North Street	30.47	31.93	1.46	3.64
R26	Residential - Manor Farm	16.31	16.38	0.08	0.19
R27	Residential - Bucknell Road	23.13	23.99	0.86	2.14
R28	Residential - Queens Crescent	22.45	23.12	0.66	1.66
R29	Residential - Kings End	22.59	23.25	0.66	1.65
R30	Residential - Kestrel Way	22.72	23.20	0.48	1.21
R31	Residential - Shearwater Drive	16.17	16.37	0.19	0.48
R32	Residential - Sunderland Drive	16.78	17.01	0.23	0.58
R33	Residential - Derwent Road	16.44	17.43	0.99	2.48

8.8.2.6 As indicated in Table 8-36, predicted NO₂ concentrations were below the AQO at all receptors in both scenarios considered.

8.8.2.7 Predicted impacts on annual mean NO₂ concentrations at the sensitive receptor locations are summarised in Table 8-37. These were calculated based on the criteria shown in Table 8-13 and Table 8-14.

Table 8-37 Predicted Cumulative Annual Mean NO₂ Impacts - Operational Phase

Receptor		Magnitude of Change	Predicted Concentration	Significance of Impact
R1	Residential - Ardley Road, Bucknell	Imperceptible	Well Below Objective	Negligible
R2	Residential - Bicester Road, Bucknell	Small	Well Below Objective	Negligible
R3	Residential - Middleton Road, Bucknell	Small	Well Below Objective	Negligible
R4	Residential - Swallofield Farm	Small	Well Below Objective	Negligible
R5	Residential - Lovelynych House	Small	Well Below Objective	Negligible
R6	Residential - A4095, Chesterton	Imperceptible	Well Below Objective	Negligible
R7	Residential - B4100, Watergate Lodge	Imperceptible	Well Below Objective	Negligible
R8	Residential - Fringford Road, Old	Imperceptible	Well Below	Negligible

	School Close		Objective	
R9	Residential - Fringford Road, Bricknells Farm	Small	Well Below Objective	Negligible
R10	Residential - A4421	Imperceptible	Well Below Objective	Negligible
R11	Residential - A4421, Harmon Close	Imperceptible	Well Below Objective	Negligible
R12	Residential - Pine Close	Small	Well Below Objective	Negligible
R13	Residential - Juniper Gardens	Small	Well Below Objective	Negligible
R14	Residential - Mullein Road	Small	Well Below Objective	Negligible
R15	Residential - Trefoil Drive	Small	Well Below Objective	Negligible
R16	Residential - Goldsmith Close	Small	Well Below Objective	Negligible
R17	Residential - Chaucer Close	Small	Well Below Objective	Negligible
R18	Kings Meadow School	Small	Well Below Objective	Negligible
R19	Residential - Wensum Crescent	Imperceptible	Well Below Objective	Negligible
R20	Residential - Isis Avenue	Imperceptible	Well Below Objective	Negligible
R21	Residential - Shannon Road	Small	Well Below Objective	Negligible
R22	Residential - St Marys Close	Imperceptible	Well Below Objective	Negligible
R23	Bicester Community Hospital	Small	Well Below Objective	Negligible
R24	Brookside Primary School	Imperceptible	Well Below Objective	Negligible
R25	Residential - North Street	Small	Below Objective	Negligible
R26	Residential - Manor Farm	Imperceptible	Well Below Objective	Negligible
R27	Residential - Bucknell Road	Small	Well Below Objective	Negligible
R28	Residential - Queens Crescent	Small	Well Below Objective	Negligible
R29	Residential - Kings End	Small	Well Below Objective	Negligible
R30	Residential - Kestrel Way	Small	Well Below	Negligible

			Objective	
R31	Residential - Shearwater Drive	Imperceptible	Well Below Objective	Negligible
R32	Residential - Sunderland Drive	Imperceptible	Well Below Objective	Negligible
R33	Residential - Derwent Road	Small	Well Below Objective	Negligible

8.8.2.8 As indicated in Table 8-37, the significance of impacts as a result of the Development was predicted to be negligible at all receptor locations. It is noted that the same impact significance was predicted when only the proposed Development was assessed.

Particulate Matter

8.8.2.9 Annual mean PM₁₀ concentrations were predicted for each scenario and are summarised in Table 8-38. Reference should be made to Drawing 8-10 for a graphical representation of predicted PM₁₀ concentrations.

Table 8-38 Predicted Cumulative Annual Mean PM₁₀ Concentrations - Operational Phase

Receptor		Predicted 2031 Annual Mean PM ₁₀ Concentration (µg/m ³)			Predicted Change as a Proportion of the AQO (%)
		Do-Min	Cumulative	Change	
R1	Residential - Ardley Road, Bucknell	16.70	16.76	0.06	0.15
R2	Residential - Bicester Road, Bucknell	16.67	16.80	0.12	0.31
R3	Residential - Middleton Road, Bucknell	16.61	16.82	0.21	0.51
R4	Residential - Swallofield Farm	17.13	17.41	0.28	0.70
R5	Residential - Lovelynych House	16.95	17.09	0.15	0.37
R6	Residential - A4095, Chesterton	17.36	17.44	0.08	0.20
R7	Residential - B4100, Watergate Lodge	17.18	17.24	0.05	0.13
R8	Residential - Fringford Road, Old School Close	16.53	16.54	0.01	0.04
R9	Residential - Fringford Road, Bricknells Farm	16.55	16.57	0.02	0.04
R10	Residential - A4421	17.23	17.29	0.06	0.15
R11	Residential - A4421, Harmon Close	16.89	16.93	0.04	0.10
R12	Residential - Pine Close	17.05	17.15	0.10	0.26
R13	Residential - Juniper Gardens	17.29	17.36	0.06	0.16

R14	Residential - Mullein Road	16.89	16.94	0.05	0.12
R15	Residential - Trefoil Drive	16.96	16.86	-0.09	-0.23
R16	Residential - Goldsmith Close	16.93	16.88	-0.05	-0.13
R17	Residential - Chaucer Close	17.18	17.08	-0.10	-0.26
R18	Kings Meadow School	16.50	16.52	0.02	0.05
R19	Residential - Wensum Crescent	17.44	17.27	-0.17	-0.42
R20	Residential - Isis Avenue	17.20	17.16	-0.04	-0.09
R21	Residential - Shannon Road	16.68	16.76	0.09	0.21
R22	Residential - St Marys Close	17.03	17.11	0.08	0.20
R23	Bicester Community Hospital	17.89	18.05	0.15	0.38
R24	Brookside Primary School	16.55	16.58	0.04	0.09
R25	Residential - North Street	18.25	18.48	0.23	0.58
R26	Residential - Manor farm	16.71	16.72	0.01	0.03
R27	Residential - Bucknell Road	17.53	17.68	0.15	0.37
R28	Residential - Queens Crescent	17.59	17.71	0.12	0.31
R29	Residential - Kings End	17.59	17.72	0.13	0.31
R30	Residential - Kestrel Way	17.66	17.77	0.11	0.27
R31	Residential - Shearwater Drive	16.99	17.06	0.07	0.18
R32	Residential - Sunderland Drive	17.05	17.09	0.04	0.09
R33	Residential - Derwent Road	17.03	16.93	-0.10	-0.25

8.8.2.10 As indicated in Table 8-38, predicted PM₁₀ concentrations were below the relevant AQO at all receptor locations for both scenarios considered.

8.8.2.11 Predicted impacts on annual mean PM₁₀ concentrations at the sensitive receptor locations are summarised in Table 8-39. These were calculated based on the criteria shown in Table 8-13 and Table 8-14.

Table 8-39 Predicted Cumulative Annual Mean PM₁₀ Concentrations - Operational Phase

Receptor		Magnitude of Change	Predicted Concentration	Significance of Impact
R1	Residential - Ardley Road, Bucknell	Imperceptible	Well Below Objective	Negligible
R2	Residential - Bicester Road, Bucknell	Imperceptible	Well Below Objective	Negligible
R3	Residential - Middleton Road, Bucknell	Imperceptible	Well Below Objective	Negligible
R4	Residential - Swallofield Farm	Imperceptible	Well Below Objective	Negligible
R5	Residential - Lovelynych House	Imperceptible	Well Below	Negligible

			Objective	
R6	Residential - A4095, Chesterton	Imperceptible	Well Below Objective	Negligible
R7	Residential - B4100, Watergate Lodge	Imperceptible	Well Below Objective	Negligible
R8	Residential - Fringford Road, Old School Close	Imperceptible	Well Below Objective	Negligible
R9	Residential - Fringford Road, Bricknells Farm	Imperceptible	Well Below Objective	Negligible
R10	Residential - A4421	Imperceptible	Well Below Objective	Negligible
R11	Residential - A4421, Harmon Close	Imperceptible	Well Below Objective	Negligible
R12	Residential - Pine Close	Imperceptible	Well Below Objective	Negligible
R13	Residential - Juniper Gardens	Imperceptible	Well Below Objective	Negligible
R14	Residential - Mullein Road	Imperceptible	Well Below Objective	Negligible
R15	Residential - Trefoil Drive	Imperceptible	Well Below Objective	Negligible
R16	Residential - Goldsmith Close	Imperceptible	Well Below Objective	Negligible
R17	Residential - Chaucer Close	Imperceptible	Well Below Objective	Negligible
R18	Kings Meadow School	Imperceptible	Well Below Objective	Negligible
R19	Residential - Wensum Crescent	Imperceptible	Well Below Objective	Negligible
R20	Residential - Isis Avenue	Imperceptible	Well Below Objective	Negligible
R21	Residential - Shannon Road	Imperceptible	Well Below Objective	Negligible
R22	Residential - St Marys Close	Imperceptible	Well Below Objective	Negligible
R23	Bicester Community Hospital	Imperceptible	Well Below Objective	Negligible
R24	Brookside Primary School	Imperceptible	Well Below Objective	Negligible
R25	Residential - North Street	Imperceptible	Well Below Objective	Negligible
R26	Residential - Manor Farm	Imperceptible	Well Below Objective	Negligible

R27	Residential - Bucknell Road	Imperceptible	Well Below Objective	Negligible
R28	Residential - Queens Crescent	Imperceptible	Well Below Objective	Negligible
R29	Residential - Kings End	Imperceptible	Well Below Objective	Negligible
R30	Residential - Kestrel Way	Imperceptible	Well Below Objective	Negligible
R31	Residential - Shearwater Drive	Imperceptible	Well Below Objective	Negligible
R32	Residential - Sunderland Drive	Imperceptible	Well Below Objective	Negligible
R33	Residential - Derwent Road	Imperceptible	Well Below Objective	Negligible

8.8.2.12 As indicated in Table 8-39, predicted impacts on annual mean PM₁₀ concentrations as a result of the Development were predicted to be negligible at all receptor locations.

Overall Impact Significance

8.8.2.13 The overall significance of cumulative operational phase emission impacts on human receptors was determined as negligible. This was based on the most significant predicted impact at discrete receptor locations and the considerations outlined previously within Table 8-31.

Ecological Receptors

Oxides of Nitrogen

8.8.2.14 Annual mean NO_x concentrations were predicted at the ecological receptors for each scenario and are summarised in Table 8-40. Exceedences of the critical level are shown in **bold** text.

Table 8-40 Predicted Cumulative Annual Mean NO_x Concentrations - Operational Phase

Receptor		Predicted 2031 Annual Mean NO _x Concentration (µg/m ³)			Predicted Change as a Proportion of Critical Level (%)
		Do-Min	Cumulative	Change	
ER1	Ardley Cutting and Quarry SSSI	30.52	30.98	0.46	1.52
ER2	Ardley Cutting and Quarry SSSI	39.98	40.49	0.51	1.69
ER3	Ardley Cutting and Quarry SSSI	19.97	20.97	1.00	3.35
ER4	Ardley Cutting and Quarry SSSI	19.98	21.33	1.35	4.50
ER5	Bure Park LNR	19.36	19.96	0.61	2.02

- 8.8.2.15 As indicated in Table 8-40, NO_x concentrations were predicted to exceed the critical level at sensitive locations ER1 and ER2 in both scenarios. This is as a result of the high pollutant levels at these locations due to the proximity of the M40.
- 8.8.2.16 Predicted impacts on annual mean NO_x concentrations at the ecological receptors are summarised in Table 8-41.

Table 8-41 Predicted Cumulative Annual Mean NO_x Impacts - Operational Phase

Receptor		Magnitude of Change	Receptor Sensitivity	Significance of Impact
ER1	Ardley Cutting and Quarry SSSI	Small	High	Slight
ER2	Ardley Cutting and Quarry SSSI	Small	High	Slight
ER3	Ardley Cutting and Quarry SSSI	Small	High	Slight
ER4	Ardley Cutting and Quarry SSSI	Small	High	Slight
ER5	Bure Park LNR	Small	Low	Negligible

- 8.8.2.17 As indicated in Table 8-41, the significance of impacts as a result of the Development was predicted to be negligible at one receptor and slight adverse at four locations. It should be noted that the relevant critical level was not predicted to be exceeded at the three locations where slight adverse impacts were predicted. Additionally, changes of this magnitude would not be considered significant in accordance with the Highways Agency DMRB guidance, as outlined previously. As such, they are considered acceptable in the context of the Development.

Nitrogen Deposition

- 8.8.2.18 Annual nitrogen deposition rates were predicted at the ecological receptors for each scenario and are summarised in Table 8-42.

Table 8-42 Predicted Cumulative Annual Nitrogen Deposition Rates - Operational Phase

Receptor		Predicted 2031 Annual Nitrogen Deposition (kgN/ha/yr)			Predicted Change as a Proportion of Critical Load (%)	
		Do-Min	Cumulative	Change	Minimum Critical Load	Maximum Critical Load
ER1	Ardley Cutting and Quarry SSSI	27.42	27.48	0.052	0.35	0.21
ER2	Ardley Cutting and Quarry SSSI	28.62	28.67	0.056	0.37	0.22
ER3	Ardley Cutting and Quarry SSSI	24.82	24.90	0.083	0.55	0.33
ER4	Ardley Cutting and Quarry SSSI	24.82	24.93	0.110	0.73	0.44

ER5	Bure Park LNR	24.97	25.08	0.114	1.14	0.57
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8.8.2.19 As indicated in Table 8-42, nitrogen deposition rates were predicted to exceed the critical levels at receptors ER1, ER2 and ER5 in both scenarios. This is due to the high baseline deposition rates at these locations, which is indicative of much of the UK.

8.8.2.20 Predicted impacts on nitrogen deposition rates at the ecological receptors are summarised in Table 8-43.

Table 8-43 Predicted Cumulative Annual Nitrogen Deposition Impacts - Operational Phase

Receptor		Magnitude of Change	Receptor Sensitivity	Significance of Impact
ER1	Ardley Cutting and Quarry SSSI	Imperceptible	High	Negligible
ER2	Ardley Cutting and Quarry SSSI	Imperceptible	High	Negligible
ER3	Ardley Cutting and Quarry SSSI	Imperceptible	High	Negligible
ER4	Ardley Cutting and Quarry SSSI	Imperceptible	High	Negligible
ER5	Bure Park LNR	Small	Low	Negligible

8.8.2.21 As indicated in Table 8-33, the significance of impacts on annual nitrogen deposition as a result of the Development was predicted to be negligible at all ecological receptors.

8.9 Summary

8.9.1.1 An Air Quality EIA has been undertaken for the proposed Development. Baseline air quality conditions were determined and potential impacts associated with atmospheric emissions during the construction and operational phases assessed.

8.9.1.2 An assessment of potential impacts associated with fugitive dust emissions during the construction phase was undertaken in accordance with the IAQM methodology. This indicated that although there was a risk of dust generation during certain activities, suitable mitigation measures would control emissions, resulting in impacts of neutral significance.

8.9.1.3 Potential impacts associated with NO₂ and PM₁₀ emissions from road traffic exhaust emissions and NO_x emissions from the Energy Centre during the operational phase were assessed using dispersion modelling and the EPUK guidance. This indicated that negligible impacts were predicted on annual mean NO₂ and PM₁₀ concentrations at all human receptor locations.

8.9.1.4 Potential impacts on annual mean NO_x concentrations were predicted to be slight adverse at two ecological receptors within the vicinity of the site. It should be noted that the relevant critical level was not predicted to be exceeded at these locations and changes of the predicted magnitude would not be considered significance in accordance with Highways Agency guidance. As

such, they are considered acceptable in the context of the Development. Impacts on annual nitrogen deposition were predicted to be negligible at all ecological designations.

- 8.9.1.5 Potential cumulative impacts associated with other committed and proposed developments in the vicinity of the Site were also assessed.
- 8.9.1.6 Although the construction phases of a number of developments may overlap, it is considered the implementation of suitable mitigation options should control impacts to an acceptable level. As such, the cumulative air quality impacts associated with fugitive dust emissions during construction are considered to be of neutral significance.
- 8.9.1.7 Potential cumulative impacts associated with NO₂ and PM₁₀ emissions from road traffic exhaust emissions and NO_x emissions from the Energy Centres were assessed. This indicated impacts were similar to those predicted when only the Development was assessed. As such, it is considered cumulative impacts would not be any greater to those associated with the current proposals.

Table 8-44 Air Quality Impact Significance Rating Summary

Impact description	Mitigation	Temporary/ Permanent	Residual Significance rating
Soiling as a result of dust emissions during the construction phase	As outlined in Table	Temporary	Neutral
Human health impacts as a result of dust emissions during the construction phase	As outlined in Table	Temporary	Neutral
Ecological impacts as a result of dust emissions during the construction phase	As outlined in Table	Temporary	Neutral
Operational road traffic and Energy Centre emissions impacts on annual mean NO ₂ concentrations at human receptors	As outlined in Section 8.5.2	Permanent	Negligible
Operational road traffic and Energy Centre emissions impacts on annual mean PM ₁₀ concentrations at human receptors	As outlined in Section 8.5.2	Permanent	Negligible
Operational road traffic and Energy Centre emissions impacts on annual mean NO _x	As outlined in Section 8.5.2	Permanent	Slight Adverse

concentrations at ecological receptors			
Operational road traffic and Energy Centre emissions impacts on annual nitrogen deposition at ecological receptors	As outlined in Section 8.5.2	Permanent	Negligible

9 Noise and Vibration

9.1 Introduction

- 9.1.1.1 This chapter relates to the Development within the site boundary for Application 1 – North of Railway of the NW Bicester Eco Development. The Chapter considers noise and vibration impacts associated with Application 1 (North of Railway) - comprising some 155 ha of land, to provide for circa 2,600 residential dwellings, land for a new primary school and extension of the Exemplar phase primary school, associated open space, recreation and play space, social and community facilities and employment land, access and infrastructure works.
- 9.1.1.2 The noise and vibration assessment considers the suitability of the site for the Development by assessing existing noise impacts on the site from nearby noise sources.
- 9.1.1.3 The assessment also considers potential noise and vibration impacts arising from the Development and their effects on people who are likely to be exposed to changes in noise levels arising from construction and operation of the scheme. Assessment of the noise impacts associated with the operation of Scheme has been based on traffic data for 2031 when the Development is expected to be in full operation.
- 9.1.1.4 Particular attention would be given to people in their homes, at their place of work and in non-residential buildings such as classrooms, health care facilities and places of worship.
- 9.1.1.5 This chapter describes:
- The current baseline conditions at the Site (North of Railway)
 - Potential impacts and the mitigation measures required to prevent, reduce or offset any potentially significant adverse effects
 - The likely cumulative effects after the mitigation measures have been implemented

9.2 Regulatory and Policy Framework

- 9.2.1.1 This impact assessment has been undertaken in accordance with current international and national legislation, and national, regional and local plans and policies relating to nature conservation in the context of the Development. A summary of the relevant legislation and policies, the requirements of these policies and the Development response has been provided in below.

Table 9-1 Contaminated Land Regulatory and Policy Framework

Policy/Legislation	Summary of Requirements	Development Response
National Planning Policy Framework (NPPF) formally published on 27 March 2012	The NPPF sets out core planning principles which "should underpin both plan-making and decision-taking. NPPF recognises that Noise	NPPF provides an overarching policy framework that has been embraced in assessing noise impacts.

Policy/Legislation	Summary of Requirements	Development Response
	pollution impacts negatively on people's quality of life. The Framework makes clear that planners must seek to avoid noise pollution as a result of new developments, and to protect tranquil areas prized for their peace and quiet.	
Planning Policy Guidance Note 24 (PPG24)	PPG24 was replaced by the National Noise Planning Policy Framework (NPPF) in March 2012. The NPPF does not set specific criteria against which to assess the suitability of the site for residential development, therefore PPG24 has been referred to.	Where appropriate, PPG 24 (and other relevant guidance) has been used to advise on site layout to minimise noise impacts.
BS5228:1 2009 +A1 2014 Code of practice for noise and vibration control on construction and open sites.	BS 5228 gives recommendations for basic methods of noise control relating to construction and open sites where work activities/operations generate significant noise levels, including industry-specific guidance.	Provisions in BS 5228 have been used in assessing construction noise and vibration impacts and in recommending mitigation measures.
BS5228:2 2009 Code of practice for noise and vibration control on construction and open sites.- Vibration	BS 5228 gives recommendations for basic methods of vibration control relating to construction and open sites where work activities/operations generate significant noise levels, including industry-specific guidance.	Provisions in BS 5228 have been considered in discussing construction vibration impacts and in recommending mitigation measures.
BS ISO 4860 Mechanical vibration and shock. Vibration of fixed structures. Guidelines for the measurement of vibrations and evaluation of their effects on structures.	BS IS 4860 provides guidance for the evaluation and measurement of vibration in buildings.	Vibration impacts have not been assessed quantitatively as detail required for this assessment would not be available at outline planning stage.
BS7385 – 2. Evaluation and measurement of vibration in building (Part 2) Guide to damage levels for groundborne vibration	BS 7385 provides guidance on the levels of vibration above which building structures could be damaged.	Vibration impacts have not been assessed quantitatively as detail required for this assessment would not be available at outline planning stage.
BS 6472 'Guide to evaluation of human exposure to vibration in	BS 6472 provides guidance for the evaluation of human exposure to vibration.	Vibration impacts have not been assessed quantitatively as detail required for this assessment would not

Policy/Legislation	Summary of Requirements	Development Response
buildings – Part 1:2008		be available at outline planning stage.
BS8223: 1999: Sound insulation and noise reduction for buildings –. Code of practice	BS8223 gives recommendations for the control of noise in and around buildings, and suggests appropriate criteria and limits for different situations. These criteria and limits are primarily intended to guide the design of new or refurbished buildings undergoing a change of use.	Where appropriate predicted noise levels have been used to indicate suitable indoor noise levels for various buildings on site and noise mitigation measures have been recommended accordingly.
Noise Policy Statement for England (NPSE)	The Noise Policy Statement for England (published on 15 th March 2010) sets out the long term vision of Government noise policy, which is to promote good health and a good quality of life through the management of noise within the context of Government policy on sustainable development.	Overarching policy that has been embraced in assessing noise impacts. Noise impacts have been assessed in accordance with relevant guidance.
Control of Pollution Act 1974	The Control of Pollution Act 1974 Section 61 sets out procedures for those undertaking works to obtain 'Prior Consent' for construction works within agreed noise limits.	Principles have been adopted as part of the construction noise assessment.

9.3 Methodology

9.3.1 General Approach

9.3.1.1 The noise and vibration assessment considers the suitability of the site for residential development in line with the National Planning Policy Framework (NPPF) (Ref 9-1) and the Noise Policy Statement for England (Ref 9-2). Policy Planning Guidance 24: Planning and Noise (PPG 24) (Ref 9-3) has been replaced by the National Policy Planning Framework (NPPF) 2012 (Ref 9-1), but the NPPF does not however set absolute limits for development as were set out in PPG 24. PPG24 has therefore been referred to in conjunction with other relevant policies and guidance, including BS82332: 2014 'Guidance on Sound Insulation and Noise Reduction for Buildings'(Ref 9-4).

9.3.1.2 Under the NPPF Planning policies and decisions should aim to:

- avoid noise from giving rise to significant adverse impacts on health and quality of life as a result of new development;
- mitigate and reduce to a minimum other adverse impacts on health and quality of life arising from noise from new development, including through the use of conditions;

- recognise that development would often create some noise and existing businesses wanting to develop in continuance of their business should not have unreasonable restrictions put on them because of changes in nearby land uses since they were established;
- identify and protect areas of tranquillity which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason.

9.3.1.3 To avoid and mitigate adverse noise effects on health arising from and impacting on new development, the NPPF makes reference to The Noise Policy Statement for England (NPSE). The NPSE was published in March 2010 and covers all forms of noise other than occupational noise. For the purposes of this report “Neighbourhood Noise” is most relevant as NPSE defines at paragraph 2.5:

“neighbourhood noise” which includes noise arising from within the community such as industrial and entertainment premises, trade and business premises, construction sites and noise in the street.

9.3.1.4 The explanatory note to the NPSE introduces three concepts relating to the adverse impacts of noise. The following three statements have been reproduced from the explanatory note:

- “NOEL – No Observed Effect Level: This is the level below which no effect can be detected. In simple terms, below this level, there is no detectable effect on health and quality of life due to the noise.”
- “LOAEL – Lowest Observed Adverse Effect Level: This is the level above which adverse effects on health and quality of life can be detected”
- “SOAEL – Significant Observed Adverse Effect Level: This is the level above which significant adverse effects on health and quality of life occur.”

9.3.1.5 The NPSE acknowledges that the values for NOEL, LOAEL and SOAEL are likely to vary depending on the noise source and environment and at present there are no defined numerical values to allow flexibility within the policy until further evidence and guidance is presented. For this reason the criteria set out in PPG24 and BS8233 have been considered in assessing the suitability of the site for the Development.

9.3.1.6 Formerly a code of practice, the recent 2014 revision of BS8233: 2014 has recently been issued as a guidance document. The standard is mainly concerned with building design from an acoustic standpoint. It does however contain information relevant to environmental noise more specifically by stating guidance for desirable internal noise levels for dwellings and other buildings. The criteria for suitable internal noise levels are based on WHO Community Noise Guidelines (1999) (Ref 9-5)

9.3.1.7 The noise assessment also considers both construction and operational noise impacts associated with the Development. The construction impacts were assessed in accordance with the provisions in BS 5228: 2009 +A1 2014 ‘Code of practice for noise and vibration control on construction and open sites’ (Ref 9-6).

9.3.1.8 The operational impacts would arise from increased road traffic and from fixed plant and similar installations to be constructed on site. Operational traffic was assessed using the provisions in the Design Manual for Roads and Bridges (DMRB) Volume 11, Part 7, Section 3 – Noise and Vibration (Ref 9-7). Noise from operational plant was assessed according to the provisions in BS 4142: 1997 'Method for rating of industrial noise affecting mixed residential and industrial areas' (BS4142) (Ref 9-8).

9.3.1.9 The baseline noise survey serves as a basis for the assessment of the suitability of the site for the Development and for assessing construction and operational noise impacts.

9.3.2 Consultation

9.3.2.1 Cherwell District Council (CDC) was consulted during the preparation of the noise and vibration assessment. The baseline monitoring locations and assessment approach were agreed with Rob Lowther, the EHO for CDC.

9.3.3 The Study Area

9.3.3.1 A desk study and site observations have indicated that road traffic is the most prominent noise impact on the current Site. The most significant impact likely from the Development would be an increase in road traffic on the existing road network. For this reason DMRB Volume 11, Section 3, Part 7 was used as guidance when carrying out the noise assessment.

9.3.3.2 The noise assessment has considered road traffic noise impacts associated with the Development and therefore, in terms of DMRB, the assessment considered links within 1km of the Development boundary.

9.3.3.3 Construction and operational noise impacts are likely to remain more localised as noise impacts are likely to impact on the immediate vicinity of the noise source, with the greatest noise impacts within 100m of construction works.

9.3.4 Methodology for Establishing Baseline Conditions

Establishing the Existing Baseline

9.3.4.1 An assessment of the site indicated that the dominant noise source across the site would be from road traffic noise coming from the A4095 (Howe's Lane and Lord's Lane), B 4300 and B4100. Baseline monitoring was carried out at locations agreed with Rob Lowther, EHO for Cherwell District Council (CDC).

9.3.4.2 Noise monitoring was carried out at selected locations over a 24 hour period. The unattended (24 hour) monitoring locations were selected at the locations indicated on Drawing 9-1, denoted by the prefix LTN (Long Term Measurement).

9.3.4.3 In addition, short term attended measurements (prefix STN on Figure 9-1) were taken along Bucknell Road and along the M40 motorway. The potential for noise impacts from the M40 were raised as a concern by Rob Lowther of CDC.

For the attended measurements daytime measurements were taken over a period of 3 hours and at night for 1 hour.

9.3.4.4 The Chiltern main railway line has the potential to generate noise and vibration levels that may impact on adjacent residential premises. Rob Lowther (Cherwell District Council) requested that the noise and vibration monitoring locations along the railway line be selected with consideration of train speeds along the route and any cuttings that might screen train noise. The vibration measurement locations are indicated as VIB 1 and VIB 2 on Figure 9-1.

9.3.4.5 To accurately represent the suitability of the site at present for the Development, the measurements have been corrected for distance to source and IMMI has been used to produce noise contours for the North West Bicester Eco-Development.

9.3.4.6 The noise contours in Drawing 9-2 and Drawing 9-3 are for daytime and night-time respectively.

Forecasting the Future Baseline (“Without Development” Scenario)

9.3.4.7 In order to predict the future baseline, road traffic on affected routes as calculated for the Do-Minimum scenario (2031), was used to produce noise contours for the site. The noise contours were produced using the IMMI noise modelling software.

Defining the importance/sensitivity of resource

9.3.4.8 The importance or sensitivity of each resource is assessed using the criteria provided in Table 9-2 which are based on the Technical Advice Note: Assessment of Noise (Scottish Government) (Ref 9-9).

Table 9-2 Determining the Importance / Sensitivity of Resource

Importance/ sensitivity of resource or receptor	Criteria
Very High	Ambient noise level is intrinsic for community noise levels, health and amenities, e.g. rural dwellings, hospitals, cultural heritage sites, existing ambient level is low.
High	Dwellings and other sensitive receptors located in urban areas
Medium	Offices and Cultural Heritage sites located in urban areas
Low	Commercial establishments such as large shopping complexes
Negligible	Factories and industrial process sites

9.3.5 Methodology for Assessing Impacts

Introduction

- 9.3.5.1 The assessment of noise and vibration impacts has been carried out in accordance with recognised guidance and has focused on existing and future receptor locations.

Construction Noise

- 9.3.5.2 The construction noise levels have been predicted with distance from source by using the measured $L_{Aeq\ 1hr}$ using the following formula as described in BS5228:

$$K_h = 20 * \log_{10} (R/10)$$

Where

- K_h = the correction for propagation across hard ground
 - R = the distance to the receptor location
 - 10 = the distance in m at which the sound pressure level from the plant has been measured, as recorded in the Tables in BS5228.
- 9.3.5.3 At this stage of the Development design, there is no detail on the construction methods and plant likely to be used during the construction phases. Therefore, it is not possible to state precisely where plant would operate and for how long during the working day. This makes it difficult to accurately predict noise levels for direct comparison with the typical noise, therefore, a worst case (noisiest) assessment has been undertaken in that, where applicable, the worst case assumption is made in each case.
- 9.3.5.4 The main impact during the construction phase of the project would be noise from plant and on-site construction traffic. Indicative construction noise levels have been predicted for varying distances from the site, which represent the dwellings closest to the Project and most likely to encounter high noise levels during construction.

Site Assessment (NPPF/NPSE)

- 9.3.5.5 An assessment has been carried out in accordance with the NPPF and NPSE to establish the suitability of the site for the Development. As discussed in Section 9.3.1, the NPSE acknowledges that the values for NOEL, LOAEL and SOAEL are likely to vary depending on the noise source and environment and at present there are no defined numerical values to allow flexibility within the policy until further evidence and guidance is presented
- 9.3.5.6 Considering the guidance in the WHO Community Noise Guidelines and the recommended internal noise levels for bedrooms in BS8233, the following criteria (Table 9-3) are considered appropriate for determining the suitability of the site for residential Development.

Table 9-3 Indoor ambient noise levels for dwellings (based on Table 4: BS8233-2014)

External noise levels	Development permitted	Development permitted with mitigation	Development not normally permitted	Internal levels to be achieved	External Living Areas
Daytime dBL _{A,16hour}	<=55	>55<=63	>63	<=35	<=55
Night time dB L _{A,8hour}	<=40	>40<=55	>55	<=30 <=45L _{AFmax} (10 - 15 times per night)	<=40

9.3.5.7 The criteria set out in Table 9-3 correlate with the criteria in PPG24, which preceded the NPPF.

Operational Traffic Noise Assessment

9.3.5.8 The assessment of operational impacts from road traffic noise has been undertaken in accordance with DMRB. Noise calculations were predicted using the technical memorandum CRTN. CRTN was produced in 1975 and updated in 1988 and it is still the standard method for calculating noise from a road in the UK. In the UK the standard index used for traffic noise is the L_{A10,18-hour} level, which is quoted in decibels.

9.3.5.9 CRTN calculates the L_{A10, 18-hour} using the following traffic composition:

- 18 Hour annual average weekday traffic flow
- Percentage of heavy goods vehicles
- Average speed

9.3.5.10 Calculations were undertaken at representative sensitive receptors within 1km of Development boundary.

9.3.5.11 Predictions of road traffic noise have been carried out in accordance with CRTN using the computer model 'IMMI' (software for modelling and mapping noise from roads, railways, industrial, construction and other open sites). This is a 3-dimensional computer model with digitised inputs that include road segments, barriers, buildings and the receptor points at which the noise levels are to be calculated. The model's base data includes the following:

- Traffic Composition for 'Do-Something' Scenario: traffic flows, percentage of HGVs and traffic speeds
- Road Configuration: gradient, surface texture, vertical and horizontal alignment and depth / height of cuttings or embankments
- Receiver Location: distance from road, angle of view, ground absorption and shielding from natural or purpose built barriers.

9.3.5.12 IMMI has been used to calculate the noise level in terms of dB L_{A10 18 hour} selected sensitive receptors at a default height of 4m to represent noise levels

at the upper floor of receptor locations. Noise levels have been calculated for the receptors for the following scenarios and the Do-Something 2031 Noise Contour is shown on Figure 9-5;

- Without the Development in the opening year of the project (Do Minimum)
- With the Development in the opening year of the project (Do Something)

Operational Plant Noise

- 9.3.5.13 BS 4142:1997 is used to determine the impacts of noise upon residential units. The guidance provided within BS 4142 provides a method whereby the likelihood of complaints due to noise from industrial sources can be assessed.
- 9.3.5.14 The standard advises that the existing background noise levels outside noise sensitive premises are compared with the rating noise levels from any nearby industrial activities. The rating noise level should include corrections for any acoustic character to the noise that makes it more readily discernible to a listener (e.g. whines, crashes, bangs etc.).
- 9.3.5.15 The background noise level (L_{A90}) is the noise level that is exceeded for 90% of the monitoring period at the assessment location. For BS 4142 it is usual to measure the background noise level at the nearest noise sensitive receptor to the industrial noise source.
- 9.3.5.16 The specific noise level is the L_{Aeq} produced by the noise source under investigation, measured as close as possible to the source, over a given reference time interval. The rating noise level is the specific noise level plus any adjustments for the acoustic characteristics of the noise as specified in clause 8.2 of BS4142. An adjustment of +5dB is applied when the specific noise has a discrete distinguishable tone or distinct impulsive characteristic.
- 9.3.5.17 The greater the difference between rating level and background noise level, the greater the likelihood of complaints.
- A difference of around +10 dB or more indicates that complaints are likely.
 - A difference of around + 5 dB is of marginal significance.
 - If the rating level is more than 10 dB below the measured background noise level then this is a positive indication that complaints are unlikely.

Operational Vibration

- 9.3.5.18 Based on concerns raised by the EHO, it was agreed that vibration levels would be monitored at two locations along the railway line. The locations were selected to consider possible differences in rail speeds along the section of track as well as differences in topography.
- 9.3.5.19 Operational vibration has been considered in terms of impacts on residents within buildings and BS 6472-1: 2008 'Evaluation of human exposure to vibration in buildings. Part 1 Vibration sources other than blasting' (Ref 9-10) has been used to assess the vibration dose value (VDV) impacts from existing rail movements.

Assessment Criteria

- 9.3.5.20 The magnitude of each impact is assessed using the criteria provided below. This assessment, in the context of this chapter, is essentially quantifying the potential outcome of construction and operational noise impacting the identified receptor.

Construction Noise

- 9.3.5.21 The ABC method set out in BS 5228: 2009 +A1: 2014 involves rounding the existing ambient noise levels to the nearest 5dB for the appropriate time period (night, evening/weekends or day) and then comparing these levels to the total noise level, including construction noise. If the total noise level exceeds the existing rounded value, then a significant effect is deemed to have occurred. Further details are provided in Table 9-4.

Table 9-4 Threshold of significant effects for dwellings (Table E1: BS5228-1)

Assessment category and threshold value period	Threshold value, in dB(A)		
	Category A	Category B	Category C
Night-time (23:00 – 07:00)	45	50	55
Evenings and weekends	55	60	65
Daytime (07:00 – 19:00) and Saturdays (07:00 – 13:00)	65	70	75

- Category A is the threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are less than these values.
- Category B is the threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are the same as category A values.
- Category C is the threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are higher than category A values

Operational Traffic Noise

- 9.3.5.22 The DMRB is used for the assessment of operational noise impacts for road schemes and gives guidance on the magnitude of impact from noise changes upon the local environment. The significance of predicted increases in road traffic noise as a result of the Development has been assessed according to the criteria described below in Table 9-5Table .

Table 9-5 Criteria for magnitude of change in traffic noise (DMRB)

Change in Traffic Noise, $L_{A10, 18h}$ (dB)	Magnitude of Noise Change
0	No change
0.1 – 0.9	Negligible
1 – 2.9	Minor

3 – 4.9	Moderate
5+	Major

Operational Vibration

- 9.3.5.23 BS 6472-2008 provides guidance on predicting the human response to vibration in buildings over the range 0.5 Hz to 80 Hz. The way in which people perceive building vibration depends on various factors, including the vibration frequency and direction. Perception thresholds for continuous whole body vibration vary widely among individuals. BS 6472 states that the effect of building vibration on people is assessed by finding the appropriate vibration dose, and is best evaluated with the vibration dose value (VDV).
- 9.3.5.24 BS 6472 sets out the threshold of vibration for humans together with the levels that are considered acceptable for the time of day and night and for the type of activity or building use. The values in Table 9-6 represent best judgement currently available and may be used for both vertical and horizontal vibration. BS 6472 sets out the criteria as ranges as members of the public are likely to exhibit differing susceptibility to vibration.

Table 9-6 VDV ranges which may result in various probabilities of adverse comment within residential buildings (BS 6472)

Place and time	Low probability of adverse comment $m/s^{-1.75}$	Adverse comment possible $m/s^{-1.75}$	Adverse comment probable $m/s^{-1.75}$
Residential buildings 16hour day	0.2 – 0.4	0.4 – 0.8	0.8 – 1.6
Residential buildings 8 hour night	0.1 – 0.2	0.2 – 0.4	0.4 – 0.8

9.3.6 Limitations and Assumptions

- 9.3.6.1 It is our opinion that the baseline noise and vibration data collected between 13 and 15 October 2010 adequately represents the noise profile for the Bicester Eco Development. The data is adequate for establishing which relevant NEC the proposed site would fall into.
- 9.3.6.2 It was agreed with the EHO that the baseline surveys would not need to be updated. Instead further predictive modelling has been carried out to consider the noise impact from increased traffic on the local road network associated with the Application 1.
- 9.3.6.3 The baseline data would not be suitable for any BS4142 assessment of plant noise from commercial and similar development. Further baseline surveys for any BS4142 assessment would need to be carried out at the closest receptor locations once the exact location for commercial or other plant have been established.

9.4 Description of the Baseline Conditions

9.4.1 Existing Baseline

Noise Surveys

- 9.4.1.1 To establish the suitability of the site for the Development, noise monitoring was carried out along roads bordering the proposed site and along the railway line. The baseline data established in 2010 has not been updated as it was agreed with the EHO for CDC that future baseline with Development Traffic would be crucial for informing the suitability of the site for the Development.
- 9.4.1.2 The noise survey was carried out between 13th and 15th October 2010. The noise measurements are summarised in Table 9-7. The noise survey locations are indicated on Drawing 9-1.

Table 9-7 Summary of baseline noise surveys

Date	Location	Period	L _{Amax}	L _{Aeq,T}	L _{A90}	L _{A10}
24 Hour Measurements						
13/10 to 14/10	LTN 1	Day 0700-2300	96.9	68.3	52.4	72.6
		Night (2300-0700)	86.6	61.6	39.0	64.9
13/10 to 14/10	LTN 2	Day 0700-2300	76.8	56.6	49.6	59.8
		Night (2300-0700)	67.8	51.6	44.7	54.7
13/10 to 14/10	LTN 3	Day 0700-2300	76.9	50.2	42.1	50.2
		Night (2300-0700)	76.8	46.6	38.3	45.8
13/10 to 14/10	LTN 4	Day 0700-2300	93.7	54.7	45.4	49.8
		Night (2300-0700)	90.7	60.9	40.4	46.2
13/10 to 14/10	LTN 5	Day 0700-2300	93.8	65.0	50.4	69.3
		Night (2300-0700)	80.4	56.2	36.6	59.4
13/10 to 14/10	LTN 6	Day 0700-2300	94.6	65.4	53.6	69.0
		Night (2300-0700)	83.8	57.7	47.9	59.4
Short Term Measurements						
13/10/10	STN 1	Day	90.1	84.2	81.5	86.0

Date	Location	Period	L _{Amax}	L _{Aeq,T}	L _{A90}	L _{A10}
	(M40)					
14/10/10		Night	86.6	73.6	55.8	78.1
14/10/10	STN 2 (Bucknall Ln)	Day	78.1	58.8	43.5	63.2
15/10/10		Night	83.0	51.5	36.6	42.6

9.4.1.3 The noise measurements in Table 9-7 reflect noise levels close to sources such as roads and the Chiltern railway line. To accurately represent the suitability of the site for the Development, future year (2031) traffic data has been used to produce noise contours across the site for the Do-Minimum (without Development) and Do-Something (with Development).

9.4.1.4 The baseline noise monitoring data is included in Appendix 9-A.

Vibration Surveys

9.4.1.5 The EHO for CDC expressed concern about possible vibration impacts from the railway line passing through the Development site and requested that baseline vibration measurements be carried out.

9.4.1.6 Baseline vibration surveys were carried out at two locations along the railway line to allow for vibration to be assessed on the basis of the vibration dose value (VDV) for the 16 hour daytime period (0700-2300) and the 8 hour period (2300-0700), in accordance with BS 6472-1: 2008.

9.4.1.7 Location VIB 1 was approximately 5m from the railway line. Location VIB 2 was at the bottom of an embankment approximately 10m from the track alignment.

9.4.1.8 The vibration data was recorded in 10 second intervals over a 24 hour period to adequately consider the vibration impact from each passing train, providing a very large data set with over 8,640 measurements at each location. The vibration data set can be provided on request.

9.4.1.9 The baseline vibration data is summarised in Table 9-8 below.

Table 9- 8 Summary of baseline vibration surveys

Location VIB 1		X-Axis	Y-Axis	Z-Axis	Average
Night-time (2300-0700)	Average	0.0002	0.0002	0.0002	0.0001
	Max	0.0133	0.0128	0.0419	0.0149
Daytime -700-2300	Average	0.0031	0.0027	0.0033	0.0017
	Max	0.2632	0.2293	0.2267	0.1261
Location VIB 2		X-Axis	Y-Axis	Z-Axis	Average
Night-time (2300-0700)	Average	0.0011	0.0011	0.0005	0.0007
	Max	0.0011	0.0011	0.0005	0.0007

Daytime -700-2300	Average	0.0012	0.0011	0.0007	0.0008
	Max	0.0056	0.0054	0.0159	0.0057

9.4.1.10 Table 9-8 indicates that average VDV values and maximum VDV values recorded at VIB 1 and VIB 2 are below the range of 0.2 to 0.4 $\text{m.s}^{-1.75}$ in BS6473 whereby there would be a 'low probability of adverse comment'.

9.4.1.11 The vibration survey data indicates that vibration impacts are unlikely with a separation distance of 15m to 20m between the track alignment and any residential receptor location.

9.4.2 Future Baseline

9.4.2.1 In the absence of the Development, the future use of the Site is likely to stay in agricultural use. Based upon this assumption, it is considered that existing ambient noise levels would remain at the Site, with possible slight increases near roads due to annual increases in road traffic. The assessment has considered traffic noise levels for 2031 without the Development in place (Figure 9-4).

9.5 Design and Mitigation

9.5.1 Mitigation of Construction Noise

9.5.1.1 Details regarding the construction methodologies are not currently available; therefore assumptions were made regarding typical plant that would be used for construction of this nature. Initial predictions indicate that the noise impact would be substantial adverse without mitigation at the receptors within 200m and moderate adverse for receptors beyond 300m. The following generic noise mitigation measures need to be implemented as appropriate for all works:

- Construction activities would be confined to times of the day when they are least likely to be disturbing.
- Careful selection of plant, construction methods and programming. Only plant conforming to relevant national or international standards, directives and recommendations on noise and vibration emissions would be used.
- Construction plant would be located, as far as is reasonably practicable, away from adjacent occupied buildings or as close as possible to noise barriers or site hoardings where these are located between the plant and the buildings.
- Static and semi-static plant/equipment (e.g. compressors and generators) would be fitted with suitable enclosures where practicable.
- Personnel would be instructed on best practice to reduce noise and vibration as part of their induction training and as required prior to specific work activities.
- When plant is not being used, it would be shut down and not left to idle.

- Vehicles would not wait or queue on the public highway or on the worksite with engines running.
- Methods of work and vehicular routes would be selected with regard to minimising noise and vibration impact.
- Where practicable, all audible warning systems and alarms would be designed to minimise noise. Broadband reverse alarms would be fitted to all vehicles.
- With the phasing of construction, it is possible that certain areas of the Development may be occupied while construction is still underway in adjacent areas. Where possible, the occupancy of completed phases of construction would be planned in such a way that there is a buffer between occupied areas and areas where construction is being carried out.
- A noise monitoring programme would also be recommended to ensure that mitigation measures achieve the required results.
- Vibration impacts would be minimised by selecting the most appropriate construction method and plant to be used. Should activities like piling be required, using vibro-piling instead of hammer piling would reduce vibration impacts.
- A Construction Environmental Management Plan (CEMP) would be developed to ensure that construction noise impacts are managed and that appropriate mitigation measures are implemented.

9.5.2 Mitigation of Permanent Operational Noise

- 9.5.2.1 Traffic noise impacts on the Development site indicate that for most of the site residential development would not require any specific or additional mitigation. Parts of the site close to major roads would require higher specification glazing to be considered in the final design.
- 9.5.2.2 Traffic noise impacts are predicted to be **Negligible** at most off-site receptors. No traffic noise mitigation measures are therefore proposed.
- 9.5.2.3 Details regarding plant to be installed at the Energy Centre are not known but it is likely that plant such as fans, extractors, chiller units and air conditioning units would be installed at the commercial premises. At detailed design stage, further studies would be undertaken to agree noise limits for plant to be installed on site with the local EHO, and ensure that the design meets these limits. The key issue would be to achieve a level below the night-time background (L_{A90}) noise level.
- 9.5.2.4 It is however noted that L_{A90} or background noise levels would change with the Development in place and acoustic design criteria and noise limits for operational plant to be installed on site would invariably be dealt with by Condition at detailed design stage.
- 9.5.2.5 There are a number of generic methods that can generally be used to reduce plant noise on site, which would be utilised as appropriate to ensure that noise limits are met:

- Screening can be an effective method in reducing noise from plant mounted in or on buildings. Reflective products like concrete have been the traditional material for noise barrier walls and enclosures. Absorptive materials present a much more effective abatement option. Reflective products like concrete or brick simply bounce sound waves in different directions, while absorptive materials can significantly reducing overall noise.
- Some items of plant cannot be completely enclosed and sound reduction treatments would not result in a complete deadening of the noise. However, such partial enclosure treatments are extremely effective at preventing transmission of a majority of the noise produced by an air conditioning unit. Results would vary depending upon the extent of the enclosure, but such treatments can affect an average 10-12 dB reduction in noise transmission.
- Fan noise can be controlled through use of traditional techniques such as silencers and enclosures.
- Select the appropriate low-noise equipment.
- Plant can generate unacceptable noise within buildings if installed incorrectly. Plant items can be fitted with damping spring to prevent structure borne noise. Soft connections and joints should be used for fan duct connection and water pipes.

9.6 Construction Impacts

9.6.1 Construction Noise

9.6.1.1 In the absence of a detailed construction programme and method statement at this stage, as assumptions have been made regarding the plant and equipment to be used during each phase of construction.

9.6.1.2 The noise levels at the selected receptor locations have been predicted using the sound pressure levels for the plant as described in BS 5228: - 1. The sound pressure levels in BS 5228 have been presented as a L_{Aeq} at 10m (Table 9-9). A high percentage on-time has been assumed so as to present a possible worst case.

Table 9-9 List of construction plant and associated sound pressure level (L_{Aeq}) in dB at 10m.

Plant	BS5228 Table Reference	Percentage On Time	L_p at 10m (L_{Aeq} dB)
Road Planer	Table C.5 No.7	70	82
Tracked Excavator	Table C.5 No. 18	70	80
Dozer	Table C.5 No. 12	60	77
Dumpers	Table C4 No. 9	60	77
Vibratory Roller (22t)	Table C5 No. 28	60	77
Asphalt Paver	Table C5 N0. 33	60	75
Diesel Generator	Table C4 No. 84	100	74

Plant	BS5228 Table Reference	Percentage On Time	Lp at 10m (L _{Aeq} dB)
Delivery Lorry	Table C.2 No.35	70	80
Tracked Mobile Crane	Table C4 No.52	60	75
Telescopic Handler	Table C4 No.54	75	79
Wheeled Loader	Table C2 No. 26	75	79
Tower Crane	Table C4 No.49	60	77
Concrete Saw	Table C4 N0. 71	10	85
Compressor	Table C5 No.5	80	75
Excavator	Table C5 No.34	75	82
Roller Compactor	Table C.5 No.29	60	76
Water Pump	Table C.2 No.45	75	65
Concrete Pump & Concrete mixer truck discharging	Table C.4 No. 28	80	79
Poker Vibrator	Table C.4 No. 33	80	78
Percussion Drill	Table C4 N0. 69	40	85
Circular Saw	Table C4 No.72	40	79
Angle Grinder	Table C4 No.93	40	80
Welder	Table C3 No.31	40	73

9.6.1.3 The construction noise impacts have been calculated using the following formula as described in BS5228:

$$k_h = 20 \times \text{LOG} \frac{R}{r}$$

Where:

K_h = the correction for propagation across hard ground

R = the distance to the receptor location

r = the distance of 10 m at which the SPL has been measured

9.6.1.4 A possible worst case has been presented by considering propagation across hard ground and by not considering screening afforded by topographical features, buildings or other structures. The predictions also assume that all the plant would run simultaneously, which is most unlikely.

9.6.1.5 Construction would commence with mobilisation to site, involving delivery of plant and equipment and the preparation of site compounds. The noise impacts associated with this activity are shown in Table 9-10.

Table 9-10 Predicted noise levels (L_{Aeq,1hr}) during mobilisation to site

Plant	Number	Total SPL @ 10m	Total SPL @ 20m	Total SPL @ 50m	Total SPL @ 100m	Total SPL @ 200m	Total SPL @ 500m
Delivery Lorry	4	84.5	78.5	70.5	64.5	58.5	44.5
Tracked Mobile Crane	1	72.8	66.8	58.8	52.8	46.8	32.8
Telescopic Handler	1	77.8	71.7	63.8	57.8	51.7	37.8
Wheeled Loader	1	77.8	71.7	63.8	57.8	51.7	37.8
Dozer	1	78.8	72.7	64.8	58.8	52.7	38.8
Dumpers	2	77.8	71.8	63.8	57.8	51.8	37.8
Diesel Generator	1	74.0	60.0	60.0	54.0	48.0	26.0
Total		87.6	73.6	73.6	67.6	61.6	39.7

9.6.1.6 Plant that would typically be used during construction of roads on the Development site and the associated noise level with distance from source is shown in Table 9-11.

Table 9-11 Predicted noise levels (L_{Aeq,1hr}) during road construction

Plant	Number	Total SPL @ 10m	Total SPL @ 20m	Total SPL @ 50m	Total SPL @ 100m	Total SPL @ 200m	Total SPL @ 500m
Road Planer	1	80.5	74.4	66.5	60.5	54.4	40.5
Tracked Excavator	1	78.5	64.5	64.5	58.5	52.4	30.5
Dozer (Spreading fill)	1	74.8	60.8	60.8	54.8	48.8	26.8
Dumpers	2	77.8	63.8	63.8	57.8	51.8	29.8
Vibratory Roller (22t)	1	74.8	60.8	60.8	54.8	48.8	26.8
Asphalt Paver	1	72.8	58.8	58.8	52.8	46.8	24.8
Diesel Generator	1	74.0	60.0	60.0	54.0	48.0	26.0
Total		85.4	71.4	71.4	65.4	59.4	37.4

9.6.1.7 Site clearance would typically involve the use of earth moving equipment and dumpers. The associated noise impacts with distance from source are shown in Table 9-12.

Table 9-12 Predicted noise levels ($L_{Aeq,1hr}$) during site clearance

Plant	Number	Total SPL @ 10m	Total SPL @20m	Total SPL @ 50m	Total SPL @ 100m	Total SPL @ 200m	Total SPL @ 500m
Dumpers	2	78.5	72.4	64.5	58.5	52.4	38.5
Tracked Excavator	1	77.5	71.4	63.5	57.5	51.4	37.5
Lorry	1	78.5	72.4	64.5	58.5	52.4	38.5
Tower Crane	1	74.8	68.8	60.8	54.8	48.8	34.8
Dozer	1	74.8	68.8	60.8	54.8	48.8	34.8
Compressor	2	77.0	71.0	63.1	57.0	51.0	37.0
Diesel Generator	1	74.0	68.0	60.0	54.0	48.0	34.0
Total		85.2	79.2	71.2	65.2	59.2	45.2

9.6.1.8 A number of underground services would be installed on site, requiring excavation and trenching. The associated noise impacts with distance from source are indicated in Table 9-13.

Table 9-13 Predicted noise levels ($L_{Aeq,1hr}$) during installation of underground services

Plant	Number	Total SPL @ 10m	Total SPL @20m	Total SPL @ 50m	Total SPL @ 100m	Total SPL @ 200m	Total SPL @ 500m
Excavator	2	83.8	77.7	69.8	63.8	57.7	43.8
Telescopic Handler	1	77.8	71.7	63.8	57.8	51.7	37.8
Dozer	1	78.8	72.7	64.8	58.8	52.7	38.8
Dumpers	2	77.8	71.8	63.8	57.8	51.8	37.8
Delivery Lorry	2	81.5	75.4	67.5	61.5	55.4	41.5
Roller Compactor	1	73.8	67.8	59.8	53.8	47.8	33.8
Water Pump	2	66.8	60.7	52.8	46.8	40.7	26.8
Compressor	2	77.0	71.0	63.1	57.0	51.0	37.0
Generator	1	74.0	68.0	60.0	54.0	48.0	34.0
Total		88.0	81.9	74.0	68.0	61.9	48.0

9.6.1.9 Noise impacts associated with the construction of buildings and other structures on site are shown in Table 9-14.

Table 9-14 Predicted noise levels (L_{Aeq,1hr}) during construction of buildings

Plant	Number	Total SPL @ 10m	Total SPL @20m	Total SPL @ 50m	Total SPL @ 100m	Total SPL @ 200m	Total SPL @ 500m
Tracked Excavator	1	77.5	71.4	63.5	57.5	51.4	37.5
Diesel Generator	1	72.0	66.0	58.0	52.0	46.0	32.0
Dumpers	1	74.8	68.8	60.8	54.8	48.8	34.8
Telescopic Handler	1	77.8	71.7	63.8	57.8	51.7	37.8
Concrete Pump & Concrete mixer truck discharging	1	78.0	72.0	64.1	58.0	52.0	38.0
Poker Vibrator	2	80.0	74.0	66.1	60.0	54.0	40.0
Tower Crane	2	77.8	71.8	63.8	57.8	51.8	37.8
Compressor	2	77.0	71.0	63.1	57.0	51.0	37.0
Total		86.4	80.4	72.4	66.4	60.4	46.4

- 9.6.1.10 Construction activities produce significantly high noise levels, particularly close to source. Construction noise tends to fluctuate and is usually of fairly short duration. The construction noise impacts would depend on the proximity of construction activities to nearby receptor locations.
- 9.6.1.11 The construction noise impacts predicted above indicate that the highest impacts occur within 200m of the site, and these are expected to be substantial adverse. The predicted noise levels are based on a possible worst case scenario. Propagation across hard ground has been assumed and no screening from topographical features or other structures has been assumed. At distances of above 300m the construction noise impacts can be expected to be moderate.
- 9.6.1.12 The most likely construction noise impacts are to be experienced at residential receptors at Greenacres, Caversfield and the Lodge on the B4100 and receptors along the A4095. Impacts are also likely where works take place close to receptors on the A4095 and near Hawkwell farm on Bucknell Road.
- 9.6.1.13 The construction noise impacts can however be mitigated. Considering that construction noise impacts are temporary in nature, with mitigation measures in place no residual impacts are expected.

9.6.2 Construction Vibration

- 9.6.2.1 There is a potential for vibration to be generated during construction. This would depend on the construction method and the type of plant to be used. In

the absence of a detailed construction programme predicting vibration impacts would be very difficult. Vibration impacts would also depend on proximity to receptor locations and on local conditions such as ground conditions.

- 9.6.2.2 Vibration impacts can be mitigated by selecting plant and equipment that would generate low levels of vibration. Vibration impact predictions in accordance with BS5228: 2009 –Part 2 are therefore not possible at this stage. It would only be possible to predict vibration impacts once details of the plant to be used and the construction methods to be used have been finalised.

9.6.3 Overview

- 9.6.3.1 As detailed above assuming that the mitigation measures are adopted during the construction phase, the impact significance has been assessed as **temporary slight adverse** for most receptor locations, with a potential for slightly higher impacts at the closest receptor locations.

9.7 Permanent Operational Impacts

NPPF/ BS8233 Assessment

- 9.7.1.1 The noise contour produced for the Do-Something 2031 (with Development traffic and cumulative traffic considered) indicates that the site would fall predominantly in the range that indicates 'Development permitted' as per the criteria based on the NPSE as described in Table 9-3. Noise levels from traffic are predicted to be below 55dB across most of the site (Figure 9-5).
- 9.7.1.2 Near major roads noise levels are likely to be elevated and the appropriate siting of sensitive receptors would need to be considered. Road traffic noise from the B4100 and A4095 means that parts of the site fall in the range of 55dB(A) to 63 dB(A), whereby according to Table 9-3, noise levels are likely to fall in the range whereby Development would be permitted with appropriate mitigation.
- 9.7.1.3 At detailed design stage consideration would need to be given to on-site traffic volumes and the associated noise levels.
- 9.7.1.4 Further assessment would also be required at detailed design stage to consider noise impacts on the proposed schools. Building Bulletin 93 (BB93) (Ref 9-11) sets out acoustic design criteria. BB93 states that noise levels in unoccupied playgrounds, playing fields and other outdoor areas should not exceed 55 dB $L_{Aeq,30min}$ and there should be at least one area suitable for outdoor teaching activities where noise levels are below 50 dB $L_{Aeq,30min}$. The 2031 Do-Something noise contours across the site (Figure 9-5) indicate that the criteria in BB93 are likely to be met, but further assessment would need to consider traffic and other noise sources in close proximity to schools at detailed design stage.

Operational Plant

- 9.7.1.5 Noise associated with plant to be installed at the Energy Centre, commercial and retail premises and other infrastructure would tend to be more localised.

Plant to be installed at commercial premises would typically be HVAC, fans, chillers and similar items. In terms of BS4142 (Ref 9-8) operational plant noise would be assessed by comparing the predicted noise levels for the plant to be installed against the background noise levels.

- 9.7.1.6 All plant to be installed on site would need to be designed to meet the background noise limits to be agreed with CDC Environmental Health. Experience from similar assessments and developments indicate that appropriate measures exist, and can be incorporated into the final design to meet the necessary limits, and therefore impacts would remain localised and within acceptable limits. Noise impacts from plant to be installed on site can be controlled through appropriate planning conditions and setting noise limits to be met at detailed design stage.
- 9.7.1.7 An assessment has been made of indicative impacts from the Energy Centre. Given the outline stage of design detail, assumptions have been made regarding certain design aspects relating to the proposed energy centre, and indicative noise impacts have been calculated, as set out in Appendix 9-B.
- 9.7.1.8 The predicted indicative noise emissions from the Energy Centre is shown in Table 9-15, although it is important to note that actual noise levels would be influenced by the detailed design of the energy centres and the plant to be installed. At this stage it is not possible to assess noise impacts associated with the commercial hub as there is no design information available. Noise impacts from the commercial hub would be dealt with by condition at detailed design stage.

Table 9-15 Predicted Noise Impacts with distance from the Energy Centre

Equipment	SPL dBA	Penalty BS 4142*	Total SPL (dBA)	L _{Aeq} at 50m	L _{Aeq} at 100m	L _{Aeq} at 200m	L _{Aeq} at 300m
Energy Centre							
External SPL	64.3	5	69.3	35.3	29.3	23.3	19.8
Plant External to Energy Centre							
Stack (after attenuators)	76	5	81	47.0	41.0	35.0	31.5
Total				47.0	41.0	35.0	32.0

* In accordance with BS4142, a 5dB penalty has been added to the predicted noise level to account for any whine, hum or tonal characteristics of the noise from the Energy Centre.

- 9.7.1.9 Table 9-15 indicates that at 100m, noise levels from the Energy Centre is likely to result in an external noise level of 41 dB(A). Assuming a 10 to 15 dB reduction for an open window, this would result in an internal noise level in a bedroom of 30dB(A) or less, which would be in line with the recommended design criteria in BS8233 of 30dB(A).

Operational Traffic

- 9.7.1.10 Operational traffic associated with the Development has been assessed in accordance with DMRB, using traffic data for the 2031 for the Do-Minimum (without Development) and Do-Something (with Development). Traffic data has been supplied as an 18 hr AAWT with average speeds and percentage HGVs. IMMI noise modelling software has been used to predict traffic noise levels for each scenario at selected receptor locations. Noise contours have also been produced for the Do-Minimum (2031) (Figure 9-4) and the Do Something (2031) (Figure 9-5).
- 9.7.1.11 The predicted noise levels for the Do Minimum (2031) and Do-Something (2031) and the resultant magnitude of noise change are shown in Table 9-16. The magnitude of noise change is based on the criteria in DMRB, as described in Table 9-5.

Table 9-16 Magnitude of change in traffic noise levels for Application 1 (2031)

Receptor	2031 Do- Min	Application 1 (2031)	Difference	Magnitude of Noise Change
	L _{A10, 18hr}	L _{A10, 18hr}		
Greenacres	70.6	70.6	0	No Change
Lodge on B4100	73.6	73.7	0.1	Negligible
Caversfield	68.3	68.4	0.1	Negligible
67 Germander Way	65.5	65.5	0	No Change
Himley Farm House	61.5	62.9	1.4	Minor
Lovelynych House	67.7	68.1	0.4	Negligible
Linkslade	72.7	72.9	0.2	Negligible
1 Trefoil Drive	66.3	55.9	-10.4	Major Beneficial
3A Couper Close	67	53.5	-13.5	Major Beneficial
15 Derwent Road	66.1	57.3	-8.8	Major Beneficial
20 Wensum Crescent	69.3	58.9	-10.4	Major Beneficial
25 Hambleside	62	62.3	0.3	Negligible
63 Shannon Rd	65.2	65.5	0.3	Negligible
30 Southwold Lane	66.5	66.5	0	No Change
55 Juniper Gardens	67.6	67.7	0.1	Negligible
94 to 104 Mulein Rd	66.3	66.4	0.1	Negligible
78 to 80 Mulein Rd	66.2	66.4	0.2	Negligible
74 to 76 Mulein Rd	66.3	66.5	0.2	Negligible
1 Germander Way	65.7	65.8	0.1	Negligible
31 Saffron Close	65.1	64.4	-0.7	Negligible
78 Isis Avenue	67.8	61.9	-5.9	Major Beneficial
98 Isis Avenue	63.4	63.6	0.2	Negligible

Hawkwell Farm	64.7	63.5	-1.2	Minor Beneficial
1 Lodge Close	65.7	66.2	0.5	Minor

9.7.1.12 Table 9-16 indicates in general the change in noise level would range from **Minor-Beneficial** to **Negligible** at most receptor locations, with a **Major Beneficial** change at certain receptors. There would be a **Minor** increase in noise level at Lodge Close and Himley Farmhouse.

9.7.1.13 There is predicted to be a substantial decrease in noise levels at a number of receptor locations due to the proposed realignment of Howes Lane (A4095). The decrease in noise level is due to the increased distance between the realigned A4095 rather than a change in traffic volumes.

9.7.1.14 Based in the predicted magnitude of noise change in Table 9-16 no mitigation measures are proposed.

9.8 Cumulative Impacts

9.8.1.1 Off-site impacts would be limited through the mitigation described above. The most likely cumulative noise impacts would be from traffic noise associated with increased traffic from all planned and consented developments included in Table 17-1 and Table 17-2 on the local road network. Cumulative traffic noise impacts have been considered in the traffic noise assessment. Traffic data has been provided that includes traffic for all proposed and consented developments and with the full Masterplan Site in place.

9.8.1.2 The predicted cumulative traffic noise impacts and the associated magnitude of noise change have been predicted in accordance with DMRB (Table 9-17).

Table 9-17 Cumulative traffic noise and magnitude of change (2031)

Receptor	Do-Min 2031	2031 with NWB	Difference	Magnitude of Noise Change
	L _{A10, 18hr}	L _{A10, 18hr}		
Greenacres	70.6	71.1	0.5	Negligible
Lodge on B4100	73.6	73.8	0.2	Negligible
Caversfield	68.3	68.6	0.3	Negligible
67 Germander Way	65.5	65.1	-0.4	Negligible
Himley Farm House	61.5	64.5	3.0	Moderate
Lovelynych House	67.7	68.7	1.0	Minor
Linkslade	72.7	73	0.3	Negligible
1 Trefoil Drive	66.3	55.6	-10.7	Major Beneficial
3A Couper Close	67	53.5	-13.5	Major Beneficial
15 Derwent Road	66.1	56.9	-9.2	Major Beneficial

20 Wensum Crescent	69.3	58.7	-10.6	Major Beneficial
25 Hambleside	62	62.6	0.6	Negligible
63 Shannon Rd	65.2	65.9	0.7	Negligible
30 Southwold Lane	66.5	66.6	0.1	Negligible
55 Juniper Gardens	67.6	67.8	0.2	Negligible
94 to 104 Mulein Rd	66.3	66.4	0.1	No Change
78 to 80 Mulein Rd	66.2	66.4	0.2	Negligible
74 to 76 Mulein Rd	66.3	66.8	0.5	Negligible
1 Germander Way	65.7	65.2	-0.5	Negligible
31 Saffron Close	65.1	63.9	-1.2	Minor beneficial
78 Isis Avenue	67.8	62.1	-5.7	Major Beneficial
98 Isis Avenue	63.4	63.9	0.5	Negligible
Hawkwell Farm	64.7	60.1	-4.6	Moderate Beneficial
1 Lodge Close	65.7	66.9	1.2	Minor

- 9.8.1.3 The predicted cumulative traffic noise levels in Table 9-17 indicates in general that the change in noise level would range from **Minor-Beneficial** to **Negligible** at most receptor locations, with a **Major Beneficial** change at certain receptors. There would be a **Minor** increase in noise level at Lovelynych House and Lodge Close, and a **Moderate** increase at Himley Farmhouse.
- 9.8.1.4 There is predicted to be a substantial decrease in noise levels at a number of receptor locations due to the proposed realignment of Howes Lane (A4095). The decrease in noise level is due to the increased distance between the realigned A4095 rather than a change in traffic volumes.
- 9.8.1.5 Based in the predicted magnitude of noise change in Table 9-1 no mitigation measures are proposed.
- 9.8.1.6 Table 17-1 indicates that only the Caversfield, Fringford Road development, located approximately 300m from the Masterplan site, has the potential for cumulative construction noise impacts. There is a planning appeal pending for this development and, if successful, it is not known whether construction of this proposed development would coincide with work on the Development.
- 9.8.1.7 There is also a potential for cumulative noise impacts where off-site construction works take place in close proximity to on-site construction works. Cumulative construction noise impacts are unlikely where there is a separation distance of more than 300m between construction locations.
- 9.8.1.8 There is a potential for cumulative construction noise impacts should works on Application 1 (North of railway), Application 2 (South of railway) and A4095 NW

Strategic Link Road take place in close proximity. The appropriate phasing of works and appropriate mitigation measures would be designed to reduce risk of potential cumulative construction noise impacts.

9.9 Summary

- 9.9.1.1 The study area for the noise assessment is defined by the red line boundary for Application 1, however consideration is given to activities within 1km of the boundary to consider noise impacts on the local road network.
- 9.9.1.2 A baseline noise assessment has been carried out to reflect the current background noise profile of the site and surrounding areas.
- 9.9.1.3 Noise and vibration surveys along the railway line running adjacent to the site indicate that noise and vibration impacts are unlikely with adoption of a suitable separation distance between receptors and the rail alignment.
- 9.9.1.4 Permanent noise impacts are likely to arise from an increase in road traffic on site and on the local road network. Daytime noise contours have been produced to indicate road traffic noise impacts associated with the Development in 2031, and these indicate that there would be no significant impacts on neighbouring receptors. In some instances, because of the proposed realignment of Howes lane, there would be a beneficial impact on certain receptors.
- 9.9.1.5 Permanent noise impacts are also likely to arise from the Energy Centres and other installations that would be required to service the site. Noise limits for the Energy Centres and other plant would be agreed with Environmental Health at Cherwell District Council, and design measures would be incorporated into the detailed designs in order to achieve these levels. These measures would include selection of quieter items of plant, acoustic treatment of the building envelope to increase the sound reduction afforded by the building, and fitting the stack with attenuators.
- 9.9.1.6 Construction noise impacts are temporary in nature, lasting for the duration of construction works. Mitigation measures would be incorporated into the Construction Code of Practice (CoCP) to ensure that these impacts are kept to a minimum.

Table 9-18 Noise and Vibration Impact Summary Table

Impact description	Mitigation	Temporary/ Permanent	Residual Significance Rating
Construction Noise Impacts	Adopt mitigation measures set out in the Code of Construction Practice (CoCP).	Temporary	Substantial to negligible adverse depending on activity and distance from works.
Operational Traffic Noise Impacts – Off-site receptors	No mitigation measures required for off-site receptor locations.	Permanent	Negligible at most receptors on the existing road network to Minor Adverse at Himley Farm due to

Impact description	Mitigation	Temporary/ Permanent	Residual Significance Rating
			increase in road traffic. There is a Major Beneficial change at receptors on the A4095 due to the realignment of Howes Lane
Operational Traffic Noise Impacts – On-site receptors	Acoustic mitigation measures to be included in detailed design of buildings.	Permanent	Slight Adverse near to some roads, assuming design meets agreed noise limits
Operational Plant Noise	Mitigation measures to be included in detailed design of buildings and selection of quieter plant. Plant will need to be designed to meet noise limits agreed with Medway Environmental Health.	Permanent	Negligible assuming design meets agreed noise limits

10 Cultural Heritage

10.1 Introduction

- 10.1.1.1 This chapter of the Environmental Statement (ES) presents information on the likely significant impacts of the Development on the Cultural Heritage resource within the site and a defined study area. For the purposes of this assessment Cultural Heritage will encompass archaeology, built heritage and historic landscape. This chapter will present the regulatory and policy framework for the assessment; describe the methodologies used to assess the potential significant effects of the Development. Details of scoping and post-scoping consultations undertaken are also provided. Baseline conditions are then described, and potential effects are then discussed, followed by details of mitigation measures proposed and an assessment of significant residual effects. A summary of the assessment together with relevant conclusions is then provided and a list of references completes the chapter.
- 10.1.1.2 This chapter will be informed by baseline data gathered during the production of a Desk-based Assessment (DBA) (Appendix 10A) (Ref 10-1), Aerial Photograph Assessment (Appendix 10B) (Ref 10-2 and Ref 10-3), Geophysical Survey (Appendix 10C) (Ref 10-4) and Archaeological Evaluation (Appendix 10D) (Ref 10-5).
- 10.1.1.3 This chapter has been prepared by the Hyder Consulting Cultural Heritage team. The aerial photograph assessment was carried out by Air Photo Services, the geophysical survey was carried out by Northamptonshire Archaeology and the evaluation was carried out by Oxford Archaeology.

10.2 Regulatory and Policy Framework

- 10.2.1.1 This impact assessment has been undertaken in accordance with current international and national legislation, and national, regional and local plans and policies relating to nature conservation in the context of the Development. A summary of the relevant legislation and policies, the requirements of these policies and the Development response has been provided in Table 10-1 below.

Table 10-1 Cultural Heritage Regulatory and Policy Framework

Policy/Legislation	Summary of Requirements	Development Response
Planning (Listed Buildings and Conservation Areas) Act 1990	This legislation applies special protection to buildings and areas of special architectural or historical interest. Section 66 of the act states that special regard is given to the desirability of preserving a building or its setting when considering whether to grant planning permission for a development	Consideration has been given to impacts on all listed buildings within the site and the defined study area and the design of buildings within the development, including the use of material has taken the special character of the listed buildings into account.
Ancient Monuments and Archaeological Areas Act	The Ancient Monuments and Archaeological Areas Act 1979	No Scheduled Monuments will be impacted by the development therefore

Policy/Legislation	Summary of Requirements	Development Response
1979	gives statutory protection to any structure, building or work which is considered to be of particular historic or archaeological interest and regulates any activities which may affect such areas. Under the Act any work that is carried out on a Scheduled Ancient Monument must first obtain Scheduled Monument consent	scheduled monument consent will not be required
National Planning Policy Framework Section 12 'Conserving and Enhancing the Historic Environment'	The NPPF sets out Government planning policy. Section 12 deals specifically with policy relating to the Historic Environment. Section 12 of the NPPF requires planning applications to determine the significance of any heritage assets which may be affected by a Development, including any contribution made by their setting. If heritage assets are to be lost as a result of a development then their significance should be recorded and understood before this happens.	A range of archaeological assessments have been carried out as part of the Environmental Impact Assessment in order to ensure that the significance of the heritage resource is understood and a mitigation strategy has been formulated so that all assets that will be impacted will be recorded and understood.
Planning Policy Statement: Eco-towns	This planning policy statement contains a range of targets for Eco-towns. Target ET15 deals with the historic environment and requires planning applications for Eco-towns to demonstrate that the extent, significance and condition of heritage assets is understood and measures to conserve and enhance heritage assets and the settings have been put in place.	A range of archaeological assessments have been carried out as part of the Environmental Impact Assessment in order to ensure that the significance of the heritage resource is understood and a mitigation strategy has been formulated so that all assets that will be impacted will be recorded and understood. In addition consideration has been given in the design to the setting of listed buildings.

10.3 Methodology

10.3.1 General Approach

10.3.1.1 This chapter will assess the archaeological, built heritage and historic landscape resource within the application site and the surrounding study area through the collation of existing written, cartographic and electronic information in order to identify the likely character, extent, quality and significance of the known or potential heritage resource. This chapter incorporates the findings of

the desk-based assessment, aerial photograph assessment, geophysical survey and evaluation (refer to Appendix 10A-D) and a walkover survey.

10.3.1.2 The specific aims of the assessment are:

- To assess the potential for the survival of buried archaeological remains within the study area, the significance of such remains and the likely impact of the Development
- To assess the impact that former intrusive activities have had on the archaeological remains
- To assess the significance of the built heritage and the potential impact of the Development on it
- To identify relevant mitigation measures to limit the effects of identified potential impacts

10.3.1.3 The study was undertaken with regard to the 'Code of Conduct and Standards and Guidance for Archaeological Desk-based Assessments' of the Institute for Archaeologists (IfA 2012; IfA 2013) (Ref 10-6 and Ref 10-7). This assessment also considered the 2011 English Heritage guidance on setting 'The Setting of Heritage Assets' (Ref 10-8).

10.3.1.4 Reference has been made to the Exemplar Phase Environmental Statement (Ref 10-9), Exemplar DBA (Ref 10-10), Exemplar Archaeological Evaluation Report (Ref 10-11) and DBAs for Application 2 (Ref 10-12) and A4095 NW Strategic Link Road (Ref 10-13).

10.3.1.5 The Cumulative Impacts assessment will consider the cumulative impacts on the historic environment of the three North West Bicester Development masterplan applications, Application 1 North of the Railway Line, Application 2 South of the Railway Line and A4095 NW Strategic Link Road, and a number of consented and planned schemes near to the masterplan area. Those schemes are South West Bicester, Bicester Business Park, Caversfield Fringford Road, RAF Bicester, Bicester 2 – Graven Hill, South West Bicester Phase 2, Bure Place Town Centre Redevelopment, Former RAF Bicester, Bicester Gateway, North East Bicester Business Park, and South East Bicester.

10.3.1.6 Bure Place Town Centre Redevelopment is located in the centre of Bicester, and is isolated from the development area. Therefore it would not add to the cumulative impacts on cultural heritage assets within the Masterplan area.

10.3.2 Consultation

10.3.2.1 The Planning Archaeologist for Oxfordshire, Richard Oram, was engaged in consultation during all stages of this project starting in 2010. He issued briefs for geophysical survey and archaeological evaluation and conducted monitoring visits during the evaluation phase. Consultation was also carried out prior to the production of this desk-based assessment in 2014 and it was advised that an updated search of the Historic Environment Record was undertaken.

10.3.2.2 The Conservation Officer at Cherwell District Council was also consulted regarding the built heritage. In discussion relating to the Exemplar Site they

had no concerns with any undesignated built heritage and confirmed that including the listed buildings in the assessment would be sufficient. No specific comment was received from the Conservation Officer in relation to this application so the comments from the Exemplar Site have been taken as an example of their opinion.

- 10.3.2.3 English Heritage only require that they are consulted when a development affects the setting of a Grade I or Grade II* listed building, a Grade I or II* registered park or garden or the site of a scheduled monument (<https://www.english-heritage.org.uk/professional/advice/our-planning-role/consent/planning-permission/>). Due to the lack of registered parks and gardens, scheduled monuments and Grade I listed buildings English Heritage were not consulted during the production of this desk-based assessment.

10.3.3 The Study Area

- 10.3.3.1 For the purpose of this assessment a study area extending up to and including 500m from the Site boundary has been defined. This was set out in the scoping report (5002-UA005241-UE31R-01) and was based on a search of the Oxfordshire Historic Environment Record (HER), the National Monuments Record (NMR) and a selection of historic maps and unpublished sources. Where specific heritage assets have been identified outside of these study areas but consultation or other research have demonstrated that they are relevant they have been included in this assessment.

10.3.4 Methodology for Establishing Baseline Conditions

Establishing the Existing Baseline

Desk Based Assessment

- 10.3.4.1 The Desk-based Assessment established the baseline data from the known heritage resource. It was based on the results of a search of the National Monuments Record (NMR), the Oxfordshire Historic Environment Record (HER), Bicester Local History Society records (Ref 10-14), the English Heritage Archive and the English Heritage National Heritage List a selection of historic OS maps and tithe and enclosure maps and published (Ref 10-15) and unpublished sources.
- 10.3.4.2 Records of all known sites, find spots and monuments of archaeological/historical significance within the study area were obtained from the NMR and the Oxfordshire HER.
- 10.3.4.3 A selection of historic maps was analysed. These were obtained from Landmark Information Group and the Oxfordshire Record Office.

Site Walkover

- 10.3.4.4 A site walkover survey was undertaken over the whole masterplan area which includes the Application 1 site on 2nd September 2010 and further visits were made to the site during the archaeological evaluation carried out between August and October 2013. The site walkover survey comprised a walkover of

the application site and visits to the Listed Buildings within the study area that could be accessed.

Aerial Photograph analysis

- 10.3.4.5 An assessment of aerial photograph was undertaken across the whole of the North West Bicester development, which includes the Application 1 site, in order to assess the potential location and extent of archaeological features within the site.

Geophysical Survey

- 10.3.4.6 A geophysical (magnetometer) survey was undertaken across the whole of the North West Bicester development which includes the Application 1 site in 2012. The objective of the geophysical survey was to provide sufficient information to enable an assessment to be made of the potential location, nature and extent of archaeological remains within the site and to cross reference features identified in the aerial photograph analysis. To achieve this a 50% sample magnetometer survey was carried out across the whole of the North West Bicester development.

Archaeological Evaluation

- 10.3.4.7 Building on the results of the geophysical survey and following consultation with Richard Oram an evaluation was carried out over the North West Bicester development, which includes the Application 1 site, in 2013. In total this was designed to provide a 2% sample of the North West Bicester development, excluding areas of existing woodland, hedgerows and buildings. The aim of the evaluation was to test features identified during the geophysical survey and to further investigate blank areas within the site where no features had been identified in the previous phased of investigations.

Forecasting the Future Baseline (“Without Development” Scenario)

- 10.3.4.8 The without development scenario has been determined by considering how the cultural heritage resource would remain within the site should it continue with its current use i.e. agricultural land. Other consented developments including the Exemplar Site, RAF Bicester, Caversfield Fringford Road, South West Bicester and Bicester Business Park have been considered when looking at potential impacts on the setting of designated heritage assets.

Defining the importance/sensitivity of resource

- 10.3.4.9 The importance or sensitivity of each resource is assessed using the criteria provided in Table 10-2.

Table 10-2 Determining the Importance / Sensitivity of Resource

Importance/sensitivity of resource or receptor	Criteria
Very High	<ul style="list-style-type: none"> ▪ World Heritage Sites (including nominated sites) ▪ Assets of acknowledged international importance ▪ Assets that can contribute significantly to acknowledged international research objectives

Importance/sensitivity of resource or receptor	Criteria
	<ul style="list-style-type: none"> ▪ Structures inscribed as of universal importance as World Heritage Sites ▪ Other buildings of recognised international importance ▪ World Heritage Sites inscribed for their historic landscape qualities ▪ Historic landscapes of international value, whether designated or not ▪ Extremely well preserved historic landscapes with exceptional coherence, time-depth, or other critical factor(s)
High	<ul style="list-style-type: none"> ▪ Scheduled Monuments (including proposed sites) ▪ Undesignated assets of Schedulable quality and importance ▪ Assets that can contribute significantly to acknowledged national research objectives ▪ Scheduled Monuments with standing remains ▪ Grade I and Grade II* Listed Buildings ▪ Other Listed Buildings that can be shown to have exceptional qualities in their fabric or historical associations not adequately reflected in the listing grade ▪ Conservation Areas containing very important buildings ▪ Undesignated structures of clear national importance ▪ Undesignated landscapes of outstanding interest ▪ Undesignated landscapes of high quality and importance, and of demonstrable national value ▪ Well preserved historic landscapes, exhibiting considerable coherence, time-depth or other critical factor(s)
Medium	<ul style="list-style-type: none"> ▪ Designated or undesignated assets that contribute to regional research objectives ▪ Grade II Listed Buildings ▪ Historic (unlisted) buildings that can be shown to have exceptional qualities in their fabric or historical associations ▪ Conservation Areas containing buildings that contribute significantly to its historic character ▪ Historic townscape or built up areas with important historic integrity in their buildings, or built settings (e.g. including street furniture and other structures) ▪ Undesignated historic landscapes that would justify special historic landscape designation, landscapes of regional value ▪ Averagely well-preserved historic landscapes with reasonable coherence, time-depth or other critical factor(s)
Low	<ul style="list-style-type: none"> ▪ Designated and undesignated assets of local importance ▪ Assets compromised by poor preservation and/or poor survival of contextual associations ▪ Assets of limited value, but with potential to contribute to local research objectives ▪ Locally Listed' buildings ▪ Historic (unlisted) buildings of modest quality in their fabric or historical association ▪ Historic townscape or built up areas of limited historic integrity in their

Importance/sensitivity of resource or receptor	Criteria
	buildings or built settings (e.g. including street furniture and other structures) <ul style="list-style-type: none"> ▪ Robust undesignated historic landscapes ▪ Historic landscapes with importance to local interest groups ▪ Historic landscapes whose value is limited by poor preservation and/or poor survival of contextual associations
Negligible	<ul style="list-style-type: none"> ▪ Assets with very little or no surviving archaeological interest ▪ Buildings of no architectural or historical note; buildings of intrusive character ▪ Landscapes with little or no significant historical interest
Unknown	<ul style="list-style-type: none"> ▪ The importance of the resource has not been ascertained ▪ Buildings with some hidden (i.e. inaccessible) potential for historic significance

Source: Design Manual for Roads and Bridges; Volume 11, Section 2, Part 2 HA 208/07

10.3.4.10 The magnitude of each impact is assessed using the criteria provided in Table 10-3.

Table 10-3 Assessing Magnitude of Impact

Importance/sensitivity of resource or receptor*	Criteria
Major	Change to most or all key archaeological materials, such that the resource is totally altered Comprehensive changes to setting
Moderate	Changes to many key archaeological materials, such that the resource is clearly modified Considerable changes to setting that affect the character of the asset
Minor	Changes to key archaeological materials, such that the asset is slightly altered Slight change to setting
Negligible	Very minor changes to archaeological materials, or setting
No Change	No change

Source: Design Manual for Roads and Bridges; Volume 11, Section 2, Part 2 HA 208/07

*Magnitude of impacts can be positive or negative

10.3.4.11 Table 10-4 illustrates how information on the value of the asset and the magnitude of impact will be combined to arrive at an assessment of the significance of effect. The matrix is not intended to 'mechanise' judgement of the significance of effect but to act as a check to ensure that judgements regarding value, magnitude of impact and significance of effect are reasonable and balanced. In order to allow for professional judgement, in some cases the matrix allows a choice of significance of effect when a magnitude of impact and a value are combined. In these cases the individual attributes of a specific

asset, along with any relevant site specific factors and consideration of other influencing elements, will be taken into account when considering which is the most appropriate significance of effect to apply.

- 10.3.4.12 Based on professional judgement, a “significant” effect in terms of the EIA Regulations is considered to be one of moderate significance or above. All effects that are considered to be significant with regard to the EIA Regulations are highlighted in bold in Table 10-4.

Table 10-4 Criteria for Determining the Significance of impact on Archaeology, Built Heritage and Historic Landscape

		Magnitude of Impact				
		<i>No Change</i>	<i>Negligible</i>	<i>Minor</i>	<i>Moderate</i>	<i>Major</i>
Value	<i>Very High</i>	Neutral	Slight	Moderate/Large	Large or Very Large	Very Large
	<i>High</i>	Neutral	Slight	Moderate/Slight	Moderate/Large	Large/Very Large
	<i>Medium</i>	Neutral	Neutral/Slight	Slight	Moderate	Moderate/Large
	<i>Low</i>	Neutral	Neutral/Slight	Neutral/Slight	Slight	Slight/ Moderate
	<i>Negligible</i>	Neutral	Neutral	Neutral/Slight	Neutral/Slight	Slight

Source: Design Manual for Roads and Bridges; Volume 11, Section 2, Part 2 HA 208/07

10.3.5 Limitations and Assumptions

- 10.3.5.1 No significant limitations have been encountered during the production of this assessment other than some restrictions during the evaluation because of ecological constraints.
- 10.3.5.2 When considering the future baseline, the ‘no development’ scenario is based on none of the further North West Bicester development (excluding the Exemplar Site) being implemented.

10.4 Description of the Baseline Conditions

10.4.1 Existing Baseline

- 10.4.1.1 The following section outlines the baseline conditions for archaeology, built heritage and historic landscape for the site and study area. A full and detailed baseline covering all assets within the study area and baseline data gathered from all sources to provide a picture of the generally cultural heritage resource across the study area is presented in the Desk-based Assessment (Appendix 10A). The detailed results of the aerial photograph assessment, geophysical survey and evaluation are presented in Appendices 10B to 10D. Therefore this section will focus solely on the key receptors in order to present a focused assessment of the assets that are likely to experience impacts as a result of the development and to allow for a targeted mitigation strategy to be presented. For a more general picture of the baseline resource please refer to the relevant appendix.

Archaeology

- 10.4.1.2 There are two undesignated heritage assets recorded on the HER within the site. These are both prehistoric in date. In the centre of the Site are anomalies identified by geophysical survey (4). The anomalies are sub-rectangular and sub-circular ditched enclosures, curvilinear ditches and pits that are likely to date to the later prehistoric or Roman periods. This survey also identified a trackway or driveway of uncertain date. In addition in the same area a crop mark of a rectilinear enclosure (2) was recorded (Figure 10-2). It is likely that this feature is also one of the anomalies recorded by the geophysical survey. Both of these assets are considered to be of **low** value.
- 10.4.1.3 The aerial photograph analysis, geophysical survey and evaluation identified various areas of activity within the site indicating buried archaeological features (Figures 10-3 and 10-4).
- 10.4.1.4 The evaluation identified an area of possible Bronze Age activity towards the eastern side of the Site. This area consists of two possible burnt mounds, located in a shallow valley of an existing stream, and possibly associated with a cluster of four pits and a sinuous ditch. Burnt mounds are not common in Oxfordshire but in areas where they have been excavated their purpose has been suggested as connected with saunas or specialised sites for cooking food. A number of linear features and pits were also identified in this area during the geophysical survey. Several linear ditches and two right-angled ditches were identified by the geophysical survey. It appears that one of the right angled ditches and one of the linear ditches may form three side of a sub-rectangular enclosure. In addition to this there are a number of possible pits; some in isolation, but four of them were located south of the possible enclosure. There is also a reverse 'c' shaped ditch in this area that may continue to form an entire enclosure in the unsurveyed area. To the west of these previous features there are six possible pits, five short sections of linear ditch aligned north east – south west and two gently curving ditches to the south of this. To the north of these features there is a long linear ditch aligned north west – south east, further short linear ditches and a 'u' shaped ditch, possibly representing the southern part of an enclosure. Slightly north of this, the northern ditch of a probable enclosure, a curving ditch of another probable enclosure and a pair of northwest – southeast curving ditches were identified. This area of archaeological activity is of **medium** value.
- 10.4.1.5 In the north of the Site there is a large sub-rectangular ditched enclosure that is orientated east – west and has an entrance on the eastern edge. A second ditch was located parallel to the northern edge of this. These features were identified as crop marks during the aerial photograph analysis and confirmed in the geophysical survey. The geophysical survey identified that within the western half of the enclosure there are up to four curving ditches and two pits and within the eastern half one curving ditch and four pits arranged in a loose square. This later ditch appears to form part of a long ovoid feature composed of interrupted lengths of ditch. Two additional ditched enclosures are located north and north east of the sub-rectangular enclosure and to the northwest is a linear ditch, aligned north west – south east, with a line of small pits extending south from this. Four similar pits were situated to the west of this. There is a large irregular semi-circular ditch to the east of the sub-rectangular enclosure

and to the south an area of ferrous responses probably indicating a dump of iron-based debris. The evaluation recovered pottery from this enclosure which dated it to the Iron Age. This asset is considered to be of **medium** value.

- 10.4.1.6 On the eastern edge of the site the geophysical survey recorded a conjoined pair of circular ditches, possibly indicating roundhouses with a probable pit in the centre of the southern one. The evaluation determined that these features were of Iron Age date. The evidence for Iron Age activity within the site appears to indicate dispersed utilisation of the landscape, which is reasonably unusual for this period and may indicate that more substantial settlement exists outside the Site. As a result this area of activity is considered to be of **medium** value.
- 10.4.1.7 In the centre of the Site is a complex and extensive area of buried ditches, pits, probable tracks and enclosures. They were identified by the aerial photograph analysis as distinctive crop marks at Hawkwell Farm. The aerial photograph analysis concluded that it was likely that these crop marks represent prehistoric or Romano-British settlement. The archaeological features identified in this area of crop marks were also picked up in the geophysical survey and evaluation. The geophysical survey identified a concentration of anomalies representing linear and curvilinear ditches some of which form curved and rectilinear enclosures in this area and many of these coincided with the location of crop marks identified in the aerial photograph analysis. Many pits of varying diameters were also detected. A large, c. 70m x 70m, sub-rectangular enclosure containing sub-dividing ditches and numerous pits was detected in the east of this area. Outside this dense area of features to the west there is a linear ditch that is aligned east – west, a pair of ditches, a group of pits, two parallel ditches, a group of five ditches on varying alignments and a probable ceramic drain. There is also an area of ridge and furrow on a north – south alignment. To the south of the dense area of features there is an area with six short ditches, four of these are aligned northwest – southeast, one northeast – southwest and one north – south. In the western area of the Site ferrous features were detected, along with a linear anomaly indicating a probable historic boundary on a north – south alignment. There were also linear ditches, two in a ‘y’ shaped arrangement, small enclosures and pits.
- 10.4.1.8 This complex of features was also identified during the evaluation and identified as a significant area of Roman activity. The activity probably indicates an agricultural settlement of relatively low status that was in use throughout the Roman period. This continuity of settlement could be considered to be unusual. Isolated finds of human remains made during the evaluation may indicate the potential for further burials to be found in the area. This area of settlement activity is considered to be of **medium** value.
- 10.4.1.9 Another small area of Roman activity on the western edge of the Site was identified during the evaluation. This area contained a limited number of features but produced a substantial amount of early Roman pottery. It may represent a small scale domestic settlement, possibly an outlying farmstead. This area is of **medium** value.
- 10.4.1.10 To the south east of Hawkwell Farm slight ridges on the flood plain of a small watercourse were identified on aerial photographs. These may indicate former water meadows or medieval cultivation or drainage. In this area several areas of

ridge and furrow were identified during the geophysical survey. In the centre of this area there are three short sections of ditch and a semi-circular ditch. To the east of this are two sinuous ditches and sections of a single ditch, all on a north west – south east alignment. A pair of adjacent pits was located to the west of the ditches. In the most southerly part of the Site there are ditches possibly representing several enclosures. These assets area considered to be of **low** value.

- 10.4.1.11 To the east of Hawkwell Farm an unusual curvilinear feature was recorded during the aerial photograph analysis. The feature was only recorded on one occasion and is not consistent with any previously recorded archaeological feature it was not picked up on the geophysical survey nor during the evaluation. It is a possible feature that may result from an agricultural process and this asset is considered to be of **negligible** value.
- 10.4.1.12 There is one further area of crop marks, in the west of the Site, indicating medieval ridge and furrow cultivation and an unidentified cut feature. The unidentified feature is an oddly shaped cut feature, which has been infilled. As most small quarries in this area are sub-rectangular or square, and this feature has a number of projections, it seems unlikely to result from this activity. Given the proximity of a World War 2 airbase at Bicester, this could be a bombing decoy, but it is not visible on photographs taken in 1946 and so its origin is uncertain. This asset is of **negligible** value.

Built Heritage

- 10.4.1.13 There are four listed buildings within the study area for the Site. Three of them are Grade II listed and one is Grade II* listed. They are all located within settlements; two each in Bucknell and Caversfield. Two of the listed buildings, Bucknell Manor House and the Churchyard Cross at Bucknell have already been identified in the DBA (Appendix 10A) as experiencing no impacts from the Development. Therefore they will not be discussed further in this chapter.

Church of St Lawrence (LB2)

- 10.4.1.14 This is a Grade II* listed church in the village of Caversfield. The earliest elements are believed to date to the 10th or 11th centuries, with further additions in the late 12th and 13 centuries. The church was restored and partially rebuilt in 1874. It is constructed of coursed and random limestone rubble with ashlar dressings and the roof is Stonesfield-slate and concrete plain tiles. It is located east of the B4100 and adjacent to Caversfield House.
- 10.4.1.15 It has national significance as a listed building and historical significance because it demonstrates the duration of continuous settlement in this location. Its setting is informed by the deserted village to the east of it and the existing buildings in the village of Caversfield. In addition the historic parish of Caversfield informs its setting. This asset is of **high** value.

Home Farmhouse (LB3)

- 10.4.1.16 This is a Grade II listed farmhouse dating to the early to mid-17th century and was extended in the 18th and 19th centuries. It is constructed of coursed squared limestone with ashlar dressings and has an old plain tile roof with

rebuilt brick gable stacks. It is located in Caversfield, to the west of the B4100 and south of St Lawrence Church.

- 10.4.1.17 This asset is considered to be of **medium** value but has national significance as a listed building and historical significance as it demonstrates the agricultural nature of this area since the post medieval period. Its setting is informed by the agricultural buildings that surround it and the agricultural land that is managed from it.

Historic Landscape

- 10.4.1.18 There has been no Historic Landscape Characterisation produced for Oxfordshire but the Cherwell District Landscape Assessment, undertaken in 1995 (Ref 10-16), provides some useful information for determining the historic value and time depth of the landscape. In addition cartographic analysis indicates changes that have occurred to the landscape.
- 10.4.1.19 The cartographic sequence for the Site, discussed in more detail in the Desk-based Assessment (Appendix 10A), demonstrates that much of the area was farmed in an open field system until the late 18th century when enclosure awards were passed and the landscape began to be divided into smaller fields with individual owners. The sequence of Ordnance Survey maps, which began in the later 19th century, records the same field boundaries within the Site that are present today. As enclosure maps were not available for this area it is not possible to determine if these boundaries date to the initial period of enclosure or are a slightly later development. The villages of Bucknell and Caversfield are largely unchanged throughout the map sequence. The key change in the area is the expansion of Bicester and therefore increasing urbanisation in the area bordering the Site. Within the wider landscape surrounding the Site there has been a slight reduction in the amount of field boundaries.
- 10.4.1.20 The Cherwell and District Landscape Assessment (1995) describes the landscape within which the Site lies as the Oxfordshire Estate Farmlands character area. This area runs from Bletchington in the south, around the north of Bicester and up to the county boundary with Northamptonshire and is characterised by a rolling landform and a pattern of woodland and mixed farmland. Much of the landscape in this character area is associated with estates linked to the extensive areas of remaining 18th century parkland and this is one of the special features of the character area. The closest evidence for parkland is at Bignell Park to the south of the Site, although this dates to the later 19th century and so is not classed with the 18th century parkland. The Landscape Assessment characterises the local landscape within and around the Site as large scale open farmland or large scale undulating farmland; the former has a weak field patterns while the latter has strong field patterns, which are given definition by well-maintained hedges.
- 10.4.1.21 The Landscape Assessment draws out some of the key landscape elements of the area surrounding the Site but does not designate it as an area of high landscape value. As with other parts of Cherwell the area to the north of Bicester has been considerably affected by military development. Military airfields such as RAF Bicester are dominant features in the landscape when they occur.

- 10.4.1.22 Other key features in the landscape of the Cherwell district are small settlements. Many of these date to the early medieval and medieval periods and a significant number of these settlements experienced abandonment or shrinkage as a result of social and economic change in the late medieval or post-medieval period. The two closest villages to the Site, Caversfield and Bucknell, have a church which dates to the Anglo Saxon period and medieval or earlier origins respectively. Both the villages experienced shrinkage in the post-medieval period with little remaining of Caversfield except for the church and the manor house. The predominant architecture in these settlements is of the vernacular style which is typical for the district.
- 10.4.1.23 Overall the historic landscape which the Site is located within can be described as typical for the area. It is of a predominantly rural nature characterised by late 18th and early 19th century arable fields. The historic landscape resource within the study area is considered to be of **low** value as it is a robust undesignated landscape of local interest.

10.4.2 Future Baseline

- 10.4.2.1 In a 'no development' scenario the archaeological, built heritage and historic landscape baseline would remain unchanged as it would not experience any impacts. Any potential intensification of ploughing regime in the arable areas of the site could potential impact the below ground archaeology due to the relatively shallow depths of topsoil across areas of the site.

10.5 Design and Mitigation

10.5.1 Construction Approach and Mitigation of Short-Term Construction Effects

Archaeology

- 10.5.1.1 Five areas of concentrated archaeological activity have been identified across the site (Figure 10-4). One of these areas dates predominantly to the Bronze Age, two of them date to the Iron Age and the remaining two date to the Roman period. All of these area contain numerous and, in places, complex archaeological features. Prior to the commencement of construction activity a programme of open area archaeological excavation would be carried out at each of these areas. The archaeological excavation would comprise the removal of topsoil (and subsoil) under archaeological supervision down to the first encountered archaeological horizon, followed by detailed investigation, recording and assessment of any features that are encountered.
- 10.5.1.2 One further area of archaeological activity of lesser value has been identified. This area contained predominantly ridge and furrow and some linear features. This area would also be subject to archaeological excavation in order to record the linear features. The ridge and furrow would not be excavated.
- 10.5.1.3 No mitigation measures would be carried out on the areas of negligible value.

- 10.5.1.4 The archaeological excavation would be carried out in accordance with a detailed archaeological mitigation strategy which would be produced and agreed with the Planning Archaeologist at Oxfordshire County Council. The archaeological mitigation strategy would detail the aims and methodology for the excavation and would contain details on the reporting, archiving and publishing of the findings of the excavations.

Built Heritage

- 10.5.1.5 There are no mitigation measures considered practical or necessary to mitigate the short term impacts to the setting of the two listed buildings within the study area arising from construction activity.

Historic Landscape

- 10.5.1.6 During the construction any construction activity in the vicinity of hedgerows to be retained would be managed to avoid causing damage to or removing the existing hedgerows as they contribute to the historic character of the field boundaries which are a key element of the Historic landscape in this area. Where practicable exclusion zones should be set up around the hedgerows to avoid accidental damage. Where removal of hedgerows is unavoidable then these would be translocated to as close to the original line as possible in order to preserve the line of the historic boundary.

10.5.2 Scheme Design and Mitigation of Permanent Operational Effects

Archaeology

- 10.5.2.1 No further mitigation is necessary for archaeology for operation effects as all impacts would have been experienced and mitigated during the construction phase.

Built Heritage

- 10.5.2.2 Measures have been built into the design to minimise impact to the setting of the listed buildings within the study area. These include preserving the views from St Lawrence's Church across to the area of woodland within the northern portion of the Site. This builds upon similar design mitigation measures implemented as part of the Exemplar Site development.
- 10.5.2.3 Home Farmhouse is located outside of the Site and is separated from it by an area of open green space and some retained hedgerows. These design mitigation measures would help to preserve the setting of this asset.

Historic Landscape

- 10.5.2.4 The existing historic farm buildings at Hawkwell Farm would be retained as part of the Development. In addition retention of historic field boundaries is included in the development design across the Site with the exception of the south east corner of the Site where two whole and one partial field boundary would be removed. Other elements of the historic landscape including watercourses and woodland would also be retained within the design. Historic routeways including the line of Bucknell Road have also been preserved.

10.6 Construction Impacts

10.6.1.1 The areas of archaeological potential would all experience impacts as a result of construction activity. Four of the areas are located in areas designated for housing, one is located in an area of green infrastructure and the other is in an area designated for primary school/energy centre/extra care housing. All of the areas of archaeological activity would experience changes to most or all of the archaeological remains within them. The archaeological mitigation measures proposed here would ensure that the archaeological remains would be recorded prior to construction and the knowledge gained from this recording process would add to the known archaeological resource and increase understanding of the historic environment in Bicester and the wider Oxfordshire area. There would be a major impact on these **medium** and **low** value assets leading to a significance of impacts of **moderate adverse**.

10.6.2 Overview of Impacts

10.6.2.1 The following section assesses the potential effects on the individual assets identified in section 10.4.

10.6.2.2 The archaeological assets would experience direct physical impacts as a result of the Development. These impacts would occur during the construction phase and once they have occurred they would be permanent and non-reversible.

10.6.2.3 The built heritage assets would experience impacts on their setting during the construction and operational phases. Any impacts on setting during the construction phase would be temporary and would be caused by construction activity, including the presence of plant and machinery including cranes, mechanical excavators and dumpers that would turn the application site from an area of open farmland to a construction site. The impacts during the operational phase would be caused by the presence of the development. It is considered that any impacts on setting would be more noteworthy and longer lasting during the operational phase as the level of impacts during the construction phase would not exceed those assessed for the operational phase. Therefore, all impacts to the setting of built heritage assets are discussed in the 'operation' section.

10.6.2.4 The historic landscape would experience impacts in both the construction and operation phases as the landscape is transformed from an area of open farmland to the masterplan development. As with built heritage it is considered that impacts on the historic landscape would be more noteworthy and long-lasting during the operation phase so they would be discussed in the operation section.

10.7 Permanent Operational Impacts

10.7.1.1 The Development would have an impact on the setting of St Lawrence's Church by changing the nature of this wider parish setting by introducing an increased urban area into this well established agricultural landscape, which could have a negative impact on the setting of this asset. However, it would not prevent an understanding of the relationship between the church and the wider area. In

addition key views from the church across the site that were maintained in the Exemplar Development would continue to be maintained in the Development. Therefore there would be a **minor** impact on this high value asset resulting from the changes to its setting. This would result in a significance of impact of **slight adverse**.

- 10.7.1.2 The Development would change the nature of part of this agricultural land, which would change the relationship between Home Farmhouse and its landscape leading to a change in its setting. Therefore the Development would have a negative impact on the setting of this asset. This impact is reduced however by the design mitigation measures outlined above. Therefore there would be a **minor** impact on this medium value asset leading to a significance of impacts of **slight adverse**.
- 10.7.1.3 This assessment has concluded that the development is located within a historic landscape which is of **low** value. The key element of the historic landscape in this area has been identified as the historic boundaries as they inform the area's historic use as farmland. The design and mitigation measures outlined in this assessment would ensure that either the field boundaries themselves or the line of them would be protected and retained once the development is in operation. However the Development would result in considerable changes to the use of the area and there would be visual changes within the landscape and changes in noise levels as it would have been transformed from a rural to an urban landscape. This would result in a magnitude of impact of **moderate** leading to a significance of impacts of **slight adverse**.

10.8 Cumulative Impacts

- 10.8.1.1 Application 1 (North of Railway), Application 2 (South of Railway), and A4095 NW Strategic Link Road together would have a cumulative impact as most or all of the key archaeological material identified by the investigations carried out as part of this assessment would be altered by the development. With mitigation in the form of archaeological excavation and recording this would lead to a significance of impacts of moderate adverse. None of the other developments included in this cumulative impact assessment would contribute to the cumulative impacts on the archaeological assets as they are not located within the extent of the areas of archaeological activity.
- 10.8.1.2 The three Applications together with the Caversfield Fringford Road development (located approximately 300m from Application 1) would represent a significant change to the setting of the listed buildings within the study area from rural agricultural to an increasingly suburban and urban landscape. This would result in a cumulative impact of moderate and a significance of impacts of slight adverse. None of the other developments listed in Table 17-1 and 17-2 would contribute to the cumulative impacts on the setting of the built heritage assets as they are located outside of their settings.
- 10.8.1.3 RAF Bicester is located to the east of the North West Bicester Development and is too far away to contribute to cumulative impacts on archaeology and built heritage assets. However development at RAF Bicester would have a cumulative impact on the historic landscape as the former RAF base is another

key element of the historic landscape within this area. The loss of this key element combined with the cumulative impacts of the 3 North West Bicester Development Applications plus the Exemplar Site, the North East Bicester Business Park, South West Bicester, South West Bicester Phase 2 and the Caversfield Fringford Road on other key landscape elements including field patterns and historic field boundaries would result in changes to many key historic landscape elements, noticeable differences in sound and changes in use across the historic landscape. This would lead to a moderate impact on the historic landscape character leading to a significance of impacts of slight adverse.

10.9 Summary

- 10.9.1.1 This assessment has considered impacts on cultural heritage assets within the site and a defined study area. In addition a programme of archaeological investigations has been carried out within the site to define the significance of the archaeological resource. This programme comprised aerial photograph interpretation, geophysical survey and trial trench evaluation.
- 10.9.1.2 An assessment of the impacts to the cultural heritage assets both within the site and the study area has been carried out using the methodology laid out in DMRB but with appropriate adaptations to allow for the nature of the development and with the application of professional judgement.
- 10.9.1.3 The archaeological investigations indicated various concentrations of archaeological features within the Site. There is an area of possible Bronze Age ritual activity, two small areas of early – middle Iron Age activity, probably indicating dispersed use of the landscape in the form of small farmsteads, A large concentration of Roman settlement activity and another small area of Roman and Iron Age activity, probably indicating a small outlying farmstead.
- 10.9.1.4 In addition to this evidence of medieval and post medieval agriculture, in the form of ridge and furrow field systems and field boundaries, was recorded by further work within the Site. These indicate the longevity of arable agriculture within the Site.
- 10.9.1.5 A programme of mitigation measures has been designed for the areas of archaeological activity. This would comprise archaeological excavation and recording. Following this mitigation the findings of the excavation would be reported and would add to our knowledge of the archaeological resource in the Bicester and wider Oxfordshire area. With mitigation the archaeological remains within the site would experience a **moderate adverse** impact.
- 10.9.1.6 Four listed buildings are located in Bucknell and Caversfield. Those in Bucknell would not be impacted by the Development but the Development would have a negative impact on the settings of the buildings in Caversfield, St Lawrence's Church and Home Farmhouse, although it would not have any physical impact on them. Design mitigation measures have been included in the development to reduce these impacts. These include maintaining a key view from St Lawrence's Church and preserving an area of green space between Home Farmhouse and the development. As a result these assets would experience **slight adverse** impacts on their setting.

10.9.1.7 The historic landscape resource within the study area is primarily an 18th century agricultural landscape with little time depth. Key features within the landscape include the historic settlements of Caversfield and Bucknell and the historic field boundaries. This landscape has been assessed as being of **low** value. Design mitigation measures have been included to preserve as many of the historic field boundaries as possible within the development to allow some legibility of the historic landscape to remain. In addition not all of the landscape would be impacted by the development. As a result of the development the historic landscape would experience **slight adverse** impacts.

Table 10-5 Cultural Heritage Impact Summary Table

Impact description	Temporary/Permanent	Significance rating
Impacts on archaeological remains indicating Bronze Age, Iron Age and Roman identified during the aerial photograph analysis, geophysical survey and evaluation	Permanent	Moderate Adverse
Impacts on the setting of St Lawrence's Church	Permanent	Slight Adverse
Impacts on the setting of Home Farmhouse	Permanent	Slight Adverse
Impacts on the Historic Landscape	Permanent	Slight Adverse

11 Contaminated Land

11.1 Introduction

11.1.1.1 This chapter relates to the Development within the site boundary for Application 1 – North of Railway of the NW Bicester development. It considers aspects relating to the chemical quality of the land and the potential associated risks to identified receptors such as human health and controlled waters that the Development may represent. This chapter describes:

- The current baseline conditions at the Site (North of Railway)
- Potential impacts and the mitigation measures required to prevent, reduce or offset any potentially significant adverse effects
- The likely cumulative effects after the mitigation measures have been implemented

11.1.1.2 To assist the understanding of the principles of this subject and their particular application within the context of the Development, it is recommended that the reader refers to the associated Hyder Consulting (UK) Limited Reports (Ref 11-1, 11-2 and 11-3), which have provided information for this chapter and copies of which are included in Appendix 11A, 11B and 11C. Reference should also be made to Chapter 15 which discusses waste such as excavated and construction waste.

11.2 Regulatory and Policy Framework

11.2.1.1 This impact assessment has been undertaken in accordance with current international and national legislation, and national, regional and local plans and policies relating to nature conservation in the context of the Development. A summary of the relevant legislation and policies, the requirements of these policies and the Development response has been provided in Table 11-1 below.

Table 11-1 Contaminated Land Regulatory and Policy Framework

Policy/Legislation	Summary of Requirements	Development Response
Environmental Protection Act (1990)	Government policy in relation to land contamination is outlined in DEFRA Circular 01/2006 'Contaminated Land'. The policy aims to both prevent new contamination and to address the inherited legacy of contaminated land. The primary legislation that covers historic land contamination is Part 2A of the Environmental Protection Act 1990, which was inserted by section 57 of the Environment Act 1995. Part 2A provides a definition of contaminated land, focussing on risks in the context of the current use and circumstances of the land. It places specific duties on local authorities to inspect their areas to identify land falling within this definition and, where they do,	Local authorities are the main regulator and are required to publish a strategy for inspecting their areas. The Environment Agency is responsible for dealing with defined 'special sites' and monitoring and reporting on progress made. Both local authorities and the Environment Agency record certain prescribed information about their regulatory actions on a public register and local

Policy/Legislation	Summary of Requirements	Development Response
	<p>to require its remediation in line with the 'suitable for use' approach.</p> <p>Part 2A of the Environmental Protection Act 1990 defines contaminated land as 'Any land which appears to be in such a condition, by reason of substances in, on or under the land that: Significant Harm is being caused or there is a Significant Possibility of such harm being caused; or Pollution of Controlled Water is being, or is likely to be, caused'.</p> <p>The identification of contaminated land on the basis that there is a significant possibility of significant harm (SPOSH) being caused is set out in DEFRA Circular 01/2006.</p> <p>The identification of contaminated land, as defined in Part 2A of the Environmental Protection Act 1990, comprises a risk-based approach. For harm to the non-aquatic environment or pollution of controlled waters to occur, there must be a 'pollutant linkage'. This linkage is based on the following being present:</p> <ul style="list-style-type: none"> ▪ Source of contamination (hazard); ▪ Pathway for the contaminant to move from source to receptor; ▪ Receptor (target), which is affected by the contaminant. This includes humans, ecosystems, controlled waters, physical systems and built structures, which could be affected by the hazard. 	<p>authorities maintain databases about potentially contaminated sites within their area.</p> <p>Development will follow principles of suitable for use criteria based upon a source-pathway-receptor risk assessment approach.</p>
<p>National Planning Policy Framework 2012</p>	<p>The National Planning Policy Framework (NPPF) was introduced in March 2012 to simplify planning and was written to help achieve sustainable development. Whilst containing only limited guidance on land affected by contamination the document does states that:</p> <p><i>"To prevent unacceptable risks from pollution and land instability, planning policies and decisions should ensure that new development is appropriate for its location. The effects (including cumulative effects) of pollution on health, the natural environment or general amenity, and the potential sensitivity of the area or proposed development to adverse effects from pollution, should be taken into account. Where a site is affected by contamination or land stability issues, responsibility for securing a safe development rests with the developer and/or landowner."</i></p>	<p>Consideration has been given to the potential risks from pollution within the study area.</p>

Policy/Legislation	Summary of Requirements	Development Response
Waste Regulations	<p>The Waste (England and Wales) Regulations 2011 states that excavated material generated by the development of land maybe subject to waste regulatory controls to ensure that waste does not harm human health or the environment.</p> <p>Waste disposal, deposit, recovery & recycling in England, Wales and Scotland is regulated primarily through Part 2 of the Environmental Protection Act and the Environmental Permitting Regulations. Under the legislation all controlled waste must be deposited, disposed of, recycled or recovered at a suitably licensed site, or a site that is registered as exempt from waste management licensing. In addition, controlled waste must be transported to a licensed (or exempt) site by an authorised waste carrier. It is an offence to deposit waste on land that does not have a waste management licence (or exemption) in force.</p>	<p>Licensing of waste disposal and treatment facilities, waste carriers and brokers and the monitoring of waste management activities is the responsibility of the Environment Agency in England and Wales.</p> <p>When dealing with waste the developemtn will apply the required waste regulations.</p>
CL:AIRE The Definition of Waste: Development Industry Code of Practice	<p>This Code of Practice (CoP) provides best practice for the development industry to use when assessing if materials are classified as waste, or not, and determining when treated waste can cease to be waste for a particular use. The CoP provides engineers, contractors, consultants and developers a basis upon which to demonstrate to the Environment Agency that they are following best practice with respect to the use and reuse of materials. It provides an auditable system to demonstrate that the CoP has been adhered to on a site by site basis. The development and use of the CoP is seen as a Better Regulation Approach by the EA.</p> <p>The CoP requires a normal risk assessment based approach (see CLR 11 above) to prove that materials are “suitable for use”. Where materials are not considered to be waste the Environmental Permitting Regulations (2010) need not be applied. Soils requiring treatment to allow their re-use are considered to be waste. Such treatment processes must be undertaken under an appropriate Mobile Treatment Permit. The CoP allows the user to demonstrate when wastes have been fully recovered, via treatment, and hence cease to be waste.</p> <p>The CoP requires regulatory agreement for each stage of the works. This is best achieved via a formal planning consent with appropriate</p>	<p>Due consideration to this guidance has been made.</p> <p>When re-use of material is appropriate a suitable for use approach as set out within CL:AIRE CoP will be applied.</p>

Policy/Legislation	Summary of Requirements	Development Response
	<p>conditions attached to the investigation, assessment and remediation. Approval is effectively obtained by discharge of the planning conditions that require regulatory agreement of:</p> <ul style="list-style-type: none"> ▪ Remediation Strategy. ▪ Remediation Method Statement. ▪ Verification Report. 	
<p>The Environment Agency's Model Procedures for the Management of Land Contamination (Contaminated Land Report 11)</p>	<p>Contaminated Land Report 11 (CLR 11) has been developed to provide the technical framework for applying a risk management process when dealing with land affected by contamination. The process involves identifying, making decisions on, and taking appropriate action to deal with land contamination in a way that is consistent with government policies and legislation within the UK. The document is consistent with the approach presented within the "Guidelines for Environmental Risk Assessment and Management" published by the Department of the Environment, Transport and the Regions, the Environment Agency and the Institute for Environment and Health (2000).</p>	<p>Assessment has been undertaken with due consideration to this guidance.</p>
<p>Water Resources Act 1991</p>	<p>The Water Resources Act 1991 provides regulation of contamination potentially impacting controlled waters and is enforced by the Environment Agency. This provides regulation separate from that within the planning framework.</p>	<p>Controlled Waters Risk Assessment (CWRA) has been undertaken and the potential impacts on water are included.</p>
<p>Control of Substances Hazardous to Health 2002</p>	<p>The Control of Substances Hazardous to Health (COSHH) Regulations, 2002, and subsequent amendments and the Construction and Design Management (CDM) Regulations, 2007, require the developer to ensure that risks to the public and site workers, in relation to the likely presence of contaminated land, are minimised.</p> <p>Additional guidance is provided by DEFRA in their series of Contaminated Land Reports (CLR 1-CLR 11).</p>	<p>Human Health Risk Assessment has been undertaken.</p>
<p>Environment Agency Pollution Prevention Guidance Notes</p>	<p>The Environment Agency has produced a range of Pollution Prevention Guidance Notes (PPGs) to provide advice on the laws and good environmental practice relevant to a number of industrial sectors and activities. These include</p>	<p>Best practice as set out in these PPGs will be implemented during the works.</p>

Policy/Legislation	Summary of Requirements	Development Response
	<p>the following:</p> <ul style="list-style-type: none"> ▪ PPG1 – General guide to the prevention of pollution ▪ PPG2 – Above ground oil storage tanks ▪ PPG5 – Works and maintenance in or near water ▪ PPG6 – Working at construction and demolition sites ▪ PPG8 – Safe storage and disposal of used oil ▪ PPG13 – Vehicle washing and cleaning ▪ PPG21 – Pollution incident response planning 	

11.3 Methodology

11.3.1 General Approach

11.3.1.1 The assessment of the potential for adverse environmental impact that could be associated with chemical contamination has been undertaken in accordance with The Statutory Guidance on Part IIA of the Environmental Protection Act 1990 (EPA 1990) as set out in Defra Circular 2012 (Ref 11-4); The Environment Agency's Model Procedures for the Management of Land Contamination (Contaminated Land Report (CLR) 11) (Ref 11-5) and other relevant supporting guidance.

11.3.1.2 The DEFRA statutory guidance for contaminated land uses the concept of a 'contaminant linkage', whereby for land to be contaminated, each of the following has to be identified:

- a contaminant (source)
- a relevant receptor
- a pathway by means of which either:
 - that contaminant is causing significant harm to that receptor, or
 - there is a significant possibility of such harm being caused by that contaminant to that receptor.

11.3.1.3 If one or more of the source, pathway or receptor is missing there can be no significant risk. If all are present then the magnitude of the risk is a function of the magnitude and mobility of the source, the sensitivity of the receptor and the nature of the migration pathway.

11.3.1.4 Although the presence of contaminants may result in contamination of the ground, land will only be designated as statutory Contaminated Land when the requirements of the strict definition of EPA 1990 Part IIA are met.

- 11.3.1.5 For definition of the terms 'Contaminated Land', 'contaminant', 'harm' and 'risk' and further details on the concept of a 'contaminant linkage' reference should be made to Part IIA of the EPA 1990.
- 11.3.1.6 As this is a development led project, consideration has been given to the NPPF. The principles for assessing if the site is "suitable for the proposed use" are based on the contaminant linkage methodology as detailed above. As a minimum the development should be considered safe and should not be able to be determined as statutory Contaminated Land under Part IIA.
- 11.3.1.7 Receptors identified as part of this study are:
- Human health (construction workers, site end users)
 - Controlled waters (groundwater and surface water)
 - Buildings and services

11.3.2 Consultation

- 11.3.2.1 Cherwell District Council and the Environment Agency (EA) were consulted during the preparation of the contaminated land assessment and relevant information is included within the baseline conditions below.

11.3.3 The Study Area

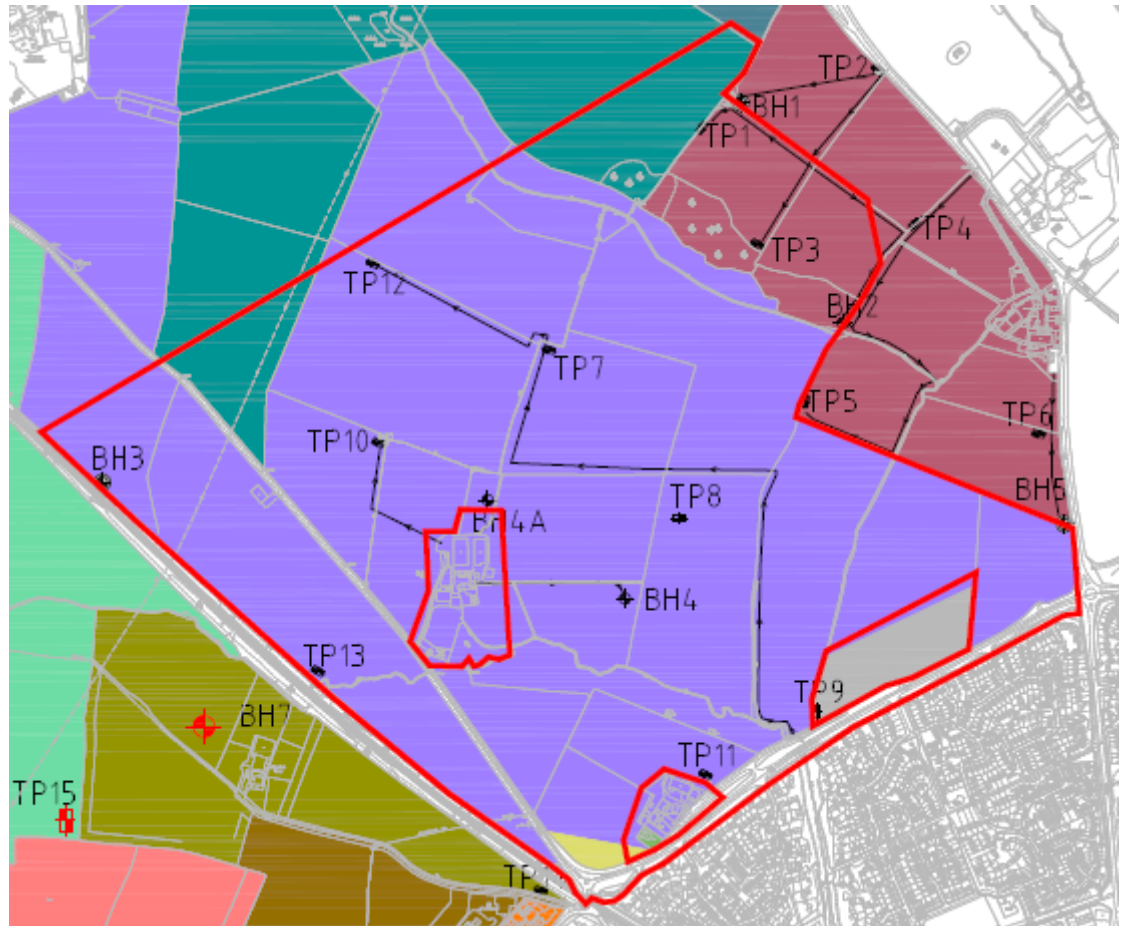
- 11.3.3.1 The study area for the contaminated land assessment is defined by the red line boundary for Application 1, as shown on Figure 11-1, however consideration is also given to activities within 500m of the boundary, e.g. landfill site, which may have an ability to cause impact on the Development.

11.3.4 Methodology for Establishing Baseline Conditions

Establishing the Existing Baseline

- 11.3.4.1 The baseline conditions for Application 1 have been determined from the following:
- Data presented in the Hyder Phase 1 Desk Study Report (Appendix 11A). This includes a review of available published and internet based information sources such as the Environment Agency (EA) database, historical maps and British Geological Survey (BGS). This report also includes a Tier 1 hydrological risk assessment report for land being considered for development as a new cemetery within the Application 1 boundary.
 - Information obtained during a preliminary intrusive ground investigation undertaken by Hyder in August 2010 (Appendix 11B). This includes details of ground conditions encountered and chemical quality of soils and groundwater sampled. This investigation covered a larger area as shown on Figure 11-1 below, than the Application 1 area considered within this chapter. Only information relevant to the Site Area is included within this chapter.

Figure 11-1 Plan showing the Hyder Site Investigation Area

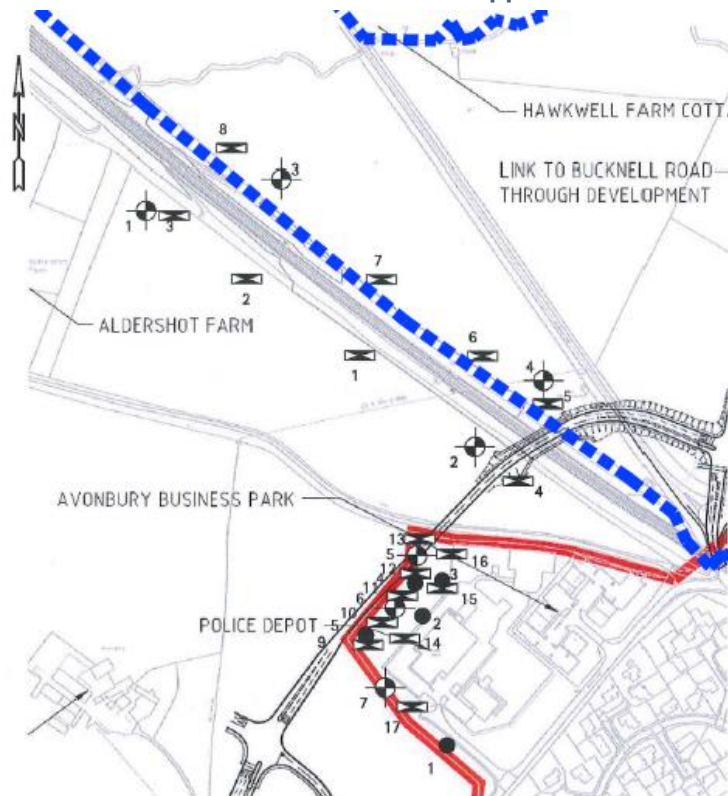


- Details have been taken from the Groundwater Supply: Feasibility Study (Appendix 11C).
- A desk study and intrusive site investigation (March 2014) was undertaken by ST Consult (Ref 11-6) on land within the southern part of the Application 1 boundary and on the other side of the railway lines shown in Figure 11-2 below (the blue dashed line indicates the Application 1 boundary). This was to provide information for the proposed road underpass in this location and investigated the landfill site present at Gowell Farm which is part of the Avonbury Business Park to the south of the Application 1 boundary. Whilst the majority of the work was undertaken on the opposite side of the railway and hence outside the Application 1 site boundary, six sample locations are within the Application 1 boundary and relevant information has been taken from this document which is appended within Appendix 11D.

Figure 11-2 Plan showing the investigation area of ST Consult
Key

Red line = ST Consult boundary

Blue dashed line = Application 1 boundary



Forecasting the Future Baseline (“Without Development” Scenario)

- 11.3.4.2 The existing ‘interpretative’ baseline conditions and risk assessment process (human health, controlled waters and buildings/structures) is carried out on the assumption that the Development and/or future land-users is/are in place.
- 11.3.4.3 The future baseline (‘without development’ scenario) will therefore be forecast by qualitatively assessing the potential baseline conditions and risks to human health, controlled waters and buildings and structures from existing sources of contamination.
- 11.3.4.4 It is not possible to predict future changes to regulatory policy and frameworks so the future baseline will be forecast assuming no significant change from current methodology. We do not envisage that any changes would materially affect the assessments made herein.

Defining the importance/sensitivity of resource

- 11.3.4.5 The significance criteria for contaminated land are based on the criteria set out in the Design Manual for Roads and Bridges (DMRB) (Ref 11-7). The significance of the identified impacts would be based on the sensitivity of the receptor taking into account the magnitude of the potential impact.
- 11.3.4.6 The assessment process comprises a number of stages. The first stage involves assigning the importance or sensitivity of each resource / receptor as assessed using the criteria provided in Table 11-2 below.

Table 11-2 Determining the Importance / Sensitivity of Resource

Importance / sensitivity of resource or receptor	Receptor: Human Health * (Soils)	Receptor: Human Health/Buildings ** (Ground Gas)	Receptor: Controlled Waters
Very High	Future users of residential properties with private gardens.	Low rise residential properties.	<p>High water quality and rare resource. Important at a regional or national scale, with limited potential for substitution, e.g.</p> <ul style="list-style-type: none"> ▪ Supply of high quality potable water to a large population <p><u>Groundwater:</u></p> <ul style="list-style-type: none"> ▪ Principal aquifer ▪ Within SPZ 1 or 2 <p><u>Surface water:</u></p> <ul style="list-style-type: none"> ▪ Supply of high quality potable water to a large population ▪ Classified as “high” water quality under the TAGWFD guidance with no EQS exceedances ▪ EC designated Salmond fishery ▪ Main Rivers ▪ Flood Zone 3b (functional floodplain)
High	Future users of allotments. Construction Workers^.	Residential properties other than low rise.	<p>High water quality and rare resource. Important at a local scale with limited potential for substitution, e.g.</p> <ul style="list-style-type: none"> ▪ Supply of a small volume of potable water for local use <p><u>Groundwater:</u></p> <ul style="list-style-type: none"> ▪ Secondary A aquifer ▪ Within SPZ 3 <p><u>Surface water:</u></p> <ul style="list-style-type: none"> ▪ Classified as “high” water quality under the TAGWFD guidance with no EQS exceedances ▪ EC designated Cyprinid fishery ▪ Some potential to supply a small volume for potable use ▪ Local drainage networks ▪ Flood Zone 3
Medium	Future users of residential properties	Public building e.g. managed apartments,	Moderate water quality and low rarity. Important at a local scale

Importance / sensitivity of resource or receptor	Receptor: Human Health * (Soils)	Receptor: Human Health/Buildings ** (Ground Gas)	Receptor: Controlled Waters
	without private gardens.	schools and hospitals.	<p>e.g.</p> <ul style="list-style-type: none"> ▪ Supply of a small volume of water for agricultural or industrial use or limited potential for potable supply <p><u>Groundwater:</u></p> <ul style="list-style-type: none"> ▪ Secondary B aquifer ▪ Not within SPZ <p><u>Surface water:</u></p> <ul style="list-style-type: none"> ▪ Classified as “good” water quality under the TAGWFD guidance with minor EQS exceedances or classified as “high” with moderate EQS exceedances ▪ Provision of water for agricultural or industrial purposes, no or limited potential to be used for potable supply ▪ Flood Zone 2 ▪ Overland / surface water flow routes
Low	Future users of public open space.	Commercial buildings.	<p>Poor water quality and low rarity e.g.</p> <ul style="list-style-type: none"> ▪ Limited potential to supply a small volume of water for agricultural or industrial use. No or limited potential for potable supply <p><u>Groundwater:</u></p> <ul style="list-style-type: none"> ▪ Secondary B aquifer ▪ Not within SPZ <p><u>Surface water:</u></p> <ul style="list-style-type: none"> ▪ Classified as “moderate” water quality under the TAGWFD guidance with minor EQS exceedances or classified as “good” water quality under the TAGWFD guidance, with moderate EQS exceedances ▪ Limited potential to supply a small volume of water for industrial or agricultural purposes. No, or limited

Importance / sensitivity of resource or receptor	Receptor: Human Health * (Soils)	Receptor: Human Health/Buildings ** (Ground Gas)	Receptor: Controlled Waters
			potential, to be used for potable supply <ul style="list-style-type: none"> ▪ Flood Zone 1
Negligible	Future users of commercial/ industrial properties.	Industrial buildings (where open and well ventilated; office pods might require separate assessment as classified as commercial).	Irreparably poor or bad water quality and low rarity. Important at a local scale e.g. <ul style="list-style-type: none"> ▪ No or very limited potential to supply water for agricultural or industrial use <u>Groundwater:</u> <ul style="list-style-type: none"> ▪ Non designated aquifer or unproductive strata ▪ Not within SPZ <u>Surface water:</u> <ul style="list-style-type: none"> ▪ Classified as “poor” water quality under the TAGWFD guidance, or any other classifications, with high EQS exceedances ▪ No potential to be used for industrial, agricultural or potable supply ▪ Flood Zone 1

* Duration of exposure to contamination and number of pathways of exposure to contamination increases from commercial/industrial (minimum) to residential with private garden (maximum) land uses. Therefore future users of industrial sites are considered to be of negligible importance as they will have minimal contact with underlying soils, whilst residential ends users are likely to be in contact with underlying soils on a more regular basis and are therefore of very high importance.

** Duration of occupancy and perception of risk increases from industrial buildings (minimum) to low rise residential properties (maximum). Amount of ventilation and management increases from low rise residential properties (minimum) to industrial buildings (maximum).

^Construction workers will only be exposed to contamination for a short duration, however, they may enter enclosed spaces and will be directly handling the soils.

Source: Professional judgement.

11.3.5 Methodology for Assessing Impacts

Introduction

11.3.5.1 The assessment of impacts to human health and controlled waters has followed the Environment Agency’s Model Procedures for the Management of Land Contamination (Contaminated Land Report 11, CLR 11) guidance. The assessment was based on the identification of ‘contaminant linkages’, i.e. source-pathway-receptor relationships. This approach accords with the guidance that accompanies Part IIA of the Environmental Protection Act of 1990 (as amended).

Conceptual Site Model

11.3.5.2 The Conceptual Site Model (CSM) links the identified potential previous and existing site sources of contamination capable of causing harm via pathways to identified receptors.

11.3.5.3 The Conceptual Site Model was characterised by identification of the following:

- On-site sources which may impact on-site receptors via plausible pathways;
- On-site source which may impact off-site receptors via plausible pathway; and
- Off-site sources which may impact on-site receptors via plausible pathways.

Human Health Risk Assessment

11.3.5.4 The Human Health Risk Assessment (HHRA) has been undertaken in accordance with the current guidance such as Contaminated Land Report 11 (CLR 11). When quantitative data exists, a tiered risk – based approach has been adopted, comprising the following:

- Tier 1 Assessment: Comparison of site contaminant concentrations against generic exposure scenarios and associated compliance criteria including an assessment of risk using a source-pathway-receptor model
- Tier 2 Assessment: Derivation of site-specific risk assessment criteria and calculation of site specific clean-up goals, if the Tier 2 assessments deem clean-ups to be necessary

11.3.5.5 The assessment has therefore been undertaken in a phased approach, focussing initially on the Tier 1 Assessment. The Tier 1 assessment includes the following stages, which were completed where applicable:

- Zoning of data/site averaging areas;
- Maximum Concentration Assessment - comparison of maximum detected concentrations against relevant Generic Assessment Criteria (GAC);
- Mean and Maximum Value Statistical Analysis – consideration of statistical outliers and 95% Upper Confidence Levels (UCLs) against relevant GAC;
- Risk Evaluation/Assessment of Significant Results; and
- Identification of the need for Tier 2 Assessment and derivation of Site Specific Assessment Criteria (SSAC).

11.3.5.6 The current philosophy in the assessment and remediation of contaminated land in the UK is to adopt an ‘end use’ risk based “suitable for use” approach whereby the significance of contamination at a site is evaluated according to either the existing use or to a proposed developments end use.

Zoning of Data/Site Averaging Areas

11.3.5.7 The development is expected to comprise predominantly residential properties, therefore the site has been considered to comprise one zone and averaging area for the purposes of this assessment.

Tier 1 Assessment

- 11.3.5.8 To identify the contaminants of potential concern (COPC), the laboratory testing results have been compared with the respective SGVs/GAC. The results and respective screening criteria are presented in the associated interpretative report, a copy of which is included within Appendix 11B.
- 11.3.5.9 For the Tier 1 Assessment, Environment Agency published generic Soil Guideline Values (SGVs) derived using the Agency's CLEA model (Ref 11-8), were used. Where these are not available, GAC published by LQM/CIEH (Ref 11-9) were utilised.
- 11.3.5.10 The assessment criteria relevant to the standard sensitive receptor setting within the CLEA model has been used i.e. a female receptor aged 1 to 6 years, a residential building (small terraced house) and a sandy loam soil with a pH7 and SOM 1%. Given the proposed site end use, the stringent "residential with plant uptake" land use scenario has been adopted.
- 11.3.5.11 Any contaminants that exceed the SGVs/GAC are considered to be COPC. Those that do not exceed the respective SGVs/GAC are not considered to be COPC and do not require further assessment in relation to the Development.

Ground Gas Risk Assessment

- 11.3.5.12 It should be noted that, in accordance with current best practice and guidance, the number and frequency of ground gas monitoring rounds required is dependent on the sensitivity of the development and the generation potential of any ground gas source. In this case, the ground gas monitoring programme has been devised in order to establish a preliminary indication of the ground gas regime at the site.
- 11.3.5.13 Preliminary monitoring of the ground gas regime was undertaken by Hyder between August and November 2010. Further monitoring was undertaken by ST Consult in 2014.
- 11.3.5.14 The results of monitoring have been assessed using the current guidance document: CIRIA C665 "Assessing Risks Posed by Hazardous Ground Gases to Buildings" (Ref 11-10) and BS8485:2007 "Code of Practice for the Characterization and Remediation from Ground Gas in Affected Developments" (Ref 11-11).

Controlled Waters Risk Assessment

- 11.3.5.15 The Controlled Waters Risk Assessment (CWRA) has been undertaken in accordance with the guidance suggested in the CLR 11 and comprised a staged approach (referred to as 'Levels'). A Level 2 Assessment has been undertaken for the purposes of this CWRA. For information, all Levels (1 to 4) are summarised in Table 11-3 below.

Table 11-3 Quantitative Risk Assessment Levels

	Soil	Groundwater
1	Pore water contamination compared directly to receptor target concentration	Not applicable
2	Attenuation in unsaturated zone and dilution at the water table	Groundwater below source - groundwater data is compared directly to target concentrations
3	Attenuation in the aquifer	Attenuation and down gradient receptor or compliance point – groundwater concentration at the receptor/compliance point is predicted using numerical modelling
4	Attenuation and dilution in the receptor	Dilution in the receptor - dilution in a receiving watercourse or pumping abstraction borehole (only with approval of EA)

11.3.5.16 The basis for the screening criteria is to ensure that the selected screening values are protective of the identified receptor. For groundwater the general approach is to use an environmental standard as experience shows that remediation of contaminated groundwater to background quality is not achievable. The standard should be relevant to the current and future receptors and the standards compliance criteria should be considered.

11.3.5.17 Standards that are applicable to this study are:

- UK Environmental Quality Standards (EQS) for the protection of aquatic life (in both freshwater and saline environments);
- UK Water Supply (Water Quality) Regulations, 2000 and 1989.

11.3.5.18 The groundwater beneath the site is considered to be the receptor in the first instance and therefore the UK Drinking Water Standards (UKDWS) have been selected as the appropriate screening criteria for the Level 2 Assessment. The results and respective screening criteria are presented in the associated interpretative report (Appendix 11B).

Assessment Criteria

11.3.5.19 The magnitude of each impact is assessed using the criteria provided in Table 11-4 below. This assessment, in the context of this chapter, is essentially quantifying the potential outcome of complete ‘pollutant linkages’ impacting the identified receptor.

Table 11-4 Assessing Magnitude of Impact

Magnitude of Impact	Human Health	Building/Structure	Groundwater*
Major	Chronic risk to human health likely to result in	Catastrophic damage to buildings/property.	Loss in water body or permanent significant detrimental impact on

Magnitude of Impact	Human Health	Building/Structure	Groundwater*
	'significant harm' as defined by the Environmental Protection Act 1990, Part IIA.	e.g. explosion resulting in building collapse.	water quality which permanently affects its use to or potential to supply water.
Moderate	Chronic damage to human health (significant harm as defined in Statutory Guidance.	Significant damage to buildings, structures and services.	Temporary loss of water body. Significant temporary detrimental impact on water quality but does not affect its use or moderate temporary detrimental impact on water quality, which does affect its use for supply purposes.
Minor	Significant chronic harm but to less sensitive receptors.	Damage to sensitive buildings, structures, services or the environment.	Moderate temporary detrimental impact on water quality, which does not affect its use for supply purposes.
Negligible	Non permanent health effects to human health (easily prevented by means such as personal protective clothing).	Easily repairable effects of damage to buildings, structures and services.	Minor temporary detrimental impact on water quality.
No Change	No discernable impact	No discernable impact	No discernable impact

*Source: Adapted from Department of Transport's Transport Analysis Guidance: The Water Environment Sub-Objective, 2003 based on methodology set out in DMRB with professional judgement added to relate to contaminated land. *Magnitude of impacts can be positive or negative

11.3.5.20 Using these definitions, a combined assessment of sensitivity and magnitude can then be undertaken to determine how significant an effect is, as demonstrated in Table 11-5 below.

Table 11-5 Assessing Magnitude of Impact

		Magnitude of Impact				
		No Change	Negligible	Minor	Moderate	Major
Value of Receptor	Very High	Neutral	Slight	Moderate/Large	Large or Very Large	Very Large
	High	Neutral	Slight	Moderate/Slight	Moderate/Large	Large/Very Large
	Medium	Neutral	Neutral/Slight	Slight	Moderate	Moderate/Large
	Low	Neutral	Neutral/Slight	Neutral/Slight	Slight	Slight/Moderate
	Negligible	Neutral	Neutral	Neutral/Slight	Neutral/Slight	Slight

11.3.6 Limitations and Assumptions

- 11.3.6.1 Subsurface ground conditions are by their nature hidden from view, and on this basis actual ground conditions at the Site have the potential to be at variance to those being reported and inferences drawn.
- 11.3.6.2 The intrusive investigation undertaken by Hyder was designed to provide a preliminary inspection to help inform a baseline of the ground conditions to facilitate the Outline Planning Application. Further recommended work would be controlled by relevant planning conditions(s). Further detailed investigation / assessments would be required to provide a higher density sampling plan reduce uncertainties and thereby to refine the Site characterisation between sampling points where previously no investigation has been undertaken.
- 11.3.6.3 This document has been prepared using factual information contained in maps and documents prepared by others. Where this is the case, no responsibility can be accepted for the accuracy of such information.

11.4 Description of the Baseline Conditions

11.4.1 Existing Baseline

Site History

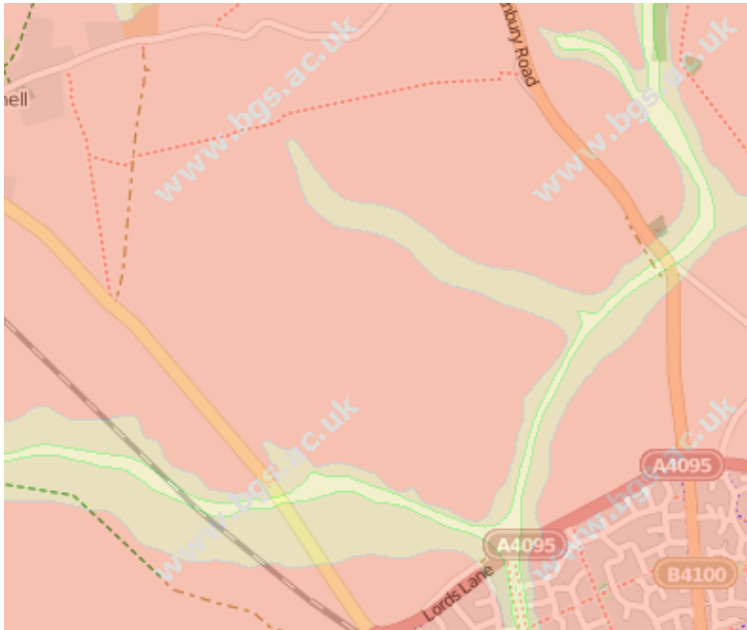
- 11.4.1.1 Since the earliest available historical map of 1881 to the present day, the site has been dominated by agricultural activity. A quarry is located on the southern side of Bucknell Road. On the 1922 edition, the Great Western Railway is present defining the southern boundary. In 1923 limekilns, quarry and pumping station are shown on southern side of railway line. These are no longer present in 1970 and are the location of the landfill site which is later developed into Avonbury Business Park.

Geology

Published Geology

- 11.4.1.2 From published BGS geological maps (Sheet 219, Scale 1:50,000) (Ref 11-12), the geology across the site is underlain by a thin cover of superficial deposits (alluvium) which follows the lines of the watercourses within the locality. The solid geology, is represented by the Combrash Formation, which primarily comprises bioclastic limestone. This is underlain by the Forest Marble Formation, which comprises grey calcareous mudstone with lenticular beds of bioclastic limestone. Further detailed information is included within the desk study report in Appendix 11A and Figure 11-4 below illustrates the drift and solid geology at the site.

Figure 11-4 Solid and Drift geology (Taken from BGS website)



Key

Superficial deposits

- ALLUVIUM - CLAY, SILT, SAND AND GRAVEL
- HEAD - CLAY, SILT, SAND AND GRAVEL

Bedrock geology

- BLADON MEMBER - MUDSTONE AND LIMESTONE, INTERBEDDED
- CORNBRASH FORMATION - LIMESTONE
- FOREST MARBLE FORMATION - LIMESTONE
- FOREST MARBLE FORMATION - LIMESTONE AND MUDSTONE, INTERBEDDED
- WHITE LIMESTONE FORMATION - LIMESTONE

Source: C09/013-CCSL British Geological Survey. ©NERC. All rights reserved.Reproduced from Online Viewer by permission of the British Geological Survey. ©NERC. All rights reserved.

Encountered Geology from Preliminary Investigation

11.4.1.3 The geological sequence is generally confirmed by the two ground investigations undertaken across the site with the strata encountered as follows:

- 0-0.2m thickness of Topsoil;
- 0.2-0.6m (up to 0.8m deep in places) of Subsoil, comprising an orange/brown gravelly/sandy Clay or sandy clayey Gravel;
- 0.6m to 1.9m (up to 2.9m deep in places) of yellow sandy Gravel and in places yellow/grey Clay, grading to completely weathered Limestone (Cornbrash Formation);
- From 1.9 to 7m depth, alternating Limestone and Clay bands of the Cornbrash Formation are represented.

Hydrogeology

- 11.4.1.4 The solid geology is designated as Secondary A aquifer. These are aquifers which are permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flows to rivers. The superficial deposits are not designated.
- 11.4.1.5 The site is not located within a Source Protection Zone (SPZ) and no major potable water supplies are present within 5km of the Site.
- 11.4.1.6 There are three groundwater abstractions recorded within the site boundary. All are registered to boreholes at Lord's Farm for general farming and domestic purposes. Two further abstractions are shown on the map at Hawkwell Farm in the centre of the Site, but these are not recorded in the EA database (from Envirocheck).
- 11.4.1.7 From the borehole log available of the BGS website, the following information is available regarding the one for the abstraction wells at Lords Farm:
- 11.4.1.8 An 80 m deep borehole at Lords Farm (SP52/18 at SP 5746 2424), drilled in 1941, was drilled through a similar sequence and terminated in the Lias. It struck water in the Cornbrash Formation, which was cased out, and at two levels below the White Limestone Formation. The rest water level was at 11m below ground level (about 68m AOD) and it yielded 1.7 l/s. Other records of water levels at Lords Farm (SP52/17A, B and C at about SP 569 245) show that the water level was at approximately 3.6m of ground level (about 76m AOD).
- 11.4.1.9 One historical well is located within the Site Area under consideration, with two further historic wells located to the south west on the opposite side of the railway line. Plans showing the locations of the wells are included in the Hydrogeological report in Appendix 11C.
- 11.4.1.10 During the Hyder site investigation (Appendix 11B) groundwater was encountered between 0.6 to 2.6 m in trial pits TP7, TP8, TP9 TP10 and TP13 (location plan in Hyder report Appendix 11B). The remaining trial pits were dry during the short time they were left open. Trial pits TP7 to TP10 and TP13 were carried out after a period of heavy rain. Groundwater monitoring, following completion of the ground investigation at the Masterplan site suggested that excavations for shallow foundations may encounter some groundwater flow in some areas, particularly after heavy rain. The groundwater strikes within the trial pits generally coincide with the top of the limestone (Cornbrash Limestone).
- 11.4.1.11 During the ST Consult investigation (Appendix 11D) groundwater was encountered in BH3 and BH4 at 4.85m and 5.40m respectively. In BH3 the groundwater rose to ground level in 3 minutes which indicated an artesian flow following a fissure strike. This location was abandoned and grouted with a bentonite seal.

Hydrology

- 11.4.1.12 There are three main watercourses on Site, as shown on Figure 7-1; one flowing in a north-westerly to south-easterly direction from the railway line across the site, another which flows from the north-north-west and joins with the

third watercourse which flows in a north-easterly to south-westerly direction. The two main streams converge and discharge into the River Bure in the centre and north-east of the Site area. The River Bure flows off-Site in a roughly north-easterly to south-westerly direction.

Landfill Sites

- 11.4.1.13 A historic landfill is recorded as present on the Site at Gowell Farm approximately 100m to the south of the Site boundary. This is currently part of Avonbury Business Park. Records suggest that this location may have been previously quarried for limestone. Local Authority records contained within the Envirocheck Report state the deposited waste as being “ash, glass, brick, pottery”, which was likely used as fill for the old quarry on Site.
- 11.4.1.14 The ST Consult investigation (Appendix 11D) included drilling in the landfill area which is outside the Application 1 boundary. Made Ground was encountered to a maximum depth of 3m (WSL3) in the area of the infilled Lime Kiln. This comprised of clinker based fill including black and brown mottling and abundant glass sharps but no visual or olfactory signs of significant contamination.
- 11.4.1.15 A plan showing the features detailed above are included within the Phase 1 desk study report (Appendix 11A) and Hydrogeological Report (Appendix 11C).

Tier 1 Hydrological Risk Assessment

- 11.4.1.16 This was undertaken to assess the suitability of land within the Application 1 boundary for the development of a cemetery. The key issues are detailed below with further information on the assessment within the report included within Appendix G of the Hyder desk study report (Appendix 11A).
- 11.4.1.17 Within the assessment a site vulnerability is determined which is based on the geology, hydrogeology and other baseline factors. The vulnerability ranking assigned to land within the Application 1 boundary is Moderate and when the number of anticipated annual burials are considered the risk rating is increased to High.
- 11.4.1.18 The site characteristics that have caused the raised vulnerability score were absence of superficial deposits and high water table.
- 11.4.1.19 The report states that subject to appropriate site investigation and agreement with the EA, it may be possible to either adjust the risk rating of the site or to design measures, such as drainage or specifications for burials, to mitigate risk to groundwater.

Contamination Status

Human Health Risk Assessment

- 11.4.1.20 During the investigation undertaken by Hyder, soil samples were taken from the Application 1 area and analysed for a suite of metal and organic contaminants. From the assessment only one soil sample of 23 samples from TP13 at 0.6m depth had a concentration slightly above the respective SGVs/GAC for Arsenic. The concentration recorded was 36.2mg/kg which is marginally above the SGV of 32mg/kg for a residential with plant uptake scenario. On review of the log for

TP13, this slightly elevated result was encountered within natural soils (very clayey sandy gravel) and therefore it is likely that the Arsenic is from natural sources. From BGS data the background concentrations in this area are around 25mg/kg which is a similar order as the concentration encountered. Due to the depth that it has been encountered, residents are unlikely to come into day to day contact with this material and therefore the risk from this slightly elevated concentration would be minimal. This assumes that the site levels remain the same.

- 11.4.1.21 All other samples analysed contained contaminants which were below the SGVs/GAC for a residential with plant uptake scenario.
- 11.4.1.22 As only one sample of the 23 samples tested returned contaminant values greater than the respective SGVs/GAC, the soil that has been tested is deemed suitable for use in gardens (including growing edible plants) without the need for treatment or other remedial action. It should however be noted that samples have been taken from depths ranging from 0.2m to 1.2m below ground level. There has therefore been limited testing of shallow soils and very limited testing (if any) of topsoil across the site.
- 11.4.1.23 The investigation undertaken in the southern portion of the Application 1 site (on northern side of the railway line) by ST Consult included analytical testing of soil samples for a suite of inorganic and organic contaminants. The results were compared to SSVs for a commercial end use and no exceedances were recorded. On review of the results, the concentrations from the locations on the northern side of the railway line (i.e. within the Site boundary) all the results were below the SSVs for a residential with plant uptake scenario.
- 11.4.1.24 All the samples from the ST Consult investigation and two from the Hyder investigation were screened for Asbestos. No fibres or asbestos containing materials (ACM) were recorded.
- 11.4.1.25 Based on the information available to date, the risks posed to human health (i.e. site end users) are considered to be low.
- 11.4.1.26 It should be noted that the investigation undertaken to date, only provides limited spatial coverage due to access constraints at the time of the works.
- 11.4.1.27 During site construction works, site workers should remain vigilant to the possible risk of encountering localised “unforeseen” areas of contaminated soils. Should potentially contaminated soil be encountered, further testing would be required to assess the risks to the health and safety of site workers, site end users and other sensitive receptors. All persons engaged in site construction works should be made aware of the findings of the intrusive investigation and the hazards associated with handling potentially contaminated materials. It is recommended that all works are conducted in accordance with the Health and Safety Executive publication entitled “Protection of Workers and the General Public during the Development of Contaminated Land” (Ref 11-13).

Gas Risk Assessment

- 11.4.1.28 Gas monitoring was undertaken during the Hyder (3 rounds) and ST Consult investigations (3 rounds).

- 11.4.1.29 From the Hyder investigation, two boreholes BH3 and BH5 are considered. BH3 is located on the northern side of the railway line at the southern boundary of the site. BH5 is located within an area known as the Exemplar site but is located adjacent to the northern boundary and therefore the data from this borehole has also been considered within this assessment.
- 11.4.1.30 From the ST Consult investigation, one monitoring well BH4 is located within the Site area, however all the results are considered as monitoring is undertaken with landfill material located to the south of the site. This could pose a risk to end users within the Application 1 site area from migration of gases on to site.
- 11.4.1.31 In line with current guidance, Gas Screening Values (GSV) for methane and carbon dioxide have been calculated.
- 11.4.1.32 Based on the concentrations recorded during the monitoring undertaken by Hyder the highest GSV are; Methane 0.0003l/h (BH5) and Carbon Dioxide 0.011l/h (BH5).
- 11.4.1.33 From the ST Consult information, the gas concentrations and flow rate recorded in BH4 (on site) are below the limit of detection (<0.1% v). BH1 and BH2 which are located on the opposite side of the railway line recorded below limit of detection with regards to methane, however carbon dioxide with a maximum of 2% v was recorded in BH2. This indicates that some gas may be migrating from the landfill site towards the Site Area. When considering all the gas monitoring undertaken including the wells within the landfill material, the worst case GSV for carbon dioxide is 0.12l/h (WSL4 within fill material).
- 11.4.1.34 The results of the gas monitoring indicate a NHBC Green Scenario (low risk) in relation of ground gases for the Development.
- 11.4.1.35 Further monitoring across the site may be required to ensure that there is no variation across the Development.
- 11.4.1.36 With regards to radon, a detailed BR 211 Radon Report was obtained from the British Geological Survey (BGS) as part of the Desk Study (Appendix 11A) and states that the estimated probability of a property being above the Action Level for radon is 3-5% and therefore basic radon protection measures are required in the construction of new properties for the site.

Controlled Water Risk Assessment

- 11.4.1.37 During the Hyder investigation, three water samples taken from the boreholes (BH1, BH3 and BH5) across the Site Area or in close proximity were analysed predominantly for metal contaminants. All the results were below the Water Quality Standards (WQS) values. Further information on the WQS values used can be found in the Hyder interpretative report (Appendix 11B).
- 11.4.1.38 Groundwater was taken from seven wells during the ST Consult investigation and screened for inorganic and organic contaminants. Generally the results were below the appropriate WQS, however slight exceedances were encountered for some metal contaminants against the screening values. For example BH4 which is located within the Site indicated slightly elevated

selenium and lead, but only a natural sequence was observed during drilling. This may indicate naturally higher concentrations or that there is impact on an off-site location.

11.4.1.39 Whilst some slight exceedances have been recorded, it is unlikely that remedial action with regards to groundwater would be required.

11.4.2 Future Baseline

11.4.2.1 In the absence of the Development, the future use of the Site is likely to stay in agricultural use. Based upon this assumption, it is considered that existing ground conditions, and low levels of contamination would remain at the Site.

11.4.2.2 The low levels of contamination encountered on the site are likely to be from natural sources and therefore the land quality is not likely to deteriorate if no development was constructed.

11.5 Design and Mitigation

11.5.1 Construction Approach and Mitigation of Short-Term Construction Effects

11.5.1.1 The remedial works required for the mitigation of impacts to the proposed future Site users and controlled waters would be completed during the construction phase of the Development. The main potential contamination impacts relating to the construction phase are considered to be:

- Impacts to construction workers;
- Impacts to the environment from the construction works;
- Impacts to adjacent people, properties and roads from the remedial and construction works.

11.5.1.2 The necessary mitigation measures to be incorporated within the construction phase are outlined below.

Mitigation of Contamination Impacts to Construction Workers

11.5.1.3 The potential impacts to construction workers from contaminants in soils and groundwater would be mitigated through the adoption of appropriate health and safety practices, as outlined in the Code of Construction Practice (CoCP). This would be set out in the CEMP.

11.5.1.4 All persons engaged in Site construction works would be made aware of the findings of the intrusive investigations and the hazards associated with handling potentially contaminated materials. All works would be conducted in accordance with the Health and Safety Executive publication entitled "Protection of Workers and the General Public during the Development of Contaminated Land", 1991.

11.5.1.5 Whilst no asbestos has been encountered, the procedures relating to asbestos outlined within the CoCP would be adhered to by construction workers with regard to the potential presence of asbestos within excavated earthworks

materials. Suitable Personal Protective Equipment (PPE) including Respiratory Protective Equipment (RPE) if necessary would be made available for use if suspected asbestos contaminating materials are encountered during the Site works.

- 11.5.1.6 Where any hazardous chemicals are used in the construction works, risk assessments would be made under The Control of Substances Hazardous to Health Regulations (as amended) (Ref 11-14).
- 11.5.1.7 The procedures relating to the monitoring of excavation works and the identification of any suspected further contamination defined within the CoCP would be adhered to. Site workers would remain vigilant to the possible risk of encountering isolated areas of contaminated material, particularly if unusual visual changes, or odours are encountered.
- 11.5.1.8 The main contractor would be required to develop contingency plans in the Construction and Environmental Plan (CEMP) to minimise accidental exposure to human and environmental receptors from unexpected hazards.
- 11.5.1.9 A Materials Management Plan would be produced detailing the strategy for re-use of soils within the Development. This would follow the approach within the CL:AIRE Development Industry Code of Practice (Ref 11-15).
- 11.5.1.10 An experienced environmental engineer would be available to attend site and undertake inspection and supervision of contingency events and subsequent actions. This would allow quick identification of potential hazards, direction of quarantine and call-off actions and sampling and testing of potentially hazardous materials. Specialist services would be called upon for further investigation and remedial actions, as necessary.

Mitigation of Contamination Impacts to the Environment, Adjacent People and Properties from the Construction Works

- 11.5.1.11 Suitable measures to mitigate the contamination impacts during the construction works are outlined below. The mitigation of construction related impacts to surface water are detailed in Chapter 7 of this ES. The following mitigation methods would be employed:
 - Prevention of water entering excavations, where possible;
 - Planned and phased topsoil stripping, excavation and stockpiling operations to ensure minimal disturbance;
 - Use of measures such as cut off ditches, silt fences or impermeable membranes to prevent uncontrolled release of runoff from excavations or exposed ground;
 - Appropriate disposal of waste from the Site;
 - Appropriate storage of potentially polluting materials and chemicals in accordance with the Control of Pollution (Oil Storage) Regulations (England) 2001 (Ref 11-16);
 - Adequate supervision of all deliveries and refuelling involving potentially polluting substances;

- Delivery and refuelling areas to be located away from surface water bodies with adequate measures in place to contain spillages at these locations;
- Leaks or spillages of potentially polluting substances to be contained, collected then removed from Site in an appropriate manner e.g. use of absorbent material, bunding or booms. An emergency action plan would be formulated which all Site personnel would have read and understood;
- Storage of machinery and equipment to be located away from surface water bodies. Drip trays to be placed underneath any parts where oil/fuel may be found;
- Use of adequate wheel wash facilities to contain and dispose of potentially polluted runoff;
- Regular washing of machinery and access roads and dampening to reduce dust emissions with appropriate collection and disposal of runoff;
- Use of pre-mixed concrete from an off-site source or limiting mixing and handling of wet concrete to a designated area away from surface water bodies and with controlled runoff for appropriate disposal;
- Should areas of contamination be identified measures would be taken to ensure that contaminated material is isolated. All equipment utilised within the contaminated area would be thoroughly cleaned before it is used outside the contaminated area;
- Special measures would be adopted during drilling of boreholes and during piling to ensure that preferential pathways are not created;
- All construction works would be carried out in accordance with PPG 6 'Working at Construction and Demolition Sites' (Ref 11-17) and other relevant PPG documents (Refs 11-18 to 11-25);
- Secure access to the Site for construction personnel only to prevent vandalism

11.5.2 Scheme Design and Mitigation of Permanent Operational Effects

Future Site Users

- 11.5.2.1 The impacts to future Site users would be mitigated by the remedial measures (if deemed necessary) that are implemented.
- 11.5.2.2 The impacts to future Site users within buildings would be mitigated by the incorporation of appropriate ground gas protection measures (if required beyond those to mitigate the risk from Radon gas) within the building design and construction, in accordance with CIRIA C665 and BS8485.
- 11.5.2.3 As part of the further detailed contaminated land investigations and assessments to be completed ahead of each development phase, installation of additional ground gas monitoring locations and further ground gas monitoring would be completed. This would provide an acceptable ground gas dataset to allow a comprehensive ground gas risk assessment to be completed. The findings of this assessment would confirm the suitability of the above listed

measures. The assessment and remedial measures would be controlled by relevant planning condition(s).

Controlled Waters

- 11.5.2.4 The impacts to controlled waters would be mitigated by the remedial measures (if deemed necessary) that are implemented.
- 11.5.2.5 Within the land proposed to be a cemetery, measures such as drainage design or specification for burials would be implemented to ensure that the risk to groundwater is mitigated. Prior to the design of the cemetery, further detailed ground investigations would be undertaken to determine the depth of groundwater (including seasonal variations) in this locality and discussions with the EA would be undertaken to ensure all requirements are met.

Buildings and Services

- 11.5.2.6 As methane concentrations within the explosive range (5-15% v/v in air) have not been detected during the ground gas monitoring completed to date, explosive ground gas is unlikely to impact upon the proposed buildings. Notwithstanding this, the impact from ground gas to proposed buildings would be mitigated by the incorporation of appropriate ground gas protection measures (if required) within the building design and construction to protect future Site users, subject to further monitoring and assessment.
- 11.5.2.7 As part of the further detailed contaminated land investigations and assessments to be completed ahead of each development phase, installation of additional ground gas monitoring locations and further ground gas monitoring would be completed to provide an acceptable ground gas dataset. This would allow a comprehensive ground gas risk assessment to be completed. The findings of this assessment would confirm whether proposed buildings require gas mitigation measures.
- 11.5.2.8 Appropriate assessment of potential risks to new water supply pipes would be completed to ensure appropriate pipe material is used within the Development. This would be controlled by relevant planning condition(s).

11.6 Construction Impacts

- 11.6.1.1 Provided that the mitigation measures outlined above and in the remedial strategy documents are followed, the likely construction impacts are detailed below.
- 11.6.1.2 The impacts on construction workers include potential chronic damage via dermal, ingestion and inhalation exposure to contamination. Construction workers are considered to be of high importance and assuming the mitigation measures are adopted, it is considered that this would result in a negligible adverse change to human health. The impact significance has been assessed as **temporary slight adverse**.
- 11.6.1.3 The impacts to adjacent site users include potential chronic damage to contamination via ingestion and inhalation of air-borne dust exposure. This could be through site activities and transportation of material off site. The main

adjacent site users are considered to be residential receptors which are considered to have a very high importance. Assuming the mitigation measures are adopted it is considered that this would result in a negligible adverse changes to human health. The impact significance has been assessed as **temporary slight adverse**.

- 11.6.1.4 Whilst low levels of contamination have been encountered on site, construction activities could result in the mobilisation of contaminants within the soil and create pathways for contaminants to migrate into the underlying groundwater or surface water. These receptors would also be at risk from general construction activities such as re-fuelling of vehicles, use of chemicals and hydrocarbons on site, stockpiling and excavation of soils. The groundwater is designated a Secondary A aquifer and is given a high importance. Assuming the mitigation measures are implemented, it is considered that this could result in a negligible adverse change in water quality. The impact significance has been assessed as **temporary slight adverse**.

11.6.2 Overview

- 11.6.2.1 As detailed above assuming that the mitigation measures are adopted during the construction phase, the impact significance has been assessed as **temporary slight adverse** for identified receptors.

11.7 Permanent Operational Impacts

- 11.7.1.1 The development mainly comprises of residential housing and therefore once developed the site end users (i.e. residents) would come into contact with soils and therefore there is the potential for chronic damage via exposure to contamination via accidental ingestion, dermal contact or inhalation of dust. Based on the information to date, low levels of contaminants have been encountered on site and if contamination was encountered in other previously uninvestigated area remedial measures would be implemented.
- 11.7.1.2 Residents are considered to have very high importance and assuming mitigation measures are adopted this would results in a negligible adverse change to human health. The impact significance has been assessed as **permanent slight adverse**.
- 11.7.1.3 Based on the gas monitoring information to date, there is the potential for low levels of gases in particular carbon dioxide to migrate from the landfill site to the south of Application 1. Site end users could be at risk from gases migrating on to site and accumulating within confined spaces in properties leading to asphyxiation. Site end users (residents) are considered to have a very high importance and assuming that appropriate mitigation measures are implemented (ie installation of suitable gas protection measures) this would result in a negligible adverse change to human health. The impact significance has been assessed as **permanent slight adverse**.
- 11.7.1.4 A small proportion of the site is likely to be developed for retail / leisure activities. During operation, there is the potential risk from accidental spillages of contaminating materials such as fuel, oil and chemicals. These areas are likely to be covered by hardstanding with appropriate drainage which would

protect the underlying soils and water receptors. Groundwater is considered to be of high importance and assuming design and mitigation measures are adopted this would result in a negligible adverse change to water quality. The impact significance has been assessed as **permanent slight adverse**.

- 11.7.1.5 A small area within the Application 1 boundary is proposed to be a cemetery. During the operation of this, there is a risk that contaminants (associated with decomposition of bodies) would enter the underlying groundwater. Based on the information to date a high vulnerability risk rating has been determined. The groundwater in the area is considered to be of high importance and assuming design and mitigation measures are adopted this would result in a negligible adverse change to water quality. The impact significance has been assessed as **permanent slight adverse**.

11.8 Cumulative Impacts

- 11.8.1.1 Off-site impacts would be limited through the mitigation described above and disposal of contaminated and uncontaminated soils to landfill would be avoided by the proposed remedial works or materials management plans. Therefore, provided that the requirements of the relevant policy and legislation relating to land contamination and remediation are adopted in design and appropriate mitigation measures are applied, it is considered that there would be no significant cumulative impacts.

11.9 Summary

- 11.9.1.1 The study area for the contaminated land assessment is defined by the red line boundary for Application 1, however consideration is given to activities within 500m of the boundary e.g. landfill site which may have an impact on the Development.
- 11.9.1.2 The assessment of the potential for adverse environmental impact that could be associated with chemical contamination has been undertaken in accordance with The Statutory Guidance on Part IIA of the Environmental Protection Act 1990 (EPA 1990) as set out in Defra Circular 2012; The Environment Agency's Model Procedures for the Management of Land Contamination (Contaminated Land Report (CLR) 11) and other relevant supporting guidance.
- 11.9.1.3 Receptors identified as part of this study are:
- Human health (construction workers, site end users)
 - Controlled waters (groundwater and surface water)
 - Buildings and services
- 11.9.1.4 Since the earliest available historical map of 1881 to the present day, the site has been dominated by agricultural activity. A quarry is located on the southern side of Bucknell Road. On the 1922 edition, the Great Western Railway is present defining the southern boundary. In 1923 limekilns, quarry and pumping station are shown on southern side of railway line. These are no longer present in 1970 and are later developed into Avonbury Business Park.

- 11.9.1.5 From published BGS geological maps, the geology across the site is underlain by a thin cover of superficial deposits over Combrash Formation and Forest Marble Formation. This sequence was generally confirmed by the investigation work undertaken by Hyder and ST Consult.
- 11.9.1.6 The solid geology is designated as Secondary A aquifer, whilst the superficial deposits are not designated. The site is not located within a Source Protection Zone (SPZ).
- 11.9.1.7 A historic landfill is recorded as present on the Site at Gowell Farm approximately 100m to the south of the site boundary. This is currently part of Avonbury Business Park. The ST Consult investigation included drilling in the landfill area where Made Ground was encountered to a maximum depth of 3m (WSL3) in the area of the infilled Lime Kiln.
- 11.9.1.8 During the investigations undertaken by Hyder and ST Consult, soil samples were taken and analysed for a suite of contaminants. There was only one Arsenic which was slightly above the guideline value for a residential end use.
- 11.9.1.9 The results of the preliminary gas monitoring indicate a NHBC Green Scenario (low risk) in relation of ground gases for the Development.
- 11.9.1.10 Generally the groundwater results were below the appropriate WQS, however slight exceedances were encountered for some metal (selenium, lead) contaminants against the screening values. Whilst some slight exceedances have been recorded, it is unlikely that remedial action with regards to groundwater would be required.
- 11.9.1.11 Assuming that the proposed mitigation measures are adopted during the construction phase, the impact significance has been assessed as **temporary slight adverse** for identified receptors.
- 11.9.1.12 Assuming that the proposed mitigation measures are adopted during the operational phase, the impact significance has been assessed as **permanent slight adverse** for identified receptors.

Table 11-6 Contaminated Land Impact Summary Table

Impact description	Temporary/Permanent	Significance rating
Damage to health of construction workers through dermal / ingestion and inhalation exposure to contamination during construction	Temporary	Slight Adverse
Damage to health of adjacent and new site users through ingestion of dust and inhalation exposure to contamination during construction.	Temporary	Slight Adverse
Potential mobilisation of	Temporary	Slight Adverse

contamination into groundwater during construction via excavation, spillages etc		
Damage to health of new site users through demal / ingestion and inhalation exposure to contamination	Permanent	Slight Adverse
Damage to health of new site users from ground gases.	Permanent	Slight Adverse
Accidental Spillages during use of retail activities	Permanent	Slight Adverse
Contaminants entering the groundwater from the use as a cemetery	Permanent	Slight Adverse

12 Agriculture and Land Use

12.1 Introduction

- 12.1.1.1 This assessment reviews the information currently available in relation to agriculture, soils and land use (including the infrastructure utilised for agricultural purposes and the structure of the businesses engaged in farming and related activities) in relation to the proposals. The methodology used to identify the key receptors is described, followed by details of these receptors.
- 12.1.1.2 Both the construction phase and operational phase impacts of the proposals are identified with detailed measures presented to mitigate these impacts, such that the residual effects of the proposals would not be significant.
- 12.1.1.3 The baseline against which the likely significant effects have been assessed are the environmental conditions at, and surrounding, the Site in July 2014.
- 12.1.1.4 This Chapter has been prepared by Dr Bruce Lascelles, employed by Hyder Consulting. Dr Lascelles is a Chartered Environmentalist and full member of the Institute of Professional Soil Scientists (IPSS) and meets the requirements of the IPSS Professional Competency Scheme for Agricultural Land Classification (ALC: see IPSS PCSS Document 2 'Agricultural Land Classification of England and Wales', given as Appendix 12-A). The IPSS Professional Competency Scheme is endorsed, amongst others, by the Department for Environment, Food and Rural Affairs (Defra), Natural England, the Science Council, and the Institute of Environmental Assessment and Management (IEMA).
- 12.1.1.5 This assessment is based upon a study of published information on climate, geology and soil in combination with a soil investigation carried out in accordance with current guidelines (see Methodology section below).

12.2 Regulatory and Policy Framework

- 12.2.1.1 This impact assessment has been undertaken in accordance with current national legislation, and national, regional and local plans and policies relating to agriculture and land use in the context of the Development. A summary of the relevant legislation and policies, the requirements of these policies and the Development response has been provided in Table 12-1 below.

Table 12-1 Agriculture and Land Use Regulatory and Policy Framework

Policy/Legislation	Summary of Requirements	Development Response
A Strategy for England; Safeguarding Our Soils (Ref 12-1)	The Strategy for England sets out the Government's aims in relation to protecting agricultural soils and in relation to protecting the soil resource during construction and development. This includes a requirement that planning decisions take sufficient account of soil quality, particularly where significant areas of the BMV (best and most versatile) agricultural land are involved.	An assessment has been made of the agricultural land grade and the potential impacts on this resource. Recommendations have been provided detailing appropriate soil handling methodologies in line with the Defra Code of Practice.

	<p>The presence of BMV agricultural land is stated to be a material consideration in planning decisions, but has to be taken into account alongside other sustainability considerations including: biodiversity, the quality and character of the landscape, accessibility to infrastructure, workforce and markets and maintaining viable communities.</p> <p>Within the Strategy there is an aim of encouraging better management of soils during the construction process. Linked to this is the Construction Code of Practice for the sustainable re-use of soils on construction sites, also published by Defra (Ref 12-2) to protect soil resources disturbed on construction sites. Whilst the Code is not legislatively binding, the wider benefits of following the guidance (in terms of sustainability, cost savings and waste controls) are clearly set out.</p>	
<p>National Planning Policy Framework (NPPF; Ref 12-3)</p>	<p>The NPPF sets out the Government's planning policies for England and how these are expected to be applied. The NPPF provides a framework within which local and neighbourhood plans can be produced. Planning law requires that applications for planning permission must be determined in accordance with the development plan. The NPPF must be taken into account in the preparation of local and neighbourhood plans, and is a material consideration on planning decisions.</p> <p>Section 11 of the NPPF deals with conserving and enhancing the natural environment. This includes a requirement that the <i>'local planning authorities should take into account the economic and other benefits of the best and most versatile agricultural land. Where significant development of agricultural land is demonstrated to be necessary, local planning authorities should seek to use areas of poorer quality land in preference to that of a higher quality.'</i></p> <p>The local planning authority should also 'put in place policies to ensure ...(safeguarding the long term potential of best and most versatile agricultural land and conserving soil resources) ...'</p> <p>The NPPF also has, as one of its core planning principles, the promotion of "mixed use developments, and encourage multiple benefits from the use of land in urban and</p>	<p>An assessment has been made of the agricultural land grade and the potential impacts on this resource.</p>

	<p>rural areas, recognising that some open land can perform many functions (such as for wildlife, recreation, flood risk mitigation, carbon storage, or food production)". The sustainable re-use of soil materials would support this objective.</p>	
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12.3 Methodology

12.3.1 General Approach

- 12.3.1.1 The principal agricultural and related resources are the quality of the agricultural land and items of fixed farm and farm-related capital, as well as other items of capital associated with diversified activities on farms. Soil and ALC surveys have been undertaken in accordance with published guidelines (MAFF 1988; Ref 12-5).
- 12.3.1.2 The ALC system provides a framework for classifying land according to the extent to which its physical or chemical characteristics impose long-term limitations on agricultural use. The ALC system divides agricultural land into five grades (Grade 1 'Excellent' to Grade 5 'Very Poor'), with Grade 3 subdivided into Subgrade 3a 'Good' and Subgrade 3b 'Moderate'. Agricultural land classified as Grade 1, 2 and Subgrade 3a falls in the 'best and most versatile' category as set out in the NPPF (see Table 1-1 above). Further details of the ALC system and national planning policy implications are set out by Natural England in its Technical Information Note 049 (see Appendix 12-B).
- 12.3.1.3 There are no legislative requirements governing the assessment of agricultural matters, and the framework of any assessment is derived from a combination of EU and national agricultural and land use policies and measures, combined with expert judgement.

12.3.2 Consultation

- 12.3.2.1 As very limited detailed published Agricultural Land Classification (ALC) information was available for the Site (in particular information which separates Grade 3 land into Subgrades 3a and 3b) Natural England was consulted on the requirements for further surveys. Their response stated that:
- 12.3.2.2 "An agricultural land classification and soil survey of the land should be undertaken at a detailed level, e.g. 1 auger boring per hectare, supported by pits dug in each main soil type to confirm the soil physical characteristics of the full depth of soil resource, to determine the impact of the development on 'best and most versatile' agricultural land and on soil resources."
- 12.3.2.3 In addition, the landowners were interviewed (as detailed below) to gather information on the existing farm business.

12.3.3 The Study Area

12.3.3.1 The Study Area for the Development includes the land within the red line boundary (Drawing 12-1), as well as adjacent land under the same ownership, such that a full assessment of the potential impact on farm viability could be undertaken.

12.3.4 Methodology for Establishing Baseline Conditions

Establishing the Existing Baseline

12.3.4.1 The baseline conditions comprise an assessment of the quality of the agricultural land, items of fixed farm and farm-related capital, as well as the agricultural practices used on the land.

12.3.4.2 A range of published information has been reviewed in order to assess the character of the Site in terms of land use and soils. This has included:

- Published soil maps (Ref 12-6)
- Published ALC maps and more detailed survey information held by Natural England (accessed on Nature on the Map website www.natureonthemap.naturalengland.org.uk)
- LandIS Soils Site Report (Ref 12-7)
- Climate data (purchased from the National Soil Resources Institute (NSRI))

12.3.4.3 In addition, surveys have been undertaken, as required by the consultation response received from Natural England. A detailed ALC survey of the Site was undertaken, in accordance with MAFF (1988), over a range of dates (September 2010, April/May 2011 and June/July 2014).

12.3.4.4 The detailed survey involved examination of the soil's physical properties at approximately 140 locations on approximately a 100 m by 100 m grid (due to the presence of a standing crop in some locations it was not always possible to follow a regular grid pattern).

12.3.4.5 The soil profile was examined at each location to the full depth of the soil profile up to a maximum depth of approximately 1.2 m using a 5 cm diameter Dutch (Edleman) soil auger. A number of soil pits were excavated at selected locations with a spade in order to confirm soil characteristics. The soil profile at each location was described using the Soil Survey Field Handbook: Describing and Sampling Soil Profiles (Ref 12-8). Based on these data each sample location was given an ALC grade following the published guidelines.

12.3.4.6 In addition, the landowners were interviewed in April 2011 where contact details were available and permission had been granted.

Forecasting the Future Baseline (“Without Development” Scenario)

12.3.4.7 The ALC grade is based on an assessment of the soil physical properties, and it is considered unlikely that these would change significantly over time, and thus the future baseline in terms of ALC grades would remain unchanged.

12.3.4.8 In relation to the farm businesses, the interviews held with the landowners attempted to gain an understanding of potential future developments to their businesses. The assessment of the future baseline also takes into account other consented developments which may have an influence on farming practices.

Defining the importance/sensitivity of resource

12.3.4.9 Current best practice and professional judgement are used to define significance criteria in relation to both agricultural land and to farming businesses.

12.3.4.10 The relative importance or sensitivity of the agricultural land that would be affected by the development can be based on the ALC grades, as set out in Table 12-2 below.

Table 12-2 Determining the Importance / Sensitivity of the agricultural land resource based on ALC Grade

Importance/sensitivity of resource or receptor	Criteria
High	Grades 1, 2 and 3a
Medium	Grade 3b
Low	Grades 4 and 5

Source: This is based on professional judgement

12.3.4.11 There is no standardised method for determining the effects of development proposals on agricultural businesses, and thus professional judgement, having regard to relevant legislation and advice, has been used for the assessment of the impact to agricultural business, as detailed below.

12.3.5 Methodology for Assessing Impacts

12.3.5.1 An assessment has been carried out of the likely effects of the proposals, both during the construction phase and in the longer-term. Where required, effects have been quantified and assessed in the wider context to evaluate the degree to which they may be considered significant. Effects have been based on the assumption that agricultural circumstances prevailing in July 2014 would continue to prevail.

12.3.5.2 The magnitude of impacts in relation to agricultural land is assessed using the criteria provided in Table 12-3, based on the extent of land take.

Table 12-3 Assessing Magnitude of Impact

Magnitude of impact*	Agricultural land take (ha)
High	>20
Medium	5-20
Low	<5

Source: This is based on professional judgement

12.3.5.3 The significance of impacts on agricultural land is then determined using the matrix presented below in Table 12-4.

Table 12-4 Significance criteria for assessing the effect of the proposals on the National Agricultural Resource

Sensitivity	Magnitude		
	High	Medium	Low
High	Major	Moderate	Minor
Medium	Moderate	Minor	Negligible
Low	Minor	Negligible	Negligible

12.3.5.4 The criteria for assessing the impact on the farm businesses have been assessed in accordance with Table 12-5 below.

Table 12-5 Significance Criteria for Assessing the Effect of the Scheme on Farm Viability

Magnitude of Impact	Farm Businesses
Major adverse	Renders an existing full-time farm business (including any diversification enterprises) unviable.
Moderate adverse	A significant effect on the workability of a full time farm business (including any diversification enterprises) but where the continued viability is not prejudiced.
Minor adverse	Limited effects on workability and the economic performance of a farm unit (including any diversification enterprises) or the loss or a significant effect on the viability of a part-time farm business.
Neutral	Where there would be no negative impact on the farm business (including any diversification enterprises).

12.3.6 Limitations and Assumptions

12.3.6.1 A small proportion of the Site was not surveyed, due to either crop or livestock restrictions. However, this area is small, equating to just 1.33% of the Site and thus it is not considered that this would adversely affect the assessment.

12.4 Description of the Baseline Conditions

12.4.1 Existing Baseline

12.4.1.1 This section of the report sets out the findings of the ALC assessment and review of the farm businesses within the Site.

Agricultural Land Classification

12.4.1.2 The ALC assessment is based on a desktop study of relevant published information on climate, topography, geology, and soil in conjunction with a soil survey carried out across the Site.

12.4.1.3 As described in the ALC Guidelines, the main physical factors influencing agricultural land quality are:

- Climate;
- Site;
- Soil; and
- Interactive Limitations.

12.4.1.4 These factors are considered in turn below.

Climate

12.4.1.5 Interpolated climate data relevant to the determination of the ALC grade is given in Table 12-6 below.

Table 12-6 Interpolated climate data

Climate Parameter	Data
Average Altitude (m)	93
Accumulated Temperature above 0°C (Jan – June)	1397
Average Annual Rainfall (mm)	687
Field Capacity Days (FCD)	148
Moisture Deficit (mm) Wheat	101
Moisture Deficit (mm) Potatoes	92

12.4.1.6 With reference to Figure 1 'Grade according to climate' on page 6 of the ALC Guidelines (Ref 12-5), the quality of agricultural land at the Site is not limited by overall climate and so could potentially be Grade 1 land in the absence of any other limiting factor.

Site

12.4.1.7 At the time of the ALC survey, the Site was under a combination of arable and pasture.

12.4.1.8 With regard to the ALC Guidelines, agricultural land quality can be limited by one or more of three main site factors as follows:

- Gradient;
- Micro-relief (i.e. complex change in slope angle over short distances); and
- Risk of flooding.

12.4.1.9 The topography across the Site is generally low, with slope angles of less than 1°. Slope angles increase in proximity to the drainage lines through the Site,

with angles of up to 3° to the south-east of Home Farm. These gradients are not considered to be a limiting factor to agricultural land quality. In addition, micro-relief (i.e. complex changes in slope angle and direction over short distances), does not limit the agricultural grading across the.

12.4.1.10 From the EA Flood Map³ it is apparent that a very limited area of the Site is considered at risk of fluvial flooding. This is restricted to a narrow corridor along the stream flowing to the south-east from Home Farm. Therefore, for the majority of the Site, the risk of flooding is not limiting to agricultural land quality. For the narrow corridor potentially at risk from flooding there would be a minor limitation to agricultural land quality, limiting these areas to Grade 2 in the absence of any other limitation.

Soil

12.4.1.11 British Geological Survey (BGS) information available online⁴ shows that the majority of the Site is underlain by bedrock geology described as the Cornbrash Formation. This is described as medium- to fine-grained poorly bedded limestone. Thin argillaceous (clay) partings or interbeds of calcareous mudstone may also be present.

12.4.1.12 The mapping also shows that interbedded mudstone and limestone are present in limited areas. The alignment of these deposits is followed by the drainage network across the Site.

12.4.1.13 The superficial mapping available from the BGS shows superficial deposits of clay, silt, sand and gravel associated with the drainage network, limited to a narrow corridor along these drainage lines.

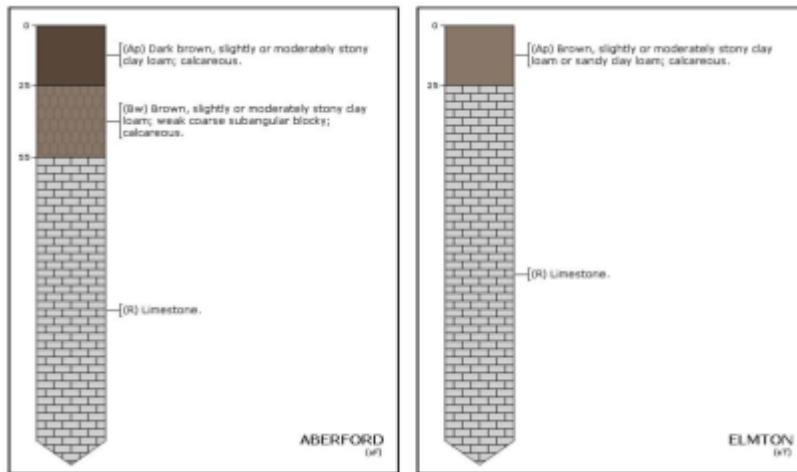
12.4.1.14 A Soils Site Report has been obtained for a 4km x 4km study area centred on the Site (NGR SP563066 24621; included as Appendix 12-C). The soils across the whole Site are mapped as belonging to the Aberford Series. These are described as shallow, locally brashy well drained calcareous fine loamy soils over limestone. These soils are relatively freely draining, but are identified as having a high leaching potential and thus little ability to retain non-adsorbed pesticides, which may therefore leach out of the soils and into surface or groundwater.

12.4.1.15 The Figure below shows two typical component profiles of the Aberford Series (taken from the Soil Site Report).

³ See <http://maps.environment-agency.gov.uk/wiyby/wiybyController?value=TF11+8RN&submit.x=0&submit.y=0&submit=Search%09&lang=e&ep=map&topic=floodmap&layerGroups=default&scale=9&textonly=off#x=457638&y=224748&lg=1,&scale=11>

⁴ <http://www.bgs.ac.uk/discoveringGeology/geologyOfBritain/viewer.html>

Figure 12-1 Aberford Component Soil Profiles



12.4.1.16 These diagrams clearly show the potentially shallow nature of these soils, lying directly over the solid parent material (limestone).

12.4.1.17 The detailed soil survey undertaken has confirmed that soils as described above are present across the majority of the Site. Typically the soil profile consists of a brown (Munsell colour 7.5YR 4/4), calcareous, slightly to very stony(10->50%) medium silty clay loam overlying a strong brown (Munsell colour 7.5YR 5/8), calcareous, moderately to very stony heavy silty clay loam. The topsoil and subsoil horizons typically give a soil profile depth of 30cm or less, below which lies the parent material (generally recorded as fractured limestone).

12.4.1.18 Typical profiles are show in the figure below

Figure 12-2 Typical shallow and deeper soil profiles overlying fractured limestone

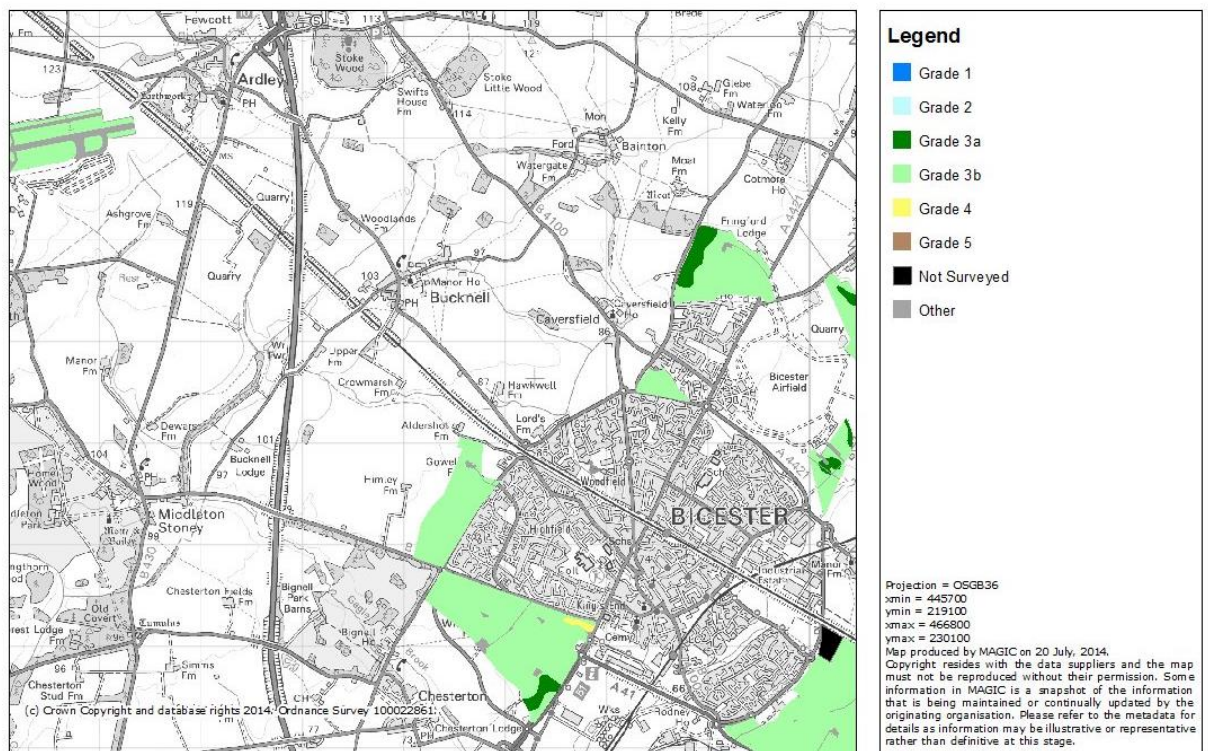


12.4.1.19 The exceptions to this are in narrow corridors along drainage lines, where the soils are developed in alluvial deposits. Here the soils are deeper, in some places in excess of 1.2m. Typical profiles consist of a brown (Munsell colour 7.5YR 4/4), calcareous, very slightly stony medium silty clay loam overlying a pale grey to white (Munsell colour 2.5YR8/1), calcareous clay or sandy clay, often mottled from approximately 25 – 30cm depth below ground surface. The signs of gleying at these depths indicates restricted drainage for at least parts of the year.

Agricultural Land Classification

12.4.1.20 The land is shown as all falling within Grade 3 from available provisional published maps. Limited more detailed published information, which shows the distinction between the Subgrades 3a and 3b, is available for the wider area, but none is available for the Site. Figure 12-3 shows the detailed mapping available, and that generally the land is graded as 3b, with only small areas of Grade 3a present.

Figure 12-3 Available detailed ALC mapping (from MAGIC)



12.4.1.21 From the published and detailed soil survey information, there are a number of key limitations on land grade across the Site: total soil depth; stone content; and soil wetness.

12.4.1.22 Soil depth is an important factor in determining the available water capacity of a soil, and can influence the range and type of cultivations which can be carried

out. The current guidelines specify minimum soil depth requirements for the grades and subgrades, as detailed below.

Table 12-7 Grade according to soil depth

Grade / Subgrade	Depth limits (cm)
1	60
2	45
3a	30
3b	20
4	15
5	<15

12.4.1.23 As the majority of the soil profiles had a recorded depth of <30cm, this limits the land grade to no higher than 3b across much of the Site. In places, depths of <20cm were recorded, limiting some areas to no higher than Grade 4. The deeper soils developed in alluvium have the potential to be of a higher grade in the absence of any other limiting factor.

12.4.1.24 Stone contents in many sample locations were high, and this presents another limitation as high stone contents act as an impediment to cultivation, harvesting and crop growth, and cause a reduction in the available water capacity of the soil. Figure 12-4 below shows the high content typically visible at the soil surface.

Figure 12-4 Typical stony soil surface



12.4.1.25 Generally where the stone content in the upper 25cm was high the soil was shallow, and so already limited in terms of the maximum grade achievable.

- 12.4.1.26 From the ALC Guidelines, a soil wetness limitation exists where ‘the soil water regime adversely affects plant growth or imposes restrictions on cultivations or grazing by livestock’. Agricultural land quality is limited by soil wetness as set out in the guidelines. This is of relevance where the soils exhibit signs of waterlogging (i.e. mottling) within the profile, and this has been taken into account when determining the land grade. This is relevant to the majority of the deeper soils developed in alluvium, where soil texture (clay-rich) and landform (i.e. low lying areas) has resulted in restricted drainage.
- 12.4.1.27 The detailed ALC grading based on the above is shown in Drawing 12-1. The area and proportion of agricultural land in each ALC grade has been measured from Figure 12-5 and are presented in Table 12-8 below.

Table 12-8 Areas and proportions of each ALC Grade

Grade / Subgrade	Area (%)
1	0
2	0
3a	4.7 (3.13)
3b	111.6 (74.35)
4	29.4 (19.59)
5	0
Non agricultural	2.4 (1.60)
Not surveyed	2.0 (1.33)
TOTAL	150.1 (100)

Agricultural Businesses

- 12.4.1.28 The land within the Site falls under three separate ownerships, although the majority of the Site is split between just two ownerships.
- 12.4.1.29 The largest landowner within this Site runs a mixed dairy and arable farm, which included land both owned and tenanted outside the Site boundary. In total 700 cattle are held across the whole farm, with this Site supporting 550 of these. Beef and dairy cattle and kept in over winter and turned out at the end of March. The arable land is used to grow barley which is recycled back as feed for the beef cattle, with additional feed stock brought in as required. There are water troughs in each field and the herd has been closed for over 45 years.
- 12.4.1.30 There is a borehole near Lord’s Farm which supplies the farm, including some of the domestic supply. This is a 120 ft, 16 inch diameter, artesian well licensed for abstraction of 48 000 litres/day. This results in a major financial saving. There are also significant fixed assets (which include the industrial units at Lord’s Farm which lie outside the red line boundary).
- 12.4.1.31 The business of the second main landowner is centred on beef suckler cows, with some cereal crop grown on rotation with the field then returned to grass to generate big bale silage. In addition to the land within the Site boundary

additional land is owned (currently proposed for the Exemplar Site development) with one field rented immediately to the east on the opposite side of the B4100 (this additional field has not been used for grazing as it has been considered not possible to move the herd safely across the road and has instead been used for cereal production).

12.4.1.32 The herd is currently disease free. The cows and calves are turned out in March, and they are generally visited daily by the farmer. There is a water pipe running from the farm buildings along the farm track which supplies drinking troughs which have been set to allow access to livestock from both sides of the hedgerow. There are a number of farm buildings used by the business; however, none of these would be affected by the proposals.

12.4.1.33 Land under the third ownership comprises two small portions of land on the northern boundary, currently under arable production.

12.4.2 Future Baseline

12.4.2.1 As noted above, the ALC grade is assessed from various soil physical characteristics, and across the Site is limited to a large degree by soil depth. These characteristics are unlikely to change over time, and as such the current ALC grades also represent the future baseline, in the absence of any development.

12.4.2.2 Of the two main farm businesses, one is already having to change as a result of the development of the Exemplar Site, which is taking a large proportion of the grazing land used by this business. In the absence of this development, it is assumed that the remaining land would continue to be grazed as part of their business.

12.4.2.3 In the absence of the development the main landowner on this Site would continue to operate in a similar manner, although some changes/upgrades to fixed assets would be undertaken, most notable being the development of a new parlour.

12.5 Design and Mitigation

12.5.1 Construction Approach and Mitigation of Short-Term Construction Effects

12.5.1.1 The sustainable re-use of the soil resource affected by the proposals would be undertaken in line with the Construction Code of Practice for the Sustainable Use of Soil on Construction Sites (Ref 12-2). This would be achieved by the development of a Soil Resources Plan (SRP) identifying the soils present, proposed storage locations, handling methods and locations for re-use where possible. Measures which would be implemented include (but are not limited to):

- Completion of a Soil Resources Survey and incorporate results into a SRP
- Link SRP to the Site Waste Management Plan (SWMP)

- Ensure soils are stripped and handled in the driest condition possible
 - Confine vehicle movements to defined haul routes until all the soil resource has been stripped
 - Protect stockpiles from erosion and tracking over
 - Ensure physical condition of the entire replaced soil profile is sufficient for the vegetation requirements
- 12.5.1.2 Approximately 46% (68.01 ha) would be set aside as open space (to include SUDS, hedgerows, a village green, allotments, community garden and green link). Implementation of appropriate soil handling and re-use measures would ensure that the soils used across the Site in these areas would be of the required characteristics and in the required condition to support a variety of specified activities. For example, surplus nutrient-poor soils (topsoils or subsoils) would be re-used in areas of habitat creation (to enable to development and sustainability of species-rich habitats) whilst surplus nutrient-rich soils would be prioritised for areas designated for food production or in areas of landscape planting. This would ensure that the retained soils can continue to provide a range of valuable ecosystem services.
- 12.5.1.3 A limitation of these soils, identified above, is that they have little ability to retain non-adsorbed pesticides, and thus may also have a limited ability to retain other pollutants. This is, in part, due to the shallow nature of these soils and thus this would be taken into account in the creation of soil profiles within the SUDS to ensure they can provide the required functions.
- 12.5.1.4 The phasing of the development would take into account how each business operates, ensuring that the phasing does not, for example, lead to the severance of parts of an enterprise from the rest of the holding or lead to the undeveloped part of the enterprise becoming unviable for the period until it is brought into the development.
- 12.5.1.5 A considerate construction approach would be used to minimise potential impacts on the agricultural enterprises during the construction phase. The potential impacts on the farm business, in particular the risks of disturbance to livestock and the risks of livestock getting out into adjacent areas, would be clearly highlighted to all construction staff during Toolbox Talks provided by the Environmental Coordinator or their recognised deputy. If there are likely to be periods of significant construction activity close to the boundary with the undeveloped fields, the option to use temporary screening would be reviewed.
- 12.5.1.6 All fencing around the Development would be sufficient to resist damage by livestock, and would be regularly checked and maintained in a suitable condition. Any damage to boundary fencing would be repaired immediately.
- 12.5.1.7 During construction the provision of water supplies to undeveloped fields would be maintained at all times. Should pipework become damaged it would be repaired immediately to ensure no disruption to drinking water supplies for livestock.
- 12.5.1.8 The protection of the water supply from the borehole close to Lord's Farm is dealt with in Chapter 7 Contaminated Land.

12.5.2 Scheme Design and Mitigation of Permanent Operational Effects

- 12.5.2.1 There is provision, within the Development, for local food production from allotments, and additional potential for local food production from private or commercial gardens (within the 46% of the development which would be set aside as open space). The use of appropriate construction techniques outlined above in relation to soil handling during the construction phase would ensure that the soils in those areas set aside for food production would be in a suitable condition to support this activity. It is also proposed that there would be advice provided locally to individuals or firms on soil management in order to maximise both productivity and sustainability.

12.6 Construction Impacts

- 12.6.1.1 The proposals for this Site would result in the loss of up to approximately 147.7 ha of agricultural land from primary agricultural productivity. However, of this only 4.7 ha is BMV land. It is considered that these proposals would have a **permanent minor adverse** impact on agricultural land on that basis that the focus of relevant policy is on the protection of BMV land.
- 12.6.1.2 During construction, there would be impacts on the agricultural enterprises. Land would be lost to the businesses as each field was brought into the Development, reducing the area available for grazing or arable production. The measures outlined above would minimise disruption to ongoing activities and minimise disturbance to remaining livestock. These should limit the likelihood of any of the enterprises becoming unviable. It is assumed that the phasing, and notice periods provided, would allow the enterprises to adapt or move such that the economic performance of the business remains unaffected, and as such it is considered that there would be no more than a **short-term minor adverse** impact on farm viability as they adapt through the changes required. This would be confirmed through further discussions with the landowners once more information on the phasing of the development is available.

12.6.2 Overview

- 12.6.2.1 Overall, there would be a **permanent minor adverse** impact on agricultural land. Assuming the successful implementation of notice periods and phasing there would be only **short-term, slight adverse** impacts on farm businesses.

12.7 Permanent Operational Impacts

- 12.7.1.1 There would be no additional impacts on the soil resource during the operational phase.
- 12.7.1.2 It is considered that, once construction is complete, the farm enterprises would have relocated totally and thus there would be no further impacts on these businesses. However, during operation there is the potential for impacts associated with disturbance and vandalism to occur outside the red line boundary (as in effect the Development brings urban boundary closer to new

areas). This is considered to be a minor issue currently, and thus it is assumed that at this level during the operational phase this would result in a **permanent minor adverse** impact on those enterprises now adjacent or in closer proximity to the Development.

12.8 Cumulative Impacts

- 12.8.1.1 A number of other developments are proposed in the vicinity of Bicester which have the potential to impact on agricultural land (Table 17-1 and Table 17-2). Some of these are at a significant scale, such as the South West Bicester development which reports a total loss of approximately 60 ha of agricultural land. However, the majority of this land has been assessed as being Grade 3b, with only a small amount of Grade 3a land (area not provided but likely to be <10% of the total area). The Bicester Business Park development states that the land to be lost is Grade 4. Provisional ALC mapping shows that the land surrounding Bicester is classed as Grade 3 or 4. Where more detailed mapping is available areas of Grade 3a land are limited in extent.
- 12.8.1.2 As such, it is considered that the potential for cumulative impacts on best and most versatile land is limited, and unlikely to be more than **permanent moderate adverse**, assuming all other developments follow current policy and guidance.

12.9 Summary

- 12.9.1.1 An assessment has been undertaken in relation to agriculture, soils and land use in relation to the Development. The assessment has been undertaken in accordance with current national legislation and national, regional and local plans and policies.
- 12.9.1.2 The soils across the Site are fairly uniform, with only approximately 3% classed as Grade 3a (i.e. best and most versatile land). The main limitations on land productivity relate to soil depth, stone content and poor drainage, and it is only in the deeper, more freely drained soils that land falls within the Grade 3a. Given the small area (approx 4.7 ha) of BMV land affected, it is considered that the proposals would have a **permanent minor adverse** impact on agricultural land.
- 12.9.1.3 During construction, appropriate soil handling methodologies would be used, in line with current guidance, to ensure the sustainable re-use of soils and maximise the value of the retained soil resource within the proposed design. This would ensure that soils with the optimum characteristics are allocated for the given end use, such as food production, habitat creation or SuDS.
- 12.9.1.4 Assuming that the phasing of construction and the notice periods provided would allow the agricultural enterprises present to adapt or move such that the economic performance of the business remains unaffected, it is considered that there would be no more than a **short-term slight adverse** impact on farm viability as they adapt through the changes required.

12.9.1.5 In addition, a considerate construction approach would be used to minimise potential impacts on the agricultural enterprises, which would focus on limiting disturbance to livestock, ease of access etc.

12.9.1.6 As the land around Bicester is likely to predominantly be Grade 3b or lower (i.e. not BMV) the potential for cumulative impacts is limited.

Table 12-9 Agriculture and Land Use Impact Summary Table

Impact description	Temporary/Permanent	Significance rating
Loss of best and most versatile agricultural land	Permanent	Minor adverse
Effects on agricultural businesses during construction	Short-term	Minor adverse
Effects on agricultural businesses during operation	Permanent	Minor adverse
Cummulative impact in relation to best and most versatile agricultural land	Permanent	Moderate adverse

13 Human Health

13.1 Introduction

13.1.1.1 This chapter provides an assessment of the likely significant impacts of the Development on human health. The World Health Organisation states that 'health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity' (Ref 13-1). This definition highlights that health status is affected by a wide-range of factors and this is reflected in the range of issues considered within this assessment. The cross-cutting nature of the human health assessment requires the use of results in other chapters of this Environmental Statement including: Air Quality; Noise and Vibration; Landscape and Visual; Traffic and Transport; Contaminated Land; and Socio-Economic and Community Effects.

13.2 Regulatory Framework

13.2.1.1 Table 13-1 presents the key regulatory and policy framework relevant to the assessment of human health effects. The regulatory and policy framework review provided in the Air Quality; Noise and Vibration; Landscape and Visual; Traffic and Transport; Contaminated Land; and Socio-Economic and Community Effects assessments are also relevant to consideration of human health impacts.

Table 13-1 Human Health Regulatory and Policy Framework

Policy/Legislation	Requirements	Development Response
UK Government Sustainable Development Strategy	The strategy identifies the five main priorities for delivering sustainable development: living within environmental limits; ensuring a strong healthy and just society; achieving a sustainable economy; promoting good governance; and using sound science responsibly. All of these factors are inherent to securing good levels of health and well-being for the UK population.	The design of the Development includes provision for open space, accessibility, walking and cycling, thereby seeking to provide the infrastructure necessary to support the community and the pursuit of healthy lifestyles.
Planning Policy Statement: Eco-towns – A Supplement to Planning Policy Statement (PPS) 1.	The PPS identifies that the built and natural environment is an important component of health and well-being. Good urban design can help to support the pursuit of healthier and more active lifestyles and contribute to reducing health inequalities.	The design of the Development has considered the need to provide the infrastructure and environment to enable residents to pursue healthy lifestyles. This has been considered through the provision of social and community facilities, leisure facilities and the appropriate mix of housing including extra care housing.
National Planning Policy Framework (NPPF) (Ref	The planning policies highlight that quality design is important as it contributes to the creation of	Quality of design and housing mix are fundamental components of the

Policy/Legislation	Requirements	Development Response
13-2): Planning Policy 6. Delivering a wide choice of high quality homes Planning Policy 7. Requiring Good Design	sustainable communities. New housing developments should have layouts that meet the needs of residents, are visually attractive and make the most sustainable and efficient use of the land. The need for an appropriate mix of housing is also highlighted, as well as the provision of appropriate services and infrastructure.	Development.
NPPF Planning Policy 4 Promoting sustainable transport	The planning policy states that the transport system needs to be balanced in favour of sustainable transport modes, giving people a real choice about how they travel. The siting of facilities needed on a day to day basis (shops, health centres, schools etc.) to ensure easy access by modes other than the private car is also highlighted. Encouragement should be given to solutions which support reductions in greenhouse gas emissions and reduce congestion.	The ability of future residents to utilise more active modes of travel is considered in the assessment, as well as the accessibility to facilities needed on a day to day basis. Accessibility has been considered in the design of the Development.
NPPF Planning policy 8 Promoting Health Communities	The needs of local communities must be understood to ensure that sufficient high quality open space, sports and recreational facilities that meet local needs are provided. When local authorities are deciding where to provide new recreational and community facilities consideration should be given to the accessibility to such developments by walking and cycling. The potential effects of such development on vibrancy and vitality and the wider effects of such development, for example on the existing built and natural environment and local residents must be considered.	As part of the design of the Development the capacity of existing sport and recreation facilities has been considered and the provision of open space and green infrastructure is a fundamental component of the design. The development will comprise 46% green infrastructure to encourage outdoor lifestyles and nurture wildlife and biodiversity. Natural landscaping will be used to create safe play areas. Public transport and active travel options have been designed into the proposal. With specially designed cycle and pedestrian routes, a bus service within 400m of every home with live timetable updates in each house, charging points for electric vehicles and an electric car club, residents will be encouraged to adopt more sustainable modes of travel.
Eco-Bicester – One Shared Vision, December, 2010 (Ref 13-3)	The Vision highlights that NW Bicester will be designed to support healthy and sustainable environments and provide opportunities for residents to make	Providing opportunities to pursue healthy lifestyles has been an integral component of the Development design.

Policy/Legislation	Requirements	Development Response
	healthy choices easily.	
Cherwell Local Plan (1996) Saved Policies (Ref 13-4)	Policy R12 – Provision of Open Space in association with New Residential Development requires that at least 2.43 hectares of public open space per 1,000 people should be provided within all new housing developments.	Provision of open space and green infrastructure has been an integral part of the Development design.
Non-Statutory Cherwell Local Plan 2011 (Ref 13-5)	Chapter six of the Local Plan includes a number of policies that are relevant to the human health assessment. Policies TR8 and TR9 relate specifically to walking and cycling.	The ability of future residents to utilise more active modes of travel is considered in the assessment, as well as the accessibility to facilities needed on a day to day basis. This has also been an integral component of the design of the Development.
	Chapter seven addresses recreation and community facilities. This section of the plan highlights the need for improvements to facilities and accessibility to them. The poor distribution of open space throughout Bicester town is identified.	Provision of open space and green infrastructure has been an integral part of the Development design. Accessibility to recreation facilities has also been an integral component of the assessment.

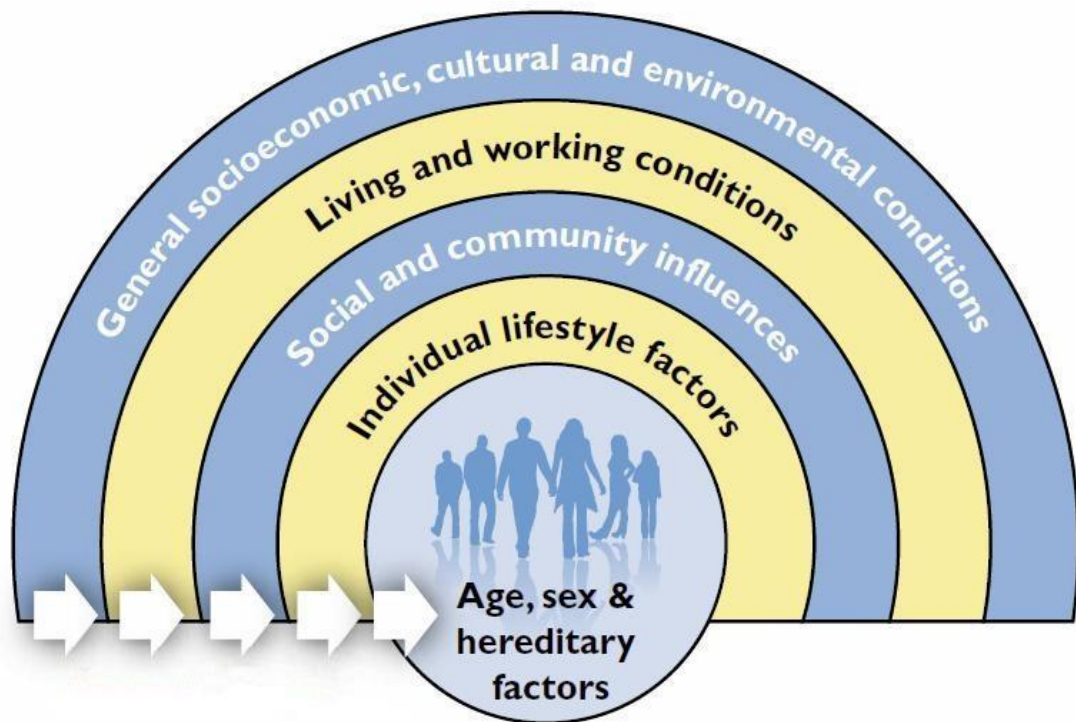
13.3 Methodology

13.3.1 General Approach

13.3.1.1 Health Impact Assessment (HIA) is a tool that can be used to assess the health impact of policies, plans and projects. A stand-alone HIA is not being undertaken for the Development; rather the impact assessment is being integrated into the ES to ensure that the interrelationships between health and other environmental topics are holistically considered rather than being assessed in isolation.

13.3.1.2 The methods proposed within the Merseyside Guidelines for HIA have been used to guide the assessment of human health impacts although they have been adapted to reflect the integration of human health considerations into the ES. The assessment uses a broad definition of health which recognises that health is affected by more than simply the presence or absence of disease and is influenced by a range of health determinants as illustrated in Figure 13-1.

Figure 13-1 Main Determinants of Health (Source: European Policy Health Impact Assessment -A Guide, 2004) (Ref 13-8)



Health Determinants Model

13.3.1.3 The assessment of impacts on human health considers how the health determinants would be affected by the Development which could result in a change in health outcomes. The following health determinants were considered in the assessment:

- Employment and Economy
- Safety and Security
- Air Quality
- Noise and Vibration
- Physical Environment (focussing on built form and urban design)
- Transport and Access
- Waste Management and Contamination
- Community and Social Infrastructure
- Community Spirit and Engagement
- Access and provision of healthcare and facilities and services

13.3.1.4 The cross-cutting nature of the human health assessment requires the use of results presented in other chapters of this ES to determine the potential effects of the Development on health outcomes. The results presented in other assessments are cross-referenced where appropriate.

13.3.2 Study Area

- 13.3.2.1 The study area for human health assessment covers Cherwell District as well as considering the wards in which the NW Bicester development are to be located and those within the immediate vicinity (Caversfield, Ambrosden and Chesterton, Launton, Fringford, Bicester West, Bicester North, Bicester East, Bicester South and Bicester Town). Drawing 13-1 shows the indicative boundary of these wards and the boundary of the Development (Application 1 North of Railway). This study area was selected to enable an understanding of the existing health characteristics of the communities surrounding the site, as well as service and facilities provision. Reference was also made to the health status trends reported for Oxfordshire to provide appropriate contextual information and comparative statistics for the assessment.
- 13.3.2.2 The human health impact assessment has also utilised the results of other chapters in this ES. Some of these topics have used slightly different study areas to that defined above and this has been acknowledged in the assessment. Therefore, the study area has varied depending upon the health determinants being considered as part of the assessment.

13.3.3 Establishing the Existing Baseline

- 13.3.3.1 The baseline conditions have been established through desk –based research. Key data sources have included Neighbourhood Statistics, the Association of Public Health Observatories and the Clinical and Health Outcomes Knowledge Base. Reference has also been made to the Annual Public Health Report 2013 published by the Director of Public Health for Oxfordshire (Ref 13-9) and the Joint Strategic Needs Assessment 2013 (Ref 13-10). Reference has been made to Ordnance Survey mapping where relevant. Trends have been identified where historical data is available.
- 13.3.3.2 No specific sites surveys have been undertaken for the assessment of human health impacts.
- 13.3.3.3 An Audit of Social Infrastructure Provision was conducted in October 2010 (Ref 13-11) and reference has been made in this ES Chapter. The report covered social infrastructure in the area surrounding the eco-town site to the north west of Bicester.

13.3.4 Methodology for Assessing Impacts

- 13.3.4.1 There is no widely accepted significance criteria used in the assessment of health impacts and, therefore, the assessment determines whether the aspects of the Development are likely to result in positive or negative impacts on health outcomes and the likelihood of such effects being realised. This is an approach typically adopted for HIAs. The level of detail presented in this assessment reflects the level of detail available about the Development and its potential future population.

13.3.4.2 The assessment identifies the impacts likely to occur during the construction and the operational phases of the Development. The health impacts are grouped by health determinant and the assessment identifies whether the health impact is positive or negative i.e. a health gain or a potential health loss, the likely geographical scale of the impact i.e. whether the impacts are likely to be local to the Development or could potentially affect wider communities and the likelihood of the health impact occurring based upon the evidence available (both information about the Development design and evidence in health literature about potential health cause and effect relationships).

13.3.4.3 Tables 13-2 present the notation and definitions that used in the assessment.

Table 13-2 Notation Used in the Matrix

Notation	Definition
Direction of Impact	
Positive Impact (+)	Aspect of the scheme is likely to result in a positive influence upon health determinants potentially resulting in long-term gains for health status or the scheme creates conditions that enable the pursuit of healthy lifestyles.
Neutral (0)	No potential change to health status likely.
Negative Impact (-)	This aspect of the scheme is likely to result in adverse impacts on health determinants through health losses or creating conditions that do not enable the pursuit of healthy lifestyles.
Likelihood of Impact Occurring (for positive and negative impacts)	
Speculative	Considered unlikely to occur – limited supporting evidence available.
Possible	Likely to occur on the basis of evidence from a range of sources.
Probable	Very likely to happen with strong evidence from a range of sources.

13.3.4.4 The assessment was desk-based and primarily qualitative, although where modelling has been undertaken for other environmental topics, for example air quality / noise and vibration assessment, the results have been used in the assessment.

13.4 Description of the Baseline Conditions

13.4.1 Existing Baseline

13.4.1.1 The purpose of the baseline data gathering is to understand the existing health status of the population living in the vicinity of the Development and Cherwell Borough as a whole. The coverage of the issues considered as part of the baseline is wider than just the existing health status of the population. Overall health and well-being, as demonstrated in Figure 13-1 is influenced by a range of factors and this is reiterated in the Director of Public Health for Oxfordshire Annual Report VI. The baseline description provides details about:

- The health status of the population including life expectancy, mortality rates for leading causes of death and incidence of lifestyle related conditions such as obesity and type II diabetes.

- Existing levels of deprivation across Cherwell district which can affect overall health status and life chances.
- The location and provision of existing health care facilities servicing the population of Bicester and the capacity of these services to accommodate future growth, as well as their accessibility by walking, cycling and public transport.

13.4.1.2 The baseline data collated in other ES chapters is also of relevance to the human health impact assessment. When reading this chapter of the ES, consideration should also be given to the baseline data presented in the following chapters: Landscape and Visual Amenity (Chapter 5), Air Quality (Chapter 8), Noise and Vibration (Chapter 9), Contaminated Land (Chapter 11), Socio-Economic and Community Effects (Chapter 14) and Traffic and Transport (Chapter 16) as they are of relevance to impact on human health.

13.4.2 Health Status

13.4.2.1 The Cherwell Health Profile published in September 2013 (Ref 13-12) identifies that health in the district is generally better than the England average for a number of health indicators.

Life Expectancy at Birth

13.4.2.2 Life expectancy at birth is an estimate of the number of years a new born baby would be expected to live, if they were to experience, throughout their lifetime, an area's age specific mortality rates. Figures 13-2 and 13-3 present the trends for life expectancy at birth for males and females for districts across Oxfordshire compared to the England average. Both graphs indicate a positive upward trend for life expectancy that is above the England average. Between 2008 and 2010, female life expectancy at birth within Cherwell District was slightly higher than that in South East and Oxford, and lower than in South Oxfordshire, Vale of White Horse and West Oxfordshire. Male life expectancy in Cherwell District was the same as male life expectancy in Oxford, but lower than the other districts within Oxfordshire.

Figure 13-2 Life Expectancy at Birth for Females (Source: Joint Strategic Needs Assessment 2013 (Ref 13-10))

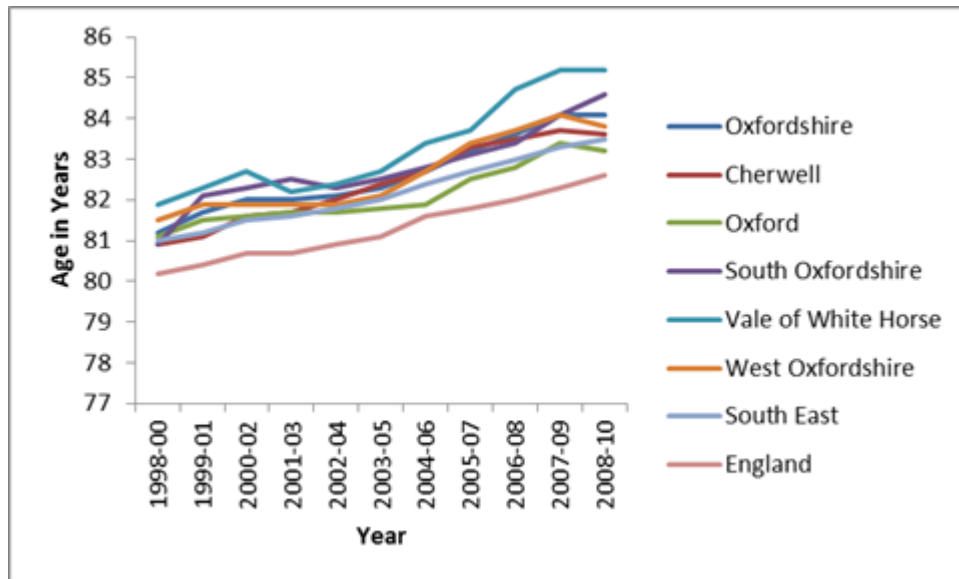
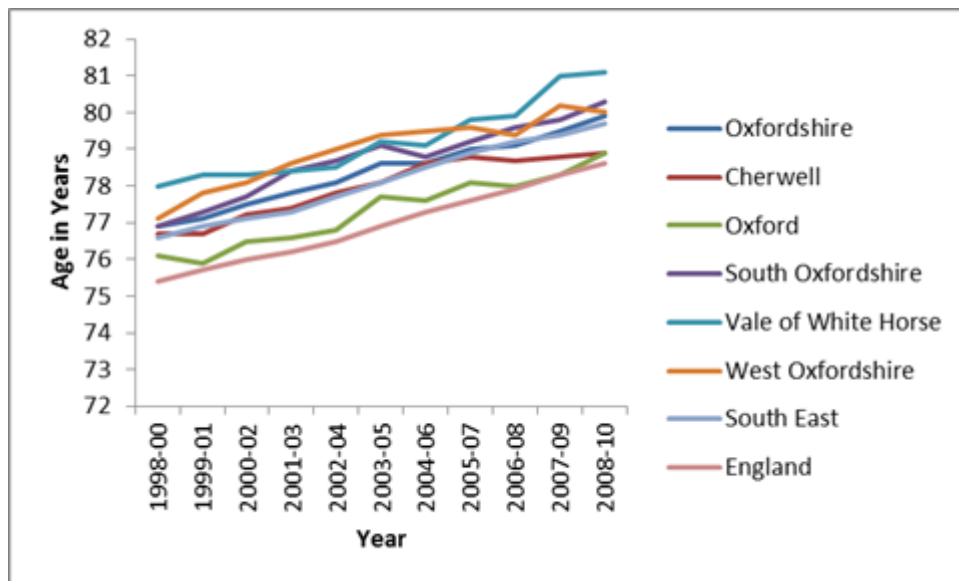


Figure 13-3 Life Expectancy at Birth for Males (Source: Joint Strategic Needs Assessment 2013 (Ref 13-10))



13.4.2.3 Table 13-3 supplements both Figures 13-2 and 13-3 with the latest life expectancy at birth statistics for the period January 2007 to December 2009 and January 2008 to December 2010 which again indicates positive results for Cherwell.

Table 13-3 Life Expectancy at Birth 2007 - 2010 (Source: Neighbourhood Statistics) (Ref 13-13)

Area	Life Expectancy At Birth (Females)		Life Expectancy at Birth (Males)	
	2007 - 2009	2008 - 2010	2007 - 2009	2008 - 2010
Cherwell District	83.7	83.6	78.8	78.9
South East	83.3	83.5	79.4	79.7

England	82.3	82.6	78.3	78.6
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13.4.2.4 Whilst the results indicate that life expectancy is good across Cherwell District as a whole, there are disparities within the district. The Cherwell District Health Profile (2013) states that life expectancy is 10.7 years lower for men and 5.0 years lower for women in the most deprived areas of Cherwell than in the least deprived areas (Ref 13-12).

General Health Status

13.4.2.5 Table 13-4 presents data about the percentage of the population in each ward reporting their health status as good. The data was obtained during the last census (2011); it provides further context for the assessment. It is evident that self-reported health status is above the England average in all wards with the exception of Bicester Town. In addition, the population was asked whether they had a long-term limiting illness, health problem or disability which restricted their daily activities or the work they are able to do. Table 13-4 demonstrates that health status is again better than the England and South East average for all wards, although there are disparities between the wards.

Table 13-4 Standard of Reported Health (Source: Neighbourhood Statistics) (Ref 13-13)

Ward	Percentage of population that considered themselves to be in good health and very good health (2011)	Percentage of Population with a Long-Term Health Problems or Disability ⁵ (2011)
Caversfield	86.4	12.6
Ambrosden and Chesterton	91	8.7
Bicester East	86	13.29
Bicester North	90.7	8.2
Bicester West	84.3	14.5
Bicester South	92.5	6.2
Bicester Town	79.3	19.3
Launton	85	15.9
Fringford	87.8	12
Cherwell Average	85	14.1
South East Average	83.6	15.7
England Average	81.4	17.6

⁵ Includes the subcategories 'day-to day activities limited a lot' and 'day-to-day activities limited a little'.

13.4.2.6 Incapacity benefit is paid to people who have been medically certified as physically or mentally unable to work. Table 13-5 presents data regarding benefits claimants in Cherwell District compared to averages for the South East and England. The data demonstrates that total claimants within Cherwell District are below the South East and England averages and this trend is reflected in the more detailed breakdown by statistical group.

Table 13-5 Key Benefits Claimants (Working Age Group) (Ref Office for National Statistics – Neighbourhood Statistics 2010) (Ref 13-13)

	Cherwell (%)	South East (%)	England (%)
Total Claimants	9	11	15
By Statistical Group			
Job Seekers	2	2	4
Employment and Support Allowance and Incapacity Benefits	4	5	7
Lone Parents	1	1	2
Carers	1	1	1
Others on income related benefits	0	0	1
Disabled	1	1	1
Bereaved	0	0	0

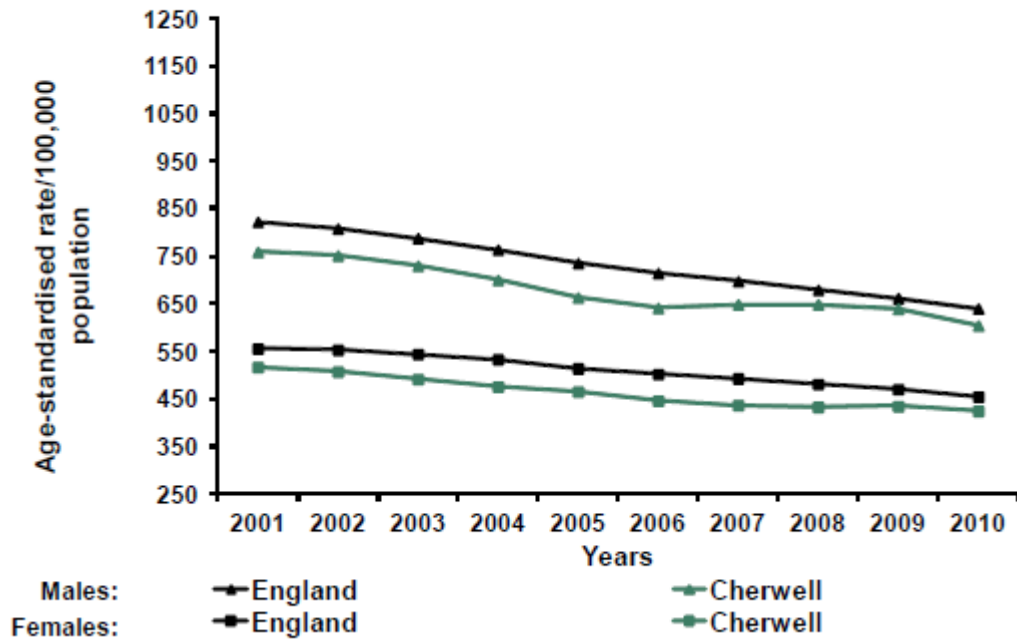
Mortality

13.4.2.7 Figure 13-4 demonstrates that since 2001 there has been a steady decrease in the age-standardised rate of all age, all cause mortality for both males and females within Cherwell District, with the rate also being lower than the rate for England.

13.4.2.8 The age standardised mortality rate for an area is the number of deaths, expressed per 100,000, that would occur in that area if it had the same age structure as the standard population and the local age-specific rates of the area applied. The rate is usually expressed per 100,000. Data sourced from Oxfordshire County Council demonstrates that there is a wide range in the age-standardised mortality rates for all ages for the wards within the study area.

Figure 13-4 Mortality Rates for Males and Females (Health Profile for Cherwell, 2013) (Ref 13-12)

All age, all cause mortality



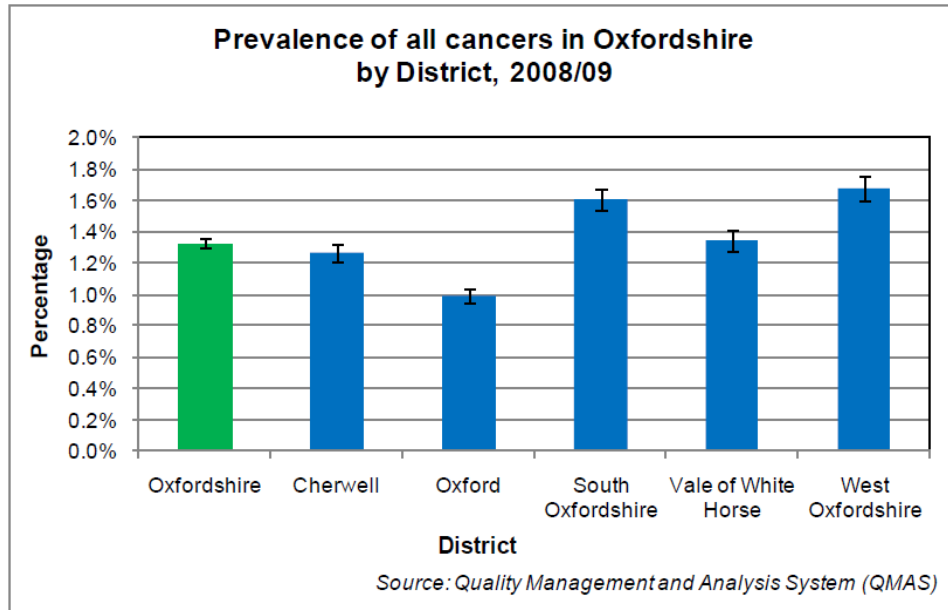
13.4.2.9 The mortality rates from coronary heart disease and stroke for each area are presented in Table 13-7. The mortality rate from heart disease in Cherwell is lower than regional and national levels; however, the rate is higher when compared to South Oxford and West Oxfordshire. The mortality rate from stroke is the second lowest of all Oxfordshire districts and lower than national rates.

Table 13-7 Mortality Rates from Coronary Disease and Stroke (Source: Joint Strategic Needs Assessment 2013 (Ref 13-10))

Area	Mortality rate from coronary heart disease (2010)	Mortality rate from stroke (2010)
Oxfordshire	55.5	32.5
Oxford	67.3	30.0
South Oxford	46.4	36.3
Vale of White Horse	58.4	31.9
West Oxfordshire	54.1	34
Cherwell	55.6	31.0
South East	63.1	37.6
England	74.2	40.9

13.4.2.10 The prevalence of cancer in Cherwell is the second lowest of all Oxfordshire's districts as demonstrated in Figure 13-5 below.

Figure 13-5 Prevalence of All Cancers (Source: Joint Strategic Needs Assessment, 2009)



13.4.2.11 Mortality rate from cancer in Cherwell (106.6) is slightly lower when compared to England average (108.1) but not significantly different.

Mental Health

13.4.2.12 Mental health rates are usually expressed per 1,000. Data sourced from Oxfordshire County Council demonstrates that there is a wide range of mental health indicators including number of people with neurotic disorders, panic disorders, anxiety and depression, etc. Data from 2006 show that the number of people with mental health disorders in Cherwell District is lower than national and regional figures.

Physical Activity and Lifestyle Habits

13.4.2.13 The Chief Medical Officer's report (Ref 13-14) states that physical activity is essential for good health and contributes to overall wellbeing. Physical activity has significant benefits in reducing coronary heart disease and in reducing other health impacts including diabetes, cancer and osteoporosis and, therefore, new developments should be well located in relation to public transport connections and provide opportunities for healthy lifestyles to be pursued where possible. If a more active population helps to reduce the number of people with poor health status this would also positively impact the local economy, helping to reduce the number of individuals claiming incapacity benefits. The following sections provide some details about mortality from diseases that are associated with lifestyle habits and levels of physical activity.

Physical Activity

13.4.2.14 Table 13-8 presents data showing levels of physical activity within Cherwell District (the percentage of the adult population participating in at least 30 minutes of sport and active recreation of at least moderate intensity at one session per week). The data demonstrates that activity levels in Cherwell are

below the England average for the year 2012/2013 and are lower than in some other parts of Oxfordshire. Ward specific data is not available for this indicator.

Table 13-8 Physical Activity Levels (Source: Active People Survey 7 June 2013, Ref 13-32)

Area	2010/11 (Percentage)	2011/12 (Percentage)	2012/13 (Percentage)
Cherwell	36.7	37.3	33.7
South Oxfordshire	36.0	46.8	38.4
Vale of White Horse	41.2	36.9	36.4
West Oxfordshire	37.3	41.5	37.2
Oxfordshire	36.9	40.2	36.5
South East	35.7	37.4	36.2
England	34.8	36.0	35.2

13.4.2.15 The 2010 Director of Public Health Annual Report for Oxfordshire (Ref 13-16), reports that almost three quarters of Oxfordshire’s population does not participate in enough physical activity. Since 2006, there has been a reported increase in activity levels although a lot more work needs to be done to improve activity levels further.

People Diagnosed with Diabetes

13.4.2.16 The number of people diagnosed with Type 2 diabetes is increasing and the main contributory factor is increasing rates of obesity. Since 1996 the number of people diagnosed with diabetes in the UK has increased from 1.4 million to 2.6 million. The number of people in the UK who have been diagnosed with diabetes has reached three million for the first time, equivalent to 4.6 per cent of the UK’s population, according to new analysis carried out by Diabetes UK and Tesco (Ref 13-15). The figure represents an increase of 132,000 people diagnosed with diabetes over the last year. A further 850,000 people are thought to have undiagnosed Type 2 diabetes.

13.4.2.17 By 2025 it is estimated that 4 million people will be living with diabetes in the UK (Ref 13-15). Modifying lifestyle behaviours and increasing levels of physical activity will therefore be very important to prevent this as it is recognised that the risk of developing Type 2 diabetes can be reduced by making lifestyle changes. The Department of Health Strategy ‘Be Active: Be Healthy’ states that physically active people have a 33-50% lower risk of developing Type 2 diabetes compared with inactive people (Ref 13-17).

13.4.2.18 Between 2011 and 2012, 5.1% of people in Cherwell on GP registers were recorded as being diagnosed with diabetes, which is below the England average of 5.8% but has increased over time from 3.1% in 2005/2006 (Ref 13-12).

Obesity

13.4.2.19 In 2010/12, 7.2% of children of school ages 4-5 within Cherwell District were considered to be obese, which is above the Oxfordshire County Council

average of 7.0% and below the England average of 9.5% (Ref 13-34). This has decreased since 2008/2009, when the figure was 7.9%.

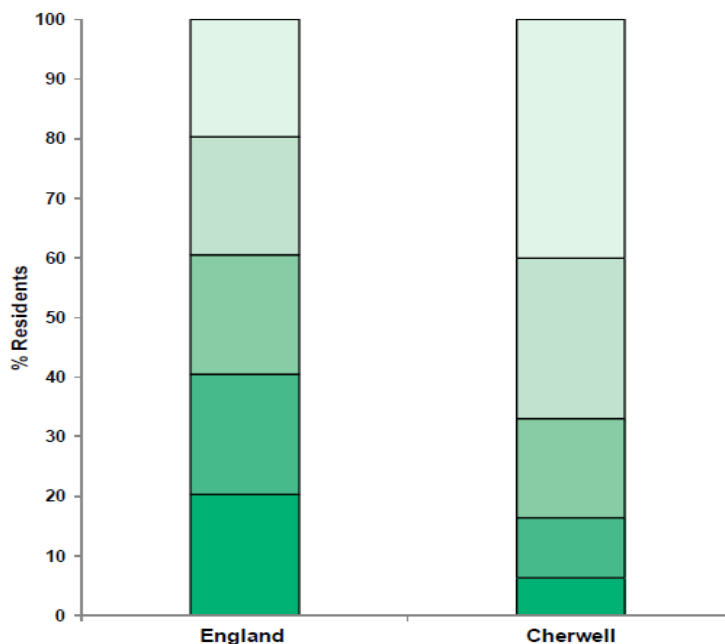
13.4.2.20 Between 2011 and 2012, 24.0% of adults in Cherwell District were classed as obese, in comparison to 24.2% of England’s population. This has gradually fallen since 2006 and 2008, when the figure was 26.2% (Ref 13-12).

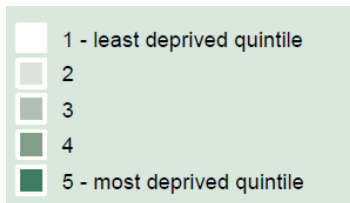
13.4.2.21 The 2013 Director of Public Health Annual Report for Oxfordshire states that with regards to obesity in adults the region is generally healthier than the national average. However, the fact remains that around 1 in 4 adults in this County (and rising) are obese. By 2020 obesity could lead to an additional 6,900 cases of diabetes in Oxfordshire alone. Increasing levels of activity and promoting opportunities for the pursuit of healthier lifestyles could help to reduce this issue in the long-term.

Deprivation

13.4.2.22 The Index of Multiple Deprivation (IMD) 2010 (Ref 13-18) is a measure of multiple deprivation experienced by individuals living in a particular area. The IMD 2010 combines seven dimensions covering income, employment, health and disability, education, skills and training, barriers to housing and services, living environment and crime and weights them to create a combined IMD score. Figure 13-6 taken from the Cherwell District Health Profile 2013 presents the proportion of residents within England, the region and Cherwell District living in neighbourhoods belonging to each of the five national deprivation quintiles. The quintiles were derived by ranking all the Lower Super Output Areas (LSOA) in England in order of their deprivation scores and dividing them into five equal groupings. The graph demonstrates that around 5% of the population of Cherwell District lives in an LSOA in the 20% most deprived in England. Almost 40% of the population live in an LSOA in the least deprived quintile.

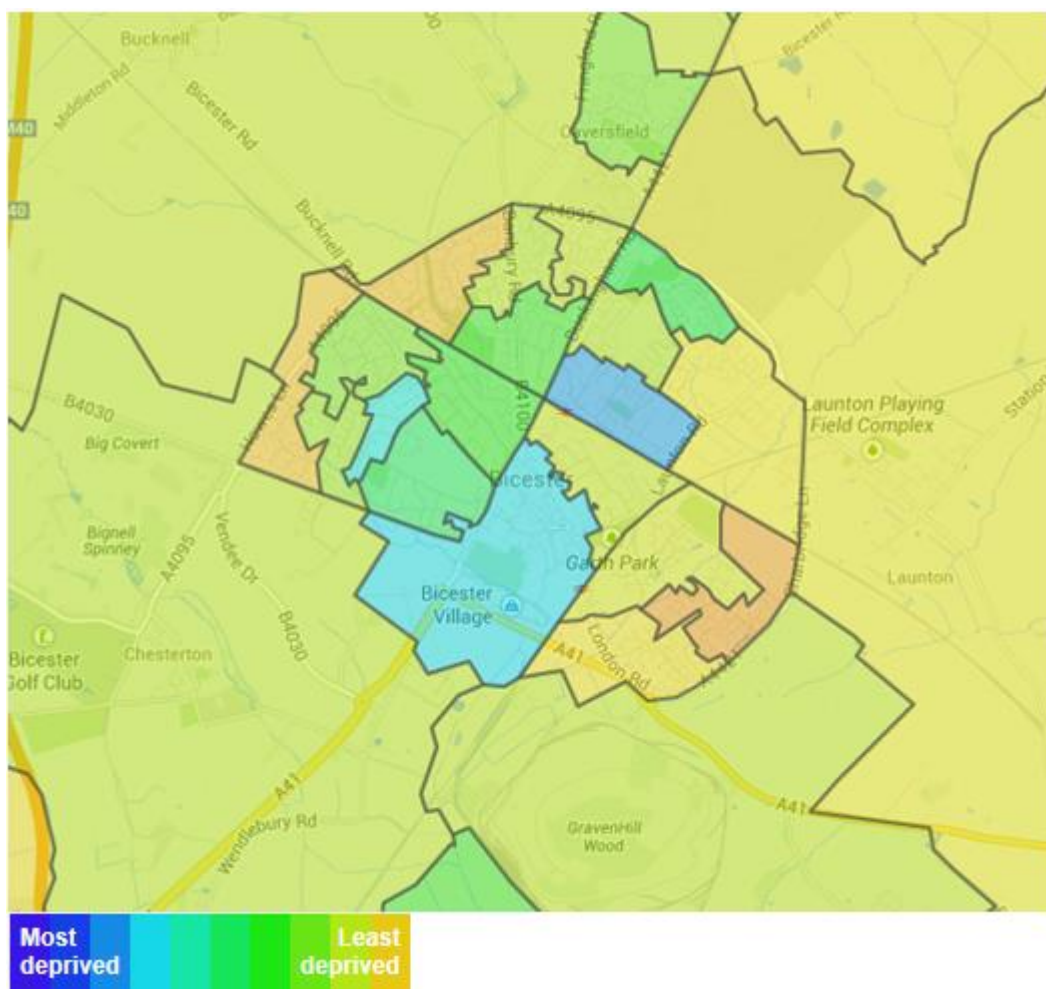
Figure 13-6 IMD Results for Cherwell (Source: Cherwell District Health Profile 2013 (Ref 13-12))





13.4.2.23 The IMD includes the Health Deprivation and Disability Domain. A review of the results for each LSOA within the wards in the study area demonstrates that there are no significant health deprivation issues within these wards i.e. none of the LSOAs lie within the top 20% most deprived nationally. Figure 13-7 presents the IMD Data for the Health Deprivation and Disability Domain within LSOAs in Bicester.

Figure 13-7 IMD Results for Bicester and surrounding LSOAs (Source: <http://opendatacommunities.org/deprivation/map>) (Ref 13-18)



13.4.2.24 Cherwell District ranks 26,319 for the IMD Health Deprivation and Disability Domain (32,482 indicates the least deprived and 1 the most deprived).

13.4.3 Accidents

13.4.3.1 Chapter 16 (Transport) presents details of Personal Injury Accidents for the key roads in the vicinity of the Development.

13.4.4 Location of Key Health Facilities

- 13.4.4.1 The location of existing health facilities including doctor's surgeries, hospitals and dentists in the vicinity of the Development are shown on Drawing 13-2. The closest GP Practice to the Site is the North Bicester surgery located approximately 700m south east of the Site. The average list size for the five GP surgeries in Bicester is 1,230 patients per GP which is in line with the average list size for the Oxfordshire Primary Care Trust (1,284 patients per GP). The dental practises, opticians and pharmacies are primarily located in the town centre as shown on Drawing 13-2.
- 13.4.4.2 The Bicester Community Hospital has only 12 beds and provides intermediate care and GP admissions. It also provides an out of hours service in a minor injuries unit.
- 13.4.4.3 The Department for Transport Core Accessibility Indicators provide a number of measures of accessibility by public transport, walking and (where appropriate) cycling to different services types including GPs and hospitals. The purpose of the indicators is to assist Local Authorities develop their evidence base for their accessibility strategies. The data for Cherwell District for 2011 demonstrates that access to GPs is good for people living in Cherwell with individuals able to access more than one GP/health care centre within 15 minutes by either public transport, walking or cycling. Accessibility data by modes of transport is provided in Table 13-8.

Table 13-8 Accessibility to Health Facilities (Source: Department of Transport, 2012) (Ref 13-19)

Indicator	Results
Travel time to nearest GP by public transport/walk	12 minutes
Travel time to nearest GP by cycle	7 minutes
Travel time to nearest GP by car	5 minutes
Number of GPs within 15 minutes by public transport/walk	2
Number of GPs with 15 minutes by cycle	4
Number of GPs within 15 minutes by car	5

- 13.4.4.4 The closest ambulance station to the Development lies approximately 12km to the north in Brackley. Both a fire station and police station are situated in Bicester.

13.4.5 Accessibility to Recreation and Amenity Facilities

- 13.4.5.1 Chapter 16 (Transport) of this ES presents details of the PRow in the vicinity of the Site. Information regarding the levels of use of the bridleways and footpaths near the Development is obtained by Oxfordshire County Council and no specific surveys have been commissioned for this assessment.
- 13.4.5.2 At present there are no cycle routes crossing the Site. Traffic-free cycle routes located southeast of the Site along Banbury Road and A4095 (Ref 13-31).
- 13.4.5.3 Walking as a low impact form of exercise can reduce the risk of strokes, osteoporosis, high blood pressure, bowel cancer, Alzheimer's disease, arthritis, anxiety and stress. In addition, regular walking can improve a person's mental health and well-being by increasing confidence, stamina, energy, weight control and life expectancy (Ref 13-23). Oxfordshire County Council has produced a Rights of Way Management Plan 2014 – 2024 (RoWMP) (to be adopted in autumn 2014) which sets out their ambitions for the improvement of PRow within the county in order to meet the Government's aim of better provision for walkers, cyclists, equestrians and people with mobility problems. There is scope for good connections to the PRow to be provided to enable future residents of the Development to pursue healthy lifestyles.
- 13.4.5.4 The 'Health Walks' initiative is a national initiative that encourages individuals to improve their fitness by using their local countryside for walking. This initiative is run in Cherwell District and walks are regularly held in Bicester (Ref 13-33).
- 13.4.5.5 The location of sports and recreation venues is shown on Drawing 14-2. Further discussion is also included in Chapter 14 (Socio Economics and Community) about the sports and recreation provision, play areas, community centres and open spaces in the vicinity of the Development.
- 13.4.5.6 The quality and availability of pedestrian and cycle facilities in the vicinity of the Development and issues of severance are discussed in Chapter 16 (Transport).
- 13.4.5.7 As identified in the Cherwell Green Spaces Strategy (Ref 13-20), there is a need for more and better green spaces to be provided within both the urban and rural areas of Cherwell to accommodate the growing population.

13.5 Design and Mitigation

- 13.5.1.1 A number of mitigation measures have been incorporated into the design process to reduce the potential adverse health effects and to maximise potential health gains offered by the Development. Mitigation measures relevant to the construction and operational phases are provided in the following sections.

13.5.2 Construction

- 13.5.2.1 Construction best practice would be employed to minimise potential adverse health effects and maximise potential health benefits for the nearby community as well as those individuals undertaking the construction works. Measures that would be implemented comprise:

- Traffic movements would be carefully phased to minimise any possible delays and disruption to regular road users, public access, community facilities, residences and businesses, particularly those used by vulnerable groups such as children.
- Construction site compounds and areas for material/plant storage would be positioned away from sensitive receptors/properties, wherever possible.
- Careful management of retained vegetation at the site periphery, to provide visual screening.
- All construction works would be undertaken in accordance with the health and safety legislation prevailing at the time of construction to ensure that all works are executed safely and to minimise risk of accidents.
- The mitigation measures recommended in Chapter 8 (Air Quality) to control dust and air quality during construction.
- Monitoring of depositional and suspended dust during construction in order that trigger levels may be set where mitigation must be increased to protect the health and amenity of local residents. These monitoring requirements would be agreed in advance with the Environmental Health Officer (EHO) at Cherwell District Council.
- The mitigation measures recommended in Chapter 9 (Noise) to control construction noise and vibration. Details regarding plant to be installed at the Energy Centre are not known but it is likely that plant such as fans, extractors, chiller units and air conditioning units would be installed at the commercial premises. At detailed design stage, further studies would be undertaken to agree noise limits for plant to be installed on site with the local EHO, and ensure that the design meets these limits. The key issue would be to achieve a level below the night-time background (L_{A90}) noise level.
- The mitigation measures recommended in Chapter 16 (Transport).
- Ensure regular dialogue and information provision to nearby residents who could potentially be affected by the construction works.
- Encourage the contractors appointed for the construction works to register with the Considerate Constructors scheme.

13.5.2.2 In addition to the above, during the preparation of the Masterplan, work has already been undertaken to engage with local companies to secure maximum benefits for local residents and employees.

13.5.3 Operation

13.5.3.1 The Site has been designed in line with key project objectives, principally, in relation to human health, to provide green infrastructure, to ensure the appropriate provision of social and community facilities, to provide access to employment opportunities and to provide the necessary design and infrastructure to promote the use of walking, cycling and public transport use rather than the private car. The following mitigation measures have been included within the design as a result of the iterative design process and recommendations from the design and assessment teams:

- Secured by design principles have been used to minimise the risk of crime occurring and the local constabulary has had the opportunity to comment on the design proposals.
- The requirements of all sectors of the society have been considered to ensure the correct balance of services and amenities to serve the Development.
- The provision of community facilities that would promote community interaction, empowerment and community development.
- Providing appropriate infrastructure to enable home-working (appropriate broadband speeds).
- The Development has been designed to facilitate easy movement by foot and cycle, thereby supporting the use of active modes of travel and the pursuit of healthy lifestyles. The objective is to provide a principal network of segregated footways and cycleways, some of these alongside roads or shared with vehicles. Traffic speeds within the development would be controlled accordingly in order to provide a safe environment for pedestrians and cyclists. The new road crossing under the railway creates the opportunity for a direct pedestrian crossing and bus only link between Bucknell Road and NW Bicester. The new urban boulevard which would be created in place of existing Howes Lane with a new alignment approximately 100 metres to the west, (with a new underpass crossing under the existing railway linking to Lords Lane) would provide a strong pedestrian priority and shared public space. Further details about the operational design of the scheme from this perspective are provided in Chapter 16 (Transport).
- The provision of secure cycle parking and storage facilities would be incorporated into the residential areas, local centre and employment areas. Cycle parking and storage is to be provided in accordance with Cherwell District Council cycle parking standards.
- The 'centre' of the Development providing the community facilities has been located to ensure that it is highly accessible by foot and cycle to all areas of the site. For example, access to the primary school by foot has been a key consideration.
- The development of a comprehensive green infrastructure strategy for the Site that includes areas of public and private green space. The green infrastructure is 46% of the Site (including Primary school green infrastructure). The green infrastructure provides opportunity for interaction between children and young people and with their environment.
- A new bus service is to be provided through the site and would enable all residents and occupiers of the site to be within 400m of a bus stop.
- Allotments are included within the site to enable local food production, as well as local orchards.

13.5.3.2 Other mitigation measures that should be implemented to reduce potential adverse human health effects and to maximise potential health gains are:

- Ensure ownership and responsibility for maintenance of external spaces and buildings are clearly defined. High levels of maintenance of, for

example, areas of green space would encourage more active use which should help to reduce incidence of crime and associated perceptions of fear of crime.

- Ensure provision of effective signage throughout the Development to encourage walking and cycling to key facilities.
- In the long-term, the 'Health Walks' initiative should be extended to include the Development to further encourage the pursuit of healthy lifestyles amongst the new residents.
- Develop opportunities to include public art within the Development to provide a means of engaging with the community and to create a 'sense of place' and 'ownership'.
- As a result of the policy of connecting the Site to the rest of Bicester by other means other than by road, a walking survey has been carried out in Bicester to identify the weaknesses in the current footpaths and cycle ways but also to establish the distances and realistic times to travel the distances to the various destinations in the town. This information would be used to deliver wider off-site improvements.

13.6 Assessment of Impacts

13.6.1.1 The assessment of impacts of the Development on human health is presented in the sections below. The impacts have been separated into construction and operational phase impacts and have been grouped by health determinants.

13.6.2 Construction Phase Impacts

Employment and Economy

13.6.2.1 During the construction phase, employment opportunities would be created and there would be potential indirect economic benefits for local businesses, for example, local accommodation providers, as a result of spending by the construction workforce (refer to Chapter 14, Socio-Economics and Community for further details). There are also opportunities for upskilling of the existing workforce as a result of the design specification for the Development. There is strong evidence documenting the health benefits of being in employment and the associated health benefits (mental and physical) (Ref 13-21). For this reason, health impacts are assessed as **positive**. The likelihood of this impact occurring is considered **possible** as the health impacts would depend upon a number of factors including: the types of jobs created, the status of those who would take the construction phase employment opportunities i.e. would they be those who are currently unemployed?, the income offered by the employment opportunities, the types of jobs that would be created and the types of contracts that employees would have - these are all factors that can ultimately influence the likely health benefits realised. To secure maximum health benefits as a result of the construction works, it is recommended that opportunities are sought to establish employment routes that enable those currently unemployed to benefit from the construction works and for local apprenticeships and training scheme providers to be engaged in the works to provide maximum upskilling benefits.

Safety and Security

- 13.6.2.2 Construction works have the potential to adversely affect health and well-being, both to those working on the construction site, but also members of the public who may come into contact with the works. The mitigation measures clearly identify that all works would be undertaken in accordance with the health and safety legislation prevailing when the scheme is constructed and that the works would be securely cordoned off to prevent public access. A CEMP would be implemented to ensure that disruption is kept to a minimum, and careful working practices would be administered during the construction phase. Whilst adherence to these legislative requirements would create a working environment that is conducive to safe working, the effects on health status are assessed as **neutral**. There is scope for further benefits to be delivered although this would depend upon the contractors appointed and the specific health and safety training they deliver to their employees, the hours that employees are required to work and any associated benefits that may be provided by the contractors that could benefit health.

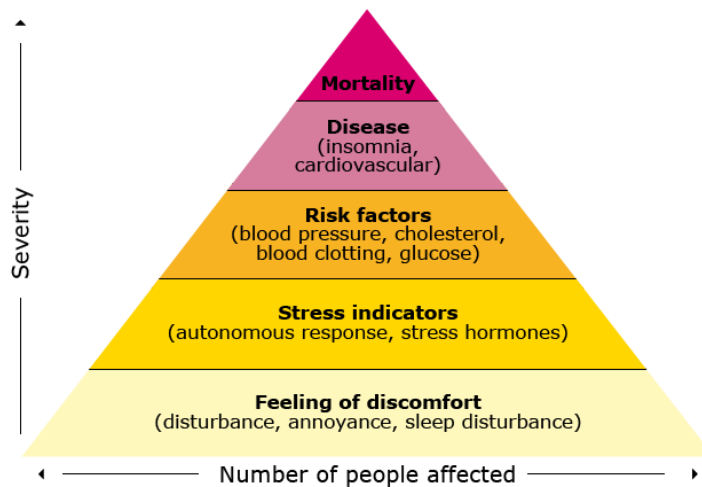
Air Quality

- 13.6.2.3 There is a large body of evidence which documents the health impacts of various pollutants and it is apparent that health effects of air pollution are greatest for 'at risk' groups including the elderly, people with chronic chest and heart disease and young children. Dust and particulate matter generated by construction sites has the potential to cause adverse health effects. Whilst dust cannot generally be ingested as the particle size is too large, it can cause eye, throat and nose irritation. PM₁₀ is of more concern from a health perspective as it can enter the lungs causing respiratory difficulties and cardiovascular concerns in the long-term (Ref 13-22).
- 13.6.2.4 The number of receptors most likely to be affected from construction dust are listed in Table 8-18 and Table 8-19 of Chapter 8 Air Quality. It is considered that the potential impact on human health from specific dust impact is **low** based on the sensitivity of the surrounding area and the approximate number of residential receptors. .
- 13.6.2.5 Owing to the temporary nature of the effects and the proposed mitigation measures in Table 8-27, including regular dust monitoring during the construction works and the establishment of trigger levels to ensure effective mitigation is implemented, the health effects are assessed as **neutral** as there should be no significant change to health status. Dust generation would also be intermittent during the construction works. The review of the existing health status of the population in Section 13.4 identified that the health of the population in Bicester is generally good and so they may be considered less vulnerable to adverse air quality effects than a population where there is a higher prevalence of existing respiratory and cardiovascular conditions.

Noise and Vibration

- 13.6.2.6 It is well documented that noise can adversely affect health and well-being. Figure 13-8 depicts the adverse health effects that can be generated by elevated noise levels.

Figure 13-8 Health Effects of Noise (Source: Babisch, W, 2002 cited in Good Practice Guide on Noise Exposure and Potential Health Effects, 2010) (Ref 13-24)



- 13.6.2.7 The most likely construction noise impacts are to be experienced at residential receptors at Greenacres, Caversfield and the Lodge on the B4100 and receptors along the A4095. Impacts are also likely where works take place close to receptors on the A4095 and near Hawkwell farm on Bucknell Road.
- 13.6.2.8 The construction noise assessment presented in Chapter 9 (Noise) states that with the implementation of mitigation there would be no significant noise impacts. Whilst, there may be some intermittent disturbance caused by certain, very noisy construction activities, they would not result in prolonged adverse impacts and so it is assessed that there would be a **neutral** effect on human health as there would be no significant health improvement delivered and no significant health loss or deterioration caused. Proactive engagement with the potentially affected receptors in advance of the construction works commencing would also be important to help manage any potential anxiety issues, as would the use and management of a complaints procedure during the construction works to ensure that any issues are promptly resolved.

Physical Environment and Urban Design

- 13.6.2.9 During the construction works there would be changes to the built and natural environment within and adjacent to the site. Modifications to the physical environment have the potential to affect human health as a result of localised disturbance which may cause anxiety or as a result of emissions, such as dust emissions or increased levels of noise and vibration (the latter issues have been discussed above). There may be temporary deterioration in amenity value for users of nearby paths and bridleways particularly those to the west of the Development, such effects are not considered likely to have a significant effect on health status. Similarly, the changes to the amenity value of the environment as a result of the construction works are not considered to result in significant changes to health status and are also assessed as **neutral**.

Healthy Lifestyles

- 13.6.2.10 Based upon the analysis provided in the 'Physical Environment' section above, the assessment for the construction phase is **neutral** as the ability of nearby residents and the wider community to pursue healthy lifestyles would not be affected by the construction works.

Transport and Access

- 13.6.2.11 Traffic and transport is a significant source of stress but there is a lack of epidemiological research on the health impacts. However, there is evidence that transport related stress can cause sleep disturbance and increase blood pressure amongst drivers (Ref 13-24).
- 13.6.2.12 Chapter 16 (Transport) has identified that there are likely to be minor adverse impacts for residents and business relating to the increase in construction vehicles on the local highway network. Potential delays to journey times for pedestrians and drivers may be experienced due to the volume of traffic and potential need to introduce temporary traffic management controls on route to the Site. The safety of road users may also be affected by the increase of large type construction vehicles. A Construction Traffic Management Plan would be produced to mitigate these impacts, effectively routing construction vehicles away from sensitive residential areas where possible. Therefore, the impacts on human health are assessed as **neutral**.

Waste Management and Contamination

- 13.6.2.13 Based on the information to date, low levels of contaminants have been encountered on site and if contamination was encountered in other previously uninvestigated area remedial measures would be implemented (Chapter 11 Contaminated Land).
- 13.6.2.14 The impacts on construction workers include potential chronic damage via dermal, ingestion and inhalation exposure to contamination. Construction workers are considered to be of high importance and assuming the mitigation measures are adopted, it is considered that this could result in a negligible adverse change to human health. The impact significance has been assessed as potential **neutral**.
- 13.6.2.15 Whilst low levels of contamination have been encountered on site, construction activities could result in the mobilisation of contaminants within the soil and create pathways for contaminants to migrate into the underlying groundwater or surface water. These receptors would also be at risk from general construction activities such as re-fueling of vehicles, use of chemicals and hydrocarbons on site, stockpiling and excavation of soils. The groundwater is designated a Secondary A aquifer and is given a high importance. Assuming the mitigation measures are implemented, it is considered that this could result in a negligible adverse change in water quality. The impact significance has been assessed as **neutral**.

Community and Social Infrastructure (including Community Spirit and Engagement)

- 13.6.2.16 During the construction phase, there would be no adverse impacts on community and social infrastructure. Impacts are assessed as **neutral** from a human health perspective.
- 13.6.2.17 The extent of an individual's participation in their community and the added control that this may offer to their lives and health status is documented in literature (Ref 13-25). It would be important during the construction phase to communicate openly with the communities that may be affected such that they understand the works that are being undertaken and any potential disruption that it may cause to adequately manage any concerns and to reduce the risk of anxiety which can have adverse impacts on mental health status.

Access to and Provision of Health Facilities and Services

- 13.6.2.18 During the construction phase, there would be no adverse impacts on the provision of health facilities and services as all existing facilities would continue to be operational and accessible. Impacts are assessed as **neutral**.

13.6.3 Operational Phase Impacts

Employment and Economy

- 13.6.3.1 Chapter 14 (Socio Economics and Community) identifies a positive significant impact on employment as the Development would generate a number of jobs and could potentially attract a significant amount of new investment within the immediate area. The Employment Strategy (Ref 14-10) provides a detailed breakdown of the on-site job calculations for Application 1. In total, the Development is expected to generate 1,048 jobs on site. These job opportunities could offer potential indirect **positive** health impacts. The likelihood of health benefits being realised is considered **possible** as the impacts would depend upon who benefits from the employment opportunities and the types of jobs, pay and contracts offered (as identified in the discussion of potential construction effects).
- 13.6.3.2 The Marmot Review (Ref 13-25) identifies that health inequalities arise because of inequalities in society. A key factor is being able to access good employment opportunities and, therefore, improving access to good jobs and reducing long-term unemployment across the social gradient would help to reduce health inequalities. Whilst health status is generally good across Cherwell District, there are inequalities between parts of the district and this is reflected in the differences in life expectancy. There are opportunities for such issues to be addressed by providing access to the employment opportunities for those who are currently unemployed. This can be secured by promoting long-term apprenticeships and initiatives and maximising the upskilling opportunities presented by the Development and in the future by the development of the rest of the NW Bicester development.

Safety and Security

- 13.6.3.3 The Development has been designed to minimise the risk of crime through the use of Secured by Design principles and this is assessed as having a potential **positive** health impact as the design would enable future residents and users of the site to pursue lifestyles that are not adversely affected by crime and fear of crime. The likelihood of this impact being realised is assessed as **probable** as there is a strong body of evidence that demonstrates the associations between urban design and incidence and fear of crime and the associated effects on health status and lifestyles. It has been identified that fear of crime may act as a barrier to physical (e.g. walking and cycling) and social activities (visiting places) that benefit health (Ref 13-26). The positioning of key walking and cycling routes through the site has been designed to ensure they benefit from natural surveillance. In the long-term, the effective maintenance of the Development and its soft and hard infrastructure would also help to ensure that such positive impacts continue to be realised.

Air Quality

- 13.6.3.4 The House of Commons Environmental Audit Committee Report (Ref 13-27) critically reviews current performance across Government in relation to the achievement of air quality targets. Transport in particular comes under heavy scrutiny with a significant shift in transport policy needed to ensure that air quality targets can be achieved. The onus is put upon local authorities to do more to tackle poor air quality and the need for Government to provide guidance about how to further develop local air quality strategies. With improved air quality there would be improved benefits to the economy and human health. The Development would result in changes to traffic flows and access which have the potential to affect air quality and, therefore human health.
- 13.6.3.5 Table 8-22 in Chapter 8 Air Quality provide details of the potential receptors likely to be affected from vehicle exhaust emissions and Energy centre emissions during the operational phase of the development. As indicated in Table 8-23, receptor sensitivity to changes in annual mean NO₂ concentrations is low at the majority of locations, medium at five receptor locations and very high at receptor R25 (North Street). The significance of impact at all locations is considered to be neutral apart from North Street where the the potential impact is predicted to be slight adverse. The medium and very high sensitivities are associated with receptor locations within the proposed AQMA, close to the congested road networks. Sensitivity to changes in PM₁₀ concentrations was low at all receptor locations. Predicted impacts on annual mean PM₁₀ concentrations as a result of the Development were predicted to be neutral at all receptor locations.
- 13.6.3.6 It should be noted that the design has been focussed upon reducing travel by private car and encouraging the use of more sustainable modes of transport and use of active travel modes (walking and cycling).
- 13.6.3.7 Chapter 8 (Air Quality) identifies that the proposed Energy Centre has the potential to cause air quality impacts as a result of combustion emissions of NO₂ and PM₁₀ from the biomass boiler and gas Combined Heat and Power

(CHP) plants. These would be emitted to atmosphere via dedicated stacks located on the roof of the Energy Centre.

- 13.6.3.8 A suitable stack for dispersion of NO_x emissions from the Energy Centre has been included within the proposals in order to control operational air quality impacts to an acceptable level. A Travel Plan has been produced to promote sustainable transport modes and reduce single-occupancy vehicle trips. Reference should be made to Chapter 16 for further details of the Transport Assessment and associated Travel Plan.

Noise and Vibration

- 13.6.3.9 The suitability of the Site to accommodate residential development in line with the requirements of Planning Policy Guidance Note 24 (PPG24) has been assessed in Chapter 9 (Noise).
- 13.6.3.10 The noise contour produced for the Do-Something 2031 (with Development traffic and cumulative traffic considered) indicates that the Site would fall predominantly in the range that indicates 'Development permitted' as per the criteria based on the NPSE as described in Table 9-3. Noise levels from traffic are predicted to be below 55dB across most of the Site. Near major roads noise levels are likely to be elevated and the appropriate siting of sensitive receptors would need to be considered. Road traffic noise from the B4100 and A4095 means that parts of the Site fall in the range of 55dB(A) to 63 dB(A) and noise levels are likely to fall in the range whereby Development would be permitted with appropriate mitigation. On this basis the use of the Site for residential development is deemed acceptable from a human health perspective and effects on the health of future residents is assessed as **neutral**.
- 13.6.3.11 Studies suggest that the physiological and psychological impacts from transport related noise include speech interference, annoyance and sleep disturbance. Within the literature there is some debate about causal links between noise levels and particular health outcomes although it is acknowledged that transport is a major source of ambient noise levels and so could have health impacts but the quantification of such effects is problematic.
- 13.6.3.12 Chapter 9 (Noise) assesses the noise impact of construction traffic but impacts can be mitigated through measures set out in Section 9.5.1. The noise assessment also indicates that change in noise level during the operational phase of the Development would be negligible at most receptor locations. Health effects as a result of traffic noise caused by the Development are assessed as **neutral**.
- 13.6.3.13 Further assessment would also be required at detailed design stage to consider noise impacts on the proposed schools.
- 13.6.3.14 The Energy Centre has the potential to generate noise nuisance and subsequent adverse health effects during its operation. Details about the plant to be installed and the potential noise impacts are not known at this stage. Further studies would be undertaken to agree noise limits for plant to be installed on site with the local EHO and to ensure that the design meets these limits. The key issue would be to achieve a level below the night-time background (L_{A90}) noise level. However, providing the mitigation measures

identified in Chapter 9 (Noise) are implemented then impacts on human health are considered to be **neutral**.

Physical Environment and Urban Design

- 13.6.3.15 Central to the design of the Development has been the concept of minimising travel by private car, and encouraging walking and cycling. The mitigation measures outlined in Section 13.5 identify how these concepts have been incorporated into the design. All of the measures should help to promote the pursuit of active lifestyles which should offer long-term health benefits and, therefore, impacts are assessed as **positive**. The health benefits of greater levels of physical activity include reductions in the risk of coronary heart disease, reductions in obesity, diabetes, hypertension, cancer, osteoporosis, depression and anxiety. The evidence documenting the health benefits of active lifestyles and exercise is very strong and the concepts used in the Development design are intended to make this possible and a way of life for new residents. The baseline data review identified that there is a need to increase activity levels to tackle issues like obesity incidence. Therefore, the likelihood of impacts on human health being realised is **probable**.
- 13.6.3.16 The comprehensive green infrastructure strategy developed for the site is wide-ranging and has been designed to ensure that the requirements of PPS1 are achieved. The network of high quality, green spaces would provide opportunities for communities to interact, for residents to participate in physical activity and allow residents to engage with their wider environment, for example, through the development of the central riparian corridor that incorporates circular walks and through the inclusion of allotments.
- 13.6.3.17 The provision within the Development for local food production from allotments is also assessed as offering potential health gains both physically and mentally. The provision of allotments offers the opportunity for local residents to grow vegetables which are essential to a healthy diet and also provide opportunities for social interaction which would offer mental well-being benefits. Impacts on human health are assessed as **positive** as this is providing a proactive opportunity for healthier lifestyles to be adopted and the health benefits of a healthy diet are well documented. The likelihood of the impacts being realised is **possible**.
- 13.6.3.18 These aspects again contribute to **positive** impacts as opportunities are provided to allow the pursuit of healthier lifestyles. Whilst the health benefits of green space are frequently cited, there are relatively few epidemiological studies on the relationship between nature and health and the mechanisms that underpin this relationship. A study in the Netherlands (Ref 13-29) sought to investigate this link further and again concluded that green space has an important impact on health. Based upon this evidence and the comprehensive green infrastructure strategy, the likelihood of such impacts being realised is considered **probable**. The importance of ensuring sufficient green space provision has been further underlined by the shortfalls in parts of Cherwell District.
- 13.6.3.19 The housing to be provided across the site seeks to meet Code for Sustainable Homes Level 5 and would meet Lifetime Homes standards. The Lifetime Homes

Standard enables the housing produced to meet the requirements of a wide range of households, for example those with children or those requiring wheelchair access. Therefore, the housing provided on the site should be appropriate for a variety of owners (this is considered important in view of the ageing population and the potential need in the future for accommodation to meet the needs of an older population).

Healthy Lifestyles

- 13.6.3.20 Issues relating to the ability to pursue healthy lifestyles through physical activity and diet have been addressed in the 'Physical Environment and Urban Design' and 'Transport and Access' sections of the assessment.

Transport and Access

- 13.6.3.21 The majority of Bicester is located within a radius of approximately 3.2km (or 2 miles) from the centre of the Development; a distance considered as being a reasonable journey by foot given the relatively flat topography of the town. Whilst there are currently limited opportunities for local journeys to be undertaken on foot to/from the, the design of the site has been modified to ensure that connections within Bicester town are developed making the scheme accessible. The design of the Site from a transport and access perspective has the potential to offer potential health gains if the design encourages greater levels of walking and cycling and, therefore, impacts are assessed as **positive**. A range of off-site improvements to walking and cycling routes have the potential to further complement the measures that have been integrated into the design of the Development, although it is not known when they would be implemented and, therefore, there is a greater level of uncertainty about whether such benefits would be delivered.
- 13.6.3.22 No significant adverse impacts have been identified in Chapter 16 (Transport) with regard to fear and intimidation or accidents and safety within the study area. The internal layout of the Development is such that traffic speeds and flows would be low which ensures that issues of fear and intimidation would be minimised. Some adverse impacts are identified with regards to pedestrian severance on Middleton Road and Middleton Stoney Road NW of Howes Lane. However, Middleton Stoney Road at this location has no development alongside it to create a desire to cross the road and therefore this severance would not be experienced by more than small numbers of pedestrians.
- 13.6.3.23 The provision of a bus service through the Development that connects with the facilities in Bicester town centre is also seen as a strength as it ensures that facilities are accessible for those parts of the community who may not be as able to walk and cycle such as the elderly or those with physical disabilities. Further consideration of accessibility to different types of land use and facilities is provided in the Transport Assessment which concludes that the Development is well located for a range of educational, employment, retail and leisure facilities within achievable walking and cycling distances. There are also facilities in Bicester town centre and other leisure opportunities that are easily accessible by cycling and public transport.

Waste Management and Contamination

13.6.3.24 Chapter 11 (Contaminated Land) concludes that end users of the site (residents) would come into regular contact with soil therefore there is the potential for accidental ingestion, dermal contact or inhalation of dust particles. However, based on the information to date, low levels of contaminants have been encountered on site and assuming mitigation measures are adopted this would result in a negligible impact to human health. Therefore, impacts on human health are assessed as **neutral**.

Community and Social Infrastructure (including Community Spirit and Engagement)

13.6.3.25 Community participation, inclusion and the establishment of strong community networks can help to protect against ill health and positively contribute to levels of overall well-being. The Department of Health (Ref 13-28) highlights the need to develop connected communities that promote social networks and engagement to provide long-term mental well-being benefits. The Development includes provision of a number of community facilities to support the local community that would live at the Development. These facilities include: village shops, a primary school, a nursery, a community centre, and an extra care housing and office space. These would provide opportunities for community interaction and engagement and provide an opportunity for healthier lifestyles to be pursued. Impacts are, therefore, assessed as **positive** and the likelihood of the impact being realised is **possible** as impacts would depend upon the extent to which the community facilities are used.

13.6.3.26 Several existing organisations and groups within Bicester are involved in projects and initiatives that would benefit both existing residents in the vicinity of the Site and new residents. These groups include: Bicester Vision, Chamber of Commerce, Grassroots Bicester, Green Gym, Bicester Town Council, Oxfordshire Youth Arts Project, Bicester Local History Society, local churches, and resident's associations. An interim community meeting facility would be onsite to provide residents with an informal meeting space while the community centre is being built.

13.6.3.27 A Community Ownership Plan has also been developed for NW Bicester. This is considered a strength from a human health perspective as it sets the framework for community ownership, engagement and responsibility that would further benefit community spirit and cohesion and could indirectly benefit mental well-being in the long-term. This is likely to benefit the local community living at the site but could also assist those living in the vicinity of the Development as there is a clear commitment in the plan to integration of existing properties with the new development. The potential health effects are assessed as **positive**, although the likelihood of the effect being realised is **speculative**. Further consideration should be given to the use of public art within key areas of open space to create a sense of well-being and ownership within the development. This could offer positive health gains if a sense of well-being is achieved although such effects are considered speculative.

13.6.3.28 Chapter 14 (Socio Economics and Community) provides an assessment of the Site on community facility provision and the effects on educational resources.

The chapter assesses the effects as positive as there would be sufficient service capacity provided and there is potential for wider environmental and sustainability multiplier effects. Ensuring access to educational opportunities is vital to health and well-being. The provision of education facilities and services across the site is assessed as being appropriate and effects assessed as **neutral**.

Access to and Provision of Health Facilities and Services

- 13.6.3.29 The Development does not include provision of a GP Centre. However, a Health Centre would be provided within the Masterplan site (as part of Application 2 South of Railway) to meet the needs of the residents of the eco-town. The provision of health facilities and services across the site is, therefore, assessed as being **neutral**. The transport assessment, as discussed in the 'Transport and Access' section above also concludes that health facilities are accessible from the Development.

13.7 Cumulative Impacts

- 13.7.1.1 The human health impact assessment has considered the results of other chapters within the ES, as some of the impacts they report have the potential to impact human health either directly or indirectly. Therefore, the assessment presented within this chapter has inherently considered potential impact interactions and how they could cumulatively affect health status. There are likely to be a number of **positive** operational cumulative health impacts for the residents that would live at the Development and potentially indirect benefits for other residents in the wider community if there are wider multiplier effects e.g. employment creation, improved cycle and walking links.
- 13.7.1.2 During the construction phase, there is the potential for cumulative adverse impacts on human health as a result of noise and vibration, dust and visual amenity nuisance, as well as potential disruption to transport and access. Individually, each of these issues have been assessed as having a **neutral** effect on human health, although there is a risk that during the works there could be particularly intense periods of activity which could result in some concerns for local residents, although they are considered unlikely to result in significant adverse impacts with the implementation of the recommended mitigation measures. Such impacts would also be temporary but within relatively long term as the construction period spans over 25 years. The use of CEMPS would help to manage such potential adverse impacts.
- 13.7.1.3 The other developments that have the potential to have cumulative impacts with the Development are presented in Table 17-1 and Table 17-2 of Chapter 17 and Drawing 17-1 and 17-2. The assessment of the cumulative impacts of these developments on human health during construction is uncertain as information is not available about the likely construction phasing. However, providing appropriate construction mitigation measures are implemented, such impacts are unlikely to be significant.
- 13.7.1.4 In the long-term, there is potential for long-term cumulative health benefits with the other developments as they would provide infrastructure benefits including the provision of new schools, new civic buildings, new housing and new

employment opportunities that could all offer indirect health benefits. The provision of associated infrastructure including new cycling routes and transport improvements as part of these developments could also offer benefits for physical activity.

- 13.7.1.5 Potential adverse impacts could occur as a result of traffic generation and the associated effects on air quality and noise and vibration. These issues have been considered in detail within the respective chapters of this ES.
- 13.7.1.6 Potential adverse impacts could occur as a result of traffic generation and the associated effects on air quality and noise and vibration. These issues have been considered in detail within the respective chapters of this ES.

13.8 Summary

- 13.8.1.1 This chapter has assessed the potential impacts on human health of the construction and operational phases of the Development. A number of mitigation measures have been incorporated into the design process to maximise potential health benefits and to minimise the likelihood of adverse health impacts occurring.
- 13.8.1.2 During the construction phase, health effects were assessed as positive with regard to the potential employment opportunities that would be created and the wider upskilling benefits that may be delivered. The impacts on the following health determinants were assessed as having a **neutral** effect on health outcomes: safety and security, physical environment and urban design, healthy lifestyles, transport and access, waste management and contamination, community and social infrastructure and access to and provision of health facilities and services. These assessments were informed by the results presented in the other ES chapters and the likelihood of there being a change to health status.
- 13.8.1.3 During operation the Development would generate a number of jobs and could potentially attract a significant amount of new investment within the immediate area. Therefore indirect positive impacts were predicted. Positive impacts are also likely to occur (both physical and mental) as a result of the commitment within the design to creating a site where walking and cycling are encouraged, the provision of community facilities that would provide opportunities for community engagement and interaction, the use of Secured by Design principles that would help to reduce levels of crime and control perceptions of fear of crime and as a result of the comprehensive green infrastructure strategy that would provide a high quality environment and areas for informal sport and recreation.

14 Socio-Economics and Community

14.1 Introduction

14.1.1.1 This Chapter sets out the likely socio-economic and community impacts associated with the Development. The Chapter describes the relevant regulatory and policy framework associated with the topic, the methodology that has been used to assess likely impacts, sets out the baseline conditions (both current and future baseline) and details the potential impacts of the Development during the construction and operational phases.

14.2 Regulatory and Policy Framework

14.2.1.1 This impact assessment has been undertaken in accordance with current international and national legislation, and national, regional and local plans and policies relating to socio-economics and community in the context of the Development. A summary of the relevant legislation and policies, the requirements of these policies and the Development response has been provided in Table 14-1 below.

Table 14-1 Socio-Economics and Community Regulatory and Policy Framework

Policy/Legislation	Summary of Requirements	Development Response
Planning Policy Statement: eco-towns – A supplement to PPS1 (Ref 14-1)	<p>A range of minimum standards which are more challenging and stretching than would normally be required for new development. The standards act to ensure that eco-towns are exemplars of good practice and provide a showcase for sustainable living.</p> <p>Standards include:</p> <p>Meeting the functional characteristics of a settlement and a minimum of 5,000 homes.</p> <p>Homes must achieve Building for Life Silver Standard and Level 4 Code for Sustainable Homes, provide 30% affordable housing.</p> <p>40% of the eco-town total area should be allocated to green space, of which at least half should be public.</p>	The proposal will meet all of the minimum standards identified in the PPS1 supplement.
National Planning Policy Framework (2012) (Ref 14-2)	The National Planning Policy Framework (2012) sets out twelve core planning principles that should underpin decision	The proposal meets the applicable core principles and advice concerning development within the NPPF.

Policy/Legislation	Summary of Requirements	Development Response
	<p>taking. Those that apply to the development are:</p> <p>Proactively drive and support sustainable economic development to deliver the homes, business and industrial units, infrastructure and thriving local places that the country needs;</p> <p>Take account of and support local strategies to improve health, social and cultural wellbeing for all and deliver sufficient community and cultural facilities and services to meet local needs;</p> <p>Always seek to secure high quality design and a good standard of amenity for all existing and future occupants of land and buildings;</p> <p>Support the transition to a low carbon future in a changing climate, taking full account of flood risk and coastal change, and encourage the reuse of existing resources, including conversion of existing buildings, and encourage the use of renewable resources (for example, by the development of renewable energy).</p> <p>With regard to delivering large scale housing development the NPPF advises at para 52 that:</p> <p>The supply of new homes can sometimes be best achieved through planning for larger scale development, such as new settlements or extensions to existing villages and towns that follow the principles of Garden Cities. Working with the support of their communities, Local Planning Authorities should consider whether such opportunities provide the best way of achieving sustainable development. In doing so, they should consider whether it is</p>	

Policy/Legislation	Summary of Requirements	Development Response
	<p>appropriate to establish Green Belt around or adjoining any such development.</p> <p>With regard to promoting healthy communities para 70 states that:</p> <p>To deliver the social, recreational and cultural facilities and services the community needs, planning policies and decisions should:</p> <p>Plan positively for the provision and use of shared space, community facilities (such as local shops, meeting places, sports venues, cultural buildings, public houses and places of worship) and other local services to enhance the sustainability of communities and residential environments; and</p> <p>Ensure an integrated approach to considering the location of housing, economic uses and community facilities and services.</p>	

14.3 Methodology

14.3.1 General Approach

- 14.3.1.1 There are no specific guidelines or requirements for assessing socio-economic impacts as part of an Environmental Impact Assessment (EIA), although Volume 11, Section 3, Parts 3, 8 and 12 of the Design Manual for Roads and Bridges (Ref 14-3) does refer to guidance for assessing the impact on Land Use, Community Access and Policies and Plans respectively. Whilst this guidance has been produced in relation to proposed roads and bridges it nonetheless provides a useful reference tool for consideration of any proposal in this context.
- 14.3.1.2 In addition, the Town and Country Planning Association in conjunction with the Communities and Local Government have produced an ‘eco-towns economy worksheet’ (Ref 14-4) to support the development of an appropriate economic strategy for each eco-town to ensure a fully sustainable, competitive and prosperous future for the town. Section 4.1 of the worksheet refers to the development and analysis of an economic baseline referencing a range of indicators and associated details.

- 14.3.1.3 The methodology used has also, in part, been informed by the (former) English Partnerships guidance; a fourth edition of the 'Additionality Guide' was issued in January 2014 by the Homes and Communities Agency (HCA) (Ref 14-5). The guide explains how to assess the additional impact of local economic growth and housing interventions and has been updated to include new information, research and guidance. This assessment seeks to identify and assess the land use changes and changes in socio-economic activities, which may arise from the Development, with resultant impacts on material assets. Unlike other environmental topics, such as noise, the sensitivity of socio-economic receptors to the proposed development is not determined by reference to designations or an objective standard. Instead, it is the nature of the activity that the human receptor is undertaking that is most influential in determining sensitivity. Professional judgement has therefore been applied in the case of each category of receptor considered in this chapter, with the degree of change to the receptor arising from the proposal determining whether or not an effect is likely to be significant.
- 14.3.1.4 The approach that has been taken in this Chapter therefore uses a combination of quantitative assessment where established formulae are available (for example in the assessment of employment impacts, where guidance from HCA and OffPAT (the Office of Project and Programme Advice and Training) is provided) and professional judgement where a qualitative assessment of impacts has been required (for example impacts on crime or open space). A baseline has been developed to provide a description of the current economic and social context for the area, described quantitatively where possible, but also making use of qualitative information where necessary. The level of activity that would have happened without the development has been estimated making use of population projections taken from the Office for National Statistics (ONS) and the Cherwell District Local Plan Submission, with economic growth forecasts taking into account existing employment land and proposals.
- 14.3.1.5 The assessment of construction impacts has been supplemented by a qualitative assessment of secondary disruption impacts from traffic, noise and other related impacts as necessary. These are explored in detail elsewhere in this Environmental Statement.
- 14.3.1.6 The methodology for assessing the 'functional' effects of the development mixes both quantitative and qualitative assessments as follows:
- Analysis of proposed land use and floor space provision to determine employment generation potential from the new development, coupled with an assessment of the likely effect on the employment availability for the existing economically active population
 - Comparison of the provision of new social and community infrastructure with identified needs and provision within the existing community
 - Consideration of cumulative impacts, for example development of the site alongside other developments in the locality
 - Recommendation of mitigation measure, where appropriate
 - Assessment of residual effects following implementation of mitigation measures.

14.3.2 Consultation

14.3.2.1 Consultation undertaken during the course of the assessment has largely been as part of the wider Masterplan preparation. Relevant comments and information that have been provided to members of the Masterplan team during the stakeholder events and consultation held as part of the site design process, have been fed back into the socio-economic assessment. Consultation feedback was taken into consideration of during evolution of the Masterplan design.

14.3.3 The Study Area

14.3.3.1 English Partnerships guidance (re-issued by the HCA in 2014) provides information relating to the scale at which assessment can be undertaken most appropriately. The guidance notes that very few proposals should be assessed only at site level (i.e. in the immediate vicinity of a proposal) given that socio-economic costs and benefits are very rarely concentrated in the actual area of physical activity. The importance of assessing impacts at local/sub-regional levels is therefore stressed, relating to an approximate ten to fifteen mile radius from the site concerned (precise delineation is acknowledged to depend on other factors including density of settlement patterns (for urban areas the radius may be less) as well as the type and scale of the proposal).

14.3.3.2 In order to determine the study area for the Application 1 (Land North of Railway) proposal, the above has been taken into account, together with other, strategic work that has been undertaken as part of the Masterplan process and now comprises the Masterplan evidence base. Maintaining some consistency between for example, the study area for this ES and those used in the preparation of the Economic Development Strategy (Ref 14-6) and population profiling work is considered to be important in order to ensure that data being extracted is accurate. Other factors feeding into determination of the spatial scope for undertaking baseline research include:

- The location of the Masterplan Site in relation to surrounding electoral wards and settlements;
- The wider Bicester settlement characteristics and strategic location;
- The components of the proposed Development and their likely catchment area.

14.3.3.3 The consideration of socio-economic and community impacts for the Development has therefore broadly focused on two spatial areas – a central impact and wider impact zones. The precise definition of these spatial areas varies slightly according to the topic under consideration broadly complies with the following, unless stated otherwise:

- The five wards that form the settlement of Bicester (Bicester North, West, East, South and Bicester Town) are referred to as Bicester Town (this is consistent with the definition within the Economic Baseline Report (SQW Ref 14-7);
- The five wards making up Bicester Town, together with the three wards that surround it (Caversfield, Launton, and Amrosden and Chesterton)

form the Bicester Wider Area (again, this is consistent with economic baseline data);

- For population, the study area comprises the Bicester Wider Area together with the ward of Fringford (this is compatible with the study area used to prepare the Demographic Profile Report (Barton Willmore 2013) (Ref 14-8); and
- For a number of other socio-economic elements the relevant spatial scope would be wider – either at District Level (Cherwell) or County level (Oxfordshire).

14.3.3.4 Table 14-2 sets out the relevant study area for each of the topics included within this socio-economic assessment.

Table 14-2 Relevant Study Areas for Baseline Topics

Baseline Topic	Details	Spatial Focus	
		Bicester Wider Area	County or District Level
Demography	Population change	+	+
	Age structure	+	+
	Population forecast	+	+
Economy	Employment	+	+
	Employment by sector	+	+
	Business	+	+
Housing	Type, tenure	+	+
	Demand		+
Education	Provision, capacity and quality	+	+
Community Facilities	Sports and recreational facilities	+	
	Community halls	+	
Crime	Crime rate	+	+
Tourism	Attractions		+

14.3.4 Methodology for Establishing Baseline Conditions

Establishing the Existing Baseline

14.3.4.1 Establishing the baseline conditions has drawn on a range of secondary information sources. These have included:

- The collection and analysis of socio-economic statistics in order to create a profile of the local area. This has been from a range of data sources including the ONS and Nomis web. Data from the preparation of other documents developed to support the Masterplan have also been used, notably the economic data prepared as part of the Economic Strategy for NW Bicester by SQW Consultants and population projections prepared by Barton Willmore (2013);

- Feedback from consultations undertaken during the masterplanning process;
- Identification of existing land uses within the Site and of key social and economic facilities within a wider study area to help identify potential activity changes resulting from the proposed development.

Forecasting the Future Baseline (“Without Development” Scenario)

14.3.4.2 The future baseline is used to estimate the level of activity that would have happened anyway, without the Development. Forecasting forward to anticipate what the baseline would be like in the future in the absence of the Development has been undertaken using the following:

- Population projections for Cherwell District provided by ONS up to 2031;
- Economic baseline information provided in support of the Masterplan process by SQW (2013);
- Identification of relevant development schemes within the Bicester area that are currently either consented or under construction.

Defining the importance/sensitivity of resource

14.3.4.3 Resources are the assets and facilities which may be affected by the Development; receptors are the users or beneficiaries of those resources. Table 14-3 summarises the resources and corresponding receptors that will be considered as part of this assessment. It should be noted that healthcare facilities are considered under Chapter 13 Human Health and are therefore not included within the table.

Table 14-3 Socio-Economic and Community Resources and Receptors

Resource	Corresponding Receptor
Residential properties	Local residents
Commercial property	Local businesses
Community infrastructure (for example education facilities, community centres)	Users of community infrastructure
Play areas and public open space	Users of these spaces

14.3.5 Methodology for Assessing Impacts

14.3.5.1 Impact significance has been assessed by consideration of the following factors for each predicted impact:

- The magnitude of the predicted impact
- The geographic extent of the impact
- The duration and reversibility of the impact
- The capacity of the local economy or area to absorb or adjust to the impact

14.3.5.2 The terms used to define the significance of residual impacts are as follows:

- **Adverse** detrimental or negative impacts to a socio-economic resource or receptor
- **Negligible** imperceptible impacts to a socio-economic resource or receptor; and
- **Beneficial** advantageous or positive impact to a socio-economic resource or receptor.

14.3.5.3 Where beneficial or adverse impacts have been identified, these have been assessed against the following scales:

- **Minor** slight, very short or highly localised impact;
- **Moderate** limited impact (by extent, duration or magnitude) which may be considered significant; and
- **Major** considerable impact (by extent, duration or magnitude) of more than local significance (for example a sizeable change in relation to the baseline, affecting a wide geographic area).

14.3.6 Limitations and Assumptions

14.3.6.1 Limitations and assumptions applicable to the socio-economic and community assessment include:

- Baseline conditions have been established using data that is currently available
- Professional judgement and expertise have been used to assess impacts where quantitative information or appropriate guidance is not available
- Employment densities have been used in line with those provided within the Economic Development Strategy for NW Bicester (SQW 2014) and a supplement to the Strategy which summarises the employment implications specifically for Application 1 (Land North of the Railway) (Ref 14-9). Employment densities have in turn been based on employment standards provided by HCA
- Population data has been used based on two modelling approaches – the Chelmer model used by Barton Willmore to provide the Demographic Profile Report for the whole Masterplan site; and Popcalc, a model used by Oxfordshire County Council. Whilst the two models take different approaches to the modelling process and are based on different sets of assumptions, the outcomes for both models are within 3% of each other over the whole Masterplan period. Data ranges from both models have been used where this is available; for the assessment of cumulative impacts, data from the Chelmer model has been utilised, which provides for scenarios including the cumulative impact of other large development sites within the Bicester area.

14.4 Description of the Baseline Conditions

14.4.1 Existing Baseline

14.4.1.1 This section describes the current economic and social environment within which the Development would sit. There are various separate topic areas that are covered here, including demography, economy, employment, housing, community and play spaces.

Demography

14.4.1.2 The existing demographic context of Bicester and the wider Cherwell District has been described in the Demographic Profile Report for the NW Bicester Eco-Town prepared by Barton Willmore (November 2013). The study area for this report has comprised each of the Census Wards making up the central urban area of the town, as well as those immediately surrounding it, that is:

- Bicester North
- Bicester East
- Bicester South
- Bicester West
- Bicester Town
- Fringford
- Launton
- Ambrosden and Chesterton
- Caversfield

14.4.1.3 For this area, Table 14-4 sets out population change within the Bicester area between 2001 and 2011. Wards experiencing the highest population growth over the ten period are Bicester North (24.2%), Bicester South (24%), Launton (195) and Ambrosden and Chesterton (16%), whilst two wards have experienced a population decrease (namely Bicester East (5.5%) and Bicester West (1.6%)).

Table 14-4 Population Change 2001-2011

Bicester Wards	2001 Population	2011 Population	% Change between 2001-2011
Ambrosden and Chesterton	3,331	3,850	15.6
Bicester East	6,186	5,846	-5.5
Bicester North	5,649	7,014	24.2
Bicester South	4,364	5,411	24.0
Bicester Town	4,918	5,158	4.9
Bicester West	7,548	7,425	-1.6
Caversfield	2,894	3,017	4.3

Fringford	2,333	2,363	1.3
Launton	3,042	3,629	19.3
TOTAL	40,265	43,713	8.7

Source: 2001 and 2011 Census Data

- 14.4.1.4 The table shows an overall population growth for the combined Bicester wards of nearly 9%. Similarly, Cherwell District has seen a total increase in population of 7.8% between 2001 and 2011, which is comparable with population change overall for Oxfordshire (ONS Mid-Year Population Estimates) (Ref 14-10).
- 14.4.1.5 Table 14-5 shows the age profile for the Bicester wards compared with that for Cherwell District. The Demographic Profile Report highlights that Bicester demonstrates a broadly similar profile to that for Cherwell, with Bicester's population slightly biased towards younger age groups.

Table 14-5 Population Change 2001-2011

Age Groups	Bicester Wards	Cherwell District
0-15	21%	20%
16-24	10%	10%
25-44	32%	29%
45-64	25%	26%
65-84	10%	13%
85+	1%	2%

Source: 2011 Census Data

- 14.4.1.6 Population projections for the wider area (at district, regional and county levels) are shown in Table 14-6. Analysis of five year increments, as shown in Table 14-6, shows change over time between 2011 and 2031 for Cherwell District, the South East and for England as a whole.

Table 14-6 Population Forecast

	2011-2016 % change	2011-2021 % change	2011-2026 % change	2011-2031 % change
England	3.6	7.3	10.9	14.3
South East	3.9	8.0	12.1	15.9
Cherwell	3.7	7.5	11.1	14.4

Source: Office of National Statistics, Population Projections

Economy

- 14.4.1.7 The existing economic function of the Site is primarily agricultural and the impacts in this context are covered within Chapter 12 (Land Use and Agriculture). Home Farm, situated east of the Site, includes the conversion

and extension of its outbuildings into 'The Courtyard' which accommodates the following businesses:

- Pea Green: Sports Physiotherapy Clinic
- Hill Partnerships (Western) Ltd, an affordable homes provider
- Teslayn Engineering, a specialist American car workshop
- UKR Engineering Affairs Ltd, specialising in the application and management of national and international drugs licensing

14.4.1.8 An Economic Baseline has been prepared to inform the development of the wider Masterplan area of North West Bicester (SQW Consultants 2013); key findings from this baseline that are of particular relevance to the Development are summarised here. The study area used for the Economic Baseline Report is as follows:

- the five wards that form the settlement of Bicester (Bicester North, West, East, South and Bicester Town) are referred to as Bicester Town;
- The five wards making up Bicester Town, together with the three wards that surround it (Caversfield, Launton, and Amrosden and Chesterton) form the Bicester Wider Area.

Employment

14.4.1.9 Table 14-7 sets out economic activity rates, showing that 88.2% of residents are economically active, which is higher than for the Bicester Wider Area, Cherwell District, Oxfordshire and for England as a whole.

Table 14-7 Economic Activity Rates

	Number of working age residents economically active	Percentage of total population economically active	Percentage of the working age population economically active
Bicester (Town)	18,225	59.1%	88.2%
Bicester (Wider Area)	23,841	57.7%	85.8%
Cherwell District	78,160	55.1%	85.2%
Oxfordshire	350,119	53.6%	81.8%
England	27,183,134	51.3%	79.2%

Source: SQW Analysis of 2011 Census Data

14.4.1.10 Characteristics of the employment base are shown in Table 14-8. For both Bicester Town and Bicester Wider Area the greatest proportion of residents are found within the 'Professional Occupations' and 'Associate Professional and Technical Occupations' categories, although figures in the former category are lower than found at District, County and country wide level. Conversely, 10.3% of Bicester Town residents work in the 'Sales and Customer Service Occupations' category, which is higher than the proportion found at other scales.

Table 14-8 Employment Characteristics

	Managers, directors and senior officials	Professional occupations	Associate professional & technical occupations	Administrative & secretarial occupations	Skilled trades occupations	Caring, leisure & other service occupations	Sales & customer service occupations	Process plant & machine operatives	Elementary occupations
Bicester (Town)	11.1%	15.5%	13.8%	12.5%	11.2%	7.8%	10.3%	7.2%	10.7%
Bicester (Wider Area)	12.0%	15.5%	15.6%	12.1%	11.2%	7.6%	9.4%	6.6%	10.0%
Cherwell	11.6%	16.7%	13.1%	11.3%	11.8%	8.4%	8.8%	7.8%	10.6%
Oxfordshire	12.0%	22.7%	13.6%	10.3%	10.7%	8.3%	6.9%	5.7%	9.7%
South-East	12.3%	18.7%	13.8%	11.5%	11.1%	9.3%	7.9%	5.7%	9.7%
England	10.9%	17.5%	12.8%	11.5%	11.4%	9.3%	8.4%	7.2%	11.1%

Source: SQW Analysis of 2011 Census Data

14.4.1.11 Key findings identified by SQW as part of the economic baseline in relation to employment by sector are that:

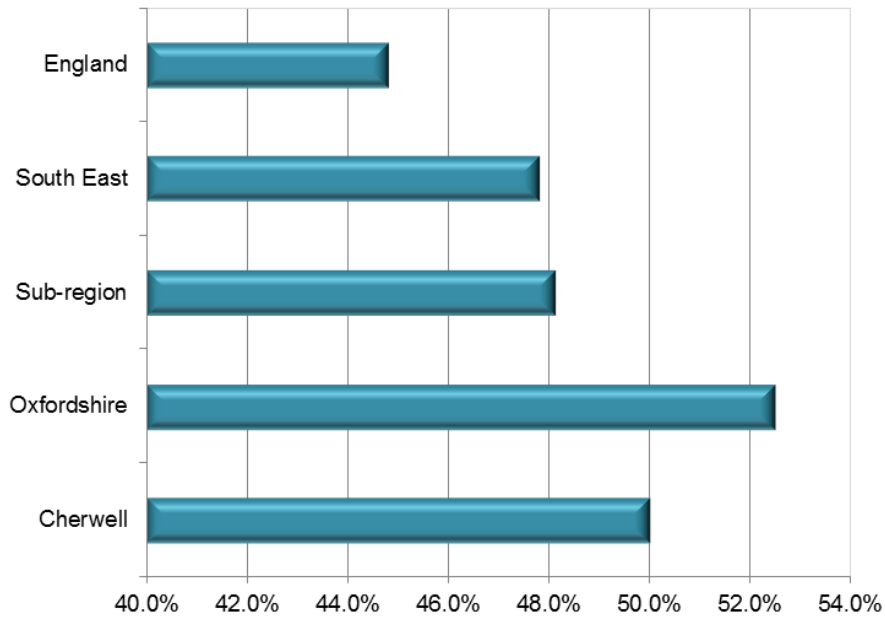
- Over-represented sectors in Bicester include manufacturing (11.82% of total employees), public administration and defence (10.71%) and wholesale and retail trade (22.47%);
- Of those sectors identified as potential growth sectors, logistics currently represents 13% of total employment in Bicester Town (compared to 7% for Cherwell District, 5% for Oxfordshire and 6% for England as a whole).

Business Start-Up Activity

14.4.1.12 Since 2008, business start-ups and closures have been shown through published statistics relating to business births, deaths and survival rates (previously statistics relating to VAT registrations and de-registrations was used). In relation to business start-up activity, SQW data shows that Cherwell District has 681.9 active enterprises per 10,000 working population and 64.9 enterprise births per 10,000 working age population, which is comparable to the region (South-East) and County proportions.

14.4.1.13 Figure 14-1 shows business survival rates for enterprises 'born' in 2006 – the figure shows that whilst the survival rate is lower for Cherwell than for Oxfordshire as a whole, the District still performs better than at wider region and country levels. The sub-region referred to in the figure is based on commuter flows and is explained in more detail within the Economic Strategy for NW Bicester.

Figure 14-1 Five Year Business Survival Rates – Enterprises Born in 2006

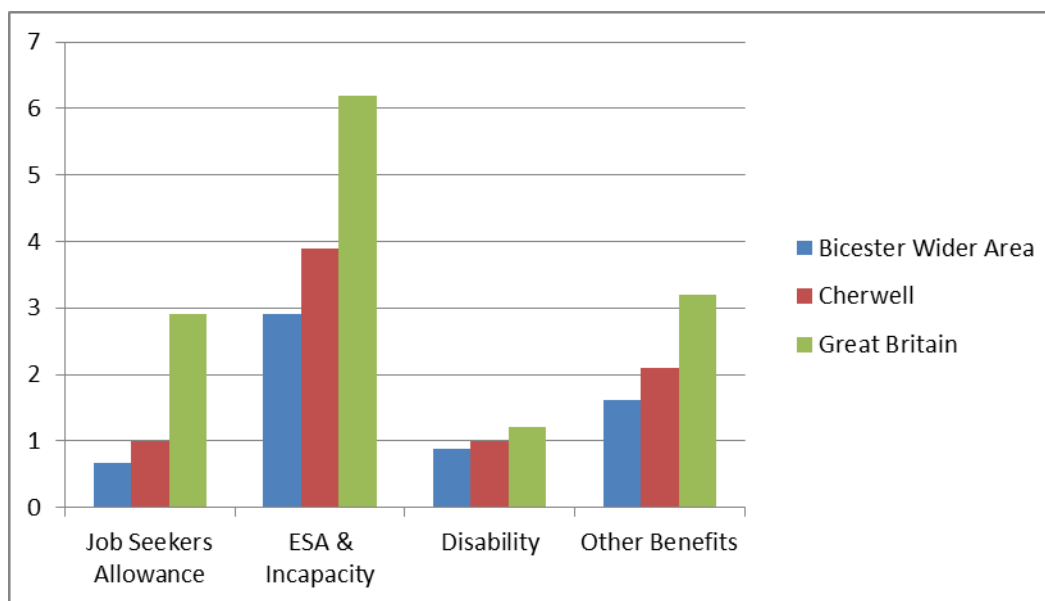


Unemployment and Benefits

14.4.1.14 The proportion of the working age population which is unemployed in Bicester Town is 2.41% (average rate across the five Town wards), compared to 4.4% for Cherwell District, 5.6% for Oxfordshire as a whole, 6.2% for the South East and 7.7% for the national average (2013 Annual Population Estimate).

14.4.1.15 Figure 14-2 portrays the breakdown in types of benefit claims. Each proportion of benefit claimants is lower for the Bicester Wider Area than the average for Cherwell District and significantly lower than for England.

Figure 14-2 Benefit Claimants expressed as a proportion of the working age (16-64) within the Bicester Area, Cherwell District and Great Britain



14.4.1.16 Focusing specifically on Job Seekers Allowance (JSA) as an indication of unemployment, within the Bicester Wider Area, there has been a general increase in the number of people claiming this benefit for longer than six months: ninety claimants registered for longer than six months in December 2011 and this number has decreased to forty claimants in June 2014. In terms of residents within the Bicester Wider Area claiming for over twelve months, there has been a decrease in the number of people claiming for this period with twenty claimants registered for more than twelve months in June 2014 in comparison to thirty claimants in December 2011.

Housing

14.4.1.17 The following points summarise accommodation type and tenure within the Bicester Wider Area in comparison to wider spatial areas as interpreted from Census Data 2001:

- Bicester Wider Area includes a smaller proportion of flat/maisonette/apartments (7.9%), in comparison to 11.2% within Cherwell District and 16% for Oxfordshire.
- There is a higher proportion of owner-occupied dwellings in the Bicester Wider Area (71.1%) in comparison to 69.3% for Cherwell District and 65.5% for Oxfordshire.
- There is a lower proportion of socially rented housing within the Bicester Wider Area: 10.9% of housing is rented from the council or other social landlords, in comparison to 12.1% within Cherwell District and 14.2% in Oxfordshire.
- A lower proportion of privately rented housing within the Bicester Wider Area: 15.7% of housing tenure in comparison to 16.2% within Cherwell District and 17.5% within Oxfordshire.

14.4.1.18 Tables 14-9 and 14-10 highlight quantities of housing type and tenure.

Table 14-9 Housing Type

	Bicester Wider Area (%) (Quantity in Brackets)
Unshared accommodation	99.99 (16,274)
House/bungalow	92.0 (14,976)
Flat/maisonette/apartment	7.9 (1,283)
Mobile/temporary structure	0.1 (21)
Shared accommodation	0.01 (2)

Source: Census Data 2011

Table 14-10 Housing Tenure

	Bicester Wider Area (%) (Quantity in Brackets)
Owns outright	25.2 (3,977)
Owns with a mortgage/loan	45.9 (7,256)
Shared ownership	0.6 (88)
Rented from council	2.1 (327)
Other social rented	8.8 (1,398)
Private rented	15.7 (2,476)
Living rent free	1.8 (277)

Source: Census Data 2011

Housing for the Elderly

- 14.4.1.19 Cherwell’s Housing Strategy for Older People (2010-2015) (Ref 14-11) prioritises providing and supporting preventative support services, increasing the provision of older peoples’ specialist housing, improving the provision of information and advice and ensuring new housing developments meet the needs of older people now and in future.

Housing Need and Affordability

- 14.4.1.20 A Strategic Housing Market Assessment (SHMA) (March 2014) (Ref 14-12) has been produced by GL Hearn Ltd and sets out key findings relating to the overall need for housing to 2031. The SHMA examines what level of housing would be needed in the County on the basis of past population trends and then considers the degree to which this needs to be adjusted to take account of identified need for affordable housing, to improve housing affordability and to support committed economic growth. The SHMA concludes that between 93,560-106,560 additional homes are needed across Oxfordshire in the period 2011-2031 (between 4,678-5,328 homes per annum). Assessed housing need at local authority level is set out in Table 14-11.

Table 14-11 Estimated Housing Needed per Year (2011-31)

Housing Needed Per Year (2011-2031)	Demographic Base + Shortfall	To Support Committed Economic Growth	To Meet Affordable Housing Need in Full	Range: Housing Need Per Year	Mid-Point of Range
Cherwell	682	1,142	1,233	1,090-1,190	1,140
Oxfordshire	3,063	4,280	5,624	4,678-5,328	5,003

Source: Oxfordshire SHMA (March 2014)

Education

14.4.1.21 Education services span from pre-school and nursery provision to universities and adult education.

Day nurseries

14.4.1.22 Nursery and pre-school provision can broadly be split into two types of services. Provision for up to two year olds is mainly through the commercial sector. This can take place in a range of settings including child minders as well as part-time and full-time day care. Provision for three to four year olds involves part-time places within or associated with primary school, or service from the private sector.

14.4.1.23 Day nursery provision within Bicester includes some seven private facilities together with eight of the primary schools in Bicester offering nursery classes. As well as day nurseries in Bicester town centre, there is also some provision in the settlements surrounding Bicester including Fringford Pre-school Play Group in Fringford, and Chesterton Play Group in Chesterton.

Primary Schools

14.4.1.24 There are twelve primary schools within the Bicester Wider Area (see 'Education' map Drawing 14-1), of which nine are within the settlement of Bicester itself. The closest of these to the Site are found within the wards of Bicester West and Bicester North, plus Chesterton Church of England Primary School which is located within the ward of Amrosden and Chesterton; nearest schools to the Site are as follows:

- King's Meadow Primary School (Bicester West)
- Brookside Primary School (Bicester West)
- St Mary's Roman Catholic Primary (Bicester West)
- Southwold County Primary School (Bicester North)
- Bure Park Primary School (Bicester North)
- Chesterton Church of England Primary School (Amrosden and Chesterton)

14.4.1.25 According to Annual Schools Census data (2012) (Ref 14-13), the primary schools listed above have a surplus capacity of 16% (equivalent to 318 places). Only one primary school in proximity to the site – Bure Park Primary School – is operating at full capacity. For primary schools within the Bicester Wider Area, there is a surplus capacity of 11% (equivalent to 422 spaces).

Secondary Schools

14.4.1.26 Demand for secondary schools is usually spread across a wider area than that for primary schools and day nurseries. Secondary school aged pupils tend to travel further to school than those of primary school age. In addition, the range of specialist subjects taught in secondary schools naturally means that they are larger institutions with wider catchment areas than primary schools. Therefore, it is appropriate to consider secondary school capacity across Oxfordshire County as a whole as well as that of the nearest facilities to the site.

- 14.4.1.27 For Oxfordshire as a whole, Annual Schools Census (2012) data shows there is a 16.5% surplus capacity across the thirty-three secondary schools. The closest secondary schools to the Site (shown on Drawing 14-1) are the Bicester Community College and Cooper School. Between them, these schools have a surplus capacity of 614 places. A new secondary school is proposed on land within Application 2 (South of the Railway).
- 14.4.1.28 Heyford Park Free school opened in September 2013 and is located in Upper Heyford near Bicester. The school is located within a business park in the premises of a former RAF and US Air Force base. The school has declared two specialisms of modern history and enterprise, which reflect the context of the school's location. This is an all through school which will admit up to 840 boys and girls in the age range of four to nineteen. In its first year the school will admit eighteen Reception age children and sixty-two students in Year 7. Eighty children were on the role for September 2013.
- 14.4.1.29 As well as local authority secondary schools, there are also several academies in Oxfordshire. The most recent data available shows:
- the North Oxfordshire Academy which opened in 2007 has 19% surplus capacity (based on pupil admission numbers stated in Oxfordshire Council's admissions information)
 - the Oxford Academy which opened in 2008 has surplus capacity of 35% (also based on pupil admission numbers stated in Oxfordshire Council's admissions information)
 - the Culham European School Academy opened in September 2011 in Abingdon. The European School Culham was an existing school catering for children of staff at EU institutions and the children of fee paying bilingual and multinational families in South Oxfordshire that has been brought into the mainstream state funded English system as an innovative, co-educational Academy, as far as possible retaining the ethos of a European school. The academy specialises in Languages and Science, will provide education for 3 to 18 year olds, and has an overall capacity of 980 places. Admission numbers for Reception class and subsequent year groups was sixty pupils per year; admission numbers for Years 12 and 13 were planned at forty pupils, although ultimately Year 12 will have a capacity of 100 pupils.
- 14.4.1.30 Discussions with the Education Department of Oxfordshire County Council suggest there is a growing demand for school places at the primary level resulting from increases in fertility, and both at primary and secondary levels as a result of the economic downturn of 2008-2009 increasing the proportion of families using state education.
- 14.4.1.31 There have been discussions with the Bicester Technology Studio.

Other Community Facilities

Health Facilities

- 14.4.1.32 Existing capacity and quality of provision is discussed in the Human Health Assessment (Chapter 13).

Sports and Recreation

- 14.4.1.33 Drawing 14-2 shows sports and recreation venues within the Bicester Wider Area and those nearby that are likely to be affected by the proposal.
- 14.4.1.34 The Cherwell Playing Pitch Strategy (Ref 14-14) identifies sports pitches within the District and assesses current shortfalls and future provision. The strategy includes all natural grass and artificial turf pitches with community access that comply with the governing bodies of sport specified dimensions and covers the period 2008-2016. With regards the Bicester area, the strategy identifies the following current shortfalls in provision:
- an overall shortfall of eight junior football pitches (three new pitches to be provided at the new playing field in the SW Bicester development, two current primary school pitches to be changed to enable community access and three pitches to be created from existing adult pitch provision);
 - an overall shortfall of two rugby pitches (to be provided at the new playing field in the SW Bicester development); and
 - qualitative improvements needed to changing provision at most sporting facilities in the area.
- 14.4.1.35 With projected population increases, together with increases in regular participation in sport of 1% per annum predicted by Sport England, the Strategy presents an outline action plan for future pitch needs in the Bicester area, to be provided in conjunction with future housing developments as follows:
- four additional junior pitches;
 - two additional mini-soccer pitches;
 - two cricket pitches; and
 - two rugby pitches.
- 14.4.1.36 In 2014 Sport England completed a modelling exercise based on the existing sports provision in Cherwell and the effects that the proposed population growth in the District will have on demand for those facilities. This exercise was undertaken for sports halls, swimming pools and artificial grass pitches. The Cherwell Playing Pitch Strategy will shortly be updated as a result of this exercise in order to reflect anticipated population growth.
- 14.4.1.37 The Bicester Sports Association provides sports facilities at Oxford Road, Bicester and nearby in nearby Chesterton. These facilities are used by local sports clubs who accommodate a wide range of ages in their playing membership. The field sports include cricket, football (junior and senior) and rugby union.
- 14.4.1.38 Built facilities include the Bicester Leisure Centre (formerly the Bicester and Ploughley Sports Centre (see Drawing 14-2). The centre has undergone

refurbishment offering a wide range of facilities for casual and regular users such as a Health Fitness suite, 25 metre swimming pool, Play n' Teach family pool with interactive water features, squash courts, activity halls and outdoor floodlit all-weather pitches. There is also a comprehensive keep-fit programme with over 30 classes to choose from. The centre also includes a registered creche and hosts a variety of sports clubs including martial arts, swimming and gymnastics. Further extension and refurbishment of the facility was undertaken in 2009 to including tenpin bowling.

- 14.4.1.39 The Cooper School Sports Facility is used by Cooper School during the day and managed by Bicester and Ploughley Sports Centre in the evenings and at weekends. The facility is situated adjacent to the Cooper School (see Drawing 14-2) on Churchill Road and includes a performance hall with theatre-style tiered seating, outdoor floodlit all weather pitches and an activity hall.
- 14.4.1.40 The Bicester Hotel located near the village of Chesterton, to the west of the Site, includes swimming pool facilities.
- 14.4.1.41 Other sports clubs located in Bicester include those at Garth Park, a 2.74 hectare site identified in the Open Space, Sport and Recreational Facilities Needs Assessment Audit and Strategy (PMP 2011) (Ref 14-15) as the only 'park and garden' in Cherwell providing opportunity for various informal recreation and community events. The Bicester Bowls Club and Bicester Tennis Club are both based in Garth Park. Other clubs within the Bicester Wider Area are Bicester Hockey Club (Coopers School) and Bicester Rugby Football Club, (adjacent to Kings End Hospital). Langford KEA Football is also located behind the KEA Social Club.
- 14.4.1.42 Other outdoor sports associated with Bicester include hunting, fishing and golf. Bicester is an established hunting centre; Bicester with Waddesdon Chase hold an annual point to point and organise hunting trials and horse shows.
- 14.4.1.43 In terms of fishing both the River Ray, the River Cherwell and other neighbouring rivers which flow down to the Thames can be fished, as can some lakes in the area. There is an established angling society at Bicester which rents six miles of stocked water of the River Ray. For golfers, nearby venues include Bicester Country Club (see Drawing 14-2).

Play Areas

- 14.4.1.44 Bicester Town Council is responsible for all the play areas and the majority of open spaces in the town. The Open Space, Sport and Recreational Facilities Needs Assessment Audit and Strategy prepared by PMP identifies fifty-eight facilities provided for children and young people in Bicester; this includes areas such as equipped play areas, ball courts, skateboard areas and teenage shelters with a primary purpose to provide opportunities for play and social interaction involving children and young people. The Audit also identifies single facilities near to Ardley, Stoke Lyne, Bucknell, near to Caversfield, Launton, Piddington and Wendlebury.

Community Centres

- 14.4.1.45 There are five community centres in Bicester. These are: Bicester East Community Centre; Langford Village Community Centre, Southwold Community Centre, West Bicester and John Paul II. These centres provide a location for a number of groups to operate from. For example, Bicester Community Church uses Bicester East Community Centre to run toddler groups and over 50s groups.
- 14.4.1.46 As part of the Pioneer Square development in Bicester, a further community building is due to be opened by summer 2015.
- 14.4.1.47 Bicester Library is the only library facility within the Bicester Wider Area. This facility is open six days a week and offers internet access. The next nearest libraries to the Masterplan site are 17 kilometres away in Deddington (to the north west) and 17 kilometres in Kidlington (to the south west).

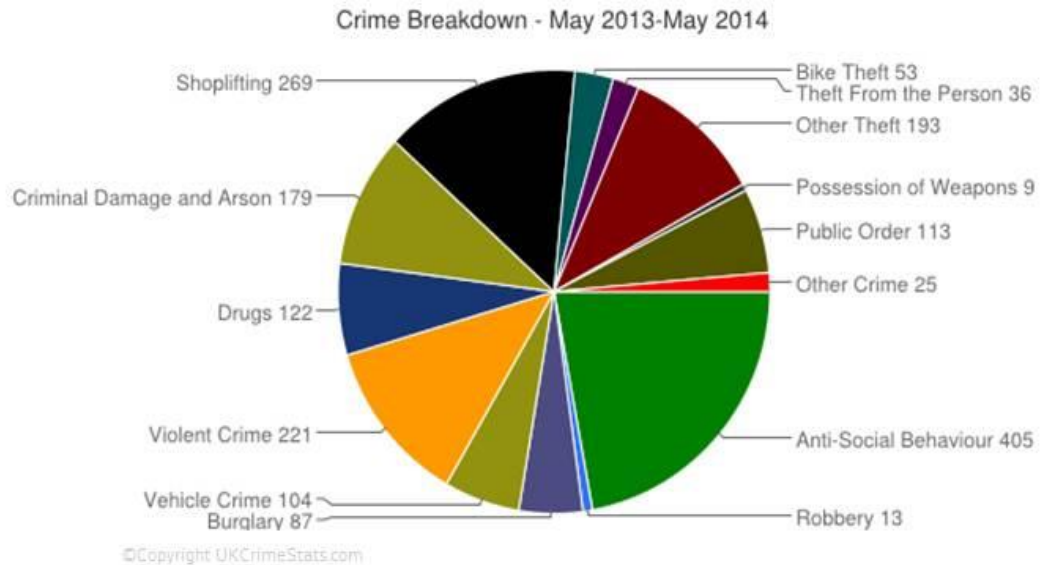
Other Open Spaces

- 14.4.1.48 There are a number of open spaces in Bicester, used both formally and informally, including Purslane Drive and Shakespeare Drive Woods which are in close proximity to the Masterplan Site. Collectively, these areas offer approximately 10ha of open space and both of these spaces are categorised as 'natural/semi-natural greenspace' in Cherwell District Council's Green Space Strategy (Ref 14-16). The majority of open spaces surrounding the Masterplan Site are categorised as 'natural and semi-natural space' and include a number of footpaths.

Crime

- 14.4.1.49 Crime levels for Bicester as recorded on the UK Crime Statistics website (http://www.ukcrimestats.com/Neighbourhood/Thames_Valley_Police/Bicester_Town) give an crime rate of 5.15 crimes per 1,000 people in May 2014. Mapping on the website shows these levels to be low or medium in different areas of the town, with low rates recorded in west Bicester close to the Application site. The largest proportion of crime is anti social behaviour, shop lifting and violent crime, as shown in Figure 14.3 below.

Figure 14-3 Crime Breakdown - May2013 to May 2014.



Tourism

- 14.4.1.50 Bicester Village has strong international links with eight other associate outlet shopping villages in mainland Europe, all exponents of high-end retailing opportunities. Bicester Village has sought to connect with other high-end heritage attractions including Blenheim Place (29 kilometres northwest) and Waddesdon Manor (19 kilometres southeast), but also luxury accommodation such as Le Manoir aux Quatre Saisons (29 km southeast) and Shakespeare House (20 km northeast). The proximity of Bicester Village and other regional assets has ensured there is a strong provision of high value visitor attractions that generate significant economic stimulus.
- 14.4.1.51 Bicester has a historic core with a good range of heritage building such as the Old Vicarage, Bicester House, St Edburghs Church and Garth which is an old Hunting Lodge. Other buildings such as the Dovecote and the town's old Lock-Up also add to the character of the town and its distinctive appeal. Collectively these offer a degree of visitor interest albeit more local in appeal. In addition the Market Square in the town still holds a traditional market-day every Friday, as well as a Farmer's Market on the second Thursday of every month with other speciality markets throughout the year. Bicester Town Council host or support a number of other events, particularly through the Summer months. These include: Bicester Town Carnival, Teddy Bear's Picnic / Bicester Activities Day, Band concerts, Mo-Town and Kings of Queens Festival. Other annual events that take place in the Town, hosted by other organisations, include the Grassroots Bicester Big Lunch and A2Dominion's Bicester Bike and Family Fun Day.
- 14.4.1.52 There are a number of other established accommodation facilities (Table 14-12) within the Bicester area, serving both business and leisure tourism markets. These include hotels/inns, guesthouses and farmhouse bed and breakfasts and self-catered units.

Table 14-12 Visitor Accommodation

Accommodation Type	North Oxfordshire Registered Accommodation
Hotels and Inns	<ul style="list-style-type: none"> ▪ Bicester Hotel, Golf and Spa ▪ Bignell Park Hotel ▪ Littlebury Hotel ▪ Kingsmere Travel Lodge
Guest Houses Bed and Breakfasts	<ul style="list-style-type: none"> ▪ AVA House bed and breakfast ▪ Weston Grounds Farm
Farmhouse Bed and Breakfasts	<ul style="list-style-type: none"> ▪ Manor Farm
Self-catered units	<ul style="list-style-type: none"> ▪ Grange Farm Country Cottages ▪ Grooms Cottage ▪ Stoke Lyne Farm Cottages

(Source: www.visitnorthoxfordshire.com)

- 14.4.1.53 Planning permission has been granted for a Travelodge within Bicester’s Pioneer Square development.

Public Rights of Way

- 14.4.1.54 No Public Rights of Way (PRoW) pass through the Site. A public footpath is located from the south west of the Site, dissecting Bicester in a north-west to south-east alignment connecting the A4095 and Buckingham Road. Public footpaths are also located to the north of the Site serving Bucknell.
- 14.4.1.55 A public bridleway is located at the south western extent of the Site, passing through the land south of the railway (the subject of Application 2).
- 14.4.1.56 The wider Bicester area has also been the subject of further investigative work by Oxfordshire County Council to retrofit a series of walking and cycling greenway routes. This includes proposed widening around Caversfield, widening through Bure Park Nature Reserve and plugging the walking and cycling gaps to connect existing walking and cycling links.

14.4.2 Future Baseline

- 14.4.2.1 Bicester is an area of significant development interest with a number of urban development schemes proposed either within the existing settlement boundary or seeking to extend the urban area in other directions. Proposals include mixed use schemes, containing a mixture of housing and commercial land uses but significantly their own provision of community facilities and services to accommodate an anticipated increase in population. The need to consider the cumulative impacts of the construction and functional stages of the proposal must account for the wider development context, both on the potential pressures on local infrastructure and other supporting services and the potential employment demands from the locality.
- 14.4.2.2 In terms of planned future development of the settlement, there are a number of significant schemes at various stages of the development process. These are

outlined in Chapter 17 and considered further as part of the cumulative assessment process.

14.5 Design and Mitigation

14.5.1.1 A number of measures have been identified in order to minimise the potential adverse impacts of construction but also maximise the potential benefits to be gained. These are discussed below.

14.5.1.2 Mitigation measures to reduce potential visual impacts and impacts upon noise are discussed in Chapter 5 Landscape and Visual Impact Assessment and Chapter 9 Noise and Vibration respectively.

14.5.2 Construction Approach and Mitigation of Short-Term Construction Effects

14.5.2.1 A Construction Environmental Management Plan (CEMP) would be implemented to ensure that disruption is kept to a minimum, and careful working practices would be administered during the construction phase. The measures discussed below would be included as part of a CEMP:

- Establish a point of contact for listening to and addressing complaints or problems that is communicated to the general public.
- Produce a regular newsletter available in hard copy or via the internet to update the general public and businesses of construction progress. These mediums would also be used to forewarn public of impending construction activities.
- A curfew policy would be adopted so as to minimise disturbance for school users, by ensuring construction traffic would not affect local schools during the morning drop off and afternoon collection times.
- Any works to the existing highway network along the site access route would be conducted in a manner that would ensure access is maintained to residential properties, businesses and community facilities. Disruption would be kept to a minimum.
- Careful consideration would be given to the location and subsequent restoration of any areas of land required temporarily for access, storage and compounds, and other related facilities.
- Health and safety issues would be considered paramount during the construction phase.
- Register with the Considerate Constructors Scheme.
- Working times implemented on site to minimise impact on residential amenity.

14.5.2.2 Additional mitigation measures include:

- Source contractors within the locality wherever possible.

- Establish pre-employment routes with construction firms to help connect the long-term unemployed with employment opportunities and access to the wider labour market.
- Traffic movements would be carefully phased and abnormal loads accompanied by the Police where necessary, to minimise any possible delays and disruption to regular road users, public access, community facilities, residences and businesses, particularly those used by vulnerable groups such as children.

14.5.3 Scheme Design and Mitigation of Permanent Operational Effects

14.5.3.1 A number of potential sources of impact have been identified during the operation of the proposal. The following mitigation measures would be implemented during this stage:

- Careful working practices and regular building maintenance to ensure potential impacts during the function of the development are minimised.
- To ensure provision of primary schools within the Site to accommodate the anticipated education demands of the resident population and positively contribute to the standard of education facilities within OCC as a whole.
- To include provision of other community facilities including the health centre and community centre, that would promote community interaction, empowerment and community development.
- To ensure the proposal includes opportunities for on-site business growth that is aligned to the eco-credentials of the site.
- To promote home-working through appropriate infrastructure such as broadband speeds.
- To ensure the safety of all user groups along the public routes, maintenance traffic using the access routes and internal roads would observe a low speed.
- Integration of the development with the local public transport network, providing information regarding transport availability in home owner's/tenant's start-up packs, and promoting public transport links in property sales.

14.6 Construction Impacts

14.6.1.1 The potential sources of impact on the socio-economic environment resulting from the proposal are identified as:

- Construction disturbances and nuisances – residential amenity may be affected by the construction works;
- A potential reduction in public safety due to construction activities;

- Local amenity: those travelling into the town centre and passing the construction site may experience a reduction in amenity due to construction activities;
- Construction employment generated locally;
- Construction staff expenditure may provide new custom for local businesses, particularly accommodation facilities, eateries and convenience retail outlets;
- Material sourcing; potential benefits to local suppliers of construction materials if sourced from the local economy;
- Sustainable construction techniques and the use of local materials; and
- Other development considerations.

Disturbance and Nuisances

14.6.1.2 There may be short term disturbance and nuisances within the Bicester wider area during the construction phase of the proposal. These impacts are discussed in more detail in Chapter 9 (Noise and Vibration) and Chapter 5 (Landscape and Visual Impact), but in the socio-economic context, the implication is that some local users may experience a temporary reduction in amenity associated with, for example construction noise impacts.

14.6.1.3 The impact on local residents and businesses is considered to be **minor adverse**, likely only to affect a relatively small geographic area at any one time and being temporary in nature; the residual impact is therefore not considered to be significant.

Public Safety

14.6.1.4 Construction works of any kind have the potential to affect public safety. Construction areas would need to be appropriately cordoned and signed to prevent public access and stipulate the necessary safety precautions if entering the site.

14.6.1.5 The impact on local residents and businesses is considered to be **minor adverse**, likely only to affect a relatively small geographic area at any one time and being temporary in nature; the residual impact is therefore not considered to be significant.

Local Amenity

14.6.1.6 The proximity of the wider Bicester settlement means that during the construction phase, there is a potential impact on local amenity, including on existing walking and cycling routes that circumnavigate the town and the opportunity for informal recreation. A short-term reduction in amenity may take place, as a result of site clearance, construction traffic and construction works.

14.6.1.7 The impact on local residents and businesses is considered to be **minor adverse**, likely only to affect a relatively small geographic area at any one time and being temporary in nature; the residual impact is therefore not considered to be significant.

Employment

- 14.6.1.8 The construction of the Development would provide employment in the construction industry. Working on a basis of 0.7 person years per dwelling (HCA guidelines) (Ref 14-17) and at an indicative rate of 200-250 dwellings per year (although it is noted that in the first year, the rate is expected to be less than this)), this equates to 140 construction jobs over a construction period of ten years. The Economic Development Strategy supporting the Masterplan notes that construction jobs 'have the potential to be long-term, as building out the Masterplan would provide ongoing future employment opportunities over a period of twenty years or more...the proportion of construction jobs that are long-term would be increased by apprenticeship and other training programmes.'
- 14.6.1.9 Job creation resulting from the construction resource demands of the proposal is considered to result in a **moderate beneficial** impact. This is likely to be significant given that the labour force that would benefit from employment creation could extend beyond Bicester itself into the wider Cherwell District and beyond.

Local Expenditure

- 14.6.1.10 Impacts on local expenditure would be both direct and indirect. Direct impacts would include through the use of local contracts to undertake construction works. More indirect impacts would be associated with local spend from construction workers. The Eurest Lunchtime Report 2008 (Ref 14-18) identified that, on average, workers spend £2.10 on lunch per day. The annual impact of this can be calculated by multiplying this spend by the number of employees during the working year (assumed to be 233 days, with four weeks holiday per annum) – this gives an annual figure in the region of £34,500 for lunch-time spend alone. Other local businesses that could benefit would include accommodation providers.
- 14.6.1.11 Direct and indirect expenditure within the wider Bicester area as a result of the Development (on both construction contracts and resources, accommodation and conveniences) is considered to result in a **moderate beneficial** impact.

Sustainable Construction Techniques

- 14.6.1.12 In addition to the employment generation potential of the construction process, the design specification of the proposal is likely to encourage the broadening in the skills base of existing skilled construction workers. The Economic Development Strategy for the Masterplan states that 'construction will provide a significant number of jobs specialising in niche eco building skills' (SQW 2013). The proposal would allow existing and future apprentices to learn skills that could generate a step change in the demand for construction materials and the use of construction techniques for a new generation of workers.
- 14.6.1.13 The potential for the existing and future construction workforce to learn new construction skills that can influence the wider construction sector is considered to be a **moderate beneficial** impact.

14.6.2 Overview

- 14.6.2.1 The assessment of impacts associated with the construction phase of the Development has identified that there are likely to be short-term impacts relating to disturbance and nuisance, public safety issues and local amenity, for residents and existing businesses within the Bicetser area, although these impacts are not considered to be significant by virtue of the fact that impacts would be temporary in nature and affect only a relatively small geographic area at any one time.
- 14.6.2.2 Positive impacts associated with the construction of the Development are considered to be significant, relating to the creation of some seventy construction jobs; the potential for existing and future construction workforce members to learn new skills and techniques associated with eco-building; and benefits associated with an increase in expenditure within the wider Bicester area from construction workers (for example food and accommodation).

14.7 Permanent Operational Impacts

- 14.7.1.1 Potential impacts arising from the operational stage of the proposed development have been assessed in relation to the following areas:

- Population
- Employment and economic growth
- Unemployment levels
- Housing availability and type
- Education provision
- Other community facilities
- Crime
- Tourism
- Open space provision

Population

- 14.7.1.2 The NW Bicester Eco-Town Demographic Profile Report (Barton Willmore November 2013) was prepared to provide a greater understanding of the demographic structure of the population that would settle in NW Bicester and how it would assimilate with the existing and wider town. The report uses the Chelmer Population and Housing Model (the Chelmer model) to forecast population change; the model results forecast a total change in population across the whole Bicester study area of approximately 19,000 people (2011-2052), representing a 44% increase in the population compared to 2011 Census levels. The population of NW Bicester is predicted to grow to 14,000 over this period (circa 6,000 dwellings by 2052). Average household size for NW Bicester is anticipated to reach 2.3 by 2053, compared to an overall Bicester average household size of 2.2 (Barton Willmore 2013).
- 14.7.1.3 A second population model has been utilised by Oxfordshire County Council – this model, called Popcalc, has presented slightly different population scenarios

for both NW Bicester and the wider study area. The two models are based on slightly differing assumptions, however are considered to both represent plausible scenarios for likely population change. The area of difference in terms of final population is in the order of 3%. Barton Willmore (2013) identify some degree of divergence in the projected population of specific age groups between outputs from each model – the Chelmer model projects a slightly higher overall population than Popcalc, with lower levels of population in younger age groups; the Chelmer model also forecasts a greater level of population decline following completion of the scheme.

- 14.7.1.4 The above presents the general picture for the whole NW Bicester Eco-town development; the population model used to provide these forecasts has been extrapolated to provide relevant data specifically in relation to Application 1 (Land North of Railway). Both the Chelmer and Popcalc models have provided two separate forecasts for NW Bicester – a ‘baseline trajectory’, which is based upon a variation to that set out in the emerging local plan and an ‘upper range trajectory’, which is based upon a faster rate of delivery.
- 14.7.1.5 Table 14-13 summarises the estimated population for the Development extrapolated from both the Chelmer and Popcalc models for each trajectory. The population forecasts are calculated using specific rates of delivery of housing units per annum, and so do not equate exactly with the 2,600 units proposed as part of Application 1 (Land North of Railway). Therefore for both models, the nearest cumulative housing numbers have been used as a starting point from which the population associated with 2,600 units has then been extrapolated. It should be noted that these forecasts relate only to population increase as a result of the Development; the cumulative impact of development, taking into account other large development sites within the wider Bicester area in addition to forecasts for the existing Bicester housing stock, is discussed further in Section 14.8.

Table 14-13 Population Forecasts Using Chelmer and Popcalc Models

	Baseline Trajectory (2,550 units)	Baseline Trajectory (extrapolated to 2,600 units)	Upper Trajectory (2,566 units)	Upper Trajectory (extrapolated to 2,600 units)
Chelmer Model	6,502	6,623	6,560	6,644
Popcalc Model	5,641	5,752	5,761	5,834

Source: Adapted from NW Bicester Eco-Town Comparison of Population Projections NTS (Barton Willmore 2014)

- 14.7.1.6 In addition to the population forecast through the above models, it is observed that the eco-label for Bicester has the potential on its own to generate greater demand for living in this location and as such could be a contributing factor to further population increase.

Housing Availability and Type

- 14.7.1.7 The population forecasts have been used to measure likely household size of home in NW Bicester in future years. Table 14-14 is taken from the NW Bicester Eco Town Comparison of Population Projections Non-Technical Summary (Barton Willmore 2014) and summarises the range of average

household size resulting from population forecast scenarios. The table shows a gradual decline in household size over time, which reflects national trends.

Table 14-14 Average Household Size Over Time

Baseline Trajectory			Upper Trajectory		
Housing Trajectory	Chelmer Model (average hhold size)	Popcalc Model (average hhold size)	Housing Trajectory	Chelmer Model (average hhold size)	Popcalc Model (average hhold size)
50	2.29	2.96	71	2.29	3.09
125	2.29	3.10	214	2.30	2.78
250	2.29	2.84	393	2.29	2.73
375	2.29	2.75	634	2.29	2.68
525	2.29	2.72	876	2.29	2.66
675	2.29	2.69	1,117	2.29	2.64
825	2.28	2.68	1,359	2.28	2.64
975	2.28	2.67	1,600	2.28	2.62
1,125	2.27	2.65	1,841	2.27	2.60
1,275	2.27	2.62	2,083	2.27	2.58
1,425	2.22	2.61	2,324	2.25	2.57
1,575	2.22	2.60	2,566	2.25	2.56
1,725	2.21	2.59	2,807	2.24	2.55
1,875	2.21	2.59			
2,025	2.20	2.58			
2,175	2.21	2.58			
2,325	2.21	2.56			
2,550	2.1	2.55			
2,775	2.21	2.54			

Source: NW Bicester Eco-Town Comparison of Population Projections NTS (Barton Willmore 2014)

14.7.1.8 The Development incorporates a range of housing types and tenures. The mix of properties would be varied and include a full range of one, two, three, four and five bed housing; 30% of the housing stock would be affordable housing in line with Cherwell District Council policy and PPS1. Specialist housing (for example extra care accommodation) would be incorporated in the development where there is an identified need.

14.7.1.9 Overall, the range of housing – from one bedroom flats to five bedroom dwellings – is considered to be appropriate in the context of forecast household sizes within the development, which are shown to change over time. The mix of housing types is further considered to have a positive impact in promoting diverse, mixed communities.

14.7.1.10 The expansion in the provision and range of affordable and private housing, including a greater proportion of homes achieving the Code for Sustainable Homes, Level 5, is considered to be a **moderate beneficial** impact.

Education

14.7.1.11 The potential effect on local schools is dependent on the potential child yield as a result of the Development. Table 14-15 below sets out the results of the population forecasts for NW Bicester in relation to primary and secondary school age children. The table sets out the results for the two population models that have been used (both the Chelmer model and Popcalc), showing the anticipated growth in number of primary school aged children over time. The figures shown for 2,600 units have been extrapolated from the cumulative housing trajectory information. It is acknowledged that the Development would include 250 units of extra care housing without child yield, nonetheless the table gives an indication of child yield of up to 2,600 units, and the yield of 2,350 units of general housing can be ascertained.

Table 14-15 Population Forecasting for Primary School Aged Children

Baseline Trajectory			Upper Trajectory		
Housing Trajectory	Chelmer Model (number of primary aged children)	Popcalc Model (number of primary aged children)	Housing Trajectory	Chelmer Model (number of primary aged children)	Popcalc Model (number of primary aged children)
50	4	9	71	18	13
125	22	23	214	34	40
250	38	48	393	59	76
375	55	76	634	89	128
525	77	112	876	124	187
675	105	151	1,117	162	251
825	138	192	1,359	212	316
975	173	231	1,600	266	381
1,125	210	269	1,841	325	442
1,275	249	303	2,083	387	497
1,425	293	328	2,324	452	544
1,575	337	354	2,566	521	587
1,725	381	377	2,600 units (extrapolated figures)	531	592
1,875	422	397			
2,025	462	417			
2,175	500	459			
2,325	530	500			

2,550	567	551	
2,600 units (extrapolated figures)	576	562	

Source: Adapted from NW Bicester Eco-Town Comparison of Population Projections NTS (Barton Willmore 2014)

- 14.7.1.12 Delivery of 2,600 homes as part of the Development is anticipated to take place in Year 19 under the baseline trajectory and Year 13 under the upper trajectory; using the population forecasts for this level of development, the primary education provision is considered to peak at this time.
- 14.7.1.13 The capacity analysis of primary schools within Bicester at present identified that the majority of schools closest to the Site have surplus capacity, equivalent to a total of 318 places. Only one school (Bure Park Primary) was found to be operating at full capacity. Application 1 (Land North of Railway) also includes provision for a 2FE primary school, capable of being enlarged to three form, in addition to other development considerations nearby that include an education component (for example the Exemplar site on which construction is due to commence shortly, also includes a 2FE primary provision), means that there would be sufficient capacity to accommodate the increase in children of pupil age.
- 14.7.1.14 In terms of growth in children of secondary school age, Table 14-16 sets out the population forecasts for children of this age by Years 19 and 13 respectively (build-out of the Development). Again, figures have been extrapolated to provide data for 2,600 housing units.

Table 14-16 Forecast Secondary School Population

Baseline Trajectory		Upper Trajectory	
Chelmer Model (number of secondary aged children)	Popcalc Model (number of secondary aged children)	Chelmer Model (number of secondary aged children)	Popcalc Model (number of secondary aged children)
322	308	240	286

Source: Adapted from NW Bicester Eco-Town Comparison of Population Projections NTS (Barton Willmore 2014)

- 14.7.1.15 Capacity analysis of existing secondary schools within Oxfordshire revealed surplus capacity, with the closest secondary schools to the Site (the Bicester Community College and Cooper School) having a surplus capacity of 614 spaces between them.
- 14.7.1.16 There may also be wider environmental and sustainability benefits associated with the Development in terms of positive educational spin-offs including behavioural change and a reduction in carbon emissions. The sustainable principles incorporated in the design of the Site, and the education facilities in particular, will contribute to an overall environmental awareness within a wide range of age groups.

14.7.1.17 The expansion in the capacity and quality of education facilities in both the immediate vicinity of the Development and further afield, is considered to be a **moderate beneficial** impact. The education facilities proposed are likely to contribute positively to wider environmental and sustainability principles in terms of positive educational spin-offs including behavioural change and a reduction in carbon emissions.

Employment and Economic Growth

14.7.1.18 The Economic Development Strategy produced to support the wider NW Bicester Eco-Town proposal states that the growth of jobs would be supported not only in the Eco-Development itself, but more generally in Bicester in a variety of sectors. Weaknesses in the local economy that would be addressed as a result of the wider scheme include reducing the high level of out-commuting (by providing high quality jobs locally), providing better education and training provision and overcoming the current lack of readily available land and modern business premises which deters inward investment at present.

14.7.1.19 Impacts on employment and economic growth in the area as a result of Application 1 (Land North of Railway) would relate principally to the potential for employment generation associated with the Development. Employment generation can take a number of forms – for example on-site jobs (resulting from allocated land uses), population-derived jobs (resulting from estimated population increase) and additional potential employment (from home working).

14.7.1.20 A full overview of the on-site employment generating potential is provided in the following table. This has been based on assumptions and information provided in the Economic Development Strategy for NW Bicester and supplement to that Strategy summarising the employment implications for Application 1 (Land North of Railway) prepared by SQW (2014), together with development quantum prepared by Farrells as part of the wider Masterplan process (Ref: 14-19). The supplement to the Economic Development Strategy notes that on-site jobs are not evenly distributed across the whole Masterplan site, with a significant proportion (approximately one third of the total) expected to be located on the business park in the south-east corner of the Application 2 Site (Land South of Railway). However, a significant number of jobs are anticipated to be created in each of the local hubs within Application 1 (Land North of Railway), as shown in the table below.

Table 14-17 On-site employment generation

On-site employment	Estimated Job Numbers	Comments
Employment in local centres – B1 office	233	Based on an assumption of 1 job per 12 sqm NIA (using HCA/OffPat guidelines) for 3,500 sqm of office space (2,800 sqm net). Assumes multi-occupied office buildings, subdivided into a total of 10-20 units ranging in size from 100-300 sqm.
Employment in local centres - B2/B8 commercial	20	Based on an assumption of 1 job per 36 sqm GIA (using HCA/OffPat

On-site employment	Estimated Job Numbers	Comments
		guidelines) for up to 708 sqm of business space.
Other employment in local centres	201	Includes: Retail/leisure – 1 job per 18 sqm NIA (using HCA/OffPat guidelines) for 1,000 sqm NIA of retail in local centres = 56 jobs Health centre – dentist – 288 sqm NIA at 35 sqm per job = 8 jobs Community halls, adult learning rooms, nursery and neighbourhood police space – assumed to require 2,518 sqm GIA, one job per 50 sqm = 50 jobs Extra care homes – 250 housing units assumed to generate 87 jobs in total.
Primary School	33	Assumes 3,330 sqm, 2 classes per year. The primary school in this application is capable of being enlarged to 3FE with added playing fields. The playing fields associated with the primary school in this application will enable an extra form entry for the Exemplar primary school.
Homeworking	421	The Cherwell Economic Analysis report (August 2012) gives a figure of 14.2% for the average percentage of workers who worked from home in Cherwell District over the last ten years, based on ONS data. The Cherwell average working adults per household is 1.26. On this basis, 2,350 homes (2,600 net of extra care homes, for which job generation has been calculated separately) will accommodate 2,961 working adults, of which 421 will work from home.
Total	908	

Source: Adapted from Supplement to Economic Development Strategy for NW Bicester (2014)

14.7.1.21 In addition to on-site jobs, the Development has the potential to create off-site jobs that are still directly related to the eco-development. The Economic Strategy for the Masterplan site refers to the Cherwell Economic Analysis Study (August 2012) (Ref 14-20), which estimates that 200 jobs are generated for every additional 1,000 population. For NW Bicester as a whole, therefore, where the Masterplan will accommodate a population of approximately 14,000 people when fully developed (i.e. 6,000 homes), it can be expected to create – without additional stimulus – around 2,800 new consumer service jobs (NW Bicester Economic Development Strategy 2014). The number of off-site jobs created as a result of the housing in the Application 1 (Land North of Railway)

area is estimated to be 1,213 (this assumes the average household size is the same as for the NW Bicester development as a whole and applies a ratio of 0.2 jobs per person) (SQW Supplement 2014).

- 14.7.1.22 Whilst a number of these would be included in the community hub and service facilities provided as part of the eco-development, a significant proportion (approximately 400) would be created to serve the additional demand of the residents and businesses and may be located elsewhere in Bicester. The Economic Development Strategy for the Masterplan area also refers to the possibility of job creation in target sectors, attracted to Bicester by the profile of the eco-development and associated marketing, but which may be better located on strategic employment sites elsewhere within Bicester (SQW 2014).
- 14.7.1.23 The proposal would generate a significant number of jobs within the wider Bicester area, both directly through employment-related land uses and the potential to offer home working and indirectly through population derived local service jobs. It is also reasonable to suggest that the proposal would generate a significant amount of new investment not just within the Bicester Wider Area but also further afield in Cherwell District, Oxfordshire and the wider sub-region. As such the employment related impacts of the Development are considered to be **major beneficial**.

Unemployment Levels

- 14.7.1.24 The Development has the potential to generate employment for those registered unemployed and potentially the long-term unemployed through the generation of a range of skill demands. The extent to which the Development would positively impact on unemployment levels would depend on the connectivity between emerging businesses and the unemployed cohort.
- 14.7.1.25 The job creation elements of the proposal and the potential to link those who are unemployed (and in particular the long-term unemployed) with permanent employment opportunities means the impacts are considered to be **moderate beneficial**.

Community Facilities

- 14.7.1.26 The Development includes a range of community facilities that are considered to generate wider socio-economic benefits to the potential residents both of the Site and the wider community. These include:
- the provision of a new community centre within the Site (this, together with the community hall proposed within the Exemplar development means that two such facilities are provided within the northern part of the Masterplan site;
 - development of a mixed-use community hub including facilities such as pub, small supermarket, small-scale retail uses and a health centre
 - appropriate mix of housing including extra care housing.
- 14.7.1.27 The community facilities to be designed as part of Application 1 (Land North of Railway Line) benefit not only residents within the site itself but also provide an

opportunity for maintaining and enhancing community well-being on a broader scale. Impacts in relation to community facilities are therefore considered to be **moderate beneficial**.

Crime

- 14.7.1.28 The design of the proposal has been developed to minimise the risk of crime occurring. Involvement from the local constabulary in the development of the masterplanning process has resulted in the impact of the proposal on overall crime levels as being **negligible**.

Tourism

- 14.7.1.29 The proposal has the potential to generate tourism both from its eco-town credentials but also through activities promoted through the eco-business centre. As such, impacts on tourism are considered to be **moderate beneficial**.

Open Space and Play Areas

- 14.7.1.30 The population generated as a result of the Development would create additional demand for play areas, recreational open space and sports facilities. The proposal accordingly incorporates a significant amount of open space, sports and play area provision, notably:
- A central green with play area and amenities (including for example a Multi-Use Games Area or MUGA and a Neighbourhood Area Equipped for Play (NEAP));
 - A network of local play areas providing a wide range of experiences and meeting Cherwell District Council's age provision requirements;
 - A Country Park;
 - General amenity space along the western edge of the Site in the vicinity of the Bure River corridor;
 - A junior pitch with changing facilities;
 - Allotments and orchards accessible to everyone
 - Community Farm and woodland burial ground.
- 14.7.1.31 Sport England's Sports Facilities Calculator can be used to provide an indication of likely demand that may be generated by a development for specific types of facility (including for example swimming pools, sports pitches and indoor sports provision). Application 1 (Land North of Railway) is likely to generate a population in the region of 7,000. Using the Sports Facilities Calculator, this level of population could create the following demand:
- 0.35 swimming pools (approximately 75 sqm of water)
 - 0.2 junior pitches (artificial turf or similar)
 - 0.5 sports halls

14.7.1.32 Open space, sports and play provision included within the proposal is considered to result in a net gain for the wider Bicester area and as such the impacts are considered to be **moderate beneficial**.

14.8 Cumulative Impacts

14.8.1.1 Due to the nature of the Development, only significant cumulative impacts relating to population, housing, employment and community infrastructure provision have been assessed. Chapter 17 sets out details of relevant consented and planned developments within the Bicester area. Of the applications listed in Chapter 17, several are for significant levels of housing development (for example SW Bicester Phases 1 and 2, Graven Hill and Application 2 (South of Railway Line)). All of these applications are supported with various social and community infrastructure and therefore it is not considered that there would be a significant cumulative impact.

14.8.1.2 Equally there are several schemes for which a significant level of employment generation is proposed (for example Bicester Business Park, Graven Hill, Bure Place Redevelopment Phase 2, North East Bicester Business Park and Bicester Gateway). The cumulative impact arising from the Development plus those of committed and planned developments listed in Tables 17-1 and 17-2, is considered to be **major beneficial**.

14.9 Summary

14.9.1.1 This Chapter has presented and assessed the likely socio-economic and community impacts likely to arise as a result of the proposed Development. The Chapter has described the relevant regulatory and policy framework associated with the topic, together with the methodology used to set out current and future baselines and to assess likely impacts. Unlike other environmental topics, such as noise, the sensitivity of socio-economic receptors to the proposed development is not determined by reference to designations or an objective standard. Instead, it is the nature of the activity that the human receptor is undertaking that is most influential in determining sensitivity. The approach taken has therefore used a combination of quantitative assessment where data is available, combined with professional judgement. This approach is similar to that used for the assessment of socio-economic impacts relating to mixed-use development projects elsewhere in the UK.

14.9.1.2 Sensitive resources and receptors identified for the topic are summarised in Table 14-18 below.

Table 14-18 Sensitive resources and receptors

Resource	Corresponding Receptor
Residential properties	Local residents
Commercial property	Local businesses
Community infrastructure (for example education facilities, community centres)	Users of community infrastructure
Play areas and public open space	Users of these spaces

- 14.9.1.3 A baseline has been developed to provide a description of the current economic and social context for the area, described quantitatively where possible, but also making use of qualitative information where necessary. The level of activity that would have happened anyway, without the development, has been estimated making use of for example, population projections taken from the Office of National Statistics (ONS) and the Cherwell District Local Plan submission, with economic growth forecasts taking into account existing employment land and proposals.
- 14.9.1.4 Adverse construction impacts that have been identified include in relation to disturbance, local amenity and public safety. It is important to recognise that these impacts would be short term and temporary in their nature and that with the implementation of identified mitigation measures, the overall adverse impact of this phase would be minimised. Impacts on employment generation and local expenditure generated during the construction phase are considered to be more beneficial.
- 14.9.1.5 During the operational phase of the proposal, impacts in terms of employment creation, housing availability and range, the provision of education, community and outdoor play facilities are considered to be significant.
- 14.9.1.6 Overall, it is considered that with the appropriate mitigation measures, the potential impacts of the proposal on the defined social and economic environment would be positive.

Table 14-19 Socio-Economic and Community Impact Summary Table

Impact description	Temporary/Permanent	Significance rating
Construction Impacts		
Disturbance and nuisance	Temporary	Minor adverse
Public safety	Temporary	Minor adverse
Local amenity	Temporary	Minor adverse
Construction employment creation	Temporary	Moderate beneficial
Local expenditure	Temporary	Moderate beneficial
Sustainable construction techniques	Permanent	Moderate beneficial
Operational Impacts		

Extending housing availability in terms of both number and range	Permanent	Moderate beneficial
Provision of new education facilities as part of the Development	Permanent	Moderate beneficial
Employment creation	Permanent	Major beneficial
Reducing unemployment	Permanent	Moderate beneficial
Provision of community infrastructure	Permanent	Moderate beneficial
Reduction in crime	Permanent	Negligible
Provision of tourism role of the eco-development	Permanent	Moderate beneficial
Provision of open space and play areas	Permanent	Moderate beneficial

15 Waste

15.1 Introduction

15.1.1.1 The Development would result in the generation of solid waste from demolition, excavation and construction (referred to this chapter as CD&E waste), and the operation of the site due to the residential and commercial uses of the site (referred to in this section as operational waste). Contaminated wastes are dealt with under Chapter 11, Contaminated Land.

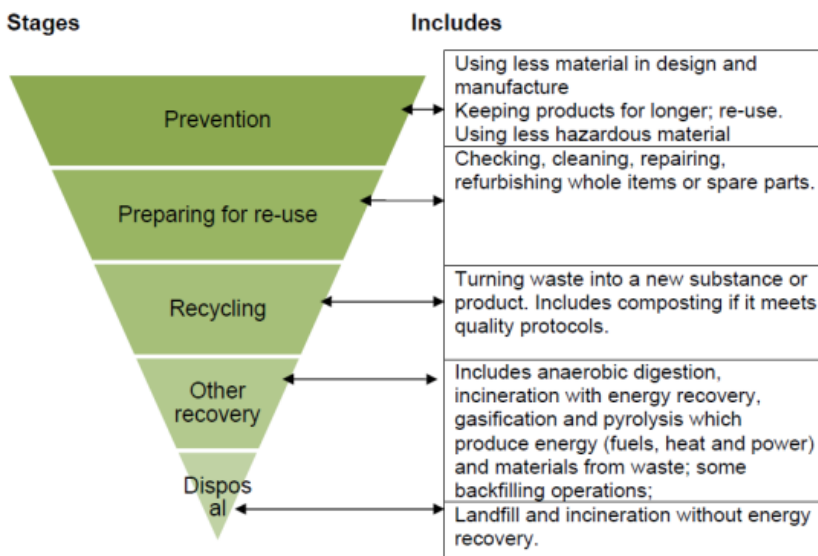
Introduction to waste management

15.1.1.2 Waste is defined in Article 3 of the European Framework Directive on waste (2008/98/EC) as “any substance or object which the holder discards or intends or is required to discard”, where the term:

- ‘waste holder’ is defined as the producer of the waste or the natural or legal person who is in possession of the waste
- ‘waste producer’ is defined as anyone whose activities produce waste (original waste producer) or anyone who carries out pre-processing, mixing or other operations resulting in a change in the nature or composition of this waste.

15.1.1.3 Waste can cause harm to the environment through its treatment and final disposal, and therefore, effective waste management should follow the principles of the waste hierarchy shown on Figure 15-1 below:

Figure 15-1 Waste Hierarchy (Ref 15-1)



15.1.1.4 The assessment will consider the impact on the environment as a result of the generation of this waste and will detail measures to mitigate these impacts.

15.1.1.5 **Demolition waste** – The existing site is largely undeveloped land, however, it is anticipated that there would be a small amount of demolition of existing buildings present on-site.

- 15.1.1.6 **Construction and excavation waste** – As the existing site is largely undeveloped land, it is anticipated that material waste likely to arise from the construction and excavation phases would consist of hard and inert materials, soils and stones, plastics, packaging (wooden and plastic), insulation material, miscellaneous metals, canteen and office waste.
- 15.1.1.7 **Operational waste** – As the development is predominantly residential, most waste generated during operation would be household waste, in addition to small quantities of waste from the commercial and public facilities.
- 15.1.1.8 The following three documents will be submitted as part of the planning application and will be referred to in this Chapter:

Preliminary Site Waste Management Plan (SWMP)

- 15.1.1.9 The Preliminary Site Waste Management Plan (SWMP) (Appendix 15A) is used to plan, implement, monitor and review waste minimisation and management on construction-sites. The Preliminary SWMP is also used to record how waste is reduced, re-used, recycled and disposed of on a construction-site. This effectively means:
- Recording decisions taken to prevent waste through concept and design.
 - Forecast waste produced on-site.
 - Plan how to reduce, re-use and then recover the forecasted waste.
 - Implement and monitor the planned activity.
 - Review the SWMP and record lessons learnt.
- 15.1.1.10 The Preliminary SWMP is a live document and is updated regularly during the course of the project. Preparing a SWMP at planning stage facilitates the identification and implementation of waste minimisation at the design stage and re-use and recycling opportunities during on-site operations, reducing the quantities of construction waste sent to landfill. Preparing a SWMP also encourages the review of current waste reduction and recovery practice levels, highlighting areas where Good and Best Practice can be achieved.

Sustainable Waste and Resources Plan (SWRP) Covering Report - Application 1 North of Railway

- 15.1.1.11 The SWRP Covering Report (Appendix 15B) relates to the SWRP for the NW Bicester Development and is specific for the Application Site 1: North of Railway. It has been prepared in accordance with the requirements of Planning Policy Statement (PPS1): Eco-towns (A supplement to PPS1), ET19 –Waste (Ref 15-2).
- 15.1.1.12 The SWRP Covering Report is applicable to Application Site 1 as it presents the waste capture rate and total recycling and residual waste per household. It also sets targets for recycling and residual waste levels for the NW Bicester Masterplan Eco-development, the overall concept for waste management, and presents specific measures that if implemented would facilitate these targets being achieved (as required by PPS1). Progression of these measures would require ownership and support.

Sustainable Waste and Resources Plan (SWRP)

15.1.1.13 Under ET 19.1 of PPS: Eco-Towns supplement to PPS1, Eco-town planning applications should include a Sustainable Waste and Resources Plan (SWRP) (Appendix 15C). This should cover both domestic and non-domestic waste, which:

- Set targets for residual waste levels, recycling levels and landfill diversion, all of which should be substantially more ambitious than the 2007 national Waste Strategy targets for 2020; it should be demonstrated how these targets would be achieved, monitored and maintained. The Waste Strategy 2007 proposes national targets for waste for 2020 as follows:
 - Residual waste reduction per person (amount left after re-use, recycling and composting) – from 370kg in 2005 to 225 in 2020.
 - Household re-use, recycling and composting – from 27% in 2005 to 50% in 2020.
 - Residual waste recovery (recycling, composting and energy recovery) from 28% in 2005 to 75% in 2020.
- Establishes how the development would be designed so as to facilitate the achievement of these targets, including the provision of waste storage arrangements which allow for the separate collection of each of the seven priority waste materials as identified in the Waste Strategy for England 2007 (Ref 15-4).
- Provides evidence that consideration has been given to the use of locally generated waste as a fuel source for combined heat and power (CHP) generation for the eco-town.
- Sets out how developers would ensure that no construction, demolition and excavation (CD&E) waste is sent to landfill, except for those types of waste where landfill is the least environmentally damaging option.

15.2 Regulatory and Policy Framework

15.2.1.1 This impact assessment has been undertaken in accordance with current international and national legislation, and national, regional and local plans and policies relating to nature conservation in the context of the Development. A summary of the relevant legislation and policies, the requirements of these policies and the Development response has been provided in Table 15-1 below. These would also need to be considered at construction phase.

Table 15-1 Waste Regulatory and Policy Framework

Policy/Legislation	Summary of Requirements	Development Response
EU Landfill Directive (Directive 1999/31/EC on the landfill of waste)	Establishes a framework for the management of waste across the European Community. It also defines certain terms, such as 'waste', 'recovery' and 'disposal', to ensure that a uniform approach is taken across the EU. Furthermore, it is an instrument for driving waste up the hierarchy through waste minimisation and increased	An assessment has been carried out against the context of the Schedule 10 of the Environmental Permitting (England and Wales) Regulations (EPR) 2010 (through which the Landfill Directive is

Policy/Legislation	Summary of Requirements	Development Response
	<p>levels of recycling and recovery.</p> <p>Sets out a number of procedures and criteria for construction, excavation and operational waste acceptance at landfills, including targets for the progressive reduction of biodegradable municipal waste (BMW) being sent for disposal in landfill.</p> <p>The principles set up for the acceptance of hazardous and non-hazardous waste at relevant landfills includes ensuring that the waste will not endanger human health and the environment and satisfies the Waste Acceptance Criteria (WAC). They also set strict requirements for the acceptance of certain stable, non-reactive hazardous waste into non-hazardous waste landfills.</p>	<p>implemented) and will assume that at a minimum, the targets in this Schedule will be met.</p> <p>Recommendations have been provided detailing the end destination of construction, excavation waste.</p>
<p>The Waste Framework Directive (Directive 2006/12/EC on waste)</p>	<p>The Waste Framework Directive (WFD; Directive 2006/12/EC on waste) contains the definition of waste. This definition is used to establish whether a material is a waste or not.</p> <p>In December 2008, the new WFD (Directive 2008/98/EC) came into force, amending some articles of the current WFD. Member States have until December 2010 for implementing the new WFD; at that time, Directive 2006/12/EC (and others) will be repealed. Amongst others, changes that will come into place include:</p> <ul style="list-style-type: none"> ▪ The setting of recycling targets for non-hazardous construction and demolition waste (70% by 2020). ▪ A provision which would enable the European Commission to adopt EU-wide end-of-waste criteria for specified wastes. A waste specified in this way would cease to be waste when it has undergone a recovery operation and complies with the criteria set by the Commission. ▪ The obligation for Member States to set up waste prevention plans within five years from the adoption of the Directive. 	<p>The WFD has been implemented through the Environmental Protection Act 1990 (as amended), the Duty of Care and Carriers and Brokers regimes and regulations and the Environmental Permitting (England and Wales) Regulations 2010.</p>
<p>Environmental Permitting (England and Wales) Regulations 2010</p>	<p>The Environmental Permitting Regulations (EPR) introduced a permitting and compliance regime, which deliver many of the requirements of the European Environmental Directives and of national policy.</p> <p>The Schedules to the Regulations identify precise requirements, article by article, for</p>	<p>A SWRP covering construction, excavation and operational waste has been produced. This has been carried out against the context of the Environmental Permitting (England and Wales) Regulations 2010.</p>

Policy/Legislation	Summary of Requirements	Development Response
	<p>each Directive which must be delivered through the permitting system. Each Directive covered by the Regime has a specific schedule. The most relevant for this project are:</p> <ul style="list-style-type: none"> ▪ Part A installations and Part A mobile plant (the Integrated Pollution Prevention and Control Directive) - Schedule 7. ▪ Domestic Part B installations and Part B mobile plant - Schedule 8. ▪ The Waste Framework Directive - Schedule 9. ▪ The Landfill Directive - Schedule 10. 	
<p>The Hazardous Waste (England and Wales) Regulations 2005, Statutory Instrument 2005 No. 894, and 2009 amendment SI 507</p>	<p>The Hazardous Waste (England and Wales) Regulations 2005 (HWR 2005) were amended on 6 April 2009. This principally widened the scope of the exemption from hazardous waste producer registration with the Environment Agency.</p> <p>Under the Hazardous Waste Regulations 2005, "it is an offence to produce hazardous waste at premises, or remove that waste from premises, unless those premises are either registered with the Environment Agency or are exempt."</p> <p>Where subcontractors produce hazardous waste, it will be removed under the Hazardous Waste Premises Registration for that site.</p> <p>The Hazardous Waste (England and Wales) Regulations 2005 require a Hazardous Waste Consignment Note (HWCN) to be produced for each consignment of hazardous waste removed from site. This may take the form of either:</p> <p>A "Standard Procedure" (single movement) HWCN, where waste is moved from one premises to a Consignee in a single journey.</p> <p>A "Multiple Collection" HWCN, (as defined in Waste (England and Wales) Regulations 2011 Schedule 2)</p>	<p>The Preliminary SWMP includes a classification of the estimated waste that will be produced on the site as inert, non-hazardous or hazardous.</p> <p>It also includes details of the waste management facilities the project would use. This will enable the project to ensure compliance with the regulations.</p>
<p>Waste (England and Wales) Regulations 2011 SI 988 And 2012 amendment SI 1889 (transposes the Revised Waste Framework Directive)</p>	<p>The Waste (England and Wales) Regulations 2011 came into force on 29th March 2011.</p> <p>These Regulations update some aspects of waste controls. The need for waste permits and authorisations for certain activities therefore does not change.</p> <p>In summary, the regulations implement the WFD and;</p>	<p>A Preliminary SWMP covering CD&E waste has been produced.</p> <p>This has been carried out in accordance with the Waste (England and Wales) Regulations 2011 SI 988.</p>

Policy/Legislation	Summary of Requirements	Development Response
	<ul style="list-style-type: none"> ▪ require businesses to confirm that they have applied the waste management hierarchy when transferring waste and to include a declaration on their waste transfer note or consignment note ▪ require a new permit waste hierarchy permit condition and where appropriate a condition relating to mixing of hazardous waste ▪ introduce a two-tier system for waste carrier and broker registration, which includes those who carry their own waste, and introduces a new concept of a waste dealer ▪ products whilst include a small number of radioactive waste materials <p>These regulations replace:</p> <ul style="list-style-type: none"> ▪ The Environmental Protection (Duty of Care) Regulations, as amended ▪ The Controlled Waste (Registration of Carriers and Seizure of Vehicles) Regulations, as amended, and ▪ amends Hazardous Waste (England and Wales) Regulations 2005 (Schedule 2) <p>DEFRA proceeded with the proposed amendments to the 2011 Regulations and, from April 2014, will allow alternative documentation to be used to record the written description of waste.</p>	
The Clean Neighborhoods and Environment Act 2005	It is the responsibility of everyone working in the construction industry to ensure that all waste is disposed of properly. All employees need to be made aware that if they are tasked with waste disposal this must be carried out in accordance with the law, or they risk being fined.	A Preliminary SWMP covering CD&E waste has been produced. This has been carried out against the context of the Clean Neighbourhoods and Environment Act 2005.
Waste Strategy for England 2007 (WSE 2007) (Ref 15-3)	<p>This strategy builds on Waste Strategy 2000 and the progress since then but aims for greater ambition by addressing the key challenges for the future through additional steps.</p> <p>The Government's key objectives are to:</p> <ul style="list-style-type: none"> ▪ Decouple waste growth (in all sectors) from economic growth and put more emphasis on waste prevention and re-use. ▪ Meet and exceed the Landfill Directive diversion targets for biodegradable municipal waste in 2010, 2013 and 2020. 	<p>The assessment has been carried out against the context of the Waste Strategy for England 2007.</p> <p>The assessment also applies the waste hierarchy with a focus on resource efficiency.</p>

Policy/Legislation	Summary of Requirements	Development Response
	<ul style="list-style-type: none"> ▪ Increase diversion from landfill of non-municipal waste and secure better integration of treatment for municipal and non-municipal waste. ▪ Secure the investment in infrastructure needed to divert waste from landfill and for the management of hazardous waste. ▪ Get the most environmental benefit from that investment, through increased recycling of resources and recovery of energy from residual waste using a mix of technologies. 	
Review of Waste Policy in England 2011	<p>This Review recognises the need to take an integrated approach to waste prevention, re-use and recycling.</p> <p>The Review contains actions and commitments, which set a clear direction towards a zero-waste economy. The Review presents the key principles in waste management policy: the waste hierarchy, what will be done to increase the diversion of waste away from landfill and producer and consumer responsibility.</p>	The assessment has been carried out against the context of the Review, applying the waste hierarchy with a focus on resource efficiency.
Planning Policy Statement 1: Delivering Sustainable Development (CLG 2005)	<p>Whereas much of the guidance offered by PPS1 is of general or background relevance to the current proposals, the following specific points are noteworthy:</p> <ul style="list-style-type: none"> ▪ Paragraph 3 of PPS1 identifies sustainable development as ‘the core principle underpinning planning’. ▪ Paragraph 20 highlights that development plan policies should take account of environmental issues, such as the mitigation of the effects of and the adaptation to climate change, the protection of the wider countryside, the potential impact of the environment on proposed developments and the management of waste in ways that protect the environment and human health, including producing less waste and using it as a resource wherever possible. ▪ Paragraph 27 addresses the impacts of climate change, the management of pollution, and natural hazards, the safeguarding of natural resources and the minimisation of impacts from the management and use of resources. 	The ES chapter has a section which considers the impact of waste in the development and makes recommendations to lesson that impact and for designing out waste.
Planning Policy	This Planning Policy Statement (PPS)	A SWRP covering

Policy/Legislation	Summary of Requirements	Development Response
Statement: eco-towns, A supplement to Planning Policy Statement 1 (CLG 2009)	<p>provides the standards any eco-town will have to adhere to and the list of locations identified with the potential for an eco-town.</p> <p>Eco-town planning applications should include a sustainable waste and resources plan (SWRP), covering both domestic and non-domestic waste, which:</p> <ul style="list-style-type: none"> ▪ Sets targets for residual waste levels, recycling levels and landfill diversion, all of which should be substantially more ambitious than the 2007 national Waste Strategy targets for 2020; it should be demonstrated how these targets will be achieved, monitored and maintained. ▪ Establishes how all development will be designed so as to facilitate the achievement of these targets, including the provision of waste storage arrangements which allow for the separate collection of each of the seven priority waste materials as identified in the Waste Strategy for England 2007. ▪ Provides evidence that consideration has been given to the use of locally generated waste as a fuel source for combined heat and power (CHP) generation for the eco-town. ▪ Sets out how developers will ensure that no CD&E waste is sent to landfill, except for those types of waste where landfill is the least environmentally damaging option. 	construction, excavation and operational waste has been produced. This has been carried out against the context of the Planning Policy Statement: eco-towns, A supplement to Planning Policy Statement 1.
Planning Policy Statement 10: Planning for Sustainable Waste Management 2005 [6] (CLG 2005) (Ref 15-2)	<p>The publication of Planning Policy Statement 10; Planning for Sustainable Waste Management (PPS10) established decision making principles to which regional planning bodies and all planning authorities should adhere when preparing planning strategies.</p> <p>Paragraph 34 suggests that proposed new development should be supported by Site Waste Management Plans (SWMPs) to identify the volume and type of material to be demolished and/or excavated, opportunities for the re-use and recovery of materials and to demonstrate how off-site disposal of waste will be minimised and managed.</p>	A SWRP and a project specific Preliminary SWMP have been prepared to identify the volume and type of material to be excavated, opportunities for the re-use and recovery of materials and to demonstrate that no construction and excavation waste is sent to landfill, except for those types of waste where landfill is the least environmentally damaging option.
Strategy for Sustainable Construction (HM Government 2008)	This Strategy is aimed at providing clarity around the existing policy framework and signalling the future direction of Government policy. It aims to realise the shared vision of	The assessment has been carried out to reduce CD&E waste to landfill compared to 2008 baseline.

Policy/Legislation	Summary of Requirements	Development Response
	<p>sustainable construction by:</p> <ul style="list-style-type: none"> ▪ Providing clarity to business on the Government's position by bringing together diverse regulations and initiatives relating to sustainability. ▪ Setting and committing to higher standards to help achieve sustainability in specific areas. ▪ Making specific commitments by industry and Government to take the sustainable construction agenda forward. ▪ To deliver the Strategy, Government and industry have devised a set of overarching targets related to the 'ends' and 'means' of sustainable construction. The 'ends' relate directly to sustainability issues, such as climate change and biodiversity; the 'means' describe processes to help achieve the 'ends'. ▪ By 2012, a 50% reduction of CD&E waste to landfill compared to 2008. 	

Oxfordshire Joint Municipal Waste Management Strategy – Recycling Targets

- 15.2.1.2 Oxfordshire Waste Partnership's (OWP) vision to maximise waste prevention across the county until 2030 is set out in the OWP Joint Municipal Waste Management Strategy (Ref 15-5), which was adopted in 2007. There has been a subsequent update to the Strategy, adopted in 2013. Cherwell District Council (CSC) is now responsible for the delivery of the strategy following the end of the OWP in summer 2014. Under the policies of the Strategy the CDC will:
- encourage the efficient use of resources, reduce consumption and take responsibility for the waste that they produce;
 - lobby central government to focus on waste as an integral part of sustainable resource management;
 - help households and individuals to reduce and manage their waste in order to ensure zero growth or better of municipal waste per person per annum;
 - provide an integrated system of collection and processing of household waste which will achieve, as a minimum:
 - By 31st March 2020: recycle or compost at least 65% of household waste
 - By 31st March 2025: recycle or compost at least 70% of household waste;
 - ensure that recycling facilities and services are available to all residents;
 - encourage businesses to reduce, re-use and recycle by providing good quality recycling services, information and advice;
 - minimise waste to landfill and recover energy from non-recyclable waste through the operation of the Ardley Energy from Waste facility with the council seeking no more than 5% of non-recyclable household waste;
 - provide waste management services for specialised, potentially polluting material streams such as hazardous waste and waste electrical and electronic equipment, which as a minimum meet legislative requirements;
 - working with the Waste Planning Authority, will ensure that waste facilities are suitably sized and distributed with the aim of minimising the transport of waste. Facilities will be well related to areas of the population, given the environmental and amenity constraints and the availability of suitable sites;
 - assist the development of local markets for recovered materials; and
 - work together to improve local environmental quality through effective communications and enforcement activity.
- 15.2.1.3 As noted above, the strategy has agreed a recycling target for Oxfordshire of 70% by 2015. This target is an improvement on the EU waste Framework Directive recycling and composting target of 50% by 2020 which is the only municipal recycling target set out in the recent National Review of Waste Policies (DEFRA 2011) (Ref 15-6), Paragraph 32.

15.3 Methodology

15.3.1 General Approach

- 15.3.1.1 The assessment will address potential impacts resulting from waste management and the use of resources associated with the works in the construction, excavation and operational phases of the development. CD&E wastes would be dealt with separately to operational wastes.
- 15.3.1.2 The now repealed Site Waste Management Plan Regulations 2008 was previously the only legislative requirement governing the assessment of CD&E waste matters. However, the implementation of a SWMP remains industry Best Practice, is a requirement of PPS10: Planning for Sustainable Waste Management and supports the requirements of PPS: Eco-Towns – A supplement to PPS1. As mentioned above, this supplement places requirements on the development to put in place a SWRP. The framework for the assessment is presented taking into consideration that the actions detailed in two key documents would be effectively implemented.
- 15.3.1.3 The Waste Management Plan for England (2013) (Ref 15-1) confirms the UK's commitment to meet its target under the Waste Framework Directive of recovering at least 70% by weight, of construction and demolition waste (Note: this relates to construction and demolition waste, excluding hazardous waste and naturally occurring material falling within code 17 05 04 in Schedule 1 to the List of Wastes (England) Regulations 2005 (SI 2005/895)). The framework for the assessment is presented with the requirements to meet these targets in mind.
- 15.3.1.4 The framework for the assessment of CD&E and operational waste is derived from a combination of national, regional and local waste and policies combined with expert judgement.

15.3.2 Consultation

- 15.3.2.1 Consultation has been undertaken with CDC as part of the assessment to:
- Define the targets in the new Oxfordshire Municipal Waste Management Strategy.
 - Discuss waste management aspirations for the eco development and set targets.
 - Determine a formal position with regards to any future waste facilities in the region and implications on waste management at the development.
 - Determine details of CDC waste and recycling collection systems (materials collected, receptacles provided, frequency of collection etc).
 - Details of any proposed Energy from Waste facility within the development and impacts and/or integration with waste management in the surrounding region.

15.3.3 The Study Area

- 15.3.3.1 In addition to the Site 1 Application itself, the study area would comprise Cherwell District (as CDC is the waste collection authority) and Berkshire, Buckinghamshire and Oxfordshire for CD&E waste (since data from CDC is not available). The study area would also comprise any waste facilities that would receive waste arising from the CD&E and operational phases of the development. Whilst the assessment would not include the operation of these facilities it would be necessary to ensure that the facilities have the capacity and capability to support the NW Bicester development deliver on its waste objectives and targets.

15.3.4 Methodology for Establishing Baseline Conditions

Establishing the Existing Baseline

- 15.3.4.1 For the purpose of this assessment, the baseline conditions include the current waste management infrastructure in Berkshire, Buckinghamshire and Oxfordshire and the performance in terms of the proportion of construction waste recycled to produce graded and ungraded aggregates and soil, used for engineering and capping and used on exempt sites.
- 15.3.4.2 Baseline conditions have been established through desk-top research, including the interrogation of key data bases such as Building Research Establishment (BRE) benchmarks and Environment Agency data tables.
- 15.3.4.3 For the purpose of this assessment, operational waste refers to residential and commercial waste arisings. The baseline conditions are the existing waste management system in Cherwell District, the quantities of waste and recyclables collected, and the performance in terms of the proportion recycled/composted.
- 15.3.4.4 Baseline conditions have been established through consultation with CDC Environmental Services, and desk-top research, including the interrogation WasteDataFlow (the web based system for municipal waste data reporting by UK local authorities to government).

Forecasting the Future Baseline (“Without Development” Scenario)

- 15.3.4.5 The future baseline (‘without development’ scenario) have been forecasted by qualitatively assessing the potential increases in waste generation within the region.
- 15.3.4.6 It is not possible to predict future changes to regulatory policy and frameworks so the future baseline has been forecasted assuming no significant change from current methodology. We do not envisage that any changes would materially affect the assessments made herein.

Defining the importance/sensitivity of resource

- 15.3.4.7 The assessment of effects from CD&E waste has focused on the potential direct impact of waste arisings on the existing local and regional waste management infrastructure. The waste management infrastructure is therefore the resource

or receptor on which impacts are assessed, and its importance / sensitivity is dependent on its capacity to absorb additional waste, using the criteria provided in Table 15-1 below.

Table 15-1 Determining the Importance / Sensitivity of Receptors

Importance/ sensitivity of receptor	Criteria
Very High	<p>Very high increase in waste generation compared to existing regional/local generation rates, resulting in the need for the expansion of regional collection or waste disposal sites and hindering the achievement of regional/local recycling/re-use targets. Waste volumes generated by the Scheme contribute to an excess of 5% of the total generation in the region*.</p> <p>No measures in place to mitigate the impact of waste generated by the Scheme.</p> <p>No regional waste capacity expected.</p>
High	<p>High increase in waste generation compared to existing regional/local generation rates, resulting in the need for the expansion of regional collection or waste disposal sites and hindering the achievement of regional/local recycling/re-use targets. Waste volumes generated by the Scheme contribute to an excess of 5% of the total generation in the region*.</p> <p>Limited measures in place to mitigate the impact of waste generated by the Scheme.</p> <p>Limited regional waste capacity expected.</p>
Medium	<p>Medium increase in waste generation compared to existing regional/local generation rates, resulting in the need for the expansion of regional collection or waste disposal sites and hindering the achievement of regional/local recycling/re-use targets. Waste volumes generated by the Scheme contribute to greater than 1% but less than 5% of the total generation in the region*.</p> <p>Limited measures in place to mitigate the impact of waste generated by the Scheme.</p> <p>Moderate regional waste capacity expected.</p>
Low	<p>Minimal increase in waste generation compared to existing regional/local generation rates, resulting in the need for the expansion of regional collection or waste disposal sites and hindering the achievement of regional/local recycling/re-use targets. Waste volumes generated by the Scheme are easily managed locally without significant increases in quantity (less than 1% of the total generation in the region*).</p> <p>Measures in place to mitigate the impact of waste generated by the Scheme.</p> <p>High regional waste capacity expected.</p>
Negligible	<p>Very minimal increase in waste generation compared to existing regional/local generation rates, resulting in the need for the expansion of regional collection or waste disposal sites and hindering the achievement of regional/local recycling/re-use targets.. Waste volumes generated by the Scheme are unlikely to require additional waste management measures beyond what are already present in the region.</p> <p>Measures in place to mitigate the impact of waste generated by the Scheme.</p> <p>Very high regional waste capacity expected.</p>

Source: Professional judgement

15.3.5 Methodology for Assessing Impacts

- 15.3.5.1 The assessment of effects from CD&E and operational waste has focused on the potential direct impact of waste arisings on the existing local, regional, and national waste management infrastructure.
- 15.3.5.2 At the current stage of outline design, the details (types, quantities, specifications, the construction methods and the suitability for re-use of excess site materials) are not known so it is not feasible to accurately determine the quantities of waste arisings during the construction and excavation phases. Therefore, benchmark information from the Building Research Establishment (BRE) has been used to forecast the waste arisings from the construction phase.
- 15.3.5.3 The amount of demolition to be carried out on-site and subsequent wastes arising from the demolition of the existent roads are considered to be minimal. Additionally, it is expected that these materials (concrete, surface and sub-base layers, soils and stones) would be able to be retained on-site for landscaping and base layers for new hard standing and roads.
- 15.3.5.4 The likely types and quantities of operational waste arisings are estimated in Section 15.5.2, using data provided by CDC and Industry benchmarks.
- 15.3.5.5 Likely volumes of CI waste have been calculated based on the most appropriate available data. Where applicable data compiled by WRAP (Ref 15-9), the British Standard 5906:2005 Waste Management in Buildings – Code of Practice (Ref 15-10) and DEFRA conversion factors (Ref 15-11) have been used as guidance to identify the potential waste arisings from the CI development.
- 15.3.5.6 A qualitative assessment has been carried out based on available knowledge and considers two impacts:
- The potential impact the Development could have on the region, in terms of waste generation
 - The impacts additional waste management measures can have on the waste generated (e.g. changes in legislative requirements, national strategy, regional waste targets, best practice).

Waste generation impact

- 15.3.5.7 The assessment classifies the impact the Development would have on waste generation in the region and the effect it has on the waste treatment facilities within the surrounding local authorities. The classification for this impact is shown in Table 15-2 below.

Table 15-2 Assessing Magnitude of Impact

Magnitude of Impact	Criteria
Major	Considerable impact (by duration and type and amount of materials used and waste generated that cannot be managed by the regional waste management infrastructure and requires transport outside of the region) of more than local significance in relation to relevant legislation, policy and/or standards.
Moderate	Limited impact (by duration and type and amount of materials used and waste generated that cannot be managed by the regional waste management infrastructure and requires transport outside of the region) of more than local significance in relation to relevant legislation, policy and/or standards.
Minor	Slight impact (by duration and type and amount of materials used and waste generated that cannot be managed by the regional waste management infrastructure and requires transport outside of the region) of more than local significance in relation to relevant legislation, policy and/or standards.
Negligible	Neutral change (by duration and type and amount of materials used and waste generated that cannot be managed by the regional waste management infrastructure and requires transport outside of the region) of more than local significance in relation to relevant legislation, policy and/or standards.
No Change	No change (by duration and type and amount of materials used and waste generated that cannot be managed by the regional waste management infrastructure and requires transport outside of the region) of more than local significance in relation to relevant legislation, policy and/or standards.

Source: Professional Judgement

15.3.5.8 The significance of impacts is then determined by the sensitivity of the receptor and the magnitude of the impact according to the matrix set below in Table 15-3 below:

Table 15-3 Significance of impacts

Magnitude of Impact	Sensitivity of the receptor				
	<i>Very High</i>	<i>High</i>	<i>Medium</i>	<i>Low</i>	<i>Negligible</i>
Major	Very Large	Large or Very Large	Moderate or Large	Slight or Moderate	Slight
Moderate	Large or Very Large	Moderate or Large	Moderate	Slight	Neutral or Slight
Minor	Moderate or Large	Slight or Moderate	Slight	Neutral or Slight	Neutral or Slight
Negligible	Slight	Slight	Neutral or Slight	Neutral or Slight	Neutral
No Change	Neutral	Neutral	Neutral	Neutral	Neutral

15.3.5.9 The significance of Impact is defined as shown in Table 15-4 below:

Table 15-4 Definition of significance of impacts

Significance	Definitions
Very Large	Significant change in environmental conditions. Impacts are likely to be of a very high magnitude and frequency and will impact on the existing strategy to deal with waste. Impact likely to be on a permanent basis
Large adverse	Considerable change in environmental conditions. Impacts are likely to be of a high magnitude and frequency and will have an effect on the existing strategy to deal with waste. Impact likely to be on a permanent basis
Moderate adverse	Noticeable increase in waste generation compared to existing regional/local generation volumes, resulting in the need for additional local disposal sites or transfer facilities and hindering the achievement of regional/local recycling/re-use targets. Impact likely to be on a permanent basis
Slight adverse	Barely perceptible increase in waste generation, compared to existing regional/local generation volumes, a minor decrease in local recycling/re-use rates and/or a noticeable increase in waste generation at a site level. Impact likely to be on a temporary basis
Neutral	No discernible effect on waste generation, disposal capacity and recycling/re-use targets.

15.3.6 Limitations and Assumptions

- 15.3.6.1 There are no published or formalised significance criteria relating to the assessment of waste impacts. Professional judgement has therefore, been drawn upon to assess the significance of the Development's environmental effects.
- 15.3.6.2 The assessment of impacts is carried out against waste baseline conditions. Forecast data for waste generation from the Development has been estimated based upon existing land use since actual waste generation data are not available. Assumptions have been made based upon the floor areas of the proposed units and the nature of existing uses that occupy them and are considered to provide a reliable basis for assessment of the conditions at the Development.
- 15.3.6.3 In the absence of suitable recycling and reuse rate data for CI waste in the region, current recycling and reuse rates for domestic properties in CDC have been used to forecast residual waste forecasts for CI premises. It is anticipated that commercial and industrial properties would be bound to meet and exceed existing domestic recycling and reuse rates.
- 15.3.6.4 The limitation above is considered unlikely to alter the overall results of this assessment.
- 15.3.6.5 The assessment has been based on data and information received from a number of external organisations and it has been assumed that the information is accurate.
- 15.3.6.6 The assessment of impacts assumes that the Development would be constructed as shown in the parameter plans and schedules accompanying the Application (Appendix 3A).

15.4 Description of the Baseline Conditions

15.4.1 Existing Baseline

CD&E waste

15.4.1.1 Berkshire, Buckinghamshire and Oxfordshire have an estimated total CD&E waste arisings of 4,233,432 tonnes (2005) (ReF 15-7). Of this total:

- 29% was recycled to produce graded and ungraded aggregates and soil (excluding topsoil) by the regions 25 recycling crushers;
- 41% entered licensed landfill sites (of this 28% was used for engineering and capping and 72% was waste); and
- 30% was used on exempt sites.

Operational waste

Waste management

15.4.1.2 Currently an alternating weekly collection system for the properties in the district is provided. In 2012 this represented 59,240 households. For households, residual waste is collected on one week and co-mingled dry recyclables and mixed organics are collected the following week.

Table 15-5 Waste collections for households (kerbside collection)

Waste stream	Waste type	Collection arrangements
Co-mingled dry recyclables	paper, tins and drink cans, cardboard, drinks cartons, tin foil and trays, magazines and newspapers, aerosols and plastic bottles and containers	Blue bins collected fortnightly with mixed organics
Mixed organics	food: waste cooked and uncooked, plants, leaves, grass cuttings, pet straw and sawdust, pruning waste and cut flowers	Brown bins collected fortnightly with co-mingled dry recyclables
Residual waste (i.e. anything cannot be recycled or composted)	disposable nappies, bin liners, plastic bags, polystyrene and cling film	Green bins Collected fortnightly
Batteries and small WEE	Batteries, toasters, hairdryers, kettles, irons, mobile phones and stereos	Kerbside collection weekly, placing the bag on one of the bins
Other	Glass, textiles, household, energy saving light bulbs and DVDs	Bring banks

Table 15-6 Waste collections for residents of flats (communal bin stores)

Waste stream	Waste type	Collection arrangements
Co-mingled dry recyclables	paper, tins and drink cans,	Blue bins

	cardboard, magazines and newspapers, aerosols and plastic bottles and containers	collected fortnightly with mixed organics
Mixed organics	food: waste cooked and uncooked, plants, leaves, grass cuttings, pet straw and sawdust, pruning waste and cut flowers	Brown bins collected fortnightly with co-mingled dry recyclables
Residual waste (i.e. anything cannot be recycled or composted)	disposable nappies, bin liners, plastic bags, polystyrene and cling film	Green bins Collected fortnightly
Glass	Glass bottles and jars	Black bins – on some developments only
Other	Batteries and small WEE, Textiles, DVDs and Glass (if black bins are not provided)	Bring banks

- 15.4.1.3 A chargeable bulky waste collections service is provided to all residents for items such as furniture and white goods.
- 15.4.1.4 Most dry recyclables are currently delivered to Enstone Community Waste Materials Recovery Facility (MRF) in West Oxfordshire (approximately 90%). The other 10% to Cheshire transfer station from where it is transferred to UPM MRF in Deeside.
- 15.4.1.5 CDC rolled out food collection services in October 2009, with everyone in the district being served by April 2010. The mixed garden waste and food waste goes to an in vessel composting facility (IVC) at Ardley (operated by Agrivert). This is in year three of a 15 year agreement.
- 15.4.1.6 Most residual waste goes to Ardley Landfill. Residual waste generated in the north of the district goes to Banbury Waste Transfer station and then to Calvert in Buckinghamshire.
- 15.4.1.7 In March 2011, Oxfordshire County Council awarded a 25 year contract for residual waste treatment to Viridor Oxfordshire Ltd. From 2014/15 all residual waste will be burnt to produce electricity at the new £200m energy from waste facility being built at Ardley in north Oxfordshire which will:
- have capacity to treat 300,000 tonnes of waste per year – sufficient to treat all of Oxfordshire’s residual municipal waste; and
 - divert at least 95% of Oxfordshire’s residual municipal waste from landfill.

Waste Statistics

- 15.4.1.8 WasteDataFlow is the web based system for municipal waste data reporting by UK local authorities to government. This resource has been interrogated to determine the current Cherwell baseline in terms of Household Waste, Residual Waste and Recycling Rates.

Table 15-7 CDC waste arisings data and recycling rates

Metric	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13
Total HH waste (t)	59,130	59,205	58,604	57,598	57,255	57,018	57,378
Residual waste per household (kg)	572.4	537.94	509.36	480.46	418.18	412.99	439.32
Total residual HH waste (t)	32,741	31,106	29,502	28,018	24,329	24,367	26,078
Total recycling %	44.63%	47.46%	49.66%	51.36%	57.49%	57.26%	54.55%

Source: WasteDataFlow

15.4.1.9 From the table above, you can see that CDC achieved a recycling rate of 54.55% in 2012/13. This performance is compared against regional and national performance in the table below. From this it is clear that CDC recycling rates are well above the England average.

Table 15-8 Recycling rates

Metric	2008/09	2011/12	2012/13
CDC	50%	*57%	**54.5%
Oxfordshire	42%	59%	60%
England	38%	42%	45%

Source: WasteDataFlow

Note

*During this period both dry recycling and organic recycling saw no significant change. Dry recycling rates decreased marginally by 0.45% whilst organic recycling increased marginally by 0.24%.

**For these two quarters of 2012/13, dry recycling decreased by 1% to 24% whilst organic recycling decreased by 2% to 30%.

15.4.2 Future Baseline

15.4.2.1 The Future Waste Arisings in the Oxfordshire Minerals and Waste Development Framework (2012) predicted the increases in waste generation within Oxfordshire:

- HH waste arisings are predicted to rise from 325,100 tonnes in 2015 to 337,900 tonnes in 2021 (4% increase), 351,700 in 2025 (8% increase) and 366,000 in 2030 (13% increase);
- C&I waste are predicted to rise from 584,900 tonnes in 2015 and 2020 to 603,500 tonnes in 2020 (3% increase), 622,800 in 2025 (6% increase) and 642,600 in 2030 (10% increase); and
- CD&E waste is predicted to 1,300,000 from 2020 until 2030 (0% increase).

- 15.4.2.2 The previous figures accounts for future changes arising from developments in the region, included currently consented developments (listed in Table 3-3 of the ES)
- 15.4.2.3 In the event that the Development does not go ahead, the management of waste on-site is likely to continue in the same way as currently, and thus opportunities for the improvement of waste storage facilities and waste management the Proposed Development would not be realised.

15.5 Design and Mitigation

15.5.1 Construction Demolition and Excavation waste

- 15.5.1.1 The potential waste types that could arise during the excavation and construction phases are summarised in Table 15-9 below.

Table 15-9 Potential waste sources during site construction

Construction phase	Potential wastes produced	Classification of waste
Excavation	Made ground, sand, gravel, clay, soil and sub-soils and landfill materials such as ash, glass, brick and pottery.	Inert; and /or Non hazardous. Potentially hazardous if it contains sufficiently high levels of heavy metals.
Construction and demolition	Construction materials, such as concrete, bricks, ceramics, plastics, metals, plasterboard, timber, insulation, packaging, cement and plaster etc. Made ground, soil and sub-soils.	Inert; and / or, Non hazardous; and / or, Hazardous. Non hazardous, and hazardous if it contains sufficiently high levels of heavy metals.

Excavation waste

- 15.5.1.2 At the time of writing, the foundation and building designs had not been carried out and so it was not possible to accurately estimate the volume of waste arising from the excavations. The geology identified at the site indicates that shallow spread foundations may be suitable for all anticipated low-load structures; therefore, the generation of spoil is expected to be minimal.
- 15.5.1.3 A Materials Management Plan would be produced detailing the strategy for re-use of soils within the Development. This would follow the approach within the CL:AIRE Development Industry Code of Practice.
- 15.5.1.4 The sustainable re-use of the soil affected by the proposals would also be undertaken in line with the Construction Code of Practice for the Sustainable Use of Soil on Construction Sites. This would be achieved by the development of a Soil Resources Plan (SRP) identifying the soils present, proposed storage locations, handling methods and locations for re-use where possible. Measures which would be implemented have been detailed in Chapter 12: Agricultural and Land Use.

15.5.1.5 It is anticipated that any spoil generated may be re-used on-site for landscaping or other purposes, therefore it is expected that only minimal volumes of material may require disposal off-site.

15.5.1.6 As detailed in the Contaminated Land section of this report, initial ground investigations consider the risks posed to human health from contaminants in the Application 1 area are considered to be low.

Demolition waste

15.5.1.7 The Site is largely undeveloped land. There is a very limited amount of road's removal occurring on-site. It is anticipated that only a small amount of materials would need to be considered for incorporation into the construction phase of the project.

Construction waste

15.5.1.8 The amount of waste produced during the construction phase would be affected by the types and methods of construction. At the time of writing, the types and methods of construction had not been decided and so it was not possible to accurately estimate the volume of waste arising from the construction.

15.5.1.9 Using waste benchmarking data from the Buildings Research Establishment (BRE, May 2012) the amount of construction waste for the buildings has been forecasted. The forecasts are shown in Table 15-10 below:

Table 15-10 Forecasted construction waste arisings from buildings

Construction Type	Average waste (m ³ /100m ²)	Development size (m ²)	Forecasted waste arising (m ³)	Average waste (tonnes/100 m ²) (BRE benchmarks)	Forecasted waste arising (tonnes)*
Housing (including extra care)	15.279	236,471	36,130	8.22	19,448.08
Primary School	13.302	14,700	1,955	5.58	820.6
B1 office in hubs	20.137	3,500	705	11.68	408.65
A2 Business e.g. dentist in hubs	15.315	360	55	9.08	32.69
B2 business in hubs	20.137	886	178	11.68	103.39
Retail in hubs	15.315	1,250	191	9.08	113.51
Nursery in hubs	13.302	500	677	5.58	27.91
Community hall in hub	13.758	1,271	175	4.24	53.83
Community	13.758	748	103	4.24	31.66

rooms					
Energy centre	16.2	400	65	6.09	24.36
Total					21,064.71

15.5.1.10 The composition of construction waste arisings from buildings is likely to be similar to that shown in Table 15-11 below:

Table 15-11 Key construction materials waste streams on typical new build

Waste material	Wastage percentage
Packaging (including wood pallets, plastic, cardboard, tins)	25 – 35
Plasterboard	5 – 36
Rubble (including broken bricks, blocks, tiles)	35 – 40
Timber (excluding pallets)	15 – 25
Cement and plaster	10 – 17
Insulation	6 – 15
Metal	3 – 9
Dry concrete products – blocks, slabs, etc.	2 – 12
Plastic products (excluding packaging)	1 -11
Ceramic material	1 - 8

Source: WRAP NetWaste

Table 15-12 Forecast of construction waste by waste stream

Waste stream	Forecasted waste arising (tonnes)
Canteen/ Office/ ad-hoc	954.84
Ceramics/Bricks	4,396.39
Concrete	6,281.59
Electrical Equipment	105.58
Furniture	39.04
Mixed Hazardous - C&D waste (17 09 03*)	124.95
Inert - mixture of concrete, bricks, tiles etc.	2,451.64
Insulation	682.53
Segregated Haz Waste (Liquids and Oils)	103.50
Metals	680.60
Packaging	1,429.94
Gypsum (17 08 02)	1,590.13
Plastics	598.58

Wood	1,625.39
Total	21,064.71

15.5.1.11 The volume of waste arising from construction would depend on how the site is managed and the implementation of the SWMP

Construction Demolition and Excavation Waste Management Measures

Produce a Site Waste Management Plan (SWMP)

15.5.1.12 A Preliminary SWMP for the Site is being submitted (Appendix 15A). This forecasts the type and quantity of waste that has been produced on the Site and sets out how waste would be managed so that it is re-used, recycled, or disposed of appropriately. The SWMP is a live document and would be updated during the duration of the project by the Client and the Principal Contractor to record the movements of waste, how it was managed and to encourage better waste management practices.

Waste generated by the excavation works

15.5.1.13 The alignment, location, level and grading of the Site development has been designed to minimise excavation volumes. It has also been designed to enable flexibility in the landscaping, so that it can accommodate the changes in spoil volumes that may arise when site conditions differ from those assumed during the design. Both these approaches should enable all excavation waste (except where contaminated) to be re-used on-site where conditions allow.

Managing wastes on-site

15.5.1.14 To reduce waste production during the construction phase the project would employ modern methods of construction such as prefabrication of units and products off-site as described by WRAP (Ref 15-8).

15.5.1.15 As part of the SWMP the Principal Contractor would have to monitor waste arisings and management practices. Auditing and measurement would enable more effective management of waste through the setting of performance targets for recycling and segregation and monitoring subcontractors on all the sites.

15.5.1.16 The phasing of the Development allows the opportunity for the construction and excavation wastes to be re-used or recycled on-site in subsequent stages of the development. The SWMP would ensure such opportunities are maximised as the preferred option for dealing with waste arising from the site.

15.5.2 Operation

Municipal household waste

- 15.5.2.1 The residential component of the Development would comprise of approximately 2,600 residential units. Likely volumes of Municipal (MH) wastes arising from the Development would be estimated to identify available options for recycling, reuse, treatment or disposal.
- 15.5.2.2 The types of waste that would arise during operation are summarised in Table 15-13 below.

Table 15-13 Types of waste generated during site operation

Waste stream	Constituents	Recyclable / reusable / non recyclable
Mixed	Food waste cooked and uncooked, prunings, pet straw and sawdust, grass cuttings, plants	Recyclable
Dry recyclables	Food tins and drinks cans, plastic bottles and containers, newspapers, directories and magazines, paper and card and aerosol cans	Recyclable
Glass	All colours of glass jars and bottles	Recyclable
Bulky	Furniture, white goods	Recyclable / non recyclable
Textiles	Clothes and small pieces of material	Recyclable
Residual	Any of the above that has not been separated for recycling. Non recyclable food packaging, plastic film, disposable nappies	Recyclable / non recyclable

- 15.5.2.3 Based on recent WasteDataFlow returns, it is estimated that approximately 2,412 tonnes of MH waste would be generated during operation of the site per annum. This figure doesn't take into account of any proposed recycling or composting. If current recycling rates (55% 2012/13) for Cherwell are applied to this figure then an annual residual waste level of **1,097 tonnes** of waste is projected. Current waste production levels and subsequent residual waste levels are-used to present a worst case scenario of no improvement in both of these areas.

15.5.2.4 Likely compositions of MH waste is set out in Table 15-14 below:

Table 15-14 Key operational materials waste streams based on WasteDataFlow returns

Waste material	Wastage rate (%)	Forecast residual waste arisings (tonnes/year)
Organic	33%	350.99
Paper / card	30%	152.25
Glass	37%	66.94
Metals	63%	46.67
Plastics	67%	142.57
Textiles	84%	63.33
Wood	100%	27.66
Other	98%	232.54
Bulky	100%	13.59
TOTAL	45%	1,096.54

Commercial and Industrial (CI) waste

15.5.2.5 At this stage, it is estimated that the Development could potentially generate around 4,614 of CI waste per annum (around 89 tonnes per week). The quantities of CI waste arisings from buildings is likely to be similar to that shown in Table 15-15 below.

Table 15-15 Estimated annual waste arisings from CI uses

Building type	Equation for waste arising	Development size (m2)	Forecast residual waste arisings (tonnes/year)
Primary school	44.95 kg/waste per pupil per year	14,700	1,176.51
B 1 office in hubs	50 litres per employees per week	3,500	225.23
A2 Business eg dentist in hubs	10 litres per m2 per week	360	50.54
B2 business in hubs	10 litres per m2 per week	886	124.32
Retail in hubs	10 litres per m2 per week	1,250	175.50
Nursery in hubs	44.95 kg/waste per pupil per year	500	0.33
Community hall in hub	100 litres per m2 per week	1,271	1,784.13
Community rooms	100 litres per m2 per week	748	1,049.49
Energy centre	5 litres per m2 per week	400	28.08

TOTAL	4,614.14
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15.5.2.6 The calculation and composition of CI waste generation is only indicative and should be further refined at a later design stage when the specific elements have been confirmed. This would enable the expected number and type of waste containers, the storage requirements and their collection frequencies to be defined.

Scheme Design and Mitigation of Permanent Operational Effects

15.5.2.7 A number of waste management measures would be put in place to minimise the impacts of operational waste. These are outlined in below Table 15-16 below:

Table 15-16 Mitigation Measures

Impact	Mitigation Measure	Comment
Increased generation of waste	Extend the CDC recycling and waste collection system to the development.	The recycling and waste collection system provided by CDC achieves a high recycling performance. This successful system would be extended to the development to utilise existing waste infrastructure and a proven system to increase recycling and reduce waste. The system comprises an alternate weekly collection for co-mingled recyclables, mixed food and garden waste, and residual waste
	Initial recycling/composting target of 70%	This is the target set out in the SWRP as a requirement under PPS1, and has been set in conjunction with the 'Energy, Water and Waste Workstream' working group, having been taken into consideration during the planning application.
	Initial residual waste level target of 300kg/household	This is also set out in the SWRP as requirement under PPS1.

15.5.2.8 In addition to the mitigation measures above there are number of alternative initiatives that would be undertaken in the future, although no specific provision has been made within the Site at present.

- Community re-use centre (Bicester Green) - Compliant with the first two tiers of the waste hierarchy (prevention and preparing for re-use), the centre is an independent social exercise. Currently the centre's main activities are repair and refurbishment of items, such as small electricals, wooden furniture and bicycles.
- Community composting project - compliant with the third tier of the waste hierarchy (recycling) a community composting project could possibly be established.
- Public Incentives Scheme - a scheme could be implemented to incentivise participation in recycling including performance based charging schemes.

15.6 Construction Impacts

- 15.6.1.1 Table 15-17 below summarises the potential impacts and the significance of the effects of waste arisings from the development prior to mitigation. The assessment is based on the following assumptions:
- Current landfill capacity in Berkshire is 938,000 tonnes, in Buckinghamshire 1,683,000 and in Oxfordshire is 1,173,000 and the current landfill capacity is projected to be reduced to 72% by 2024. Therefore the sensitivity of the receptor is assessed to be Low for construction and demolition because the local and/or regional environment has manageable capacity for potential waste impacts.
 - Waste arising from earthworks can be used as landfill capping or re-used on-site; therefore the sensitivity of the receptor is assessed to be Low for waste arising from earthworks because the site, local and/or regional environment has manageable capacity for potential waste impacts.
- 15.6.1.2 During the construction period there are two key phases of development which could result in impacts upon the waste generation and capacity of the local waste management infrastructure to accommodate this material. These are the excavation phase and the construction and demolition phase.
- The timescale of the construction phase is a long term activity (25 years). However, the magnitude of the impact is assessed to be Minor for construction and demolition waste. This would require mitigation to prevent an adverse impact on the Scheme and local targets, as well as waste management capacity.
 - The timescale for excavation is a medium term activity. The magnitude of the impact for earthworks is assessed as Negligible due to the volume of excavated material that would be re-used on-site, and therefore earthworks would not generate a significant amount of spoil requiring off-site disposal.
- 15.6.1.3 Recycling all inert and non hazardous waste on-site and implementing the SWMP (Appendix 15A) would ensure that impacts of construction and demolition waste are minimised. The significance of effect on the Oxfordshire waste management infrastructure following mitigation is likely to be **Neutral or Slight Adverse**.
- 15.6.1.4 The alignment, location, level and grading of the development has been designed to minimise excavation volumes. It has also been designed to enable flexibility in the landscaping, so that it can accommodate the changes in spoil volumes that may arise when site conditions differ from those assumed during the design. Both these approaches should enable all excavation waste (except where contaminated) to be re-used on-site where conditions allow. The excavation works would result in no significant effects following implementation of these approaches, thereby resulting in a **Neutral** impact.
- 15.6.1.5 The residual significance of effects following mitigation are shown in Table 15-17 below:

Table 15-17 Significance of Impacts (Construction)

Development phase	Mitigation	Significance of effects
Construction and Demolition	No waste sent to landfill except where landfill is the least environmentally damaging option, as detailed in the SWRP and PPS: Eco-Towns – A supplement to PPS1 Waste to be managed through the development SWMP (Appendix 15A) Waste to be monitored and audited	Neutral or Slight Adverse
Excavation	Excavation volumes minimised through design All excavation materials to be re-used on-site	Neutral

15.6.1.6 As detailed above assuming that the mitigation measures are adopted during the construction phase, the impact significance has been assessed as **temporary slight adverse** for identified receptors.

15.7 Permanent Operational Impacts

15.7.1.1 Prior to any of the mitigation measures identified in Section 15.5.2, waste arisings from the Development would contribute an additional 7,027 tonnes per annum of MH and commercial and industrial waste and recyclables. Of this 7,027 tonnes, 2,412 tonnes (34.3%) are forecast to relate to domestic use. Note: this would be in addition to the estimated 59,000 tonnes per annum of domestic waste already being generated by CDC.

15.7.1.2 Impacts of waste generated in the operational phase of the Development would be long-term effects. The assessment anticipates a significant volume of residual waste generated from the Development (**3,194 tonnes**) would be diverted away from landfill thereby resulting in low impact on this receptor.

15.7.1.3 The Development is likely to produce an increase of MH residual waste in CDC. At a local/regional level, however, the increase in household waste generated by the Development is considered to have a moderate impact as the increase would represent a small proportion of the estimated MH residual waste arisings within CDC in 2012/13 (approximately 4.23%). In addition to this, the implementation of the mitigation measures detailed in the table below would result in a **Slight Adverse** significance of impact.

15.7.1.4 The significance of effects following mitigation is shown in Table 15-18 below:

Table 15-18 Significance of Impacts (Operation)

Development phase	Mitigation	Significance of impact
Operation	Implementation of SWRP, and specifically: <ul style="list-style-type: none"> ▪ Extend the CDC recycling and waste collection system to the development ▪ An initial recycling/composting target of 70% 	Slight Adverse

	<ul style="list-style-type: none"> ▪ Initial residual waste level target of 300kg/household ▪ Establish a community composting project 	
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15.8 Cumulative Impacts

15.8.1.1 Whilst some information and quantitative data are available for the planned and consented schemes included in Table 17-1 and Table 17-2, it has not been possible to undertake a meaningful quantitative assessment of their potential impacts with regard to waste for the following reasons: Demolition and excavation waste:

- Quantitative data are either not available on likely volumes of waste to be generated, or data needed to calculate likely volumes are not available
- Construction waste: neither quantitative data and detailed enough schedules available on the construction activities proposed
- Operational waste: Area/accommodation schedules for all other proposed developments are available with some degree of detail, however data is not available to allow assessment of the current baseline situation for these developments such that the net change is unknown and not possible to estimate.

15.8.1.2 The above comprise inherent constraints to accurately predicting the waste arisings from these schemes. However it is considered that all of the planned and consented schemes would be developed in line with the same policy requirements as the Development including the requirements for maximising re-use and recycling of demolition, excavation and construction waste through a SWMP and the meeting of targets for recycling and composting waste. Accordingly whilst there may be an overall increase in the quantity of waste arising, it would be managed in such a way that there would be a positive contribution to sustainable waste management.

15.8.1.3 All the planned and consented schemes in Tables 17-1 and Table 17-2 would generate waste. It is reasonable to assume that they would need to comply with local and regional policy in addition to legislation. Therefore through mitigation of other schemes, and the proposals set out in this chapter it is reasonable to conclude that there would be no cumulative impacts.

15.8.1.4 Given the current and predicted waste production levels within Oxfordshire, it is reasonable to anticipate that the region would have suitable capacity to effectively manage the wastes associated with their construction and operation. It is reasonable to conclude that other schemes would effectively mitigate the impact of their waste arisings and the outcome of any waste assessment would be similar to that of this assessment.

15.9 Summary

15.9.1.1 The waste assessment has considered the potential impacts resulting from waste production and management associated with the works in the construction, demolition and excavation (CD&E) and operational phases of the Development.

- 15.9.1.2 A desk study has been undertaken to establish the national, regional and local policy context with respect to waste management in the region. The desk study has also established existing waste capacity and management within the study area. The framework for the assessment of CD&E and operational waste is derived from a combination of national, regional and local waste and policies combined with expert judgement.
- 15.9.1.3 BRE benchmarks, Waste and Resources Action Programme (WRAP) sources, Waste DataFlow data and BS5906:2005 have been used to predict the likely waste generation from the Development during CD&E and operation phases.
- 15.9.1.4 It is forecast that the construction phase of the Development would result in 21,065 tonnes of waste being produced over the total construction period. At the time of writing, the foundation and building designs had not been carried out and so it was not possible to accurately estimate the volume of waste arising from the excavations. However, the alignment, location, level and grading of the Site development has been designed to minimise excavation volumes. All excavation waste (except where contaminated) is expected to be re-used on-site where conditions allow.
- 15.9.1.5 The implementation of a SWMP and good site and specification practices would facilitate the minimisation, re-use and recycling of waste to avoid unnecessary landfilling during the CD&E phases. It is therefore considered that the Development would accord with the principles of the waste hierarchy and would minimise the impacts on waste disposal facilities. Taking into consideration the mitigation measures proposed, the impact significance for construction and demolition waste has been assessed to be **Neutral or Slight Adverse** for identified receptors.
- 15.9.1.6 Taking into consideration the mitigation measures proposed, the impact significance for excavation waste has been assessed to be **Neutral** impacts for identified receptors.
- 15.9.1.7 Operational waste production would impact the capacity of the existing waste management infrastructure and waste disposal facilities to manage the wastes likely to arise from the development. It is forecast that during the operational phase of the Development 3,194 tonnes of residual waste per annum would be produced. Taking into consideration the mitigation measures proposed, the impact significance for operational waste has been assessed to be **Slight Adverse** for identified receptors.

Table 15-19 Chapter topic Impact Summary Table

Impact description	Temporary/Permanent	Significance rating
Construction and demolition waste impact on waste management infrastructure	Permanent	Neutral or Slight Adverse
Excavation waste impact on waste management infrastructure	Temporary	Neutral
Operational Construction waste impact on waste management infrastructure	Permanent	Slight Adverse

16 Transport

16.1 Introduction

- 16.1.1.1 This chapter considers the potential impacts of traffic and transport associated with the Application 1 (North of Railway) Development and the predicted associated impacts on sensitive receptors in the area.
- 16.1.1.2 The chapter follows the assessment methodology set out in the document entitled, “Guidelines for the Environmental Assessment of Road Traffic” (Ref 16-1) (published by the Institute of Environmental Assessment (IEA) in 1994. The IEA is now known as the Institute of Environmental Management and Assessment (IEMA), so this document will be referred to as the ‘IEMA Guidelines’ throughout the remainder of this chapter.

16.2 Regulatory and Policy Framework

- 16.2.1.1 This impact assessment has been undertaken in accordance with current legislation, national and local plans and policies. Outlined below are those elements of current legislation, policy and guidance relevant to transport in the context of the Development. A summary of the relevant legislation and policies, the requirements of these policies and the NW Bicester response is provided in Table 16-1 below.

16.2.2 Best Practice Guidance

- 16.2.2.1 In addition to the legislation/policies identified in Table 16-1, two additional documents are relevant to the Development being considered:
- In April 2008 the Department for Transport published, ‘Building Sustainable Travel into New Developments: A Menu of Options for Growth Points and Eco-towns.’ (Ref 16-2)
 - Communities and Local Government produced a, ‘Design to Delivery: Eco-towns Transport Worksheet Advice to Promoters and Planners’ in March 2008 (Ref 16-3). This supplements the Department for Transport guidance stated above providing a menu of options, concentrating primarily on outcomes and a route map.

Table 16-1 Traffic and Transport Legislation and Policy Framework

Policy/Legislation	Summary of Requirements	Development Response
<p>National Planning Policy Framework (NPPF) (2012)</p>	<p>The National Planning Policy Framework (NPPF) (2012) streamlines national planning policy.</p> <p>The NPPF sets out 12 core planning principles that should underpin decision taking. The principle which relates to transport planning, and in the turn the Development is:</p> <ul style="list-style-type: none"> • Actively manage patterns of growth to make the fullest possible use of public transport, walking and cycling and focus significant development in locations which are or can be made sustainable. <p>Chapter 4 'Promoting sustainable transport' and specifically Paragraph 29 states that 'the transport system needs to be balanced in favour of sustainable transport modes, giving people a real choice about how they travel.'</p> <p>Paragraph 32 states that 'decisions should take account of whether:</p> <ul style="list-style-type: none"> • The opportunities for sustainable transport modes have been taken up depending on the nature and location of the site, to reduce the need for major transport infrastructure; • Safe and suitable access to the site can be achieved for all people; and • Improvements can be undertaken within the transport network that cost effectively limit the significant impacts of the development. Development should only be prevented or refused on transport grounds where the residual cumulative impacts of development are severe.' <p>Paragraph 34 states that 'decisions should ensure developments that generate significant movement are located where the need to travel will be minimised and the use of sustainable transport modes can be maximised.'</p> <p>Paragraph 35 states that 'developments should be located and designed where practical to:</p> <ul style="list-style-type: none"> • Accommodate the efficient delivery of goods and supplies; • Give priority to pedestrian and cycle 	<p>The Development includes an access and travel strategy in the Transport Assessment (TA) which sets out how high targets will be achieved for sustainable modes including high quality infrastructure and travel plan measures.</p> <p>The accessibility of the Development is reviewed in detail in the TA showing how walking, cycling and buses offer realistic alternatives to the car.</p> <p>The impacts of the Development are fully assessed to demonstrate how the impacts can be accommodated.</p> <p>The location of the Development as an extension to Bicester provides the opportunity to offer good accessibility and a range of transport options.</p>

Policy/Legislation	Summary of Requirements	Development Response
	<p>movements, and have access to high quality public transport facilities;</p> <ul style="list-style-type: none"> • Create safe and secure layouts which minimise conflicts between traffic and cyclists or pedestrian, avoiding street clutter and where appropriate establishing home zones; • Incorporate facilities for charging plug-in and other ultra-low emission vehicles; and • Consider the needs of people with disabilities by all modes of transport.' <p>Finally, Paragraph 38 states that for larger scale residential developments in particular 'key facilities such as primary schools and local shops should be located within walking distance of most properties.'</p>	
<p>'A Supplement to Planning Policy Statement 1 - Eco-towns'</p>	<p>'A Supplement to Planning Policy Statement 1 - Eco-towns' was published by Communities and Local Government (C&LG) in 2009. Although Planning Policy Statement 1 was superseded by the NPPF upon its publication in 2012, the Eco-towns supplement is extant. This document was prepared with the intention that Eco-towns were considered as exemplar projects to achieve greener and low carbon developments.</p> <p>Section ET11 commencing on page 8 sets out the requirements with respect to transport. For convenience this has been reproduced below.</p> <p>"ET11.1 Travel in eco-towns should support people's desire for mobility whilst achieving the goal of low carbon living. The town should be designed so that access to it and through it gives priority to options such as walking, cycling, public transport and other sustainable options, thereby reducing residents' reliance on private cars, including techniques such as filtered permeability. To achieve this, homes should be within ten minutes' walk of (a) frequent public transport and (b) neighbourhood services. The provision of services within the eco-town may be co-located to reduce the need for individuals to travel by private car and encourage the efficient use of the sustainable transport options available.</p> <p>ET11.2 Planning applications should</p>	<p>The Development includes an access and travel strategy in the Transport Assessment (TA) which sets out how the PPS1 targets will be achieved for sustainable modes including high quality infrastructure and travel plan measures.</p> <p>In summary the targets are met in the following way:</p> <p>Creating a highly permeable network of walking and cycling routes across the Development and a bus route on the primary route. The large majority of housing plots are within a 400m, 5 minutes walking distance and there are some plots towards the NW edge of the development and close to the Exemplar phase that are between 600- 800m away. Thus all homes are within a 10 minutes' walk of a bus service. All of the housing plots are with 800m or a ten-minute walk of the Home Farm local centre, the small local shop located in the centre of the development and the facilities co-located with the extra care village;</p> <p>A frequent bus service of</p>

Policy/Legislation	Summary of Requirements	Development Response
	<p>include travel plans which demonstrate:</p> <ul style="list-style-type: none"> (a) How the town's design will enable at least 50 per cent of trips originating in eco-towns to be made by non-car means, with the potential for this to increase over time to at least 60 per cent (b) Good design principles, drawing from Manual for Streets, Building for Life, and community travel planning principles (c) How transport choice messages, infrastructure and services will be provided from 'day one' of residential occupation, and (d) How the carbon impact of transport in the eco-town will be monitored, as part of embedding a long term low-carbon approach to travel within plans for community governance. <p>ET11.3 Where an eco-town is close to an existing higher order settlement, planning applications should demonstrate:</p> <ul style="list-style-type: none"> (a) Options for ensuring the key connections around the eco-town do not become congested as a result of the development, for example by extending some aspects of the travel plan beyond the immediate boundaries of the town, and (b) Significantly more ambitious targets for modal share than the 50 per cent (increasing to 60 per cent over time) mentioned above and for the use of sustainable transport. <p>ET11.4 Where eco-town plans intend to incorporate ultra-low carbon vehicle options, including electric car schemes to help achieve a sustainable transport system, planning applications should demonstrate that:</p> <ul style="list-style-type: none"> (c) There will be sufficient energy headroom to meet the higher demand for electricity, and (d) The scheme will not add so many additional private cars to the local road network that these will cause congestion. <p>ET11.5 Eco-towns should be designed in a way that supports children</p>	<p>every 15 minutes is proposed to serve the development rising to every 10 minutes subject to viability;</p> <p>A Framework Travel Plan accompanies the application, demonstrating how the design will achieve the 50% mode share by non-car modes, how transport choices and infrastructure will be provided from the outset and how the carbon impact will be monitored;</p> <p>A traffic impact assessment and ES chapter on traffic and transport provides an assessment of where there will be congestion impacts and what mitigation is required as a result of the development and measures will be agreed with OCC and the Highways Agency;</p> <p>It is acknowledged that the standards seek to achieve a higher target of 60% non-car modes for Eco towns where they are adjacent to a higher order settlement. The targets set for NW Bicester seek to achieve the 50% non-car as a minimum, but it also needs to be recognised that the town of Bicester currently has high car use given its location close to the strategic motorway network and therefore achieving 50% already represents a substantial shift in travel towards non-car modes.</p> <p>Measures to support electric/ low carbon vehicles are proposed in the Framework Travel Plan including provision of charging points for any residents who request them, free electricity for charging electric vehicles and special deals to purchase electric cars</p>

Policy/Legislation	Summary of Requirements	Development Response
	<p>walking or cycling to school safely and easily. There should be a maximum walking distance of 800m from homes to the nearest school for children aged under 11, except where this is not a viable option due to natural water features or other physical landscape restrictions.”</p>	<p>and scooters.</p> <p>The primary school has been located so as to maximise the potential for walking and cycling. All houses are within 800m as the crow flies to either of the primary schools on the eastern side of the masterplan. The small areas that may be outside are likely to be low in density and thus impact on few households.</p>
<p>DfT Circular 02/13 (Ref 16-4)</p>	<p>DfT Circular 02/13 sets out the way in which the Highways Agency will engage communities and the development industry to deliver sustainable development and, thus, economic growth, whilst safeguarding the primary function and purpose of the strategic road network. In relation to environmental impact, developers must ensure all environmental implications associated with their proposals, are adequately assessed and reported so as to ensure that the mitigation of any impact is compliant with prevailing policies and standards. It states that where a likely negative impact on the environment resulting from the proposals occurs outside of a highway boundary as a result of the proposals (for example air quality, visual impacts, artificial light or noise impacts at new housing affected by a road); any required mitigation measures must be located outside of the strategic road network's highway boundary.</p> <p>The Circular requires developers to ensure adequate environmental information is provided at all stages of the planning process to satisfy the local planning authority and any other consenting authorities that the environmental impacts have been appropriately considered, that measures have been included within the proposals as required by relevant policies or otherwise, as fully as is reasonably possible, and to enable all residual impacts to be taken into account by the local planning authority in the development consent process.</p>	<p>The Development includes an access and travel strategy in the Transport Assessment (TA) which sets out how high targets will be achieved for sustainable modes including high quality infrastructure and travel plan measures.</p> <p>The accessibility of the Development is reviewed in detail in the TA showing how walking, cycling and buses offer realistic alternatives to the car.</p> <p>The impacts of the Development are fully assessed to demonstrate how the impacts can be accommodated.</p> <p>The location of the Development as an extension to Bicester provides the opportunity to offer good accessibility and a range of transport options.</p>
<p>Local Transport Plan</p>	<p>The recent revision of the chapter relating</p>	<p>The Development will</p>

Policy/Legislation	Summary of Requirements	Development Response
<p>3 – Oxfordshire County Council (OCC) Chapter 16 Bicester (Ref 16-5)</p>	<p>to Bicester sets out the County’s approach to transport in the town.</p> <p>The priority for Bicester is set out as being to provide the transport infrastructure which supports the aspirations set out in the <i>Local Plan</i> and the initiatives for their implementation in the forthcoming <i>Bicester and North West Bicester Eco-Town Masterplans</i>. This includes tackling the challenges identified in the <i>Bicester Movement Study</i> and those specific to Central Government standards for transport in Eco Towns. This will enable the town to thrive and realise its full growth potential, and its essential role in Oxfordshire’s economy.</p> <p>The strategy identifies a series of improvements to increase the overall capacity of transport networks and systems within the locality, enabling them to accommodate the additional trips generated by development; to adapt to their cumulative impact and to mitigate the local environmental impact of increased travel.</p> <p>It is established that where schemes are needed to mitigate one particular development, the developer will be expected to either construct or provide funding for the scheme; where a scheme is required due to the impact of more than one development, each developer will be expected to make a contribution proportional to the scale of their impact. Additional funding may also be sought via the Local Transport Board to the Local Growth Fund and other sources. It is noted that Oxfordshire County Council are working towards a strategic transport contribution rate for developer funding, which will be adopted in a future update of this strategy.</p>	<p>contribute to the growth of the town and provide new transport infrastructure to support the Development as well as bring wider benefits.</p> <p>Mitigation of transport impacts has been considered in areas of the town corresponding to those identified in the detailed policies and proposals by OCC, thus the Development will be helping to fulfil the aims and policies of the LTP.</p>
<p>Oxfordshire Parking Policy (2009)</p>	<p>Oxfordshire Parking Policy was published on 9th November 2009. This document has been prepared in accordance with the requirements of all local authorities in the county including Cherwell District Council.</p>	<p>The parking policy for the site is established in the TA and seeks to be under the maximum standards for</p>

Policy/Legislation	Summary of Requirements	Development Response
	This data is also included within the 'Residential Road Design Guide', which forms the basis of site layout, priority of modal movement, and infrastructure.	provision.

16.3 Methodology

16.3.1 General Approach

16.3.1.1 This chapter has been prepared using the assessment methodology set out in IEMA Guidelines. This chapter should be read in combination with the Transport Assessment and Framework Travel Plan submitted separately with this application, together with the overarching Access and Travel Strategy forming part of the NW Bicester Masterplan submission. Where appropriate cross-references will be made to these documents and a summary of the relevant sections of these documents reproduced in this chapter for convenience.

16.3.2 Consultation

16.3.2.1 Table 16-2 summarises the consultations held in relation to traffic and transport issues. Consultation has been on-going throughout the development of the Masterplan and to inform the Development, but the dates are given for the formal Transport Workstream meetings.

Table 16-2 Summary of Consultations held in respect of Traffic and Transport

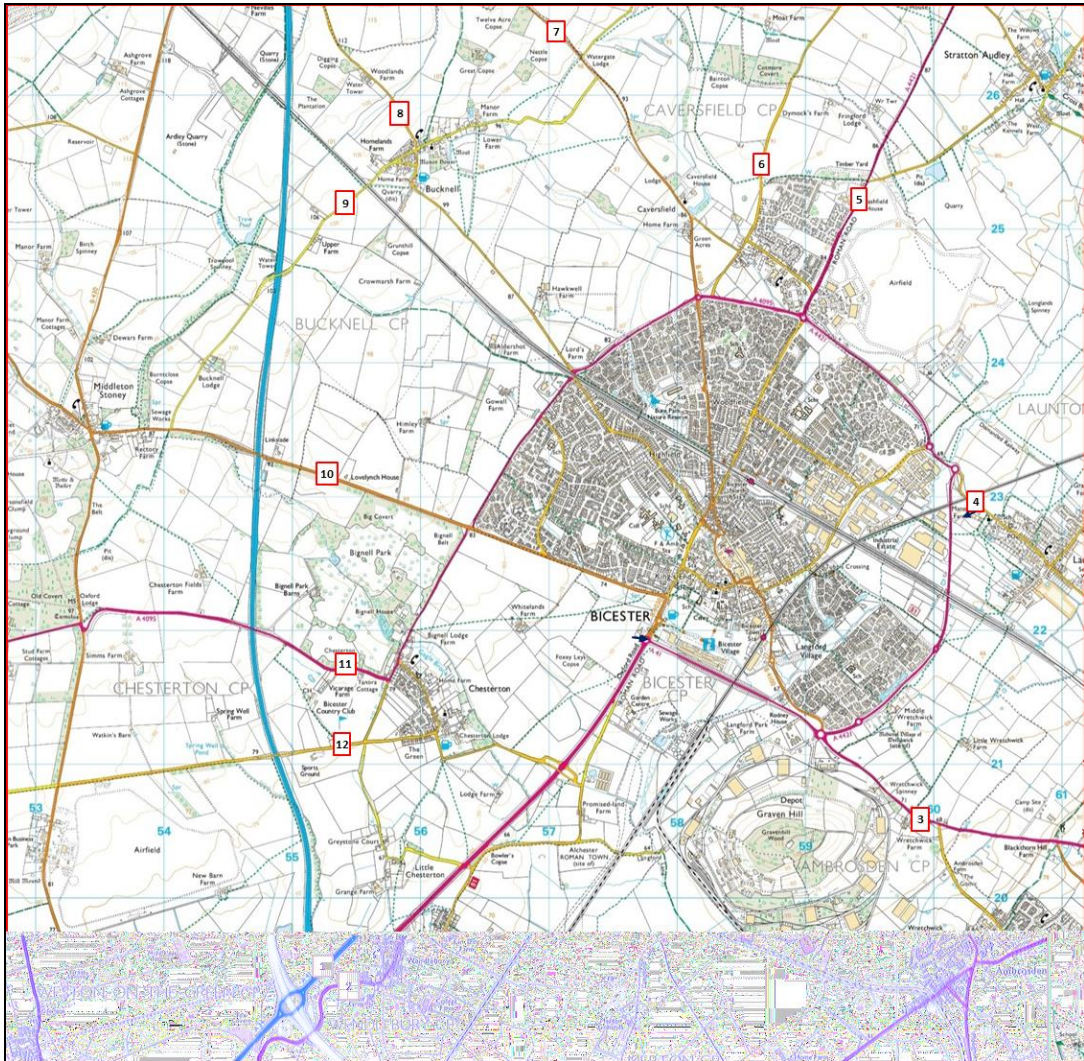
Consultee	Date	Reason for Contact	Key Outcome
Oxfordshire County Council	30/4/13	Transport Workstream meetings held to:	Masterplan Access and Travel Strategy (June 2014)
	25/6/13		
	30/7/13	Agree extent of Study Area	Scoping Note for Application 1 TA and scoping for EIA (June 2014)
	25/9/13	Agree approach to transport modelling and trip generation for the Development.	
	22/10/13		
	5/12/13	Agree approach to access and travel by all modes.	Scoping response from OCC for the EIA (July 2014)
	14/1/14		
	24/2/14	Agree scope for Application	
	8/5/14		
	11/6/14		
Cherwell District Council	As above	Included in above	As above
Highways	14/1/14	Included in Transport Workstream	Masterplan Access and Travel Strategy (June

Agency	24/2/14 8/5/14	meetings held to: Agree approach to traffic modelling Agree approach to J9 and J10 of M40	2014) Scoping Note for Application 1 TA and scoping for EIA (June 2014) Scoping opinion on EIA received July 2014
Network Rail	9/7/14	Meeting to discuss new links passing under the railway line.	Scoping Opinion received for EIA traffic and transport July 2014

16.3.3 The Study Area

- 16.3.3.1 The study area is illustrated below in Figure 16-1 and encompasses the road network of Bicester within the twelve cordon locations (which are the points of entry/exit to Bicester).
- 16.3.3.2 Oxfordshire County Council (OCC) was consulted on the extent of the study area to be considered using the information from traffic studies and forecasts. It was agreed that the study area should include the entirety of Bicester for the purposes of initial assessment in order to be able to identify links where traffic levels are forecast to increase. In relation to the scoping response of OCC, the study area includes Boundary Way on the east side of Bicester as requested.

Figure 16-1 Study Area



16.3.3.3 The IEMA Guidelines set out two rules that are used to establish whether an environmental assessment of traffic effects should be carried out. They are set out below:

- Rule 1 - Include road links where traffic flows will increase by more than 30% (or the number of heavy goods vehicles will increase by more than 30%)
- Rule 2 - Include any other specifically sensitive areas where traffic flows will increase by 10% or more.

16.3.3.4 In this instance it is considered that as the Development forms part of Eco Bicester and is proximate to sensitive residential areas and communities, the 10% threshold should apply.

16.3.4 Methodology for Establishing Baseline Conditions

Establishing the Existing Baseline Case 2012

Traffic Flows

- 16.3.4.1 Baseline conditions for the surrounding highway network have been established using the Bicester SATURN model run by White Young Green (WYG) on behalf of OCC. The model currently has a base year of 2012 and the outputs from the model were made available in February 2014 to provide a baseline for NW Bicester.
- 16.3.4.2 Key road links in relation to Application 1 are shown on Drawing 16-1 and extent of the road network and link flow locations included in the Base Year analysis is shown in Drawing 16-2.
- 16.3.4.3 The Bicester SATURN model was built using 2007 traffic data, and hence the model has a 2007 base year. In order to validate the use of the model with a 2012 Base Year, a series of vehicle counts were carried out by OCC in 2012/2013 and supplied to Halcrow who undertook a validation exercise. In total 35 automatic traffic counts were undertaken. The validation report is included as part of the evidence base for the Cherwell Local Plan.
- 16.3.4.4 The 2012/2013 observed count data was compared to modelled traffic flow data from the 2007 base year Bicester AM and PM peak scenarios. The validation checks showed that the model nearly validates to the criteria set out in DMRB. The most significant issue is the overestimation of modelled flows on the B430. When considering the validation of the model within the town itself, the DMRB criteria were met.
- 16.3.4.5 The Bicester Saturn Model has been recommended and agreed with OCC and the Highways Agency (HA) as the appropriate tool for assessing the impacts of NW Bicester Application 1 (Land North of the Railway) within the submission timescale.
- 16.3.4.6 The Bicester Saturn Model has thus been recommended and agreed with OCC and the HA as the only appropriate tool for assessing the impacts of Application 1 (North of Railway) within the submission timescale.
- 16.3.4.7 The baseline traffic analysis uses the Saturn Model Flows to provide the evidence of current traffic levels. Baseline AM and PM peak hour flows for links and junctions across the study area have been obtained from the Bicester Saturn Model 2012 Base Year.

Personal Injury Accident Data

- 16.3.4.8 Personal Injury Accident data has been obtained from OCC for the key routes on the west side of Bicester, as shown in Figure 16.6 Bicester Accident Area later in the chapter. This takes into account all accidents between 1st January

2009 and 31st January 2014 and includes all accidents reported to the police during that time and will inform the baseline conditions.

Public Transport

- 16.3.4.9 Existing bus services and routes through the development have been identified to allow a review of the need to provide additional bus services/increase bus frequency.

Forecasting the Future Baseline Case 2031 (“Without Development” Scenario)

- 16.3.4.10 A future year / Reference Case have been developed by WYG for 2031 using the Saturn model. This includes all committed and planned developments which represents maximum growth of the town without NW Bicester. For the purposes of environmental assessment, this scenario is to be used as the Future Year Baseline against which the impacts of NW Bicester Masterplan will be assessed.
- 16.3.4.11 Table 16-3 sets out committed and planned development that has been considered as part of the 2031 Reference Case in the Saturn Model. This table is extracted from the Bicester Peripheral Routes Study (WYG on behalf of OCC) as developments included within the model in 2031. It should be noted that this is a fully comprehensive list of planned developments as agreed for testing with the County Council to provide a full assessment of development planned for the town. As such the Reference Case is a worst case of 2031 traffic levels.

Table 16.3: Committed and Planned Development

Input	Uncertainty	Comments
393 house/2,900sqm employment development at NW Bicester exemplar	Near certain	Site approved and S106 signed. Expecting to implement by the end of 2013.
4,607 house/25.5Ha employment development at NW Bicester Masterplan	Near certain	Site accepted by central government for eco-development. Is in the emerging Local Plan as BICESTER 1. Masterplan to be submitted for SPD in Spring 2014.
Additional 1,000 houses on NW Bicester Masterplan	More than likely	This is additional housing numbers than Cherwell District Council have previously discussed but can be fitted within the red line boundary of the Masterplan site
1,900 house/104,000 sqm employment development at Graven Hill	Near certain	BICESTER 2 in the proposed Local Plan. Approved subject to S106
1,631 house development at SW Bicester	Near certain	Under construction.
720 house development at SW Bicester	More than likely	Site identified in emerging Local Plan as BICESTER 3. Application going to Planning Committee imminently
Additional 100 houses at SW Bicester	More than likely	Currently being considered
46,200 sqm employment development at Bicester Business Park, including relocation of Tesco store	More than likely	Outline permission granted in 2010. Identified in the proposed Local Plan as BICESTER 4.
Town centre redevelopment phase 1	Certain	Has just opened, including superstore, cinema and smaller retail units
Town centre redevelopment phase 2	Reasonably foreseeable	Proposed in the emerging Local Plan as BICESTER 6. CDC considering now that phase 1 is open.
RAF Bicester	Near certain	In the Local Plan as BICESTER 8. Plans being drawn up.
19,800 sqm employment at Bicester Gateway	More than likely	Identified in the proposed Local Plan submission as BICESTER 10.
26,400 sqm employment development at NE Bicester Business Park	More than likely	Identified in the proposed Local Plan submission document as BICESTER 11.

800 houses / 64,812 sqm employment development at SE Bicester	More than likely	Identified in the emerging Local Plan as BICESTER 12.
Bicester Village phase 4	Near certain	Approval subject to S106
Caversfield, Fringford Lane	Near Certain	200 dwellings
RAF Bicester (new houses in Caversfield)	Certain	Under construction

Source: White Young Green February 2014

16.3.4.12 In addition there are various proposals for transport included in the Reference Case of the traffic model:

- Town centre access improvements (these have already been implemented but were not in the base year model 2012);
- Changes implemented as part of the town centre redevelopment (as above);
- Traffic calming and 30mph speed limit on Middleton Stoney Road;
- Changes at the Pingle Drive junction, A41 / Oxford Road (ESSO) junction and along the A41 corridor as part of the mitigation measures from Tesco's move and Bicester Village phase 4;
- Park & ride entrance/exit at the junction of Vendee Drive and the A41;
- A4095/B4100 junction alterations as part of NW Bicester Exemplar site;
- Alterations to the A41/London Road (Rodney House) junction as part of Graven Hill mitigation;
- M40 Junction 9 Phase 2 improvements;
- M40 Junction 10 Pinch Point Scheme;
- London Road level crossing would be closed permanently to through traffic at points immediately north and south of the current rail level crossing; and
- Removal of the existing level crossing at Charbridge Lane.

Defining the importance/sensitivity of resource

16.3.4.13 Resources are the assets and facilities which may be affected by the Development such as the highway network. Receptors are the users or beneficiaries of those resources such as pedestrians and drivers who travel within the Study Area. Table 16-3 summarises the resources, corresponding receptors and their importance / sensitivity as part of this assessment.

Table 16-3 Determining the Importance / Sensitivity of Resource

Importance/sensitivity of resource or receptor	Resource	Receptor
High	Traffic flows on highway network near schools, colleges, playgrounds, accident blackspots, retirement homes and roads where without footways that are used by pedestrians.	Residents/workers travelling to and from work on foot and by vehicle, school children, leisure walkers.
Medium	Traffic flows at congested junctions and on highway network near doctors' surgeries, hospitals, shopping areas with roadside frontage, roads with narrow footways, unsegregated cycleways, community centres, parks, recreation facilities.	Residents/workers travelling to and from work on foot and by vehicle, school children, leisure walkers, people visiting shops etc.
Low	Traffic flows: places of worship, public open space, nature conservation areas, listed buildings, tourist attractions and residential areas with adequate footway provision.	Residents of or workers travelling to these places.
Negligible	Receptors with low sensitivity to traffic flows and those sufficiently distant from affected roads and junctions.	Residents/workers travelling by foot or by vehicle.

Source: IEMA Guidance and professional judgement

16.3.4.14 The impacts of traffic may be on the following receptors (as set out in the 'Guidelines for the Environmental Assessment of Road Traffic') as:

- People at home
- People at work
- Sensitive groups including children, elderly and disabled
- Sensitive locations such as hospitals, churches, schools, and historical buildings
- People walking
- People cycling
- Open spaces, recreational areas, shopping areas
- Sites of ecological/nature conservation value
- Sites of tourist/visitor attraction.

16.3.5 Methodology for Assessing Impacts

16.3.5.1 The environmental effects of road traffic resulting from the proposals have been assessed upon the local highway network in accordance with the IEMA guidelines. The assessment has been carried out for a total of 46 links within the identified study area.

- 16.3.5.2 Assessments have been undertaken across a typical working day with the effects compared across the peak morning and evening hours. On any link where increases in traffic flow are in excess of the above IEMA impact thresholds (30% on any link or 10% on sensitive links), a detailed environmental assessment against the assessment criteria would be undertaken on this link.
- 16.3.5.3 The IEMA Guidelines state that an environmental assessment of traffic effects should be carried out when there is an increase in flow by more than 30% (or the number of heavy goods vehicles would increase by more than 30%) and where there is an increase of traffic flow of 10% in sensitive areas.
- 16.3.5.4 In this instance it is considered that as the Development forms part of the NW Bicester Masterplan which aims to meet PPS1 targets and is proximate to sensitive residential areas and communities, therefore the 10% threshold should apply.
- 16.3.5.5 In order to determine the significance of effects, the following parameters have been considered:
- The sensitivity of each link on the preferred route
 - The percentage increase in total traffic and/or HGVs as a result of the Scheme along each link on the preferred route
 - The environmental effects as set out within IEMA Guidelines on each link where the impacts of the scheme are above the significance thresholds.
- 16.3.5.6 The environmental effects as set out in the IEMA Guidelines cover the following areas of concern:
- Severance
 - Driver delay
 - Pedestrian delay
 - Pedestrian amenity
 - Fear and intimidation
 - Accidents and safety
 - Hazardous loads
 - Dust and dirt.
- 16.3.5.7 In addition, the Design Manual for Roads and Bridges (DMRB) guidelines include the need to separately assess the impact of a scheme on pedestrians, cyclists and equestrians. This is related specifically to the impact of the A4095 Strategic NW Link Road and will be dealt with in the ES for that separate application. A commentary on the impact on Public Rights of Way is however included in this Chapter for completeness.
- 16.3.5.8 The remaining headings in the IEMA Guidelines are discussed in other chapters within this Environmental Statement. They include Noise and Vibration (Chapter 8), Air Quality (Chapter 9), Landscape and Visual Impact (Chapter 5), Ecology (Chapter 6), and Cultural Heritage (Chapter 10).

- 16.3.5.9 Severance occurs when there is difficulty experienced in crossing a heavily trafficked road. The guidance set out in Design Manual for Roads and Bridges Volume 11, Section 3, Part 8 Pedestrians, Cyclists, Equestrians and Community Effects suggests that changes in traffic flow of 30%, 60% and 90% are considered as 'minor', 'moderate' and 'major' changes in severance respectively. Severance change is therefore measured in terms of percentage change in traffic rather than in actual flow.
- 16.3.5.10 Driver delay is determined through use of changes in congested link speeds including junction delay.
- 16.3.5.11 The IEMA Guidelines suggest that pedestrian delay is experienced at a lower threshold when pedestrians experience a 10 second delay crossing a carriageway with no crossing facilities for a two-way flow of 1,400 vehicles per hour. The upper threshold amounts to a 40 second delay, also where no crossing facilities exist.
- 16.3.5.12 The pedestrian amenity threshold, as set out in the IEMA Guidelines to assess the significance of change, is where the traffic flow is doubled.
- 16.3.5.13 Fear and intimidation can be established through a combination of traffic flow, speed and composition. The criteria from the IEMA Guidelines for assessing this have been set out in Table 16-4 below.

Table 16-4 Assessing Magnitude of Impact of Fear and Intimidation

Importance/sensitivity of resource or receptor*	Average Traffic Flow over 18 Hour Day (Vehicle/hour)	Total 18 Hour Goods Vehicle Flow	Average Speed over 18 Hour Day (Mile/hour)
Major	1800+	3000+	20+
Moderate	1200 - 1800	2000 – 3000	15 – 20
Minor	600-1200	1000 - 2000	10 - 15

Source: IEMA Guidance

- 16.3.5.14 Accidents and safety is assessed using the personal injury accident data obtained from highway authority records. The IEMA Guidelines recommend that professional judgement will be needed to assess the impacts.
- 16.3.5.15 There are no hazardous loads associated with the Development so this section does not apply.
- 16.3.5.16 The significance of impacts is then determined using the approach described in Chapter 4 of this ES.

16.3.6 Limitations and Assumptions

16.3.6.1 The following assumptions regarding the baseline data have been made:

- All committed developments and proposed highway schemes will be built by 2031 and associated traffic flows will be on the highway network

- No further developments, new highway schemes or changes to public transport services, other than those previously committed, will be introduced within the area as this could affect traffic flow and pedestrian movement.

16.4 Description of the Baseline Conditions

16.4.1 Key Roads within the Study Area

16.4.1.1 The Key roads within the study area are shown on Figure 16.2 and have been described within this chapter.

M40

16.4.1.2 The M40 is a motorway connecting London to Birmingham from the M25 to the M40. It passes Bicester to the west in a south to north alignment providing access to High Wycombe to the south east and Warwick to the north-west. Two junctions of the M40 can be used to access NW Bicester, namely junction 10 located 7.4km to the north west of the site and junction 9 located 6.1km south west of the site.

A41

16.4.1.3 The A41 connects the south west of Bicester to the M40 in the south west. It is a dual carriageway subject to the national speed limit. This segment of carriageway is predominantly bound by fields, with the exception of Wendlebury in the south west and Bicester Village (designer outlet) at the north east of the segment. There are no properties directly fronting the road. The A41 changes alignment at Bicester Village, taking an easterly alignment towards Aylesbury.

B4100 Banbury Road

16.4.1.4 The B4100 Banbury Road carriageway extends in a south to north alignment, from its convergence with Buckingham Road, Field Street and North Street via a 5-arm roundabout (southern extent) to its roundabout convergence with the A4095 Lord's Lane and Southwold Lane and then past the NW Bicester. The northern section (north of the roundabout junction with the A4095) is predominately rural in character and subject to the national speed limit. There is a tight bend in the vicinity of Home Farm with a junction to Caversfield.

16.4.1.5 The section to the south of the A4095 junction has a 40mph speed limit and an access only restriction on heavy goods vehicles. This section has limited frontage access but is traffic calmed with build outs and there are pedestrian crossing points. South of the junction with Stable Drive, there are residential properties with frontage access to the road. There are footways adjacent to the road south of the A4095 and a parallel walking and cycling route segregated from traffic on significant sections.

A4095 Lord's Lane

- 16.4.1.6 The A4095 Lord's Lane is a single lane carriageway (in each direction) that extends between its roundabout junctions with the B4100 Banbury Road and Bucknell Road. The road is subject to a 50mph speed limit and street lighting is provided. There is a segregated walking and cycling route on the southern side and limited frontage access.

Bucknell Road

- 16.4.1.7 Bucknell Road connects the B4100 in the town centre north to the roundabout between the A4905 Howes Lane and Lord's Lane and then north towards Bucknell village. It is a street lit single carriageway benefitting from footways on both sides of the road, providing access to a number of residential roads. It has a 30mph speed limit and access only restriction for heavy goods vehicles. There are many frontage properties, local shops and schools along the route from the town centre. North of the A4095 it becomes a rural lane providing access to Bucknell village.

A4095 Howes Lane

- 16.4.1.8 The A4095 Howes Lane is a single lane carriageway that extends from Bucknell Road to the junction with the B4030 Middleton Stoney Road. It is rural in character with a speed limit varying between 40 and 50mph, no lighting for the majority of its length and no footways or adjacent path. There are no properties with frontage access to the road.

B4030 Vendee Drive

- 16.4.1.9 Vendee Drive is a recently constructed link connecting the A41 to the south to Middleton Stoney Road and Howes Lane at a roundabout in the south western boundary of the site. It is a single carriageway road subject to a 50 mph speed limit. There are no properties adjacent to the road and there is a segregated footway/ cycleway on the eastern side.

B4030 Middleton Stoney Road

- 16.4.1.10 Middleton Stoney Road is a single carriageway bounding the west of Bicester in a south east to north west alignment. It is subject to the national speed limit until a point east of the Howes Lane/ Vendee Drive roundabout where the route is proposed to be traffic calmed as part of the SW Bicester development, and would then become a 30 mph route. Residential dwellings exist to the north of Middleton Stoney Road, with fields and new development to the south. There is no frontage access from properties.

Shakespeare Drive

- 16.4.1.11 Shakespeare Drive is a single carriageway connecting Middleton Stoney Road to the A4095 Howes Lane, providing a local distributor road for the western residential area of Bicester. It is subject to a 30mph speed limit and benefits from street lighting and a continuous footway on the western extent of the road. HGVs are restricted from using this route except for access. There are local shops and services and a primary school with access off the road and some properties with frontage access.

Buckingham Road

- 16.4.1.12 Buckingham Road links from a roundabout junction with Field Street and Banbury Road at its' southern end to the A4421 roundabout junction. At the southern end there are properties with direct access to the road and the entrance to Bicester North Station. There are footpaths and footways on both sides of the road. Parking restrictions are in force to assist the free flow of traffic. Northwards from the Fair Close junction there is limited direct access. There is traffic calming (build out) south of the A4421 roundabout.

A4095 East of Banbury Road

- 16.4.1.13 The A4095 is single carriageway link between Banbury Road and Buckingham Road. The carriageway is lit and the speed limit is 50mph. Right turn central bays are provided for side roads leading to the residential area to the south of the link. Land use to the north of the link consists of fields and DLO Caversfiled land. A shared use footway is provided along the southern side of the carriageway and controlled pedestrian crossings are provided to the east of the junction with Fringford Road and to the west of the roundabout on Buckingham Road. The majority of the northern side of the carriageway has a large grassed verge and is tree lined with no footway provision.

Queens Avenue, South of Bucknell Road

- 16.4.1.14 Queens Avenue is a single carriageway road between the signalised junction with Bucknell Road and the junction with Kings End. It is a 30mph speed limit, is street lit and parking/loading is restricted. Bus stops are provided on both sides of the carriageway, to north of Queens Court. Footways are provided on both sides of the carriageway with a grassed buffer zone. The western footway is shared by pedestrians and cyclists. A toucan crossing facility is provided south of St John's Street, linking to the shared footpath connecting to Hunt Close. A pedestrian crossing is provided to the north of Kings End at the end of the shared use footway. Land use along Queens Avenue is mixed with residential properties accessed via side roads/private drives, Bicester Community College and the Magistrate's Court.

A4421 Neunkirchen Way

- 16.4.1.15 The A4421 Neunkirchen Way link between the A41 and Peregrine Way is dual carriageway with two lanes in each direction. The speed limit is 50mph and street lighting is provided. A shared use footway is provided along the northern side of the carriageway. There is a residential estate to the north of the link, but there are no residential frontages. To the south of the link there are fields.

A4421, East of Skimmingdish Lane

- 16.4.1.16 The A4421 between Bicester Road and the A4095 is single carriageway with a speed limit of 50mph. The majority of the link is unlit. Off-carriageway facilities for both pedestrians and cyclists are only provided along the southern side of the carriageway between Bicester Road and Launton Road and at the northern section of the link where it connects to the A4095. To the north of the link there

is a gliding club and airfield. To the south of the link, there is a residential estate but with no frontages or access from the A4421.

A4421, North of Skimmingdish Lane

- 16.4.1.17 The A4421 link to the north of Skimmingdish Lane is single carriageway, with a speed limit of 50mph and has no street lighting. Off-carriageway facilities for both pedestrians and cyclists are provided along the western side of the carriageway and bus stops are located north of the A4095 roundabout. To the east of the link there is a gliding club and airfield and to the west there are residential estates but with no frontages or direct access from the A4421.

Ardley Road, East of B430

- 16.4.1.18 Ardley Road is a single carriageway road between Station Road and Middleton Road which crosses over the M40. It is mainly rural in character with a speed limit of 60mph, changing to 30mph at the traffic calmed entry gate to Bucknell Village. A weight restriction on vehicles over 7.5 Tonnes is in place except for access. There are no footways or adjacent paths along the route and a 'pedestrians ahead' warning sign is located within the village. Street lighting has only been provided where there is a road hump north, just north of Bainton Road. Along the link there are farm houses set back from the carriageway and in Bucknell Village there are properties with frontage access.

A4095 North of Chesterton

- 16.4.1.19 The A4095 is a single carriageway road with a speed limit of 60mph, changing to 30mph at the entry to Chesterton Village. There are no footways or footpaths provided and there is no street lighting. The road is mainly rural in character between the M40 and Chesterton Village with fields to the north and a golf course to the south. Within Chesterton Village there are residential frontages, a parish hall and a school. Footways are provided on both sides of the carriageway but there is no street lighting.

The Approach, West of Bucknell Road

- 16.4.1.20 The Approach is a single carriageway road connecting Hudson Street and Bucknell Road. It is a residential area with a 30mph speed limit. Footways are provided on both sides of the carriageway which is street lit. Bus stops are located on both sides of the carriageway with a shelter on the southern side. Double yellow line waiting and loading restrictions are located on the corners of the junction with Bucknell Road.

Bicester Road, East of A4421 junction

- 16.4.1.21 Bicester Road is a single carriageway road between the A4421 and Station Road. The speed limit is 50mph, changing to 30mph at the entry to Launton Village. National Cycle Network Route 51 is located along Bicester Road and an off-road segregated cycle/footway is provided on the southern side of the carriageway between the A4421 roundabout and the bridge over the railway line. Land use is mixed along the link with fields to the north and residential frontages, a parish hall and a school along the southern section. Footways are

provided on both sides of the carriageway but there is no street lighting. Bus stops are provided in both directions, east of The Glades.

Fringford Road, North of Caversfield

- 16.4.1.22 Fringford Road is a single carriageway road with a speed limit of 60mph, changing to 40mph at the entry to Caversfield Village. It is rural in character with fields located either side of the carriageway. Footways/footpaths have not been provided and there is no street lighting.

Ardley Road, North of Bucknell

- 16.4.1.23 Ardley Road is a single carriageway road between Station Road and Water Lane. It is a 30mph road with footways provided on both sides of the carriageway for the majority of the link. There is no street lighting provided and the carriageway is fronted by residential properties and a community hall, just north of the Station Road junction. Bus stops are located south of Water Lane and a shelter provided on the western side of the carriageway.

Middleton Road, West of Bucknell

- 16.4.1.24 Middleton Road is a single carriageway road between Ardley Road and Bicester Road, which crosses over the M40. It is mainly rural in character with a speed limit of 60mph, changing to 30mph when entering Bucknell Village. Street lighting is not provided and there are no footways or adjacent paths. Along the eastern section of the link there are residential frontages within Bucknell Village. Along the remaining rural section of the link, there are accesses to farm houses/buildings and an oil distributor property, north of Bicester Road.

Green Lane, West of Chesterton

- 16.4.1.25 Green Lane is a single carriageway road between Northampton Road and Alchester Road, which crosses over the M40. It is rural in character and has a speed limit of 60mph, changing to 30mph at the traffic calmed entry to Chesterton Village. Within Chesterton Village there are residential frontages with section of on-street parking bays. Street lighting and footways are only provided on the link within the village.

Wendlebury Road, East of M40

- 16.4.1.26 Wendlebury Road is a single carriageway road connecting between Oxford Road and the A41. It is mainly rural in character with a speed limit of 60mph road, changing to 30mph at the traffic calmed entry to Wendlebury Village. National Cycle Network Route 51 is located along Wendlebury Road and to the north of the link there is cycle facility along the westbound carriageway. Land use is predominately rural, with a garden centre just south of the A41 junction. Within Wendlebury Village there are residential frontages and a public house. There are no footways or footpaths along the link and there is no street lighting.

16.4.2 2012 Baseline Traffic Flows

16.4.2.1 Baseline flows for the peak hours on links across the study area have been obtained from the Bicester Saturn Model 2012 Base Year. This gives AM and PM peak hour flows and these have been factored to give 12 hour (0700 to 1900) and 18 hour flows (0600 to 0000) using a factor of 4.33 and 5.21 respectively on the total of AM plus PM peak hour flows. The factors have been derived from Automatic Traffic Count (ATC) data collected locally to NW Bicester for the NW Bicester Exemplar Development Transport Assessment. Separate factors have been derived for the M40 using locally derived Highways Agency TRADS data, giving factors of 6.03 for the 12 hour flows and 7.04 for the 18 hour flows. It should be noted that the factors have been rounded to two decimal places in the text thus there will be minor differences to the calculated flows from the use of the full factors. The flows are set out in Table 16-5.

Table 16-5 Base Year 2012 Traffic Flows

Link Ref	Link Description	Base Year 2012			
		AM Peak Hour	PM Peak Hour	12 Hour Flows	18 Hour Flows
1	A41 northbound, N of M40 J9	1210	1493	11705	14088
2	A41 southbound, N of M40 J9	1205	1109	10021	12060
3	A41 Oxford Rd, S of A41 junction	2562	2490	21878	26331
4	Vendee Drive, W of A41 junction	353	249	2607	3138
5	A41, N of Pingle Drive	1496	1678	13745	16543
6	Middleton Stoney Rd, W of Kings End	970	846	7864	9465
7	Middleton Stoney Rd, W of Howes Lane	556	655	5244	6312
8	Howes Lane, N of Middleton Stoney Rd	618	697	5695	6854
9	Howes Lane, E of Shakespeare Drive	750	848	6920	8329
10	Lords Lane, E of Bucknell Road	1003	1118	9185	11055
11	Lords Lane, W of Banbury Road	1108	1215	10060	12107
12	Bucknell Road, N of Lords Lane	247	192	1901	2288
13	Bucknell Road, S of Howes Lane	540	833	5946	7156
14	Banbury Road, N of Lords Lane	1117	1186	9973	12003
15	A4095 E of Banbury Road	1885	1886	16330	19654
16	Banbury Road, S of A4095	457	634	4725	5686
17	Buckingham Road, S of Skimmingdish Lane	717	842	6751	8125
18	Queens Avenue, S of Bucknell Road	1035	1454	10779	12973
19	A41 E of A41 Oxford Road	2129	2265	19028	22901
20	A4421 Neunkirchen Way	1370	1661	13126	15797
21	A41, E of London Road roundabout	2293	2396	20306	24439
22	A4421, E of Skimmingdish Lane	1471	1688	13680	16465
23	Shakespeare Drive, S of Howes Lane	142	152	1273	1532
24	M40 J10 northbound off slip road	482	599	4681	5634
25	Ardley Road (E of B430)	207	195	1741	2095
26	M40 J10 southbound on slip road (from A43)	658	354	4382	5274
27	B430 M40 over bridge	2184	2170	18855	22693
28	A4095 N of Chesterton	602	553	5002	6020
29	Shakespeare Drive, E of Middleton	611	455	4616	5556

Link Ref	Link Description	Base Year 2012			
		AM Peak Hour	PM Peak Hour	12 Hour Flows	18 Hour Flows
	Stoney Road				
30	The Approach, W of Bucknell Road	320	243	2438	2934
31	A41 East of Pioneer Road	2141	2378	19570	23553
32	Bicester Road, E of A4421 junction	663	617	5543	6671
33	A4421 N of Skimmingdish Lane	1311	1132	10579	12733
34	Fringford Road, N of Caversfield	74	112	805	969
35	B4100 Banbury Road, N of Bainton Road	1117	1186	9973	12003
36	Ardley Road, N of Bucknell	207	195	1741	2095
37	Middleton Road, W of Bucknell	27	12	169	203
38	B4030 Middleton Stoney Road, NW of NWB	556	655	5244	6312
39	Green Lane, W of Chesterton	407	360	3321	3998
40	Wendlebury Road, E of M40	331	207	2330	2804
41	M40 northbound (mainline only), S of J9	3876	4332	49454	57812
42	M40 southbound (mainline only), S of J9	4424	4012	50828	59418
43	M40 northbound (mainline only), S of J10 / N of J9	5513	6271	71000	83000
44	M40 southbound (mainline only), S of J10 / N of J9	5500	5101	63872	74667
45	M40 northbound (mainline only), N of J10	5259	5849	66927	78238
46	M40 southbound (mainline only), N of J10	4842	5102	59914	70040

16.4.3 Pedestrian Provision

- 16.4.3.1 The majority of Bicester is located within a two mile distance of the development and therefore accessible by cyclists and those on foot, particularly given the flat topography on which the town is situated. A detailed audit of pedestrian and cyclist facilities has been undertaken and is reported in the Transport Assessment and in Appendix 2 of the separately submitted NW Bicester Access and Travel Strategy. The pedestrian provision in the immediate vicinity of the Development is described below.
- 16.4.3.2 On Lord's Lane there is a footway aligning the entire southern extent of the A4095 carriageway between its roundabout convergences with Bucknell Road (to the south west) and the A4421 to the south east.
- 16.4.3.3 Pedestrians wishing to access the north of Bicester town centre can follow footpaths on both sides of the B4100 Banbury Road. The B4100 Banbury Road carriageway is generally aligned by footways along both sides for the entirety of the route, varying in width between 1.2 and 2.0 metres, which is substandard in places. The footways do however benefit from a generally good horizontal alignment, street lighting, tactile paving and appropriate crossing infrastructure and are considered to be well maintained in terms of their surface condition.
- 16.4.3.4 At the junction of Bucknell Road with Lord's Lane and Howes Lane pedestrian movements are limited by the bridge under the railway. The eastern footway on Bucknell Road is narrow whilst the western footway ends in a verge

immediately under the railway bridge. A pedestrian refuge is provided to the south of the junction although pedestrians wanting to walk from Bucknell Lane to the eastern arm of Howes Lane would either need to use the narrow section of footway on the eastern side or cross under the bridge in the middle of the two junctions with limited visibility.

16.4.3.5 Howes Lane (A4095) is a single carriageway with a 50mph speed limit. There is no provision for pedestrians and cyclists or crossing facilities, with the exception of a footway on the south side of the road between Shakespeare Drive and Bucknell Road.

16.4.3.6 Current severance issues therefore exist for pedestrians crossing the A4095 close to the Banbury Road junction and to an extent walking alongside of Bucknell Road. Current demand for movements across the A4095 are low given the mainly rural nature of existing uses on the NW side of the A4095 corridor.

16.4.4 Public Rights of Way

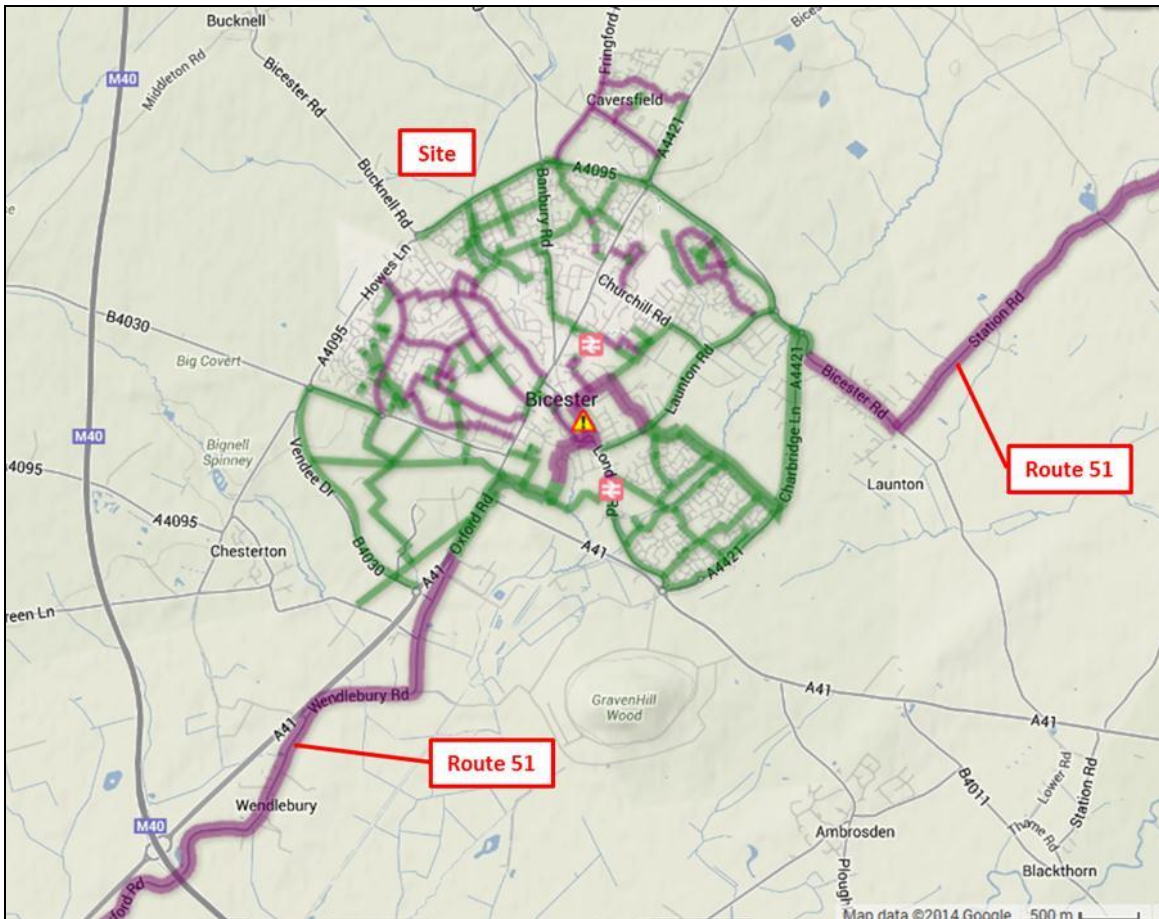
16.4.4.1 The Definitive Map of Public Rights of Way (included as Drawing 16-3) outlines footpaths and bridleways in the vicinity of the Site. A public footpath is located from the south west of the Site, dissecting Bicester in a north-west to south-east alignment connecting the A4095 and Buckingham Road. Public footpaths are also located to the north of the Site serving Bucknell.

16.4.4.2 A public bridleway is located at the south western extent of the Site, passing through the land south of the railway (the subject of Application 2).

16.4.5 Cycling

16.4.5.1 It can be seen from Figure 16-2 that route 51 of the National Cycle Network (NCN) passes through Bicester in a south west to north east alignment. A combination of on-road (green) and off-road (purple) sections form the route as it passes in close proximity to Bicester town centre and via both railway stations. A number of routes currently exist to the south and east of the site, providing connectivity to Bicester and Caversfield respectively.

Figure 16-2 Local Cycle Routes (Source: Sustrans)



16.4.6 Bus Services

16.4.6.1 Bus Services in the town are shown in Figure 16-3. The bus station facilities in Bicester town centre have been redeveloped to provide bus bays on Manorsfield Road adjacent to the new retail centre. Table 16-6 provides a summary of the bus routes that currently operate from Manorsfield Road in Bicester town centre. The X88 showing on the plan appears to have recently ceased as a service.

Table 16-6: Bus Routes from Bicester Town Centre

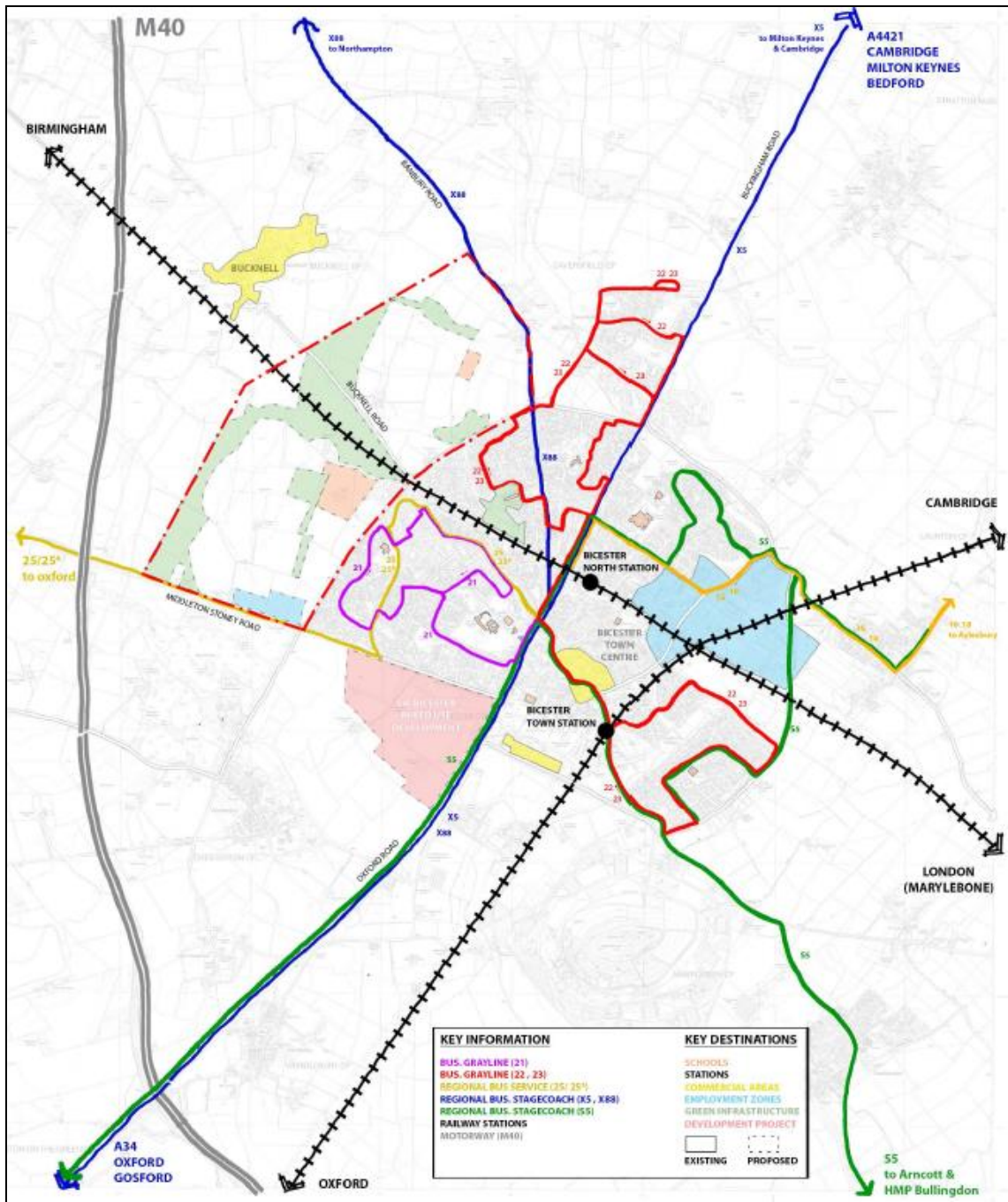
Service	Route	First	Last	Approximate Daytime Frequency
8	Cambridge - Bedford - Oxford	0635	2145	Every two hours
8	Oxford - Bedford - Cambridge	0740	2305	
18	Buckingham - Steeple Claydon - Bicester	0830	1745	Every two hours
18	Bicester - Steeple Claydon - Buckingham	0835	1800	
21	Bicester - Chesterton - Bicester (Circular)	0755	1755	Every 30 minutes
21	Bicester - Chesterton - Bicester (Circular) arrivals	0750	1820	
22	Bicester - Caversfield - Bicester (Circular)	0735	1825	Hourly
22	Bicester - Caversfield - Bicester (Circular) arrivals	0755	1900	
23	Bicester - Caversfield - Bicester (Circular)	0845	1745	Hourly
23	Bicester - Caversfield - Bicester (Circular) arrivals	0930	1830	
24	Bicester - Churchill Road - Bicester (Circular)	0800	1830	Every 30

Service	Route	First	Last	Approximate Daytime Frequency
24	Bicester - Churchill Road - Bicester (Circular) <i>arrivals</i>	0812	1842	minutes
25	Kidlington / Oxford – Bicester <i>arrivals</i>	0725	1907	Hourly
25	Bicester - Oxford / Kidlington	0625	1910	
S5	Oxford - Gosford - Bicester - Glory Farm / Launton / Arncott / Langford	0645	0011	Every 15 minutes
S5	Glory Farm / Arncott / Launton / Langford - Bicester - Gosford - Oxford	0555	2311	
X5	Cambridge - Bedford - Oxford	0635	2145	Every 30 minutes
X5	Oxford - Bedford - Cambridge	0740	2305	

Source: Traveline South East, times taken from Manorsfield Road, correct as of 30/10/2013

16.4.6.2 In the vicinity of the Site there are bus services serving the Bure Park estate approximately three times per hour. This route circulates through the estate and Caversfield.

Figure 16-3 Existing Bus Services



Source: collated by Farrell's from Traveline data

16.4.7 Rail Services

16.4.7.1 The town has two rail stations, namely Bicester North and Bicester Town. Bicester North station is located approximately 2.9km south east of the centre of the Site, whilst Bicester Town station is sited approximately 3.7km south east of the centre of the site. At the time of writing, Bicester Town rail station was closed due to improvements being undertaken in relation to the Chiltern Railways Evergreen 3 project. This would provide a passenger train service between Oxford and London Marylebone via Bicester. The station is due to re-open in summer 2014 with the Oxford-London link opening in spring 2016. This would see improvements to the station itself including level access, two new platforms, a rebuilt car park, cycle parking, bus stops and improved access roads.

Table 16-7: Summary of rail services

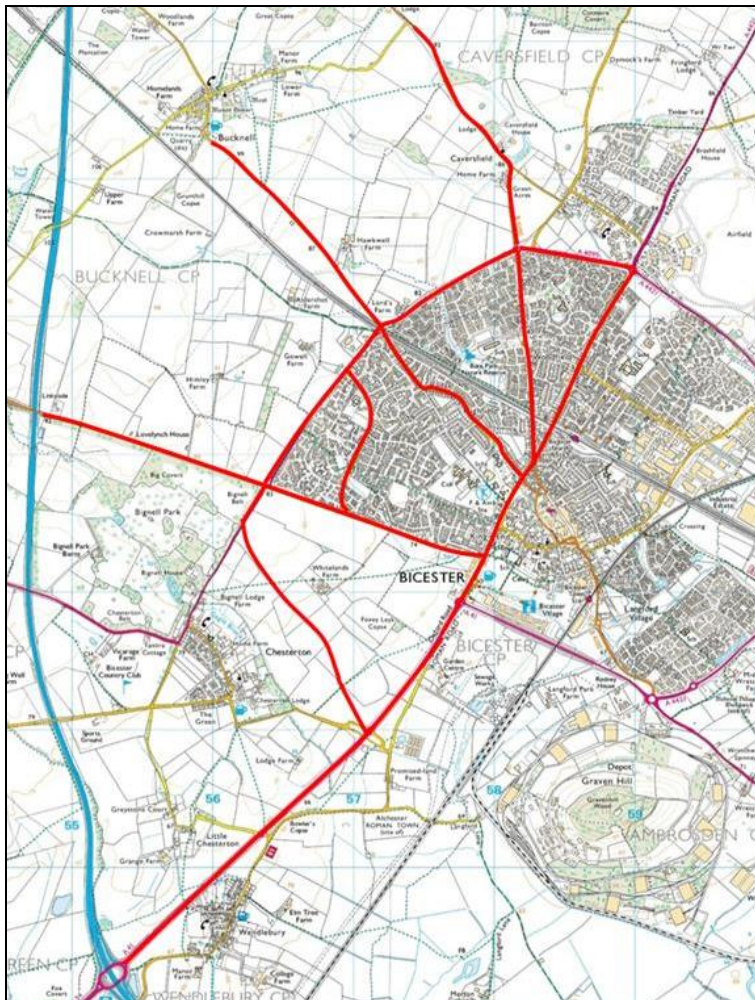
Station	Route	Journey Time (approximate)	Frequency
Bicester North	To London Marylebone	60 minutes	4 per hour
	To High Wycombe	30 minutes	2 per hour
	To Banbury/ Birmingham	20 minutes	4 per hour
Bicester Town	To Oxford	30 minutes	1 every 2 hours

16.4.7.2 As can be seen from Table 16-7 above, the regular services throughout the day ensure a good range of destinations are readily accessible from Bicester North and Bicester Town rail stations. The employment, recreational and shopping opportunities within Oxford are available within a 30 minutes rail journey from Bicester Town station although services are only every two hours at present. There is a service approximately every 15 minutes to Banbury, Birmingham and London from Bicester North station. Once the Evergreen3 proposals are finished there will be half hourly services to London and Oxford from Bicester Town Station and a reduction in the journey time to London.

16.4.8 Accidents and Safety

16.4.8.1 Personal injury accident (PIA) data was provided by OCC for the period 1st January 2009 and 31st January 2014. The PIA study area includes all roads in the vicinity of the Site, as set outlined in Figure 16-4 (map of PIA area).

Figure 16-4 Accident Analysis Area



16.4.8.2 There have been a total of 114 incidents with the study are over the five year period between January 2009 and January 2014; 98 slight, 14 serious and two fatal in severity. Tables 16-8 and 16-9 provide an overview of casualties and their severity. Of the two fatal accidents; one occurred in 2012 along the B4030 Middleton Stoney Road in which a HGV travelling southeast hit a pedestrian; the second fatal accident occurred along Bucknell Road when a vehicle travelling southeast lost control and exited the carriageway, hitting a tree and killing both driver and child passenger.

Table 16-8 All Accidents by Severity

	2009	2010	2011	2012	2013	2014	Total
Fatal	0	1	0	1	0	0	2
Serious	3	0	3	3	5	0	14
Slight	14	10	33	20	18	3	98
Total	17	11	36	24	23	3	114

Table 16-9 Casualties by Severity

	2009	2010	2011	2012	2013	2014	Total
Fatal	0	2	0	1	0	0	3

Serious	3	0	6	3	5	0	17
Slight	17	15	43	31	26	4	136
Total	20	17	49	35	31	4	156

16.4.8.3 There have been a total of 14 pedestrian accidents over the five year study period. Table 16-10 provides an overview of pedestrian accidents and their severity. The fatal pedestrian accident within this study period is as stated above (Middleton Stoney Road). A total of four serious accidents occurred within the study period, of which two accidents occurred along Buckingham road.

Table 16-10 Pedestrian Accidents by Severity

	2009	2010	2011	2012	2013	2014	Total
Fatal	0	0	0	1	0	0	1
Serious	2	0	1	1	0	0	4
Slight	1	0	5	0	3	0	9
Total	3	0	6	2	3	0	14

16.4.8.4 There have been a total of 9 cycle accidents recorded over the five year study period. Table 16-11 provides an overview of cycle accidents and their severity. The majority of cycle accidents (8 of 9) were slight with only one severe accident and no fatal accidents during the study period.

Table 16-11 Cycle Accidents by Severity

	2009	2010	2011	2012	2013	2014	Total
Fatal	0	0	0	0	0	0	0
Serious	0	0	0	0	1	0	1
Slight	0	1	3	2	2	0	8
Total	0	1	3	2	3	0	9

Cluster Analysis

16.4.8.5 Further analysis has been undertaken at key locations within close proximity to the Site where clusters of accidents have been identified from the accident data presented in Appendix 2 (accident data). This includes the existing key junctions within the vicinity of the site.

Bucknell Road near Hawkwell Farm

16.4.8.6 Four accidents were recorded within a 350m section of the B4100 in the latest five year period. Two of the accidents were slight in severity, with one serious and one fatal. Three of the accidents were a result of drivers losing control of the vehicle. Causes included speeding and being under the influence of alcohol. The incident involving a fatality was due to excessive speeding, travelling too fast for conditions, aggressive driving and being impaired by alcohol. Three of

the four accidents involved vehicles travelling southeast-bound along Bucknell Road.

B4100 (near Home Farm)

- 16.4.8.7 Five accidents in total occurred in a 70m segment of the B4100 near Home Farm, all of which slight in severity. Two of the five accidents occurred as a result of the vehicle losing control rounding a corner along the B4100, travelling north/northwest bound. Two of the accidents occurred at the same junction adjoining Caversfield Road and the B4100. In both cases the vehicles pulling out of the junction failed to see the oncoming vehicle travelling southeast bound along the B4100, rounding a right hand bend. Another incident occurred due to a driver unfamiliar with driving on the left pulled out from a layby onto the wrong side of the road, colliding with an oncoming vehicle.

B4100 Banbury Road/A4095 Roundabout

- 16.4.8.8 Two incidents have been recorded at the roundabout between the B4100 and A4095 in the last five years, one of which was serious in severity and the other slight. An incident involving a car and a motorcycle occurred due to the car travelling northbound attempting to make a U-turn north of the splitter island north of the roundabout. The car driver failed to give way to a motorcycle overtaking travelling northbound, resulting in a collision and serious injury to the motorcyclist.

A4095/Buckingham Road/Skimmingdish Lane

- 16.4.8.9 Three accidents have been recorded at the roundabout between the A4095, Buckingham Road and Skimmingdish Lane, all of which were slight in severity. Two of the accidents were a result of vehicles colliding at the roundabout, one due to a driver failing to give way and the other due to an unknown distraction in the car. The remaining incident was a result of a driver being impaired by alcohol and losing control of the car.

B4030/Vendee Drive/Middleton Stoney Road/A4095

- 16.4.8.10 Two accidents have been recorded at the roundabout between the B4030 and A4095 within the last five years, both of which were slight in severity. Both accidents were caused by drivers not stopping at junctions. The cause of one accident was due to a driver speeding and acting recklessly, failing to stop at the junction and exiting the carriageway. The other incident was due to a driver being impaired by drugs failing to stop at the junction and exiting the carriageway.

Howes Lane/Shakespeare Drive

- 16.4.8.11 Three accidents have been recorded at the junction between Howes Lane and Shakespeare Drive, all of which were slight in severity and involving two cars. Two of the accidents were a result of a car jumping a red light, resulting in a collision. The remaining incident was due to a driver failing to give way at the junction.

Accident Summary

- 16.4.8.12 In summary, the number of incidents on Bucknell Road near Hawkwell Farm, on the B4100 Banbury Road and the junction of Howes Lane/ Shakespeare Drive

mean that safety issues need to be considered further in the impact assessment. The number of accidents at the roundabouts does not appear to be unusual given the volume of traffic movements.

16.4.9 2031 Future Baseline Traffic Flows

- 16.4.9.1 A 2031 Future Baseline / Reference Case (without the Application 1 Development) has been assessed by WYG using the Bicester Saturn Model. This includes all committed and planned developments which represents maximum growth of the town without NW Bicester. For the purposes of environmental assessment, this scenario is to be used as the Future Year Baseline against which the impacts of Application 1 (Land North of Railway) of the NW Bicester Masterplan will be assessed.
- 16.4.9.2 It is predicted that there would be a significant increase in traffic flow for the majority of links assessed by 2031 compared to the Base Year. Table 16-12 provides the predicted 2031 Future Baseline / Reference Case traffic flows, with flows shown for the AM and PM peak hours and over a 12 and 18 hour period. The percentage increase in flow is shown. The increase in flows is the direct result of planned development in Bicester and growth in traffic movements on the wider network.

Table 16-12 2031 Future Baseline / Reference Case (without development) Forecast Traffic Flows

Link Ref	Link Description	2031 Future Baseline / Reference Case (without development)				Percentage Change of Traffic Flow compared to Base Year 2012			
		AM Peak Hour	PM Peak Hour	Flow over 12 hours	Flow over 18 hours	AM Peak Hour	PM Peak Hour	Flow over 12 hours	Flow over 18 hours
1	A41 northbound, N of M40 J9	1510	1575	13360	16079	25%	5%	14%	14%
2	A41 southbound, N of M40 J9	1242	1269	10874	13087	3%	14%	9%	9%
3	A41 Oxford Rd, S of A41 junction	4324	4016	36116	43468	69%	61%	65%	65%
4	Vendee Drive, W of A41 junction	757	989	7561	9100	114%	297%	190%	190%
5	A41, N of Pingle Drive	2229	2235	19331	23266	49%	33%	41%	41%
6	Middleton Stoney Rd, W of Kings End	966	1158	9198	11070	0%	37%	17%	17%
7	Middleton Stoney Rd, W of Howes Lane	519	642	5028	6051	-7%	-2%	-4%	-4%
8	Howes Lane, N of Middleton Stoney Rd	1075	1198	9843	11847	74%	72%	73%	73%
9	Howes Lane, E of Shakespeare Drive	1077	1173	9744	11727	44%	38%	41%	41%
10	Lords Lane, E of Bucknell Road	1391	1409	12125	14593	39%	26%	32%	32%
11	Lords Lane, W of Banbury Road	1384	1448	12264	14760	25%	19%	22%	22%
12	Bucknell Road, N of Lords Lane	257	432	2984	3591	4%	125%	57%	57%
13	Bucknell Road, S of Howes Lane	516	932	6271	7547	-4%	12%	5%	5%
14	Banbury Road, N of Lords Lane	1522	1755	14191	17080	36%	48%	42%	42%
15	A4095 E of Banbury Road	2106	2163	18487	22250	12%	15%	13%	13%
16	Banbury Road, S of A4095	764	929	7332	8824	67%	47%	55%	55%
17	Buckingham Road, S of Skimmingdish Lane	1258	1252	10870	13082	75%	49%	61%	61%
18	Queens Road, S of Bucknell Road	1998	2109	17785	21405	93%	45%	65%	65%
19	A41 E of A41 Oxford Road	3505	3447	30106	36233	65%	52%	58%	58%
20	A4421 Neunkirchen Way	1849	1938	16400	19738	35%	17%	25%	25%
21	A41, E of London Road roundabout	1969	1632	15594	18768	-14%	-32%	-23%	-23%
22	A4421, E of Skimmingdish Lane	2154	2453	19951	24011	46%	45%	46%	46%
23	Shakespeare Drive, S of Howes Lane	138	85	966	1162	-3%	-44%	-24%	-24%

Link Ref	Link Description	2031 Future Baseline / Reference Case (without development)				Percentage Change of Traffic Flow compared to Base Year 2012			
		AM Peak Hour	PM Peak Hour	Flow over 12 hours	Flow over 18 hours	AM Peak Hour	PM Peak Hour	Flow over 12 hours	Flow over 18 hours
24	M40 J10 northbound off slip road	759	523	5552	6682	57%	-13%	19%	19%
25	Ardley Road (E of B430)	364	532	3880	4670	76%	173%	123%	123%
26	M40 J10 southbound on slip road (from A43)	565	240	3486	4196	-14%	-32%	-20%	-20%
27	B430 M40 over bridge	2376	2579	21458	25825	9%	19%	14%	14%
28	A4095 N of Chesterton	1076	976	8886	10695	79%	76%	78%	78%
29	Shakespeare Drive, E of Middleton Stoney Road	950	873	7894	9501	55%	92%	71%	71%
30	The Approach, W of Bucknell Road	401	507	3932	4732	25%	109%	61%	61%
31	A41 East of Pioneer Road	3075	3009	26347	31710	44%	27%	35%	35%
23	Bicester Road, E of A4421 junction	421	580	4335	5217	-37%	-6%	-22%	-22%
33	A4421 N of Skimmingdish Lane	1780	1641	14815	17830	36%	45%	40%	40%
34	Fringford Road, N of Caversfield	99	188	1243	1496	34%	68%	54%	54%
35	B4100 Banbury Road, N of Bainton Road	1353	1599	12784	15386	21%	35%	28%	28%
36	Ardley Road, N of Bucknell	349	533	3819	4597	69%	173%	119%	119%
37	Middleton Road, W of Bucknell	32	30	268	323	19%	150%	59%	59%
38	B4030 Middleton Stoney Road, NW of NWB	522	642	5041	6067	-6%	-2%	-4%	-4%
39	Green Lane, W of Chesterton	611	561	5075	6108	50%	56%	53%	53%
40	Wendlebury Road, E of M40	450	254	3049	3669	36%	23%	31%	31%
41	M40 northbound (mainline only), S of J9	4001	4310	50075	58538	3%	-1%	1%	1%
42	M40 southbound (mainline only), S of J9	4387	4077	50997	59616	-1%	2%	0%	0%
43	M40 northbound (mainline only), S of J10 / N of J9	5786	6269	72633	84908	5%	0%	2%	2%
44	M40 southbound (mainline only), S of J10 / N of J9	5398	4693	60800	71075	-2%	-8%	-5%	-5%
45	M40 northbound (mainline only), N of J10	5243	6053	68060	79562	0%	3%	2%	2%
46	M40 southbound (mainline only), N of J10	5877	5133	66337	77548	21%	1%	11%	11%

16.5 Design and Mitigation

16.5.1 Construction Approach and Mitigation of Short-Term Construction Effects

- 16.5.1.1 The construction phase of development is anticipated to commence in 2018 and build out over approximately a 25 year period (whilst the period to 2031 is used for the purposes of the traffic assessment). As a large proportion of the construction traffic is anticipated to be heavy goods vehicles it is essential that residential areas are avoided during the course of construction by heavy goods vehicle drivers associated with the proposals. It is therefore considered appropriate to have a lorry routing agreement to ensure drivers use the peripheral road/ A4095 and would be prohibited from passing through the centre of Bicester unless they are transporting locally sourced materials/goods. This would be included within the Construction Traffic Management Plan.
- 16.5.1.2 It is anticipated that over the life of the construction period, virtually all construction traffic for the Development would use the A41/Vendee Drive from the M40 Junction 9 and the A4421 around the eastern side of Bicester.
- 16.5.1.3 It would be ensured that regular wheel cleaning / dirt control would be undertaken at key stages of the construction to minimise spillage on the road surface. Arrangements for regular road maintenance and cleaning, e.g. road sweeping in the vicinity of the site access point as necessary would be included within the Construction Traffic Management Plan.
- 16.5.1.4 Temporary road signs and traffic management control would be provided where necessary to ensure construction vehicles have a clear route to and from Site and do not affect the safety of other road users.

16.5.2 Scheme Design and Mitigation of Permanent Operational Effects

- 16.5.2.1 The Access and Travel Strategy for NW Bicester is set out in Chapter 6 of the Transport Assessment and the Framework Travel Plan which accompany Application 1 (North of Railway).
- 16.5.2.2 The Development layout includes good connections for walking and cycling within the site and from the site as well as a frequent bus service between the Development and the town centre and rail station(s). The Development will therefore benefit from a high level of connectivity to the wider NW Bicester development as well as the rest of the town. The mix of land uses and provision for sustainable modes, together with travel plan measures to encourage 'smarter choices' will enable the targets for mode share and travel set out in the Supplement to PPS1 to be achieved.
- 16.5.2.3 The improvements to and/ or contributions to support off-site walking and cycling links of particular relevance in providing good connectivity to and from the Application 1 development are as follows:

- Upgrade of the route alongside the railway from Lord's Lane to Banbury Road as a surfaced cycleway and footpath
- Improvements along Banbury Road, some of which are being delivered as part of the Exemplar development
- Minor improvements to the existing cycleway on the south side of Lord's Lane to remove vegetation that impacts on feelings of personal security for users
- Improvements to the routes through Bure Park to encourage their use as leisure walking and cycling routes.

16.5.2.4 A frequent bus service is proposed between the Application 1 development and the town centre, aiming to provide six services per hour by full occupation of the Application 1 development subject to viability at that point in time, with a minimum of four per hour. In the early phases of the Application 1 development the service would use Banbury Road and travel through the Exemplar development, but as the site builds out there will be a loop from Bucknell Road via a busway into the development and returning on Lord's Lane.

16.5.2.5 A crucial means of mitigating traffic impacts will be to achieve modal share and containment of trips targets, and this will also help the NW Bicester vision to be achieved. The strategy for sustainable travel measures is fully detailed in the Framework Travel Plan but includes support for a car club, promotion of electric vehicles and cycling promotion and support as well as a management and monitoring structure to give confidence that targets can be achieved.

16.5.2.6 A vehicular access strategy has been developed with the following key considerations:

- Meet OCC policy aspirations to increase the capacity of the Howes Lane/ Lord's Lane junctions and links, recognising the strategic importance of the corridor for movements on the north west of the town
- The need to integrate NW Bicester into the town and thus to minimise the barrier presented by new road links to the development and ensure they can be easily crossed by walkers and cyclists
- Addressing the constraints presented by the existing Howes Lane/ Lord's Lane corridor and in particular the rural lane character of Howes Lane and the skewed underpass of the railway with the junctions on either side
- Minimise impacts of traffic in nearby existing residential areas and communities.

16.5.2.7 A range of options were assessed to arrive at the best access strategy for the Howes Lane/ Lord's Lane corridor and access for the Masterplan when considering the whole range of factors. Each option assumed a single carriageway of lower speed than the existing route but included the removal of the existing junction constraints near the railway. A route was selected and developed and is incorporated into the Masterplan and will be provided in detail as part of the separate planning application for the A4095 NW Strategic Link Road. The design includes the following:

- a new road to replace Howes Lane and Lord's Lane from the Middleton Stoney Road roundabout to join Lord's Lane east of Purslane Drive
- a new underpass of the railway north of the existing Avonbury Business Park, passing to the north of Lord's Farm on the east side of the railway
- keeping part of the old Howes Lane and Lord's Lane to provide access to and from the existing residential areas and Bucknell Road to the south
- A bus only section south of the new link on the east side of the railway
- Traffic travelling from Bucknell Road in the town centre will be diverted to the east on the Old Lord's Lane, then north through the Masterplan, thus aiming to reduce the attractiveness of the route for through traffic
- A one way out of the Shakespeare Drive area towards the new link to avoid as much through traffic as possible.

16.5.2.8 Access into the development of the land north of the railway is proposed from a number of junctions:

- Three traffic signalised junctions on the new Lord's Lane link and existing Lord's Lane on the north side of the development
- An access onto Bucknell Road on the east side of the railway
- Two access points onto Banbury Road (from the Exemplar development).

16.5.2.9 The number and location of junctions aims to spread traffic movements on the road network rather than lead to a concentration in a small number of locations which minimises traffic routing through other parts of the development as well as adjacent residential areas and communities.

16.5.2.10 Within the development of land north of the railway it is proposed to have a primary route linking the new link at a junction east of the railway line through the development to join the Exemplar spine road. There will be secondary roads connecting to Bucknell Road and to Lord's Lane west of the Banbury Road roundabout as well as to provide access to parts of the development.

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16.6 Construction Impacts

16.6.1 Potential Impacts

16.6.1.1 The potential impacts during the construction phase are identified as:

- Potential impact on pedestrian amenity and fear and intimidation due to the increase in vehicle flows and the change in flow composition i.e. an increase in large type vehicles. A lorry movement plan would be prepared to carefully phase construction vehicles to and from Site.
- Potential increase in pedestrian and driver delay due to the additional vehicles associated with the Development on the highway network together with possible temporary traffic management. However, possible disruption would be minimised by ensuring working times are outside of

peak periods, convoy systems are in place to group vehicle movements, movements are restricted away from schools start and closing times and temporary facilities are designed to minimise disruption to traffic.

- Potential reduction in public safety, particularly vulnerable road users, due to the introduction of large type vehicles travelling to and from Site. Construction traffic would be restricted from travelling past schools and where this is not possible; vehicles would be restricted during start and closing times. A convoy system and banks man would be used where vehicle movements need assistance to reduce the potential effect on the safety of road users and potential traffic management control.

16.6.2 Overview

16.6.2.1 The assessment of impacts associated with the construction phase of the Development has identified that there are likely to be **minor adverse** impacts for residents and business relating to the increase in construction vehicles on the local highway network. Potential delays to journey times for pedestrians and drivers may be experienced due to the volume of traffic and potential need to introduce temporary traffic management controls on route to the development site. The safety of road users may also be affected by the increase of large type construction vehicles. A Construction Traffic Management Plan would be produced to mitigate these impacts, effectively routing construction vehicles away from sensitive residential areas where possible.

16.7 Permanent Operational Impacts

16.7.1.1 The permanent traffic and transport operational impacts associated with the additional traffic flow generated by Application 1 (North of Railway) in 2031 have been assessed by firstly identifying those links expected to see an increase in traffic of more than 10% in either a peak hour or daily flow as set out in Section 16.4.9.

16.7.1.2 For each of those links, the impact on the following has then been considered:

- Severance and Pedestrian Amenity
- Driver delay
- Pedestrian Delay
- Fear and intimidation
- Accidents and safety.

16.7.2 Traffic Generation and Assignment

16.7.2.1 The anticipated generation of the traffic from the Development has been calculated. The Bicester Saturn Model has then been used to assign traffic to the highway network with the Reference Case 2031 traffic. This has been undertaken for the full NW Bicester development of 6,000 homes. Full details of the predicted development trip generation and assignment for the Development

can be found within the separate Transport Assessment for Application 1 (North of Railway).

16.7.2.2 The proportion of traffic generated by the Application 1 Development in relation to the overall masterplan has been calculated as 38.14% in the AM peak hour, 41.48% in the PM peak hour and 39.48% in the 12 hour period.

16.7.2.3 These percentages have been applied to link and junction flows to identify the percentage impact of the Application 1 Development on Reference Case 2031 traffic levels.

16.7.2.4 Table 16-13 shows the total predicted number of trips generated by Application 1 (North of Railway) for each link and compared to the predicted increase in traffic flow from the Reference Case 2031. The percentage change on each link in the different time periods is then identified.

16.7.2.5 Table 16-13 shows in highlight those links where a 10% or more increase in traffic is forecast from the Development compared to the Reference Case in 2031. The impact on the following links would therefore be further considered under for each factor:

- Banbury Road, N and S of Lords Lane
- Buckingham Road, S of Skimmingdish Lane
- Shakespeare Drive
- M40 J10 northbound off slip road
- Ardley Road (E of B430)
- The Approach, W of Bucknell Road
- Ardley Road, N of Bucknell
- Middleton Road, W of Bucknell
- B4030 Middleton Stoney Road, NW of NW Bicester Masterplan

Table 16-13 Application 1 (North of Railway) Development Flows

Link Ref	Link Description	2031 Future Baseline/ Reference Case Flows		Application 1 Flows		2031 Future Baseline with Application 1 Flows		Percentage Change	
		AM Peak Hour	PM Peak Hour	AM Peak Hour	PM Peak Hour	AM Peak Hour	PM Peak Hour	AM Peak Hour	PM Peak Hour
1	A41 northbound, N of M40 J9	1510	1575	21	-24	1531	1551	1%	-2%
2	A41 southbound, N of M40 J9	1242	1269	-6	22	1236	1291	0%	2%
3	A41 Oxford Rd, S of A41 junction	4324	4016	122	132	4446	4148	3%	3%

Link Ref	Link Description	2031 Future Baseline/ Reference Case Flows		Application 1 Flows		2031 Future Baseline with Application 1 Flows		Percentage Change	
4	Vendee Drive, W of A41 junction	757	989	25	88	782	1077	3%	9%
5	A41, N of Pingle Drive	2229	2235	91	94	2320	2329	4%	4%
6	Middleton Stoney Rd, W of Kings End	966	1158	21	78	987	1236	2%	7%
7	Middleton Stoney Rd, W of Howes Lane	519	642	347	408	866	1050	67%	64%
8	Howes Lane, N of Middleton Stoney Rd	1075	1198	-53	-125	1022	1073	-5%	-10%
9	Howes Lane, E of Shakespeare Drive	1077	1173	50	18	1127	1191	5%	2%
10	Lords Lane, E of Bucknell Road	1391	1409	-90	-84	1301	1325	-6%	-6%
11	Lords Lane, W of Banbury Road	1384	1448	-88	-139	1296	1309	-6%	-10%
12	Bucknell Road, N of Lords Lane	257	432	-45	-112	212	320	-18%	-26%
13	Bucknell Road, S of Howes Lane	516	932	77	33	593	965	15%	4%
14	Banbury Road, N of Lords Lane	1522	1755	50	201	1572	1956	3%	11%
15	A4095 E of Banbury Road	2106	2163	8	53	2114	2216	0%	2%
16	Banbury Road, S of A4095	764	929	126	109	890	1038	17%	12%
17	Buckingham Road, S of Skimmingdish Lane	1258	1252	148	115	1406	1367	12%	9%
18	Queens Avenue, S of Bucknell Road	1998	2109	47	114	2045	2223	2%	5%
19	A41 E of A41 Oxford Road	3505	3447	98	113	3603	3560	3%	3%
20	A4421 Neunkirchen Way	1849	1938	59	88	1908	2026	3%	5%
21	A41, E of London Road roundabout	1969	1632	23	28	1992	1660	1%	2%
22	A4421, E of Skimmingdish Lane	2154	2453	58	134	2212	2587	3%	5%
23	Shakespeare Drive, S of Howes Lane	138	85	54	53	192	138	39%	62%
24	M40 J10 northbound off slip road	759	523	114	72	873	595	15%	14%
25	Ardley Road (E of B430)	364	532	48	9	412	541	13%	2%
26	M40 J10 southbound on slip road (from A43)	565	240	13	-3	578	237	2%	-1%
27	B430 M40 over bridge	2376	2579	11	79	2387	2658	0%	3%
28	A4095 N of Chesterton	1076	976	42	33	1118	1009	4%	3%

Link Ref	Link Description	2031 Future Baseline/ Reference Case Flows		Application 1 Flows		2031 Future Baseline with Application 1 Flows		Percentage Change	
29	Shakespeare Drive, E of Middleton Stoney Road	950	873	71	145	1021	1018	7%	17%
30	The Approach, W of Bucknell Road	401	507	153	86	554	593	38%	17%
31	A41 East of Pioneer Road	3075	3009	4	25	3079	3034	0%	1%
23	Bicester Road, E of A4421 junction	421	580	-14	12	407	592	-3%	2%
33	A4421 N of Skimmingdish Lane	1780	1641	68	16	1848	1657	4%	1%
34	Fringford Road, N of Caversfield	99	188	2	2	101	190	2%	1%
35	B4100 Banbury Road, N of Bainton Road	1353	1599	51	14	1404	1613	4%	1%
36	Ardley Road, N of Bucknell	349	533	54	9	403	542	16%	2%
37	Middleton Road, W of Bucknell	32	30	109	182	141	212	340%	606%
38	B4030 Middleton Stoney Road, NW of NWB	522	642	88	161	610	803	17%	25%
39	Green Lane, W of Chesterton	611	561	11	13	622	574	2%	2%
40	Wendlebury Road, E of M40	450	254	32	-8	482	246	7%	-3%
41	M40 northbound (mainline only), S of J9	4001	4310	12	1	4013	4311	0%	0%
42	M40 southbound (mainline only), S of J9	4387	4077	1	1	4388	4078	0%	0%
43	M40 northbound (mainline only), S of J10 / N of J9	5786	6269	119	63	5905	6332	2%	1%
44	M40 southbound (mainline only), S of J10 / N of J9	5398	4693	16	-2	5414	4691	0%	0%
45	M40 northbound (mainline only), N of J10	5243	6053	11	0	5254	6053	0%	0%
46	M40 southbound (mainline only), N of J10	5877	5133	6	5	5883	5138	0%	0%

16.7.3 Pedestrian Severance

16.7.3.1 Table 16-14 identifies the likely impact on pedestrian severance and amenity for each of the selected links. Severance occurs when there is difficulty experienced in crossing a heavily trafficked road. The guidance set out in Design Manual for Roads and Bridges Volume 11, Section 3, Part 8 Pedestrians, Cyclists, Equestrians and Community Effects suggests that changes in traffic flow of 30%, 60% and 90% are considered as 'minor', 'moderate' and 'major' changes in severance respectively.

16.7.3.2 It can be seen that the increased traffic flow from the Development would be likely to impact on four of the links. Middleton Road would be likely to have a major impact on pedestrian severance in both peak hours in terms of percentage impact and Middleton Stoney Road NW of Howes Lane a moderate impact. Middleton Stoney Road at this location has no development alongside

it to create a desire to cross the road and therefore this severance would not be experienced by more than small numbers of pedestrians. The other links are more sensitive with residential properties and other land uses such as schools and shops nearby.

Table 16-14 Impact on Level of Pedestrian Severance

Link Ref	Link Description	2031 Future Baseline with Application 1 Development Flows		Percentage Change from 2031 Future Baseline		Impact on Level of Pedestrian Severance	
		AM Peak Hour	PM Peak Hour	AM Peak Hour	PM Peak Hour	AM Peak Hour	PM Peak Hour
7	Middleton Stoney Rd, W of Howes Lane	866	1050	67%	64%	Moderate	Moderate
13	Bucknell Road, S of Howes Lane	593	965	15%	4%	-	-
14	Banbury Road, N of Lords Lane	1572	1956	3%	11%	-	-
16	Banbury Road, S of A4095	890	1038	17%	12%	-	-
17	Buckingham Road, S of Skimmingdish Lane	1406	1367	12%	9%	-	-
23	Shakespeare Drive, S of Howes Lane	192	138	39%	62%	Minor	Moderate
24	M40 J10 northbound off slip road	873	595	15%	14%	-	-
25	Ardley Road (E of B430)	412	541	13%	2%	-	-
29	Shakespeare Drive, E of Middleton Stoney Road	1021	1018	7%	17%	-	-
30	The Approach, W of Bucknell Road	554	593	38%	17%	Minor	-
36	Ardley Road, N of Bucknell	403	542	16%	2%	-	-
37	Middleton Road, W of Bucknell	141	212	340%	606%	Major	Major
38	B4030 Middleton Stoney Road, NW of NWB	610	803	17%	25%	-	-

16.7.4 Pedestrian Amenity

16.7.4.1 Table 16-15 sets out each link and identifies where there would be a likely impact on pedestrian amenity based on the predicted increase in traffic flows with the Application 1 Development Flows. The pedestrian amenity threshold, as set out in the IEMA Guidelines to assess the significance of change, is where the traffic flow is doubled.

16.7.4.2 It can be seen that of the links assessed there would be likely to be an adverse impact on pedestrian amenity on Middleton Stoney Road, Shakespeare Drive and Middleton Road.

Table 16-15 Impact on Level of Pedestrian Amenity for 2031 Future Baseline / Reference Case with Application 1 (North of Railway)

Link Ref	Link Description	2031 Future Baseline with Application 1 Development Flows		Percentage Change from 2031 Future Baseline		Impact on Level of Pedestrian Amenity	
		AM Peak Hour	PM Peak Hour	AM Peak Hour	PM Peak Hour	AM Peak Hour	PM Peak Hour

Link Ref	Link Description	2031 Future Baseline with Application 1 Development Flows		Percentage Change from 2031 Future Baseline		Impact on Level of Pedestrian Amenity	
7	Middleton Stoney Rd, W of Howes Lane	866	1050	67%	64%	Impact	Impact
13	Bucknell Road, S of Howes Lane	593	965	15%	4%	-	-
14	Banbury Road, N of Lords Lane	1572	1956	3%	11%	-	-
16	Banbury Road, S of A4095	890	1038	17%	12%	-	-
17	Buckingham Road, S of Skimmingdish Lane	1406	1367	12%	9%	-	-
23	Shakespeare Drive, S of Howes Lane	192	138	39%	62%	-	Impact
24	M40 J10 northbound off slip road	873	595	15%	14%	-	-
25	Ardley Road (E of B430)	412	541	13%	2%	-	-
29	Shakespeare Drive, E of Middleton Stoney Road	1021	1018	7%	17%	-	-
30	The Approach, W of Bucknell Road	554	593	38%	17%	-	-
36	Ardley Road, N of Bucknell	403	542	16%	2%	-	-
37	Middleton Road, W of Bucknell	141	212	340%	606%	Impact	Impact
38	B4030 Middleton Stoney Road, NW of NWB	610	803	17%	25%	-	-

16.7.5 Driver Delay

16.7.5.1 In order to assess driver delay on the links identified for assessment, link speeds have been used. Where there is a reduction in link speed with the Development compared to the Reference Case this gives an indication of increased driver delay.

16.7.5.2 Congested speeds by link (including junction delay) have been provided from the Bicester Saturn Model. Table 16-16 shows the speed in the Reference Case 2031 and with the Development. These speeds are for the full 6,000 home NW Bicester Masterplan and thus represent a worst case in terms of delay on each link for Application 1.

16.7.5.3 The links where speed in kilometres per hour reduces significantly with development are highlighted. This indicates that there would be an increase in driver delay on Middleton Stoney Road, west of Howes Lane and the NW Bicester development, Banbury Road, Buckingham Road and Shakespeare Drive.

16.7.5.4 With regard to the significance of the impacts, the following assessment by examining the level of change against the current speeds and using professional judgement is made:

- Middleton Stoney Road: minor adverse and not significant;
- Banbury Road, both north and south of Lord's Lane: moderate adverse and significant;
- Buckingham Road: minor adverse and not significant;

- Shakespeare Drive: moderate adverse and significant.

16.7.5.5 It is emphasised that these impact assessments are for the full NW Bicester development for this factor. For the Application 1 Development, particularly given that it would not directly connect to Shakespeare Drive as it is on the eastern side of the railway, it is considered that the impacts on these links would be minor adverse. The assessment for Application 1 (North of Railway) is therefore:

- Middleton Stoney Road: **minor adverse** and not significant
- Banbury Road, both north and south of Lord's Lane: **moderate adverse** and significant
- Buckingham Road: **minor adverse** and not significant
- Shakespeare Drive: **minor adverse** and significant.

Table 16-16: Change in Congested Link Speed (with Junction Delay) with Development

Link			No NW Bicester KPH		With Full NW Bicester KPH		Change in Speed (With vs No NWB) KPH	
			AM	PM	AM	PM	AM	PM
7	Middleton Stoney Road, W of Howes Lane	EB	76.6	76.56	72.08	73.38	-4.52	-3.18
		WB	76.58	75.98	69.69	68.1	-6.89	-7.88
13	Bucknell Road, S of Howes Lane	NB	48	48	48	48	0	0
		SB	48	48	48	48	0	0
14	Banbury Road, N of Lord's Lane	NB	73.35	67.86	71.13	63.46	-2.22	-4.4
		SB	27.12	44.25	14.37	38.21	-12.75	-6.04
16	Banbury Road, S of A4095	NB	32.34	29.73	32.29	19.65	-0.05	-10.08
		SB	44.28	44.56	43.26	44.4	-1.02	-0.16
17	Buckingham Road, S of Skimmingdish Lane	NB	46.76	43.12	46.76	39.13	0	-3.99
		SB	57.41	57.53	57.35	57.52	-0.06	-0.01
23	Shakespeare Drive, S of Howes Lane	NB	48	48	32	32	-16	-16
		SB	48	48	31.92	31.98	-16.08	-16.02
24	M40 J10 northbound off slip road	NB	43.22	43.55	42.62	43.37	-0.6	-0.18
25	Ardley Road (E of B430)	NB	43.81	36.42	43.61	37.43	-0.2	1.01
		SB	47.96	47.97	47.69	47.68	-0.27	-0.29
29	Shakespeare Drive, E of Middleton Stoney Road	NB	48	48	31.32	31.67	-16.68	-16.33
		SB	48	48	28.08	28.95	-19.92	-19.05
30	The Approach, W of Bucknell Road	NB	22.02	21.35	19.48	20.97	-2.54	-0.38
		SB	32	32	31.73	31.05	-0.27	-0.95

Link			No NW Bicester KPH		With Full NW Bicester KPH		Change in Speed (With vs No NWB) KPH	
			AM	PM	AM	PM	AM	PM
36	Ardley Road, N of Bucknell	NB	43.81	36.42	43.61	37.43	-0.2	1.01
		SB	47.96	47.97	47.69	47.68	-0.27	-0.29
37	Middleton Road, W of Bucknell	NB	63.99	63.96	63.56	63.79	-0.43	-0.17
		SB	61.76	61.66	61.83	61.73	0.07	0.07
38	B4030 Middleton Stoney Road, NW of NW Bicester	EB	80	80	80	80	0	0
		WB	79.21	78.02	77.21	72.22	-2	-5.8

16.7.6 Pedestrian Delay

16.7.6.1 The IEMA Guidelines suggest that pedestrian delay is experienced at a lower threshold when pedestrians experience a 10 second delay crossing a carriageway with no crossing facilities for a two-way flow of 1,400 vehicles per hour. The upper threshold amounts to a 40 second delay, also where no crossing facilities exist.

16.7.6.2 The likely impact of pedestrian delay based on the predicted traffic flows of the Application 1 Development has been assessed. A commentary on each link is provided in Table 16-17. A **minor adverse** impact is anticipated on Banbury Road (north of Lord's Lane), Buckingham Road and Shakespeare Drive.

Table 16-17 Impact on Pedestrian Delay

Link Ref	Link Description	2031 Future Baseline with Application 1 Development Flows		Commentary
		AM Peak Hour	PM Peak Hour	
7	Middleton Stoney Rd, W of Howes Lane	866	1050	The flow level is below the threshold volume of traffic. There are no destinations for pedestrians on the west side of Middleton Stoney Road. The impact would be negligible.
13	Bucknell Road, S of Howes Lane	593	965	The flow level is below the threshold volume of traffic. There are various crossing locations provided. The impact would be negligible.
14	Banbury Road, N of Lords Lane	1572	1956	The flow level is above the threshold volume of traffic. A new toucan crossing is to be provided as part of the Exemplar development. The impact would be minor adverse.
16	Banbury Road, S of A4095	890	1038	The flow level is below the threshold volume of traffic. There are various crossing locations provided. The impact

Link Ref	Link Description	2031 Future Baseline with Application 1 Development Flows		Commentary
				would be negligible.
17	Buckingham Road, S of Skimmingdish Lane	1406	1367	The flow level is just above the lower threshold volume of traffic. There are various crossing locations provided. The impact would be minor adverse.
23	Shakespeare Drive, S of Howes Lane	192	138	The flow level is below the threshold volume of traffic. There are various crossing locations provided. The impact would be negligible.
24	M40 J10 northbound off slip road	873	595	The flow level is below the threshold volume of traffic. There are no pedestrian routes given that it is part of the motorway. The impact would be negligible.
25	Ardley Road (E of B430)	412	541	The flow level is well below the threshold volume of traffic. The impact would be negligible.
29	Shakespeare Drive, E of Middleton Stoney Road	1021	1018	The flow level is below the threshold volume of traffic but there are limited crossing facilities. The impact may be minor adverse.
30	The Approach, W of Bucknell Road	554	593	The flow level is well below the threshold volume of traffic. The impact would be negligible.
36	Ardley Road, N of Bucknell	403	542	The flow level is well below the threshold volume of traffic. The impact would be negligible.
37	Middleton Road, W of Bucknell	141	212	The flow level is well below the threshold volume of traffic. The impact would be negligible.
38	B4030 Middleton Stoney Road, NW of NWB	610	803	The flow level is below the threshold volume of traffic. There are no destinations for pedestrians on the west side of Middleton Stoney Road. The impact would be negligible.

16.7.7 Fear and intimidation

16.7.7.1 Fear and intimidation can be established through a combination of traffic flow, speed and composition. The criteria from the IEMA Guidelines for assessing this have been set out in Table 16-6.

16.7.7.2 Table 16-18 shows the predicted 2031 traffic flows with the Development over an average 18 hour period and identifies the likely impact of fear and intimidation. The sensitivity of the link is summarised in terms of the receptors in the vicinity, as set out earlier in Table 16-5.

16.7.7.3 The assessment of impact shows a potential minor adverse impact on Bucknell Road south of Howes Lane, Banbury Road north of Lord's Lane and Buckingham Road, south of Skimmingdish Lane.

Table 16-18 Impact on Level of Fear and Intimidation

Link Ref	Link Description	Average Flow over 18 hours	Sensitivity of Link	Average Speed (PM peak average of two way)	Assessment of Impact
7	Middleton Stoney Rd, W of Howes Lane	555	Negligible	70.7	Negligible
13	Bucknell Road, S of Howes Lane	451	Medium	48	Minor adverse
14	Banbury Road, N of Lords Lane	1021	Negligible	50.8	Minor adverse
16	Banbury Road, S of A4095	558	Low	32.0	Negligible
17	Buckingham Road, S of Skimmingdish Lane	803	Low	48.3	Minor adverse
23	Shakespeare Drive, S of Howes Lane	96	Medium	44.8	Negligible
24	M40 J10 northbound off slip road	425	Negligible	43.4	Negligible
25	Ardley Road (E of B430)	276	Low	42.6	Negligible
29	Shakespeare Drive, E of Middleton Stoney Road	590	Medium	30.3	Negligible
30	The Approach, W of Bucknell Road	332	Medium	26.0	Negligible
36	Ardley Road, N of Bucknell	274	Low	42.6	Negligible
37	Middleton Road, W of Bucknell	102	Low	62.8	Negligible
38	B4030 Middleton Stoney Road, NW of NWB	409	Negligible	76.1	Negligible

16.7.8 Accidents and Safety

- 16.7.8.1 The increase in traffic flows generated by the Development in relation to Application 1 (North of Railway) may increase the potential for collisions on the highway network. Areas of existing collisions can be assessed to identify whether mitigation measures are required to improve facilities for vulnerable road users.
- 16.7.8.2 An analysis of personal injury accidents has been undertaken for the past five years. The study area for the accident analysis did not include all of the links being assessed in detail. As such a precautionary approach has been taken with this small number of links, assuming there may be a significant impact.
- 16.7.8.3 Of the links assessed, a minor adverse impact may potentially be experienced on Middleton Stoney Road, Shakespeare Drive and the Approach, Ardley Road and Middleton Road. There is potential for a moderate adverse impact on Banbury Road north of the A4095 junction given the increase in traffic flows and the cluster of personal injury accidents on this link in the past five years in the vicinity of Home Farm.

Table 16-19 Impact on Accidents and Safety

Link Ref	Link Description	Existing Accident issues	Assessment of Impact
7	Middleton Stoney Rd, W of Howes Lane	A pedestrian fatality was recorded but no cluster of accidents	Minor adverse

Link Ref	Link Description	Existing Accident issues	Assessment of Impact
13	Bucknell Road, S of Howes Lane	None identified	Negligible
14	Banbury Road, N of Lords Lane	A cluster of incidents recorded on the section near to Home Farm	Moderate adverse
16	Banbury Road, S of A4095	None identified with the exception of a small number at the A4095 roundabout	Negligible
17	Buckingham Road, S of Skimmingdish Lane	None identified with the exception of a small number at the A4421 roundabout	Negligible
23	Shakespeare Drive, S of Howes Lane	A number of incidents recorded at the junction of Howes Lane and Shakespeare Drive	Minor adverse
24	M40 J10 northbound off slip road	Not included in assessment	Negligible
25	Ardley Road (E of B430)	Not included in assessment	Minor adverse
29	Shakespeare Drive, E of Middleton Stoney Road	None identified	Negligible
30	The Approach, W of Bucknell Road	Not included in assessment	Minor adverse
36	Ardley Road, N of Bucknell	Not included in assessment	Minor adverse
37	Middleton Road, W of Bucknell	Not included in assessment	Minor adverse
38	B4030 Middleton Stoney Road, NW of NWB	A pedestrian fatality was recorded but no cluster of accidents	Minor adverse

16.7.9 Impact on PROW

- 16.7.9.1 In addition to the impact on links where an increase in traffic flows generated by the Development of more than 10% is identified, the impact on the public rights of way network has been considered. Within the Development there are no PROW directly impacted. New footpath connections would be provided through the Bure stream area and under the railway to the western side, for example, which would have a beneficial impact on the network.
- 16.7.9.2 The A4095 Strategic NW Link Road would cross the Bicester Bridleway 4 (via Aldershot Farm) which is a key strategic walking, cycling and equestrian route. There could be severance caused by the new road/building construction. It is proposed that a controlled crossing of the new road for walkers, cyclists and equestrians is provided to minimise any severance impacts of the Development.

16.8 Cumulative Impacts

- 16.8.1.1 All planned and committed developments have been considered when generating the traffic flows for the Reference Case 2031 and included in the assessment with the Development. The Reference Case has been agreed with OCC and CDC. The full impact of NW Bicester is dealt with in the TA Chapter 11.

16.9 Summary of Impacts

- 16.9.1.1 This section has presented and assessed the likely traffic and transport impacts likely to arise as a result of the Development in relation to Application 1 (North of Railway). The relevant regulatory and policy framework has been summarised and the methodology used to set out current and future baselines.
- 16.9.1.2 The traffic flow for the base case year of 2012 and the predicted 2031 Future Baseline / Reference Case (without development) have been identified using the Bicester SATURN model for the highway network.
- 16.9.1.3 Minor adverse construction impacts have been identified and include the effect on residents and businesses due to the increased traffic flows consisting of a high proportion of heavy goods vehicles. Mitigation measures would be put in place to reduce the severity of the impacts such as producing a Construction Traffic Management Plan which would identify lorry routes away from residential roads and schools and ensure operations are during off-peak periods.
- 16.9.1.4 The traffic flows with the Development have been generated and then been compared to the Future Baseline/ Reference Case 2031. Links have been identified where the percentage increase in traffic is more than 10%. The impact on these links in terms of pedestrian severance, amenity, delay and fear and intimidation together with driver delay and accidents and safety have been assessed.
- 16.9.1.5 Table 16-20 summarises the assessment of each of the links against each of the factors.

Table 16-20 Traffic and Transport Impact Summary Table

Link		Pedestrian severance	Pedestrian Amenity	Driver Delay	Pedestrian Delay	Fear and Intimidation	Accidents and Safety
Link Ref	Link Description						
7	Middleton Stoney Rd, W of Howes Lane	Moderate adverse	Moderate adverse	Minor adverse	Negligible	Negligible	Minor adverse
13	Bucknell Road, S of Howes Lane	Negligible	Negligible	Negligible	Negligible	Minor adverse	Negligible
14	Banbury Road, N of Lords Lane	Negligible	Negligible	Moderate adverse	Minor adverse	Minor adverse	Minor adverse
16	Banbury Road, S of A4095	Negligible	Negligible	Moderate adverse	Negligible	Negligible	Negligible
17	Buckingham Road, S of Skimmingdish Lane	Negligible	Negligible	Minor adverse	Minor adverse	Minor adverse	Negligible
23	Shakespeare Drive, S of Howes Lane	Moderate adverse	Moderate adverse	Minor adverse	Negligible	Negligible	Minor adverse

24	M40 J10 northbound off slip road	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
25	Ardley Road (E of B430)	Negligible	Negligible	Negligible	Negligible	Negligible	Minor adverse
29	Shakespeare Drive, E of Middleton Stoney Road	Negligible	Negligible	Minor adverse	Minor adverse	Negligible	Negligible
30	The Approach, W of Bucknell Road	Minor adverse	Negligible	Negligible	Negligible	Negligible	Minor adverse
36	Ardley Road, N of Bucknell	Negligible	Negligible	Negligible	Negligible	Negligible	Minor adverse
37	Middleton Road, W of Bucknell	Major adverse	Major adverse	Negligible	Negligible	Negligible	Minor adverse
38	B4030 Middleton Stoney Road, NW of NWB	Negligible	Negligible	Minor adverse	Negligible	Negligible	Minor adverse

16.9.1.6 Following the assessment of impacts, further mitigation has been considered to address those areas where impacts are significant (i.e. a moderate or major adverse impact).

16.10 Mitigation of Impacts

16.10.1.1 The assessment of impacts has identified that there are a number of locations where moderate adverse impacts may arise and there is a need for further mitigation to reduce the significance of these impacts. These are discussed in turn below.

Middleton Stoney Road, West of Howes Lane

16.10.1.2 The level of traffic increase forecast on this link is anticipated to have a significant impact on pedestrian severance and amenity. It should be highlighted however that the level of traffic increase forecast for Application 1 (Land North of Railway) is unlikely to arise in reality from the Development assessed in this chapter as the increase from the Masterplan in this area is due to the access points into the western parts of the overall NW Bicester development. Moreover, Middleton Stoney Road forms the western extent of NW Bicester and there are no properties on the western side of the road. Thus the actual impact of severance is likely to be minimal. Nonetheless, as access points are provided from Middleton Stoney Road west of Howes Lane, there would be a need to introduce the built up area speed limit to the north west and appropriate speed reduction measures on this section.

Banbury Road, north and south of A4095

16.10.1.3 Driver delay is anticipated to be increased on Banbury Road both north and south of the A4095 junction, given the increase in traffic in this area from both the Reference Case and the NW Bicester development. A potential scheme to

replace the roundabout junction with a traffic signalised cross roads is set out in the Transport Assessment, in order to increase the junction capacity and reduce driver delay in this area.

Shakespeare Drive, South of Howes Lane

16.10.1.4 The level of traffic increase forecast on this link is anticipated to have a significant impact on pedestrian severance and amenity. It should be highlighted however that the level of traffic increase forecast for Application 1 (Land North of Railway) is unlikely to arise in reality from the Development assessed in this chapter as the increase from the NW Bicester Masterplan in this area is largely due to the connections into the land to the south of the railway from Shakespeare Drive. However, it is proposed that measures are introduced in the area to mitigate impacts on pedestrians and cyclists which may include speed reduction measures (built outs for example), widened footways/ cycle route and crossing points.

Middleton Road, West of Bucknell

16.10.1.5 The Bicester Saturn Model forecasts an increase in traffic routeing through Bucknell village and using Middleton Road both in the Reference Case and with the Development. It is considered likely that the model does not fully take account of the difficult alignment of Bainton Road as an access to the village and may be over-predicting traffic movements. Nonetheless it is recognised that the NW Bicester development is in close proximity to the village and the routes westwards towards J10 of the M40/ south to the A34 via the village may be used to an extent by Development traffic. In order to minimise this impact it is proposed to introduce traffic calming measures in the village, the nature and extent of which would be agreed with OCC and the Parish Council.

16.11 Residual impacts

16.11.1.1 Table 16-21 sets out the residual impacts on links as a result of mitigation of those areas where moderate adverse impacts are anticipated without further measures.

16.11.1.2 The residual impacts of the Development following mitigation are mainly assessed as negligible or minor adverse with Middleton Road west of Bucknell being moderate adverse and significant.

Table 16-21 Traffic and Transport Residual Impacts

Link		Pedestrian severance	Pedestrian Amenity	Driver Delay	Pedestrian Delay	Fear and Intimidation	Accidents and Safety
Link Ref	Link Description						
7	Middleton Stoney Rd, W of Howes Lane	Minor adverse	Minor adverse	Minor adverse	Negligible	Negligible	Minor adverse
13	Bucknell Road, S of Howes Lane	Negligible	Negligible	Negligible	Negligible	Minor adverse	Negligible

14	Banbury Road, N of Lords Lane	Negligible	Negligible	Minor adverse	Minor adverse	Minor adverse	Minor adverse
16	Banbury Road, S of A4095	Negligible	Negligible	Minor adverse	Negligible	Negligible	Negligible
17	Buckingham Road, S of Skimmingdish Lane	Negligible	Negligible	Minor adverse	Minor adverse	Minor adverse	Negligible
23	Shakespeare Drive, S of Howes Lane	Minor adverse	Minor adverse	Minor adverse	Negligible	Negligible	Minor adverse
24	M40 J10 northbound off slip road	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
25	Ardley Road (E of B430)	Negligible	Negligible	Negligible	Negligible	Negligible	Minor adverse
29	Shakespeare Drive, E of Middleton Stoney Road	Negligible	Negligible	Minor adverse	Minor adverse	Negligible	Negligible
30	The Approach, W of Bucknell Road	Minor adverse	Negligible	Negligible	Negligible	Negligible	Minor adverse
36	Ardley Road, N of Bucknell	Negligible	Negligible	Negligible	Negligible	Negligible	Minor adverse
37	Middleton Road, W of Bucknell	Moderate adverse	Moderate adverse	Negligible	Negligible	Negligible	Minor adverse
38	B4030 Middleton Stoney Road, NW of NWB	Negligible	Negligible	Minor adverse	Negligible	Negligible	Minor adverse

17 Interrelationships and Cumulative Impacts

17.1 Introduction

- 17.1.1.1 This chapter assesses the potential cumulative effects of the development of Application 1 (North of the Railway), located to the north west of Bicester, hereafter known as ‘the Development’. This Chapter aims to ensure the incremental impacts resulting from the combined effects of various actions are assessed. Even though the impacts of each action, when independently assessed, are considered insignificant, incrementally, the impacts could be significant.
- 17.1.1.2 This Chapter will address two main areas where there is potential for cumulative impacts:
- 1 Application 1 with other local developments
 - 2 In-combination effects of Application 1 on specific receptors

17.2 Technical Assumptions and Method

Legislation and Planning Policy Context

- 17.2.1.1 Schedule 3(1) of the Town and Country Planning (Environmental Impact Assessment) (England and Wales) Regulations 2011 state that *“the characteristics of development must be considered, having regard, in particular to ...b) the cumulation with other development”*, Schedule 3(2) *“the existing land use”* and Schedule 4(4) *“description of the likely significant effects of the development on the environment which should cover....cumulative effects.”*

Guidance Documents

- 17.2.1.2 There is no specific UK guidance on cumulative effects assessment but the European Commission has published the Guidelines for the Assessment of Indirect and Cumulative Impacts as well as Impact Interactions in 1999 (Ref 17-1). These guidelines provide information on methods, the assessment process and information needed to assess the impacts.

Spatial Scope

- 17.2.1.3 The spatial scope for the assessment has taken into consideration the following:
- Cumulative effects with other developments
 - Combined effects from impact interactions
- 17.2.1.4 This required the analysis of cumulative effects at two spatial scales. The area wide assessment considered the cumulative effects of the:
- Cumulative effects with other developments in the vicinity of the site
 - The ES considered impacts from construction and operation, where individual impacts have the potential to cause impact interactions.

Methodology

17.2.1.5 The assessment of cumulative effects consisted of two elements:

Combined Effects with Other Developments

17.2.1.6 Other developments considered in the vicinity of Application 1 where the Development has potential for cumulative impacts are set out in Table 17-1 below. In addition to the consented schemes in Table 17-1, further consideration has been given of the cumulative impacts of the Development with planned or consented schemes within the Masterplan Site (e.g. Application 2, A4095 NW Strategic Link Road and the Exemplar site).

Combined Effects of Individual Impacts

17.2.1.7 The combined effects of individual impacts from the Development on a particular receptor have been assessed using the methodology as outlined in the EC guidelines and good practice accepted methodology.

Assessment of Effects

17.2.1.8 As discussed above, there is no established guidance in the UK for assessing the significance of cumulative effects. For cumulative effects assessment, the key is to focus on the receptor and consider its capacity to accommodate the changes that are likely to occur because of the Development. Sensitive receptors have been identified in the technical chapters (Chapters 5 to 16). The existing status of these receptors, current trends and existing regulatory requirements were established in defining the baseline.

Significance Criteria

17.2.1.9 The terms used to define significance of cumulative and residual impacts are as follows:

- **Adverse:** detrimental or negative impacts to an environmental resource or receptor
- **Negligible:** imperceptible impacts to an environmental resource or receptor
- **Beneficial:** advantageous or positive impact to an environmental resource or receptor.

17.2.1.10 Where beneficial or adverse impacts have been identified, these have been assessed against the following scales:

- **Minor:** slight, very short or highly localised impact
- **Moderate:** limited impact (by extent, duration or magnitude) which may be considered significant
- **Major:** considerable impact (by extent, duration or magnitude) of more than local significance or in breach of recognised acceptability, legislation, policy and standards.

Limitations

- 17.2.1.11 The construction programmes for the planned and consented schemes in Table 17-1 and Table 17-2 were not available during the preparation of the ES. It was not possible to do any quantitative predictions because of the uncertainty of overlaps in construction periods.

17.3 Baseline Conditions

- 17.3.1.1 The baseline for assessing cumulative effects considered the planned and consented developments in the vicinity which are likely to have in combination effects with the Development. The baseline also established the policy and planning context for the development, which identified likely developments in the future. These are discussed in more detail below.
- 17.3.1.2 For the assessment of combined impacts and impact interactions during construction, the baseline has been established in the technical chapters where potential cumulative impacts have been identified. This chapter presents a summary and identifies any other impact interactions.

17.4 Mitigation and Enhancement Measures

Construction Mitigation

- 17.4.1.1 The potential cumulative effects during construction are due to the combined effect of traffic generation, noise, vibration, visual impact and dust, as well as generation of waste during construction. These impacts are likely to be temporary and occur in the immediate vicinity of the site. A CEMP would be prepared, which would be likely to reduce these impacts. Mitigation measures identified in the technical chapters would help mitigate impacts.

Operational Mitigation

- 17.4.1.2 The Access and Travel Strategy for NW Bicester contains measures to minimise traffic impacts and subsequent environmental effects. For ecology, mitigation measures have been proposed to ensure that there would be a net gain in biodiversity. The development of the Masterplan Site and other sites in the Bicester wastewater treatment works catchment area have the potential to result in a cumulative excessive demand on the treatment capacity of the works and or the ability of the receiving watercourses to dilute resulting discharges of effluent. Further work is being undertaken to assess the treatment required. Cumulative impacts are not anticipated for landscape, visual, noise and contaminated land. Potential cumulative impacts are identified for agricultural land, cultural heritage and waste. However, mitigation measures as identified in the relevant chapters would help reduce the development's cumulative impacts.

17.5 Assessment of Cumulative Effects

- 17.5.1.1 This assessment has considered the potential cumulative effects with other developments in the vicinity of Application 1. In most cases, detailed consideration of the combined effects of the Development together with other

developments will be limited to others that have been constructed, are being constructed or those that have been granted consent. The list of Consented Schemes is presented in Table 17-1. To fully assess cumulative effects, it is also necessary to consider other planned developments and these Planned Schemes are presented in Table 17-2.

Table 17-1 Consented Schemes near Application 1

Project/ Development	Description	Status
Bicester Eco Town Exemplar Site Caversfield Oxfordshire (10/01780/HYBRID)	Development of Exemplar phase of NW Bicester Eco Town to secure full planning permission for 394 residential units and an energy centre (up to 400 square metres), means of access, car parking, landscape, amenity space and service infrastructure and outline permission for a nursery of up to 350 square metres, a community centre of up to 350 square metres, 3 retail units of up to 770 square metres (including but not exclusively a convenience store, a post office and a pharmacy, an Eco-Business Centre of up to 1,800 square metres, office accommodation of up to 1,100 square metres, an Eco-Pub of up to 190 square metres, and a primary school site measuring up to 1.34 hectares with access and layout to be determined.	Under Construction
South West Bicester (06/00967/OUT)	Development of residential accommodation consisting of 1,631 units, 3.91ha employment space, hotel, health village, secondary school and community hall. This development is around 2.3 km from Application 1. Additional 100 houses currently being considered.	Under Construction
Bicester Business Park (07/01106/OUT)	46,200 sqm employment development at Bicester Business Park, including relocation of Tesco store. This development is around 2.8 km from Application 1.	Planning Permission granted in 2010
Caversfield, Fringford Road (13/01056/OUT)	200 dwellings approximately 300m from Application 1.	Planning appeal pending
RAF Bicester (new houses in Caversfield)	197 dwellings from new build and conversion approximately 1km from Application 1.	Under construction

Table 17-2 Planned Schemes

Strategic Site	Description
NW Bicester Application 2 (South of Railway)	51ha to south of Application 1, within the NW Bicester Masterplan Site, for proposed mixed use eco development of 900 homes, new primary and secondary school, a local centre, site access arrangements, commercial buildings and open space.
A4095 NW Strategic Link Road	Principle site infrastructure for NW Bicester Masterplan, comprising re-alignment of Howes Lane, new crossings below the railway line and a new primary sub-station.
Bicester 2 -	227.5ha predominantly brownfield site to the south of Bicester proposed for mixed

Strategic Site	Description
Graven Hill	use development of 1,900 dwellings, significant employment land providing for high quality job opportunities, associated services, facilities and other infrastructure including the potential for the incorporation of a rail freight interchange. This site is around 4 km south of Application 1. Approved subject to S106
South West Bicester Phase 2	Anticipated to accommodate 720 homes with associated services, facilities and other infrastructure within a 28.5ha site. This site is around 2.8 km south west of Application 1. Application going to Planning Committee imminently.
Bure Place Town Centre Redevelopment Phase 2	Anticipated to comprise the redevelopment at Bure Place to provide a new supermarket, cinema, restaurants, shops, car parking and bus interchange. CDC considering now that Phase 1 is open. This site is around 2.8 km south east of Application 1.
Former RAF Bicester	Development would support heritage tourism uses, leisure, recreation, employment and community uses associated with the development of a museum to RAF Bomber Command. The development of hotel and conference facilities would also be supported as part of a wider package of employment uses. Plans being drawn up. This site is around 1.6 km south east of Application 1.
Bicester Gateway	Knowledge economy employment development to the south of the existing retail area (Wyevale Garden Centre), adjacent to the A41 on a 15ha site. This site is around 4 km south of Application 1.
North East Bicester Business Park	8ha Business Park development for employment use. This site is around 2.7 km south east of Application 1.
South East Bicester	A mixed use 40ha site for employment and residential development to the east of the ring road to the south east of Bicester. (800 houses/ 64,812sqm employment development) This site is around 4.3km south east of Application 1.

17.5.1.2 Most of the developments are at a distance of 1km or more from Application 1, except for the Exemplar Site, Applications 2 and A4095 NW Strategic Link Road within NW Bicester Masterplan Site, at Fringford Road, Caversfield and the new houses in the RAF Bicester site in Caversfield, which have the potential cumulative effects relating to traffic.

In combination effects of the Masterplan Site on specific receptors

17.5.1.3 It is considered that construction works have the greatest potential for impact interactions. The combination of noise, visual and air quality impacts (dust and emissions from increased vehicle traffic) have the potential to cause **significant adverse cumulative impacts**.

Construction Impacts

- 17.5.1.4 It is considered that the construction phase of the Development could have the greatest potential to contribute to combined impacts and impact interactions. During construction, potential impacts exist for sensitive receptors. The receptors considered to be most sensitive during the construction phase are the new residents of the completed phase (such as those residents in the Exemplar site, residents of the early development while the mid development phase is being constructed, and the residents of the early and mid-development while the later development is being constructed), pedestrians on the surrounding roads and residents of nearby residential areas adjacent to the eastern and northern boundaries of the Exemplar Site and users of the local road network. Criteria for identifying those receptors that are potentially sensitive include the nature of the receptor, proximity to the works and extent of exposure to impacts and impact interactions.
- 17.5.1.5 Potential impact interactions are mainly related to noise, vibration, dust and traffic. Interactions would occur during the construction phase, therefore would be temporary effects.

Operational Impacts

- 17.5.1.6 The assessment of operational impacts considers the impact of the Development with other future developments. Adverse cumulative impacts during operation are identified for cultural heritage, agricultural land, air quality, and transport. There would be a beneficial cumulative impacts on human health and employment.

Topic Specific Cumulative Effects

- 17.5.1.7 The following sections provide an assessment of the potential cumulative impacts associated with each environmental topic and their likely significance.

Landscape and Visual Impact

- 17.5.1.8 The Application 1 Development would be separated from Application 2 (South of Railway) by the existing railway line (on a vegetated embankment), limiting inter-visibility. Chapter 5 provides further details on the cumulative impacts on landscape and visual. In summary, there are not likely to be significant cumulative landscape and visual effects from Application 1 as part of the wider Masterplan for NW Bicester.
- 17.5.1.9 Other committed developments in the vicinity of Bicester are separated from the existing urban area or other infrastructure such that there would be **no cumulative impacts** on the local landscape or visual amenity of north west Bicester.

Ecology

- 17.5.1.10 The Application 1 Development is part of a large-scale mixed use development on the wider Masterplan Site for NW Bicester. Chapter 6 provides further details on the cumulative impacts on ecology. Overall, development of the wider Masterplan has sought to ensure that the most valuable habitats are retained within suitable buffers, that wildlife corridors are provided that would enable

both wildlife and people to cross the Masterplan Site safely. Overall, the wider Masterplan should lead to a development that would result in a net gain in biodiversity and no adverse impacts should arise as a result of the Masterplan.

- 17.5.1.11 Other developments of relevance to this assessment are detailed in Table 17-1 and Table 17-2. The closest of these are two housing developments: a proposal for 200 dwellings at Caversfield, along Fringford Road approximately 300m from the Masterplan site; and the other, for 197 dwellings at RAF Bicester, Caversfield, which is currently under construction.
- 17.5.1.12 The impact assessment concluded that, assuming the effective implementation of the mitigation measures outlined in Chapter 6, there would be no residual impacts on habitats and species. It is not envisaged that the developments listed in Table 17-1 and Table 17-2 would lead to any direct impacts on the habitats and species associated within the study area. Therefore, together with the other developments, there would be **no cumulative impacts** on species and habitats.

Hydrology

- 17.5.1.13 Development of the Site, together with other sites in the Bicester wastewater treatment works (WWTW) catchment area, has the potential to result in a cumulative excessive demand on the treatment capacity of the works and/or the ability of the receiving watercourses to dilute resulting discharges of effluent. Further work is underway to assess the treatment requirement. Alternative on-site measures to treat effluent from the NW Bicester development are also being considered and these may become available to the Site in the future. If these become available there would be no cumulative impacts arising from the Site on the Bicester wastewater treatment works, otherwise the infrastructure modelling currently underway would assess the need for an infrastructure upgrade. It is considered that upgrading the infrastructure at the WWTW would provide sufficient mitigation to manage any cumulative impacts.
- 17.5.1.14 Similarly, the cumulative impacts of the Development (Application 1 North of Railway) with Application 2 (South of Railway), and the Exemplar Site may be significant in terms of water supply. However there is an aspiration to attain water neutrality, i.e. reducing overall demand to allow new development within the existing supply, and Thames Water has a long term water supply strategy to ensure demand can be met without harm to the environment. Therefore, there could be minor cumulative effects arising from this development and others planned in the area. The development of the Site would not have any other permanent adverse effects on the water environment.

Air Quality

- 17.5.1.15 Cumulative effects from the proposed Development and other developments may have potential effects on air quality during both the construction and operation phases. There are likely to be cumulative effects of construction dust on new residents in the Exemplar Site and those from the earlier development phases during the construction of the mid and later development phases.

- 17.5.1.16 Should the construction phase programmes overlap then there is the potential for increases in dust impacts at sensitive locations in the vicinity of the site. However, these may only occur if significant dust generating activities are undertaken within 350m of each other. Given the size of the Site it is not anticipated these conditions would occur on a regular basis. Additionally, suitable mitigation for each development phase would be implemented to control emissions at source. As such, the cumulative air quality impacts associated with fugitive dust emissions during construction are considered to be of neutral significance.
- 17.5.1.17 During the operational phase, there is potential for significant traffic generation with associated vehicle exhaust emissions. The cumulative impacts as a result of the Development were predicted to be neutral at all receptor locations apart from North Street, where the cumulative impacts were predicted to be slight adverse. It is noted that the same impact significance was predicted when only the proposed Development was assessed. The cumulative impacts on annual mean PM₁₀ concentrations as a result of the Development were predicted to be neutral at all receptor locations. The overall significance of cumulative operational phase emission impacts on human receptors was determined as slight adverse.

Noise

- 17.5.1.18 The predicted cumulative traffic noise levels in Chapter 8 indicates in general that the change in noise level would range from Minor-Beneficial to Negligible at most receptor locations, with a Major Beneficial change at certain receptors.
- 17.5.1.19 There is predicted to be a substantial decrease in noise levels at a number of receptor locations due to the proposed realignment of Howes Lane (A4095). The decrease in noise level is due to the increased distance between the realigned A4095 rather than a change in traffic volumes.
- 17.5.1.20 Based in the predicted magnitude of noise change no mitigation measures are proposed.
- 17.5.1.21 Table 17-1 indicates that only the Caversfield, Fringford Road development, located approximately 300m from Application 1, has the potential for cumulative construction noise impacts. However, it is not known whether construction of this proposed development would coincide with work on the Development.
- 17.5.1.22 There is also a potential for cumulative noise impacts where off-site construction works take place in close proximity to on-site construction works. Cumulative construction noise impacts are unlikely where there is a separation distance of more than 300m between construction locations.
- 17.5.1.23 There is a potential for cumulative construction noise impacts should works on Application 1 (North of railway), Application 2 (South of railway) and A4095 NW Strategic Link Road take place in close proximity. The appropriate phasing of works and appropriate mitigation measures would be designed to reduce risk of potential cumulative construction noise impacts.

Cultural Heritage

- 17.5.1.24 Application 1 (North of Railway), the Exemplar Site, Application 2 (South of Railway), and A4095 NW Strategic Link Road together would have a cumulative impact as most or all of the key archaeological material identified by the investigations carried out as part of this assessment would be altered by the development. With mitigation in the form of archaeological excavation and recording this would lead to a significance of impacts of **moderate adverse**. None of the other developments included in this cumulative impact assessment would contribute to the cumulative impacts on the archaeological assets as they are not located within the extent of the areas of archaeological activity.
- 17.5.1.25 The three Applications together with the Caversfield Fringford Road development (located approximately 300m from Application 1) would represent a significant change to the setting of the listed buildings within the study area from rural agricultural to an increasingly suburban and urban landscape. This would result in a cumulative impact of **moderate** and a significance of impacts of **slight adverse**. None of the other developments listed in Table 17-1 and 17-2 would contribute to the cumulative impacts on the setting of the built heritage assets as they are located outside of their settings.
- 17.5.1.26 RAF Bicester is located to the east of the North West Bicester Development and is too far away to contribute to cumulative impacts on archaeology and built heritage assets. However development at RAF Bicester would have a cumulative impact on the historic landscape as the former RAF base is another key element of the historic landscape within this area. The loss of this key element combined with the cumulative impacts of the 3 North West Bicester Development Applications plus the Exemplar Site, the North East Bicester Business Park, South West Bicester, South West Bicester Phase 2 and the Caversfield Fringford Road on other key landscape elements including field patterns and historic field boundaries would result in changes to many key historic landscape elements, noticeable differences in sound and changes in use across the historic landscape. This would lead to a **moderate** impact on the historic landscape character leading to a significance of impacts of **slight adverse**.

Soils and Contamination

- 17.5.1.27 No likely cumulative impacts with other developments have been identified.

Agriculture and Land Use

- 17.5.1.28 A number of other developments are planned or consented in the vicinity of Bicester which have the potential to impact on agricultural land (Table 17-1 and Table 17-2). Some of these are at a significant scale, such as the South West Bicester development which reports a total loss of approximately 60 ha of agricultural land. However, the majority of this land has been assessed as being Grade 3b, with only a small amount of Grade 3a land (area not provided but likely to be <10% of the total area). The Bicester Business Park development states that the land to be lost is Grade 4. Provisional ALC mapping shows that the land surrounding Bicester is classed as Grade 3 or 4. Where more detailed mapping is available areas of Grade 3a land are limited in extent.

17.5.1.29 As such, it is considered that the potential for cumulative impacts on best and most versatile land is limited, and unlikely to be more than permanent **moderate adverse**, assuming all other developments follow current policy and guidance.

Human Health

17.5.1.30 There are likely to be a number of **positive** operational cumulative health impacts for the residents that would live at the Development and potentially indirect benefits for other residents in the wider community if there are wider multiplier effects e.g. employment creation, improved cycle and walking links.

17.5.1.31 During the construction phase, there is the potential for cumulative adverse impacts on human health as a result of noise and vibration, dust and visual amenity nuisance, as well as potential disruption to transport and access. Individually, each of these issues have been assessed as having a **neutral** effect on human health, although there is a risk that during the works there could be particularly intense periods of activity which could result in some concerns for local residents, although they are considered unlikely to result in significant adverse impacts with the implementation of the recommended mitigation measures. Such impacts would also be temporary but within relatively long term as the construction period spans over 25 years. The use of CEMPs would help to manage such potential adverse impacts.

17.5.1.32 The other developments that have the potential to have cumulative impacts with the Development are presented in Table 17-1 and Table 17-2 of Chapter 17 and Drawing 17-1 and 17-2. The assessment of the cumulative impacts of these developments on human health during construction is uncertain as information is not available about the likely construction phasing. However, providing appropriate construction mitigation measures are implemented, such impacts are unlikely to be significant.

17.5.1.33 In the long-term, there is potential for long-term cumulative health benefits with the other developments as they would provide infrastructure benefits including the provision of new schools, new civic buildings, new housing and new employment opportunities that could all offer indirect health benefits. The provision of associated infrastructure including new cycling routes and transport improvements as part of these developments could also offer benefits for physical activity.

Socio Economics

17.5.1.34 Due to the nature of the Development, only significant cumulative impacts relating to population, housing, employment and community infrastructure provision have been assessed. Chapter 17 sets out details of relevant consented and planned developments within the Bicester area. Of the applications listed in Chapter 17, several are for significant levels of housing development (for example SW Bicester Phases 1 and 2, Graven Hill and Application 2 (South of Railway)). All of these applications are supported with various social and community infrastructure and therefore it is not considered that there would be a significant cumulative impact.

17.5.1.35 Equally there are several schemes for which a significant level of employment generation is proposed (for example Bicester Business Park, Graven Hill, Bure Place Redevelopment Phase 2, North East Bicester Business Park and Bicester Gateway). The cumulative impact arising from the Development plus those of committed and planned developments listed in Tables 17-1 and 17-2, is considered to be **major beneficial**.

Waste

17.5.1.36 All the planned and consented schemes in Tables 17-1 and Table 17-2 would generate waste. It is reasonable to assume that they would need to comply with local and regional policy in addition to legislation. Therefore through mitigation of other schemes, and the proposals set out in this chapter it is reasonable to conclude that there would be no cumulative impacts.

Traffic and Transportation

17.5.1.37 Cumulative impacts have been identified and include the effect on residents and businesses due to the increased traffic flows consisting of a high proportion of heavy goods vehicles. Mitigation measures would be put in place to reduce the severity of the impacts such as producing a Construction Traffic Management Plan which would identify lorry routes away from residential roads and schools and ensure operations are during off-peak periods.

17.5.1.38 The traffic flows with the Development have been generated and then been compared to the Future Baseline/ Reference Case 2031. The impact in terms of pedestrian severance, amenity, delay and fear and intimidation together with driver delay and accidents and safety have been assessed. The assessment of impacts has identified that there are a number of locations where moderate adverse impacts may arise and mitigation to reduce the significance of these impacts has been suggested in Chapter 16 of this ES.

17.6 Summary

17.6.1.1 This chapter has considered cumulative impacts associated with Application 1. The baseline for the assessment included other future developments in the vicinity of the Site, including other developments in the wider Masterplan for NW Bicester.

17.6.1.2 The potential cumulative impacts with other developments are likely to be during the construction phase on traffic and transport, air quality and noise and vibration associated with the combined effect of construction vehicles and operation of machinery. No likely cumulative effects are anticipated during the operational phase of these other developments.

17.6.1.3 Combined or impact interactions are likely to occur during the construction phase. Each environmental chapter has identified mitigation measures to reduce impacts. Following implementation of these mitigation measures, the interaction impacts are considered to be mostly negligible.

Glossary

100- and 1000-year events A means of identifying a likelihood of flooding, giving an estimate of how frequently a flood level or flow could be expected to occur. A 100-year event has a 1 in 100 (or 1%) chance of occurring in any one year.

Aberford Series Name given to the soil type present across the area.

Accumulated Temperature (ATO) Median accumulated temperature above 0°C from January to June recorded between 1961 and 1980. This gives a measure of the warmth of the local climate.

Air-borne noise This refers to noise which is fundamentally transmitted by way of the air and can be attenuated by the use of barriers and walls placed physically between the noise and receiver.

Alluvium Sediment deposited by rivers on adjacent land.

Altitude Height above sea level

Ambient sound The totally encompassing sound in a given situation at a given time, usually composed of sound from all sources near and far.

Annual Average Rainfall (AAR) Average amount of precipitation falling at a specified site between 1941 and 1970 recorded by the Meteorological Office. This gives a measure of the wetness of the local climate.

Application 1 Land to the North of Lords Lane. This application covers some 155 ha and includes the majority of the land within the masterplan area to the north of the railway line. The application would provide for some 2,600 new homes, including 250 provided on an 'extra care' basis, open space, land for a new primary school and further land for the extension of the primary school being provided in the Exemplar phase. A new local centre would be provided to meet the needs of the community. The application provides for site access arrangements which include the partial realignment of Bucknell Road through the site.

Application 2 Land to the north west of Howes Lane. This application covers some 51 ha and represents part of the land to the south of the railway line. The application would provide for some 900 new homes, 14.5 ha of open space, land for a new primary school and secondary school, an energy centre and a local hub. The application also provides part of the realigned Howes Lane and site access arrangements.

A4095 NW Strategic Link Road A new A4095 NW Strategic Link Road for Bicester will be promoted which will address the traffic movement and highways constraints issues which have long been an issue for the town. This planning application is currently being progressed in consultation with the Council.

Arable crop A crop sown in cultivated land: in this context applies to cereal or other combinable crops and root crops.

ARCADY Traffic capacity modelling software for roundabouts

Auger A tool for exposing the soil profile without the need for digging a large soil pit

Audible range The limits of frequency which are audible or heard as sound. The normal ear in young adults detects sound having frequencies in the region 20 Hz to 20 kHz, although it is possible for some people to detect frequencies outside these limits.

Available Water Capacity (AWC) A measure of moisture that plants can extract from the soil. Related to soil texture, soil structure, stoniness and depth of the soil that roots can exploit

Background noise The term used to describe the noise measured in the absence of the noise under investigation. It is described as the average of the minimum noise levels measured on a sound level meter and is measured statistically as the A-weighted noise level exceeded for ninety percent of a sample period. This is represented as the L₉₀ noise level.

Best and Most Versatile Land (BMV) Land falling into Grades 1, 2 and 3a as determined under the Agricultural Land Classification system

Blackwater Foul drainage which is treated for domestic or commercial purposes to supplement or replace mains water supply

Blue roof A blue roof is a roof design that is explicitly intended to store water, typically rainfall. Blue roofs can provide a number of benefits depending on design

Brashy Term used to describe soils containing a high proportion of loose broken rock

Brown roof A brown roof is a Green Roof Systems that permits, for example, the conservation of urban biodiversity when redeveloping a Brownfield Site Brown roofs generally provide high roof insulation, while maintaining habitats and green spaces in urban areas, thus encouraging biodiversity

Calcareous soil Soil containing free carbonate (usually CaCO₃) sufficient to effervesce visibly when treated with 10% diluted HCl.

Clay A soil separate consisting of particles < 0.002 mm in equivalent diameter.

Code for Sustainable Homes An environmental impact rating system for housing in England & Wales, setting new standards for energy and water efficiency, beyond those required for building regulations.

Contaminated Land Any area which appears to be in such a condition, by reason of substances in, on or under the land that significant harm is being caused, or there is a significant possibility of such harm being caused, or significant pollution of controlled waters is being, or is likely to be, caused. Land that has been polluted or contaminated would not necessarily fall within the above legal definition of contaminated land. For an area of land to meet the definition of contaminated land, a significant pollutant linkage must be established. A pollutant linkage consists of three parts; A source of contamination in, on or under the ground; A pathway by which the contamination is causing significant harm (or which represents a significant possibility of such harm being caused) and a receptor (of a type specified in the regulations).

Contaminated Land Report 11 The model procedures for the Management of Land Contamination, CLR 11, have been developed to provide the technical framework for applying a risk management process when dealing with land affected by contamination. The process involves identifying, making decisions on, and taking appropriate action to deal with land contamination in a way that is consistent with government policies and legislation within the UK.

Controlled Waters Risk Assessment A staged approach to define the level of risk to controlled water as Land contamination can affect groundwater, freshwater and coastal waters. Groundwater is particularly vulnerable to contamination as it underlies many sites and is difficult to clean up once polluted.

Cyprinid fishery An *EC designated fishery* capable of supporting coarse fish.

Decibel [dB] The level of noise is measured objectively using a Sound Level Meter. This instrument has been specifically developed to mimic the operation of the human ear. The human ear responds to minute pressure variations in the air. These pressure variations can be likened to the ripples on the surface of water but of course cannot be seen. The pressure variations in the air cause the eardrum to vibrate and this is heard as sound in the brain. The stronger the pressure variations, the louder the sound is heard. The range of pressure variations associated with everyday living may span over a range of a million to one. On the top range may be the sound of a jet engine and on the bottom of the range may be the sound of a pin dropping. Instead of expressing pressure in units ranging from a million to one, it is found convenient to condense this range to a scale 0 to 120 and give it the units of decibels.

Demography Study of both quantitative and qualitative aspects of human population.

dB(A): A-weighted decibels. The ear is not as effective in hearing low frequency sounds as it is hearing high frequency sounds. That is, low frequency sounds of the same dB level are not perceived to be as loud as high frequency sounds. The sound level meter replicates the human response of the ear by using an electronic filter which is called the "A" filter. A sound level measured with this filter switched on is denoted as dB(A). Practically all noise

is measured using the A filter. The sound pressure level in dB(A) gives a close indication of the subjective loudness of the noise.

Early Medieval Period AD410 to 1066

EC Designated fishery A watercourse identified as maintaining fish and for which regular monitoring and reporting is undertaken by the Environment Agency

Employed Persons who are working full-time or part-time during a specified payroll period. Temporary employees and those on paid-leave are included in this definition

Energy Centre One energy centre where on-site energy will be generated through low carbon technology such as a biomass boiler and/ or biomass or gas Combined Heat and Power plant ('CHP').

Environmental Protection Act 1990, Part IIA set up a system for the regulation of contaminated land in England and Wales. The regime provides a framework for identifying and remediating (cleaning up) contaminated land. Contaminated land is land that poses an unacceptable risk to human health or the environment through its current use. The Part 2A regime did not apply to radioactive contaminated land until it was extended in 2006.

Erosion Movement of soil materials by water or wind action

Exemplar The first phase of NW Bicester Eco-development being progressed by A2Dominion Group.

Field Capacity Days (FCD) A meteorological parameter which estimates the period when the soil moisture deficit is zero; i.e. the soil is full (or over-full) of water.

Flood Estimation Handbook (FEH) A best practice approach to estimating flood runoff based on national records and statistical methods.

Flood Zone 1 An area where flooding from watercourses or the sea is expected to occur less frequently than once in a thousand years (has less than a 0.1% chance of occurring in any one year).

Flood Zone 2 An area where flooding from watercourses is expected to occur between once in a hundred years and once in a 1000 years, or from the sea between once in a two hundred years and once in a 1000 years

Flood Zone 3 An area where flooding from watercourses is expected to occur more frequently than once in a hundred years or from the sea more than once in a two hundred years.

Fluvial flooding Flooding as a result of river flows overtopping river banks and spreading across adjacent land.

Free-Field Refers to a situation in which the radiation from a sound source is completely unaffected by the presence of any reflecting surfaces.

Full Time Employment Working full-time is defined as working 31 hours or more a week.

Geology The science that deals with the dynamics and physical history of the earth, the rocks of which it is composed, and the physical, chemical, and biological changes that the earth has undergone or is undergoing

Gley Conditions of poor aeration resulting in chemical reduction of iron and other elements and in grey colours and mottles, usually caused by poor or imperfect drainage.

Gradient Change in elevation with distance.

Green Infrastructure General green infrastructure provision includes a Country Park, Wetland Waste Water Treatment Facility, Village Green, Green Loops Linear Park (including riparian corridor), area for a Burial Ground, Sustainable Drainage features including swales and attenuation ponds, allotments, a community farm, street trees, informal recreational sports fields and play areas

Green roof A green roof or living roof is a roof of a building that is partially or completely covered with vegetation and a growing medium, planted over a waterproofing membrane. It may also include additional layers such as a root barrier and drainage and irrigation systems

Ground Gas Risk Assessment Land contamination can give rise to volatile contaminants which can pose a risk of harm to human health by asphyxiation or illness if inhaled. Vapours and gases such as methane may also pose a risk of fire or explosion. Good practice in gas hazard evaluation and risk assessment is to assess how to apply these to particular situations. Assessing the degree of risk posed by methane and other gases from the ground is a key step in the feasibility appraisal of new developments and of remedial works for existing ones.

Health Impact Assessment A process of assessing the impact of a project, plan or programme on human health and wellbeing.

Heavy goods vehicles (HGV) Assumed to be buses, rigid trucks and semi trailer trucks with a weight greater than 3 tonnes. Also heavy vehicles can be defined in terms of length as buses, or trucks with a length exceeding 5.25 metres.

Hide A measurement of land for tax assessment used in the Domesday Book. Approximately 120 acres, depending on local variations.

Housing Tenure Nature of an occupant's legal estate in a tract of land (freehold or leasehold) which indicates whether the occupant is an owner or tenant.

Human Health Risk Assessment The human health risk assessment process is used to establish the risk to humans and aims to provide a methodology (consistent with CLR 7-11) that supports quantitative risk assessment by deriving site specific assessment criteria to assess chronic risks to human health from land contamination and the site is evaluated according to either the existing use or to a proposed development. Land contamination can affect the health of people living, working, visiting or otherwise present on a site.

Industry of Employment The sector of employment, defined by the Standard Industrial Classification of employment (2007)

ISIS A computer modelling package used to estimate flows and flood levels in rivers.

Iron Age 800BC to AD43

JFLOW A computer package used to give a broad estimate of flood levels

Job Provision Approximately 233 jobs in multi-occupied office units, based mainly in the local centre. Approximately 20 jobs in local business units, providing workshop space for light industry or small scale storage. A further 201 jobs in a variety of retail and local service activities, including a nursery, community facilities and extra care housing 33 jobs at the primary school. Approximately 420 jobs undertaken wholly or primarily from home. 140 construction jobs throughout the construction period, estimated for this application to be approximately 10 years.

Job Seekers Allowance JSA claimant count records the number of people claiming Jobseekers Allowance (JSA) and National Insurance credits at Jobcentre Plus local offices. People claiming JSA must declare that they are out of work, capable of, available for and actively seeking work during the week in which the claim is made.

Landscape Landscape is defined in the European Landscape Convention as '...an area, as perceived by people, whose character is the result of the action and interaction of natural and/or human factors'.

L_n noise descriptors. Because noise varies with time, a single noise value cannot adequately define the noise ambient. For this reason, the acoustic environment is described using a number of noise level descriptors (as used in this report) as follows;

L_{10} The sound pressure level that is exceeded for 10% of the time for which the given sound is measured.

L_{90} The level of noise exceeded for 90% of the time. The bottom 10% of the sample is the L_{90} noise level expressed in units of dB(A).

L_{eq} Equivalent sound pressure level - the steady sound level that, over a specified period of time, would produce the same energy equivalence as the fluctuating sound level actually occurring.

L_{Amax} The maximum RMS A-weighted sound pressure level occurring within a specified time period.

Leaching The transport of materials down through a soil as a result of water draining vertically down through the soil.

Loam The textural class name for soil having moderate amounts of each of sand, silt and clay.

Loudness A rise of 10 dB in sound level corresponds approximately to a doubling of subjective loudness. That is, a sound of 85 dB is twice as loud as a sound of 75 dB which is twice as loud as a sound of 65 dB and so on

LVIA Landscape and Visual Impact Assessment – the assessment of impacts on landscape and visual amenity

Main badger setts These usually have a large number of holes with large spoil heaps, and the sett generally looks well used. They usually have well used paths to and from the sett and between sett entrances. Although normally the breeding sett is in continual use all year round, it is possible to find a main sett that has become disused because of excessive disturbance or for some other reason

Masterplan The NW Bicester Masterplan Site lies approximately 1.5km from the Bicester town centre, within the parish of Caversfield, and its boundary runs alongside the B4030, B4095 and B4100. The Masterplan is intended to set out the framework for future NW Bicester development and is intended to be used to help guide all forthcoming planning applications. The Masterplan site is being developed in four phases, with the Exemplar Site, located on the north eastern edge of the Masterplan, being progressed as the first phase. Planning permission has been granted for the Exemplar Site. The three remaining phases comprise Application 1 (North of Railway), Application 2 (South of Railway) and A4095 NW Strategic Link Road. Planning applications for these three sites are being submitted to the local planning authority in August 2014.

Microphone An electro acoustic transducer which receives an acoustic signal and delivers a corresponding electric signal.

Micro-relief The changes in slope angle that occur over short distances.

Main River A designated river where the Environment Agency has powers to carry out flood defence works

Medieval Period 1066 to 1540

Modern period 1914 to present

Moisture deficit The difference between the maximum amount of water potentially stored in a drained soil and the amount remaining after some of the water has been used by growing vegetation.

Mottles Patches of different colour or shades of colour interspersed with the dominant matrix colour.

Noise Sound which a listener does not wish to hear.

NW Bicester The wider eco-development being progressed by A2Dominion Group. This comprises a 406 hectare site to the north west of Bicester.

Occupation A person's occupation is coded from the response to the question asking for the full title of the Main job and the description of what is done in that job. It is coded to the 2000 edition of the Standard Occupational Classification (SOC).

Ordinary watercourse A (usually small) watercourse which does not form part of a *main river*. Maintenance of an ordinary watercourse is the responsibility of the riparian owner but local authorities have permissive powers to carry out flood defence works

Outlying badger setts These usually only have one or two holes, often have little spoil outside the hole, have no obvious path connecting them with another sett, and are only used sporadically

Parent material The material within which a soil has developed (for example limestone or alluvium).

Post-medieval period AD1540 to AD1914

Prehistoric period Pre 30,000BC to AD43

Rainwater Harvesting Collecting, storing and using rainwater for domestic or commercial purposes to supplement or replace mains water supply

Roman Period AD42 to AD410

Salmonid fishery An EC designated fishery capable of supporting trout and similar fish.

Sensitive Receptors People or places that have the potential to experience impacts.

Shared Accommodation A house in multiple occupation

Silage Fodder harvested whilst green and kept succulent by partial fermentation

Silt A soil separate consisting of particles 0.063 to 0.002 mm in equivalent diameter.

Slowly Permeable Layer (SPL) A layer at least 15 cm in thickness with the upper boundary within 80 cm of the surface and with soil textural and structural characteristics that impede the downward movement of excess rainfall.

Soil The upper layer of the earth's crust, in which plants grow: descriptions usually identify the relevant characteristics of its (usually) horizontal layers in terms of their significance for soil characteristics and crop growth, usually to 1.2 m depth.

Soil Guideline Values are scientifically based generic assessment criteria to help evaluate long-term risks to human health from chemical contamination in soil.

Soil profile A vertical section of a soil.

Soil Quality The ability of a soil to provide a given function or functions (such as supporting crop growth, allowing water infiltration and storage to mitigate flood risk etc.)

Soil structure The combination or arrangement of individual soil particles into larger compound units (or peds) with channels between. The secondary units are characterised and classified on the basis of size, shape and degree of development.

Soil texture The relative proportion of the various soil particle size fractions in a soil (sand, silt and clay).

Standardised Mortality Rate This rate is calculated by dividing the number of deaths by the actual local population in a particular age group multiplied by the standard population for that particular age group and summing across the relevant age groups.

Subsidiary badger setts Often these have only a few holes, are usually at least 50 m from a main sett, and do not have an obvious path connecting them with another sett. They are not continuously active

Subsoil Lower layers of soil lying between the topsoil and the material (solid rock or sediment) on which the soil has developed

Suckler cows Cows belonging to a meat breed or born of a cross with a meat breed, and belonging to a herd intended for rearing calves for meat production

Superficial deposits Sediments laid down over the top of the solid rocks, for example materials deposited by rivers.

Sustainable Drainage Systems (SuDS) A sequence of water management practices and facilities designed to drain surface water in a manner that will provide a more natural and sustainable approach than what has been the conventional practice of routing run-off through a pipe to a watercourse.

Topsoil The upper part of a soil, often darker in colour and often considered to be more fertile than underlying layers.

Unemployment A person is defined as unemployed if he or she is not in employment, is available to start work in the next 2 weeks and has either

looked for work in the last 4 weeks or is waiting to start a new job. This is consistent with the International Labour Office (ILO) standard classification.

Unshared Accommodation A dwelling consisting of one household space

Waste Data Flow A waste analysis programme used by local authorities to log waste arisings within their district

Wetness Class Soil wetness is classified according to the depth and duration of waterlogging in the soil profile. Six wetness classes are identified; from very well to very poorly drained.

Wetness limitation A soil wetness limitation exists where the soil water regime adversely affects plant growth or imposes restrictions on cultivations or grazing by livestock.

Worklessness Worklessness is a less familiar term than unemployment to describe those who are economically inactive. The economically inactive are people of working age who are not working, not in full-time education or training and are not actively seeking work.

Zone of Visual Influence Approximate, theoretical area from which any part of the Development would be visible.

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