

APPENDIX 2: INVERTEBRATE STATUS CODES

Earlier published reviews of scarce and threatened invertebrates employed the Red Data Book criteria used in the British Insect Red Data Book (Shirt 1987) with the addition of the category RDBK (Insufficiently Known) after in 1983. In addition, the status category Nationally Notable (now termed Nationally Scarce) was used from 1991. The original criteria of the International Union for the Conservation of Nature (IUCN – now called the World Conservation Union) for assigning threat status used in these publications had the categories *Endangered*, *Vulnerable*, and *Rare*, which were defined rather loosely and without quantitative parameters. The application of these categories was largely a matter of subjective judgment, and it was not easy to apply them consistently within a taxonomic group or to make comparisons between groups of different organisms. The deficiencies of the old system were recognised internationally, and in the mid-1980s proposals were made to replace it with a new approach which could be more objectively and consistently applied. In 1989, the IUCN's Species Survival Commission Steering Committee requested that a new set of criteria be developed to provide an objective framework for the classification of species according to their extinction risk. The first, provisional, outline of the new system was published in 1991. This was followed by a series of revisions, and the final version adopted as the global standard by the IUCN Council in December 1994. The guidelines were recommended for use also at the national level. In 1995, the Joint Nature Conservation Committee (JNCC) endorsed their use as the new national standard for Great Britain, and subsequent British Red Data Books have used these revised IUCN criteria. These criteria are used in this present report and are as follows:

EXTINCT (EX) A species is *Extinct* when there is no reasonable doubt that the last individual has died.

EXTINCT IN THE WILD A species is *Extinct* in the wild when it is known to survive only in cultivation, in captivity or as a naturalised population (or populations) well outside the past range.

CRITICALLY ENDANGERED

A species is *Critically Endangered* when it is facing an extremely high risk of extinction in the wild in the immediate future, as defined by any of the following criteria:

A. Population reduction in the form of either of the following:

1. An observed, estimated, inferred or suspected reduction of at least 80% over the last 10 years or three generations, whichever is the longer, based on direct observation, an index of abundance appropriate for the species, a decline in area of occupancy, extent of occurrence and/or quality of habitat, actual or potential levels of exploitation or the effects of introduced species, hybridisation, pathogens, pollutants, competitors or parasites.
2. A reduction of at least 80%, projected or suspected to be met within the 10 years or three generations, whichever is the longer, based on any of these parameters.

B. Extent of occurrence estimated to be less than 100 Km² or areas of occupancy estimated to be less than 10 Km² and estimates indicating any two of the following:

1. Severely fragmented or known to exist at only a single location.
2. Continuing decline, observed, inferred or projected, in any of the following: a. extent of occurrence b. area of occupancy c. area, extent and/or quality of habitat d. number of locations or sub-populations e. number of mature individuals
3. Extreme fluctuations in extent of occurrence, area of occupancy, number of locations or sub-populations or number of mature individuals.

C. Population estimated to number less than 250 mature individuals and either:

1. An estimated continuing decline of at least 25% within 3 years or one generation, whichever is longer or
2. A continuing decline, observed, projected, or inferred, in numbers of mature individuals and population structure in the form of either severely fragmented (*i.e.* no sub-population estimated to contain more than 50 mature individuals) or all individuals are in a single sub-population

D. British population estimated to number less than 50 mature individuals.

E. Quantitative analysis showing the probability of extinction in the wild of at least 50% within 10 years or 3 generations, whichever is the longer.

ENDANGERED (Formerly RDB category 1)

A species is Endangered when it is not *Critically Endangered* but is facing a very high risk of extinction in the wild in the near future, as defined by any of the following criteria:

A. Population reduction in the form of either of the following:

1. An observed, estimated, inferred or suspected reduction of at least 50% over the last 10 years or three generations, whichever is the longer, based on direct observation, an index of abundance appropriate for the species, a decline in area of occupancy, extent of occurrence and/or quality of habitat, actual or potential levels of exploitation or the effects of introduced species, hybridisation, pathogens, pollutants, competitors or parasites.
2. A reduction of at least 50%, projected or suspected to be met within the 10 years or three generations, whichever is the longer, based on any of these parameters.

B. Extent of occurrence estimated to be less than 5,000 Km² or areas of occupancy estimated to be less than 10 Km² and estimates indicating any two of the following:

1. Severely fragmented or known to exist at no more than five locations.
2. Continuing decline, observed, inferred or projected, in extent of occurrence, area of occupancy, area, extent and/or quality of habitat, number of locations or sub-populations or the number of mature individuals.

C. Population estimated to number less than 2500 mature individuals and either:

1. An estimated continuing decline of at least 20% within 5 years or 2 generations, whichever is longer or
2. A continuing decline, observed, projected, or inferred, in numbers of mature individuals and population structure in the form of either severely fragmented (*i.e.* no sub-population estimated to contain more than 250 mature individuals) or all individuals are in a single sub-population

D. British population estimated to number less than 250 mature individuals.

E. Quantitative analysis showing the probability of extinction in the wild of at least 20% within 20 years or 5 generations, whichever is the longer..

VULNERABLE (Formerly RDB category 2)

A species is *Vulnerable* when it is not *Critically Endangered* or *Endangered* but is facing a high risk of extinction in the wild in the medium-term future, as defined by any of the following criteria (A to E):

A. Population reduction in the form of either of the following:

1. An observed, estimated, inferred or suspected reduction of at least 20% over the last 10 years or three generations, whichever is the longer, based on direct observation, an index of abundance appropriate for the species, a decline in area of occupancy, extent of occurrence and/or quality of habitat, actual or potential levels of exploitation or the effects of introduced species, hybridisation, pathogens, pollutants, competitors or parasites.
2. A reduction of at least 20%, projected or suspected to be met within the 10 years or three generations, whichever is the longer, based on any of these parameters.

B. Extent of occurrence estimated to be less than 20,000 Km² or areas of occupancy estimated to be less than 20,000 Km² and estimates indicating any two of the following:

1. Severely fragmented or known to exist at no more than ten locations. Continuing decline, observed, inferred or projected, in extent of occurrence, area of occupancy, area, extent and/or quality of habitat, number of locations or sub-populations or the number of mature individuals.
2. Extreme fluctuations in extent of occurrence, area of occupancy, number of locations or sub-populations or number of mature individuals.

C. Population estimated to number less than 10,000 mature individuals and either:

1. An estimated continuing decline of at least 10% within 10 years or 3 generations, whichever is longer or
2. A continuing decline, observed, projected, or inferred, in numbers of mature individuals and population structure in the form of either severely fragmented (*i.e.* no sub-population estimated to contain more than 1000 mature individuals) or all individuals are in a single sub-population

D. Population very small or restricted in the form of either of the following:

1. Population estimated to number less than 1,000 mature individuals.
2. Population is characterised by an acute restriction in its area of occupancy (typically less than 100 km) or in the number of locations (typically less than 5). Such a species would thus be prone to the effects of human activities (or stochastic events whose impact is increased by human activities) within a very short period of time in an unforeseeable future, and is thus capable of becoming *Critically Endangered* or even *Extinct* in a very short period.

E. Quantitative analysis showing the probability of extinction in the wild of at least 10% within 100 years.

LOWER RISK (Formerly RDB category 3)

A species is Lower Risk when it has been evaluated but does not satisfy the criteria for any of the categories *Critically Endangered*, *Endangered* or *Vulnerable*. Species included in the Lower Risk category can be separated into three sub-categories:

- **Conservation Dependent** species which are the focus of a continuing species -specific or habitat-specific conservation program targeted towards the species in question, the cessation of which would result in the species qualifying for one of the threatened categories above within a period of five years.
- **Near Threatened** Species which do not qualify for *Lower Risk (Conservation Dependent)*, but which are close to qualifying for *Vulnerable*.
- **Least Concern**
Species which do not qualify for *Lower Risk (Conservation Dependent)* or *Lower Risk (Near Threatened)*.

DATA DEFICIENT A species is *Data Deficient* when there is inadequate information to make a direct or indirect assessment of its risk of extinction based on its distribution and/or population status. A species in this category may be well studied, and its biology well known, but appropriate data on abundance and/or distribution are lacking. *Data Deficient* is therefore not a category of threat or Lower Risk.

LOWER RISK (NATIONALLY SCARCE – FORMERLY NATIONALLY NOTABLE)

Species which are not included within the IUCN threat categories and are estimated to occur less than 100 hectads of the Ordnance Survey national grid in Great Britain. It should be noted that Lower Risk (Nationally Scarce) is not a threat category, but rather an estimate of the extent of distribution of these species. Lower Risk species are subdivided as follows:

- | | |
|-----------|---|
| Na | species estimated to occur within the range of 16 to 30 10-kilometre squares of the National Grid System. |
| Nb | species estimated to occur within the range 31 to 100 10-kilometre squares of the National Grid System. |
| N | Diptera (flies) not separated, falling into either category Na or Nb. |

NATIONALLY LOCAL (L)

Species which, whilst fairly common, are evidently less widespread than truly common species, but also not qualifying as Nationally Notable having been recorded from over one hundred, but less than three hundred, ten-kilometre squares of the UK National Grid.

ASSOCIATED DEFINITIONS

Extent of occurrence

Extent of occurrence is defined as the area contained within the shortest continuous imaginary boundary which can be drawn to encompass all the known, inferred or projected sites of present occurrence of a species, excluding cases of vagrancy. This measure may exclude discontinuities or disjunctions within the overall distributions of species (e.g. large areas of obviously unsuitable habitat) (but see 'area of occupancy'). Extent of occurrence can often be measured by a minimum convex polygon (the smallest polygon in which no internal angle exceeds 180 degrees and which contains all the sites of occurrence).

Area of occupancy

Area of occupancy is defined as the area within its 'extent of occurrence' (see definition) which is occupied by a species, excluding cases of vagrancy. The measure reflects the fact that a species will not usually occur throughout the area of its extent of occurrence, which may, for example, contain unsuitable habitats. The area of occupancy is the smallest area essential at any stage to the survival of existing populations of a species (e.g. colonial nesting sites, feeding sites for migratory species). The size of the area of occupancy will be a function of the scale at which it is measured, and should be at a scale appropriate to relevant biological aspects of the species. The criteria include values in km², and thus to avoid errors in classification, the area of occupancy should be measured on grid squares (or equivalents) which are sufficiently small.

APPENDIX 3: AQUATIC INVERTEBRATE SPECIES RECORDED

Group / species	English name	Ecological associations and comments	In aquatic area					
			1	2	3	4	5	6
ANNELIDA	LEECHES							
Erpobdellidae								
<i>Erpobdella testacea</i>		eutrophic water bodies where it feeds on insect larvae		+				
COLEOPTERA	WATER BEETLES							
Dytiscidae								
<i>Agabus bipustulatus</i>		freshwater ponds etc		+				
<i>Hydroporus palustris</i>		freshwater ponds etc		+				
<i>Hydroporus planus</i>		most water bodies will support this common species		+			+	
<i>Hydroporus pubescens</i>		freshwater ponds etc		+				
Elmidae								
<i>Limnius volkmari</i>		aquatic species	+				+	
Haliplidae								
<i>Haliplus ruficollis s. str.</i>		ponds ditches and similar static water bodies		+			+	
Hydrophilidae								
<i>Helophorus minutus</i>				+				
CRUSTACEA: AMPHIPODA								
Gammaridae								
<i>Gammarus pulex</i>		most freshwater habitats		+	+	+	+	
CRUSTACEA: ISOPODA								
Asellidae								
<i>Asellus aquaticus</i>	freshwater hog louse	most freshwater habitats		+	+	+	+	
DIPTERA	TRUE FLIES							
Chironomidae	midges							
unidentified larvae				+	+	+	+	
Culicidae	mosquitoes							
unidentified larvae				+				
Tipulidae	crane flies							
unidentified larvae						+	+	
EPHEMEROPTERA	MAYFLIES							
Baetidae								
<i>Baetis rhodani</i>		Usually in running water - especially riffles	+					
HETEROPTERA	WATER BUGS							
Corixidae								
<i>Callicorixa praeusta</i>		Aquatic species. Most still or slow-flowing water bodies.		+			+	
<i>Sigara lateralis</i>		freshwater ponds etc thriving in those polluted by animal dung		+				
<i>Sigara stagnalis</i>		Aquatic species.		+				
Gerridae								
<i>Gerris lacustris</i>		Aquatic species. Ponds, lakes and canals with abundant submerged vegetation.		+				
Naucoridae								
<i>Ilyocoris cimicoides</i>		Aquatic species - weedy ponds, canals etc		+		+		
Notonectidae								
<i>Notonecta glauca</i>		Aquatic species - weedy ponds, canals etc		+				
MOLLUSCA	WATER SNAILS							
Lymnaeidae								
<i>Lymnaea peregra</i>	the wandering snail	ponds, streams and marshes		+	+	+	+	
<i>Planorbis planorbis</i>		freshwater habitat with pondweeds		+				
ODONATA								
Coenagrionidae								
<i>Enallagma cyathigerum</i>	Common blue	static, open water bodies with emergent vegetation,		+				

	damselfly	flying mid May to early October							
<i>Ischnura elegans</i>	Blue-tailed damselfly	found in most permanent water bodies, the adults flying from May to August		+					
PLECOPTERA	STONEFLIES								
Nemouridae									
<i>Nemoura cinerea</i>		aquatic larvae are associated with still and very slow water		+					
TRICHOPTERA	CADDIS FLIES								
Limnephilidae									
<i>Limnephilus auricula</i>		common species of grassy pools and ditches including temporary waters		+					

APPENDIX 7M

Hyder Consulting (2010) North-West Bicester Eco-town Exemplar Site Biodiversity Strategy

A2Dominion Group and P3 Eco (Bicester) Ltd NW Bicester eco development Exemplar

Appendix 7M: NW Bicester eco development
Exemplar Eco-Town Biodiversity Strategy



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Appendix 7M: NW Bicester eco development Exemplar Eco-Town Biodiversity Strategy

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Report No 0510-UA001881-UE21R-01-ETBS

Date 25 November 2010

This report has been prepared for A2Dominion Group and P3 Eco (Bicester) Ltd in accordance with the terms and conditions of appointment for Appendix 7M: NW Bicester eco development Exemplar Eco-Town Biodiversity Strategy dated May 2010. Hyder Consulting (UK) Limited (2212959) cannot accept any responsibility for any use of or reliance on the contents of this report by any third party.

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Appendix A:Heads of terms for Landscape and Ecology Conservation Management Plan

Appendix B: Examples of initiatives to involve local residents in their local environment

Drawings

Drawing 7M-1 The landscape proposals

Drawing 7M-2 Figure to illustrate biodiversity losses and gains.

1 Introduction

This document forms an Eco-Town Biodiversity Strategy (ETBS) for the proposed Exemplar development. This has been created as a standalone ETBS document for the proposed Exemplar development. A separate ETBS will be produced for the remainder of the proposed NW Bicester eco development, which will incorporate the findings and proposals of the Exemplar ETBS.

This document sets out the key elements of the ETBS in relation to the proposed Exemplar development and details the mechanism by which a positive benefit for biodiversity will be achieved.

2 Siting, location and context

The proposed Exemplar development is located on the north-western edge of Bicester in Oxfordshire. The proposed development is approximately 21.1 hectares (ha) and is agricultural land that largely comprises arable and grassland fields used for silage production and cattle grazing.

A full ecological assessment was undertaken of the proposed development and wider area, including a comprehensive desk-based assessment and suite of ecological surveys, to provide up-to-date information regarding biodiversity within the area. This information has been used to assess potential impacts on ecological receptors and to identify measures to ensure a net gain in biodiversity.

The ecological assessment compiled information with respect to the habitats and species likely to be present within or in close proximity to the proposed development. It also identified opportunities for net biodiversity gain, including areas for habitat enhancement, habitat creation and ecological benefits by design. Important green infrastructure and wildlife corridors were also identified during the ecological assessment process. Full details of the ecological assessment can be found within Chapter 7 of the Exemplar Environmental Statement.

2.1 Biodiversity baseline and 'Key habitat'

The proposed development is not located within or in close proximity to any statutory or non-statutory designated sites of nature conservation importance.

The proposed Exemplar development currently comprises arable farmland intensively managed as grassland leys for silage production, and cattle-grazed improved grassland of little intrinsic nature conservation value. A small number of trees and shrubs had been planted in one of the grazed pastures approximately five years previously. The grass surrounding these trees and shrubs is tall and unmanaged. The invertebrate surveys revealed that the site is of limited value to invertebrates. Two uncommon invertebrate species were recorded within an area of longer grassland habitat on the north-western edge of the site. The fields are enclosed by a network of species-rich hedgerows. These hedgerows support breeding birds, including low numbers of yellowhammer, song thrush, dunnoek and whitethroat, all of which are species of conservation concern. One pair of barn owls was also confirmed to be breeding in a nest box 125m west of the proposed development. A pair of kestrels were also recorded nesting in a barn owl box in the south-west corner of the site. The hedgerows were considered to be suitable habitat for common reptile species. Whilst no reptile species were recorded within the proposed development, low numbers of common lizard and grass snake were found along adjacent hedgerows and close to the proposed development boundary. The hedgerows were also

considered suitable for use by hedgehogs. The hedgerows also function as linear corridors allowing movement of species across the proposed Exemplar development.

The River Bure and a tributary cross the proposed development area. One confirmed common pipistrelle bat roost was located within a mature tree on the bank of the River Bure. The watercourses and several hedgerows were found to be key areas of activity for foraging and commuting bats. Two further bat roosts were found in buildings outside of the proposed development in St Lawrence's Church, Caversfield, and at Home Farm. A 'main' badger sett is located within the proposed development adjacent to the tributary of the River Bure, and a single hole 'outlying' sett was found within the banks of the River Bure.

The hedgerows and the River Bure and its tributary were considered to be the most important habitat features within the proposed Exemplar development and are therefore considered to be 'Key habitat' features that will be maintained, managed and enhanced for their biodiversity interest. This will ensure that these habitats are able to support viable populations of species of conservation concern, including species currently recorded within the proposed development (for example breeding birds and bats), and species currently absent which would benefit from enhancement measures (such as valuable invertebrate species and assemblages).

Mechanisms for the long-term protection and management are discussed under Section 3 Management (below).

2.2 Masterplanning and design

This section considers how the masterplanning process has considered the conservation of existing habitats, the creation of new habitats and how these will be designed and programmed in alongside development. Regular meetings and discussions between the project team have ensured the creation of a proposed development masterplan which features biodiversity as a key element of the design. This design has also incorporated knowledge of local ecology and UK and Local Biodiversity Action Plan (BAP) targets, including consideration of the nearby Conservation Target Areas (CTAs). With these in mind, the masterplan design seeks to deliver the following principal objectives of an eco-town development:

- Protecting and enhancing the existing 'Key habitat';
- Mitigating the impact of development and securing net biodiversity gain;
- Integrating biodiversity with the built environment; and
- Increasing biodiversity's resilience and ability to adapt to climate change.

The measures provided to achieve these principals within the proposed Exemplar development are described in detail within the following paragraphs. The landscape proposals and a drawing illustrating biodiversity losses and gains are presented at the end of this report.

2.2.1 Protecting and enhancing the existing 'Key habitat'

The masterplan design has ensured the protection of the 'Key habitats' identified within the proposed development, including the hedgerows and the River Bure and its tributary. The design also protects and enhances these 'Key habitats' for the valuable species they are known to support, for example: bats, breeding birds, and badgers, and also species they have the potential to support, such as reptiles, hedgehogs and invertebrates. These habitats will be managed in the long-term under a Landscape and Ecology Conservation Management Plan (see Section 3, below).

Hedgerows

All hedgerows within the proposed development will be retained as far as possible; however, it will be necessary to breach these features to provide access, or to create visibility splays. Where this will occur, the affected sections of hedgerow and their associated ground flora will be translocated and replanted nearby within the proposed development. This will ensure that the hedgerow network is retained and that there is no net loss of hedgerows (see Section 2.3, below).

The majority of hedgerows within the proposed Exemplar development will also have a buffer comprising at least 3m of tall, less-intensively managed diverse grassland. This long grass habitat will complement the species-rich hedgerows and provide additional habitat for wild flowers and invertebrate species, thus increasing the foraging resource for bats, birds and other fauna. Adjacent to these hedgerow buffers there will also be areas of supplementary and transitional green habitats, including allotments, native tree and shrub planting, and SuDS features. Thus, all of the hedgerows will be retained within or adjacent to semi-natural habitats. The retention of hedgerows and the creation of diverse buffer habitats will maintain nesting opportunities and foraging resources for birds, and provide continued habitat and wildlife corridors for species such as invertebrates, reptiles, hedgehogs and bats. New native tree and shrub planting alongside existing hedgerows areas will also reinforce and enhance the hedgerow habitat already present. This will include the provision of fruit and nut bearing trees and shrubs to provide increased foraging for invertebrates, bats and birds. Neither the watercourses nor the retained hedgerows and associated habitats will be lit so that they maintain their value for nocturnal fauna, including light-sensitive bat species.

During construction the hedgerows will be protected through sensitive construction methods, see Section 2.3 below for further details.

2.2.2 River Bure and tributary

The River Bure and its tributary together with the adjacent riparian and wooded corridor will be retained as part of the proposed development design. A wide belt of semi-natural habitat will be maintained alongside the River Bure and its tributary to protect both the channels and their flood zones. New mixed broadleaved woodland and orchard planting will be created alongside the River Bure to provide a wooded corridor which will also provide a link between the retained hedgerows and the riparian habitat. This woodland planting will also widen the tree-lined riparian corridor and enhance the ecological value of the River Bure. This planting will be of benefit to invertebrates and the species that feed on them, such as bats and hedgehogs, and provide nesting sites for birds. The wind-fallen fruit will also provide additional foraging habitat for badgers. It is also proposed to plant orchard trees alongside the tributary of the Bure, which will also be of benefit to badgers, and diverse grasslands which will be of particular benefit to invertebrates.

Where the roads within the proposed development cross the watercourses, these will be designed to minimise impacts on the watercourses and associated protected species, creating a dark corridor beneath the structures, protecting the use of these areas for nocturnal species such as bats and badgers. During the operational phase of the proposed development, the bridges will need to be lit for safety reasons. However, the lighting will be designed to be highly directional and shielded to ensure that the watercourses and adjacent supplementary habitats will be maintained as 'dark corridors' to allow bats continued foraging and commuting routes across the proposed Exemplar development.

Sustainable Drainage Systems (SuDS) that form part of the proposal will ensure water quality within the watercourses is protected once the site is developed. The design of the SuDS also includes features such as grassy swales, water-filled ditches, permanently wet and ephemeral

attenuation ponds, which provide additional wetland habitat that will be of conservation value to flora and fauna species. These features will be planted with appropriate mixes of native plants to maximise their benefit to wildlife. Areas of diverse grassland will also be created within the river corridors. Where conditions are dry and nutrient-poor subsoil can be uncovered, calcareous grassland species will be sown. Damp areas or areas with a more neutral soil will be sown with a more appropriate native wildflower seed mix.

2.2.3 Protected species

In addition to the protection and enhancement of the 'Key habitats' above, the design of the proposed Exemplar development has ensured the retention of all confirmed and potential bat roost trees in unlit corridors. The design also retains the most valuable commuting and foraging habitat along the River Bure and tributary, these areas will also be unlit. The 'main' badger sett and a single outlying sett within the proposed development will be retained, and disturbance avoided as much as possible. The setts will also be retained within the dark unlit corridors along the River Bure and tributary and screened from development using scrub planting.

2.3 Mitigating the impact of development and securing net biodiversity gain

2.3.1 Mitigation measures

The following mitigation measures will be included within the proposed development to ensure there are no residual impacts on habitats and species. Drawings illustrating the landscape proposals and the biodiversity losses and gains are provided at the end of this report.

Hedgerows

All translocation operations will take place under close ecological and arboricultural supervision and will preferably be undertaken in the autumn/winter period when plants are dormant. This will also avoid conflicts with nesting birds. Should this timing not be possible, further after-care such as watering, may be required to ensure their continued survival. Appropriate measures will be determined in consultation with an arboricultural consultant. Any section of translocated hedgerow will be coppiced at height prior to moving and nest boxes will also be provided in suitable habitat on site to maintain nest sites for breeding birds. In addition, there will be measures to enhance and bolster the existing hedgerows, such as tree and shrub planting, and the provision of supplementary, transitional and buffer habitats adjacent to hedgerows. Together these measures will ensure there is not net less of hedgerows and provide a biodiversity gain. If it is not possible to translocate a hedgerow or the translocation fails new native tree and shrub planting will be provided to compensate for the habitat lost. These measures are discussed in more detail in Section 2.3.2, below.

Indirect impacts associated with disturbance will be minimised by having haul routes and storage/staff facilities located away from retained hedgerows. In addition, any night-time lighting will be kept away from retained hedgerows and will be limited only to those areas where it is absolutely necessary. Retained hedgerows will also be carefully fenced in compliance with British Standards BS5837, to ensure that they are not subject to accidental damage during construction. This protective fencing together with a suitable buffer will ensure that the roots of the hedgerow trees and shrubs are not undermined during any excavation works. In addition, the buffer and adjacent supplementary habitats will protect the hedgerows from indirect disturbance arising from increased human presence, site traffic, noise and lighting during the operational phase of the proposed development.

River Bure and tributary

Current best practice guidance will be followed to control site run-off, and standard mitigation techniques will ensure water quality within these watercourses is protected during all phases of the proposed development. Night-time lighting is not proposed during the construction of the proposed Exemplar development, but should it be necessary it will be kept away from the watercourses.

Pre-construction water quality monitoring of the River Bure and tributary will be collected from three points: upstream of both watercourses; and downstream of the proposed Exemplar development after the River Bure and its tributary have converged. This will ensure a baseline of water quality is provided against which both pre-, during- and post-construction monitoring can be compared.

Barn owls

Given the close proximity of the nest site to the proposed Exemplar development, the nest boxes (including that which was used in 2010), will be moved to a location on the edge of the woodland to the west of the proposed development or other areas of suitable habitat, thus ensuring they remain within suitable foraging habitat but in an area that will not be developed as part of the NW Bicester eco development in the future. Nest boxes would only be moved once it has been confirmed that no owls are currently using them by an experienced, licensed ecologist. This will ensure that there is no net loss in nesting opportunities for barn owls within the local area. In the event that the nest boxes are in poor condition new boxes will be installed instead. These boxes will also provide suitable nesting opportunities for the kestrels that were nesting on the proposed development.

Bats

Street lighting close to the watercourses and hedgerows will be designed to be directional and shielded to ensure that they are maintained as 'dark corridors' to allow bats continued foraging and commuting routes across the Exemplar development. It is therefore considered that there will be no net loss of suitable foraging and commuting habitat for bats.

Badgers

During the installation of the bridge structure over the River Bure, it may be necessary to close a single outlying sett located within the banks of the River Bure in the southern part of the proposed development, to prevent disturbance to badgers. Should disturbance prove likely, the closure of this sett may need to proceed under licence to Natural England, depending on activity levels at the sett at the time of construction works. Protective fencing will be installed around the 'main' badger sett to ensure that it is protected from accidental damage throughout construction. Protective fencing will also be installed around the 'outlying' badger sett prior to its closure (should this be necessary), and throughout construction works if it is to be retained. Any works close to the 'main' badger sett will also be carried out under close ecological supervision to ensure disturbance to badgers is minimised as far as possible. The need for works to proceed under licence to Natural England would also be reviewed and methods of working devised to ensure that activities likely to cause disturbance are avoided if at all possible. The protection and retention of the 'main' sett, the provision of dark corridors to areas of suitable foraging areas and the creation of habitats of value to foraging badgers will ensure that there is no net loss of habitat for badgers.

2.3.2 Securing net biodiversity gains

Habitat creation

In addition to protecting and enhancing existing 'Key habitats', new habitat creation will also be delivered as part of the proposed Exemplar development. The choice of which type of habitats to create on site has been driven by three broad objectives:

- Habitats which will complement the 'Key habitats' being retained;
- Habitats for which creation will make a positive contribution to local and national biodiversity objectives; and
- Habitats which are visually attractive and will enhance the quality of life for the residents of the Exemplar.

It is therefore proposed to create areas of the following:

- Flower-rich calcareous grassland;
- Flower-rich neutral/damp grassland;
- Mixed broad-leaved woodland;
- An area of orchard;
- Belts of tree and shrub planting to create links across the site where none currently exist;
- Permanently wet ponds;
- Temporarily wet features including ponds, ditches and swales;
- Lines of street trees, and blocks of tree and shrub planting as part of traffic controlling measures within home zones;
- Green walls and allotments; and
- Boxes will be provided for bat, bird and invertebrate species.

Areas of diverse grassland, including damp grassland and dry calcareous grassland, will be provided in areas of open space within the proposed development, and alongside hedgerows. These areas will be of potential value to invertebrates (such as the Shaded Pug moth), bats, and birds that are insectivorous. Prior to development there were no areas of diverse grassland within the site; therefore, its inclusion within the design will help to contribute to UKBAP targets for Lowland Calcareous Grassland habitat and the Cherwell BAP for Grassland, Grazing Marsh and Heathland. These grassland areas will also provide an increase in biodiversity, in keeping with Policy ET 16.1 of PPS: Eco-towns, A Supplement to PPS1.

New mixed broadleaved woodland and orchard planting will be provided in habitat adjacent to the River Bure and tributary, which will provide a buffer between the retained farmland and the development, and elsewhere within the proposed development. This woodland planting will also widen the tree-lined riparian corridor and enhance the ecological value of the River Bure and its tributary. Planting of woodland will increase the value of the proposed development for species such as invertebrates, birds, bats, and hedgehogs. Badgers will also benefit from the wind-fall fruit arising from the proposed orchard planting.

Providing woodlands will contribute to UKBAP targets for Lowland Mixed Broadleaved Woodland habitat, the Oxfordshire LBAP for Woodlands, and the Cherwell BAP habitat for Woodlands. It will also be in keeping the closest Conservation Target Area (CTA), the Tusmore and Shelswell Parks with Stoke Lyne Woodlands CTA, which comprises mixed broad-leaved woodland, and with the Oxfordshire Landscape Strategy for this area, which is Wooded Estatelands. These areas will also provide an increase in biodiversity, in keeping with Policy ET 16.1 of PPS: Eco-towns, A Supplement to PPS1.

Tree and shrub planting within the proposed development has been designed to provide a diverse range of food sources for birds and structural heterogeneity to maximise their value for hedgerow/scrub nesting birds. The hedgerows will be bolstered in areas bordering the fields associated with Home Farm. Additional tree planting will provide a link between hedgerows where no boundary feature previously existed, improving connectivity on the proposed development boundary. The allotment areas will also be bordered with low hedgerows and shrub planting which will increase their value for fauna, such as nesting birds. Overall, the areas of tree planting will ensure that in the long-term, new links are created within the proposed development.

Surface water drainage within the proposed development will be managed using SuDS features. These will include permanent and ephemeral ponds, ditches, and swales. This combination of features will be seeded with native species, appropriate to the ground conditions, with native wetland species planted in wet features and species-rich grassland within dry locations. These features will provide diverse habitats of value for invertebrate species, amphibians and reptiles, such as grass snakes which have been recorded in close proximity to the proposed development. Together the SuDS features create a network of wet and dry habitats across the site.

Boxes will be provided in a range of habitats across the proposed development for use by invertebrates, nesting birds and roosting/hibernating bat. More detail on these boxes is provided within Section 2.4, below.

By increasing the overall diversity of habitat types present on site, and managing these habitats for their biodiversity interest, it will be possible to increase the opportunities for a wider range of species to exist on site than were present prior to development. The contribution that the habitat creation measures will make to local biodiversity could be recorded using the Biodiversity Action Recording System (BARS)) which is available to all BAP practitioners.

Table 1. Summary of biodiversity losses and gains

The areas of semi-natural habitats together with the artificial nest and roost features that would be retained and/or created as part of the proposed development would be managed to benefit wildlife in accordance with the Landscape and Ecology Management Plan. Habitats and species would be monitored in accordance with this management plan to ensure that the benefits to biodiversity are recorded and that management is altered, as necessary, to ensure that a net gain in biodiversity is achieved. Habitats and species that could be monitored include the hedgerows, areas of grassland, the SuDS features, orchards, butterflies, bats and birds. More details will be provided within the management plan.

Habitat/species	Value	Impact and effect	Mitigation/enhancement	Overall effect	Loss/Gain
Arable Land	Negligible value to wildlife. Regularly cut for silage. Small area of less intensively managed grassland on northern-western boundary; however, considered too small to be of value to wildlife.	Total loss of habitat. Little impact on the nature conservation resources in the local area.	Dependent on the time of year that works take place in this area pre-construction surveys may be required for brown hares and nesting birds.	Loss of habitat of negligible value to wildlife.	Loss of habitat of negligible nature conservation value
Grassland	Negligible value. Closely grazed by cattle. Species-poor flora.	Total loss of existing habitat. 13499m ² of diverse grassland comprising native species will be created within areas of green space and alongside the hedgerows.	New areas of grassland will be managed to benefit wildlife. The grasslands will include species associated with dry calcareous soils and wetland habitats. The species mix chosen will be appropriate to the location.	Loss of habitat of negligible value to wildlife. Gain in diverse grassland of potential value to wildlife as it develops. Fauna that will benefit include invertebrates, reptiles, bats and hedgehogs. Positive effect.	Gain Diverse grassland created
Recent plantation	Recently planted area of trees and shrubs less than 1m high. Supports unmanaged, species-poor grassland too small and recent in origin to be of value to invertebrates, foraging bats or birds.	Total loss of existing habitat. 9058m ² of new woodland and orchard planting.	Where possible trees and shrubs will be relocated elsewhere within the proposed development to areas of woodland planting to accelerate the development of this habitat. Loss of long grass habitat from this location will be compensated for by the creation of more diverse grassland that is managed to benefit wildlife.	Grassland loss will be more than compensated for through new grassland planting. New woodland and orchard planting will compensate for the loss of the plantation area. Positive effect.	Gain

Habitat/species	Value	Impact and effect	Mitigation/enhancement	Overall effect	Loss/Gain
Woodland planting and orchards	Orchards (an Oxfordshire BAP habitat) created as part of the proposed development in line with BAP targets. Not present prior to development. New woodland planting comprising native trees and shrubs comprising native species of value to wildlife will be created.	9058m ² created (605m ² orchard and 8453m ² of woodland planting).	New plantings will be of benefit to fauna in particular invertebrates, birds, bats, hedgehogs and badgers.	Positive effect. (Gain already considered elsewhere in table.)	
Hedgerows	Species-rich hedgerows, the majority of which would be considered 'important' under the Hedgerows Regulations (1997). Valuable wildlife corridors for species such as invertebrates, reptiles, and bats. Nesting habitats for breeding birds. Species-poor ground floras. UKBAP, Cherwell BAP and Oxfordshire LBAP habitat.	Network fragmented by access roads. 465 linear metres translocated.	Sections of hedgerow that will be removed as part of the proposed development will be replanted to maintain hedgerow links across the site. Fencing will be installed to protect retained hedgerows during construction. New planting will bolster hedgerows. Creating semi-natural habitats including allotments alongside these features will create additional habitat niches and transitional habitats of value to a range of wildlife, enhancing the value of the retained hedgerows. Nest boxes will be provided to compensate for temporary loss of habitat, as hedgerows will be coppiced at height prior to translocation.	In line with BAP targets for both the Cherwell and Oxfordshire BAPs there will be no net loss of hedgerows. Species associated with hedgerows, in particular invertebrates, will benefit from improved management of the hedgerow network in accordance with the Landscape and Ecology Conservation Management Plan. Positive effects as the hedgerows recover and benefit from management.	Gain in the longer term

Habitat/species	Value	Impact and effect	Mitigation/enhancement	Overall effect	Loss/Gain
Watercourses	Seasonally wet or wet during periods of high rainfall. Valuable corridors for bats. Limited value to aquatic species due to the lack of water for most of the year. UKBAP, Cherwell BAP and Oxfordshire LBAP habitat.	Corridors breached by access roads.	Width of bankside habitat removed to accommodate the bridges will be minimised as far as possible. Tree planting will compensate for trees removed. Watercourses and associated riparian habitat retained in wide corridors of semi-natural habitat. New habitats of value to wildlife will be created within river corridors, such as diverse grassland and woodland planting. Sensitive lighting design to ensure dark corridors retained. SuDS features will ensure water entering these features is balanced and treated. New wetland habitats created as part of SuDS supporting native plant species will lead to an increase in wetland habitats across the site.	New habitats of value to wildlife created within stream corridor, including SuDS features, diverse grassland and woodland planting. Water quality protected. Overall positive effect on these features in line with BAP targets.	Gain - improved water management, new habitats created.
School grounds	Although predominantly comprising amenity grassland habitats of value to wildlife will be created. These include an orchard, a nature trail supporting wildflower species, and areas of native tree and shrub planting.	New habitat created within the 10197m ² allocated to the school grounds.	Habitats of value to wildlife will be managed sympathetically to benefit wildlife, It is likely that this would occur since the school is likely to need to meet the requirements of a BREEAM assessment.	Likely to be beneficial but this is dependent on sympathetic management of these green spaces.	Gain (dependent on habitat management)

Habitat/species	Value	Impact and effect	Mitigation/enhancement	Overall effect	Loss/Gain
Allotments and gardens	Although it is not their primary function, the habitats within these areas will be of value to a range of wildlife, including: invertebrates, reptiles, amphibians (particularly if garden ponds are created), nesting birds, badgers and bats.	3764m ² of allotments and 19700m ² of gardens will be created.	Once the dwellings are occupied it is likely that the residents will be involved in the management of the areas of open space. This is likely to have a beneficial effect on the way that they manage their gardens and allotments. At the very least it is likely that compost heaps will be created that will be of benefit to invertebrates and reptiles. Some of the nest boxes, bat roost boxes and invertebrate boxes provided as part of the propose development will be located in these areas.	Likely to be positive particularly in the longer-term as these areas develop and mature. Gain in the longer-term as habitats develop (already considered elsewhere in table with respect to species).	
SuDS features	Ephemeral and permanently wet features will be created as part of the proposed development. Of potential value to invertebrates, amphibians, bats and badgers.	A range of habitats created that would be of benefit to wildlife (covering 1366m ²).	A range of features will be created including: wet ditches, swales, perched ponds and wet ponds. These will be planted with native plants that are appropriate to the conditions, thus wetland plants will be used in features that will be wet or damp, whereas, plants associated with dry conditions will be planted elsewhere.	Positive effect. Gain already considered elsewhere in table.	

Habitat/species	Value	Impact and effect	Mitigation/enhancement	Overall effect	Loss/Gain
Invertebrates	Two uncommon species recorded: Shaded Pug moth and Roesel's Bush-cricket. Overall, site is of limited value to invertebrates.	Loss of existing habitat. It is likely that the uncommon invertebrates would persist on the site since suitable habitats for them would be retained alongside the hedgerow where they were recorded previously.	New habitats of greater value to invertebrates will be created as part of the development proposals. These include: areas of long grass habitat, hedgerows managed to benefit invertebrates, new tree and shrub planting, orchard planting, areas of diverse grassland, permanent wetlands, ephemeral wetlands, allotments, street trees and new habitats within the school grounds. Gardens and allotments also likely to be of benefit to invertebrate species diversity, particularly areas that are less regularly managed.	Loss of habitat of limited value to invertebrates. Creation of habitat that could potentially be of value to invertebrates. Overall a positive effect on these features.	Gain. New habitats created.
Amphibians	No features suitable for breeding amphibians on site. Habitat of limited value to foraging amphibians.	Not likely to be affected.	Temporary and permanently wet habitats created as part of the development proposal could provide conditions suitable for breeding amphibians. The areas of diverse grassland, other SuDS features and areas of tree and shrub planting could also be used by foraging amphibians. Habitats would be managed to benefit amphibians. Garden ponds and other wetland features likely to be created in private gardens which will also be of benefit to amphibians, in particular common frogs.	Overall, positive effects on amphibians as the newly created habitats develop.	Gain. New habitats created.

Habitat/species	Value	Impact and effect	Mitigation/enhancement	Overall effect	Loss/Gain
Reptiles	Common lizard and grass snake recorded in close proximity to development and are likely to be present within the proposed development in small numbers.	Reptiles were found to be associated with grassland adjacent to field boundaries and watercourse. These habitats will be retained or enhanced.	Reptiles will benefit from the habitat creation and enhancement measures, including: retention and enhancement of hedgerows and river corridors, together with adjacent buffer habitats such as diverse grasslands and woodland planting; provision of allotments. Compost heaps and less well managed areas within the allotments and private gardens will also provide habitats for reptiles.	Overall, positive effects on reptiles as the newly created habitats develop.	Gain. New habitats created.
Breeding birds	Site supports small numbers of breeding bird species of conservation concern including: four pairs of yellowhammer; one pair of whitethroat (probable breeding); three pairs of dunnock and one pair of song thrush (probable breeding). One pair of kestrels were confirmed to be breeding within a barn owl box.	Loss of hedgerow habitat used by breeding birds. Disturbance birds nesting in hedgerows, trees and nest boxes. Barn owl boxes to be moved and/or replaced to location where any birds occupying them will not be disturbed by construction work.	Works timed to avoid nesting birds. Where this is not possible, measures will be implemented to avoid disturbance. New nest boxes will be provided to compensate for the temporary loss of nesting sites, as sections of hedgerow are coppiced at height prior to translocation (100 boxes suitable for hole-nesting species and open fronted boxes will be provided). Nest boxes will also be provided on dwellings and public buildings to encourage swifts, house martins, swallows, house sparrow and starlings to nest on the site (54 boxes). Birds will benefit from improved management of the hedgerows. Insectivorous birds will benefit from the creation of habitats of value to invertebrates. Birds	Habitat that supports yellowhammers and whitethroats will be removed; thus, these species are unlikely to persist post-development. Song thrush and dunnock are likely to remain on site and will benefit from the proposed habitat creation. Kestrel may use the nest boxes provided for barn owls and return to forage over the site when the new habitats on the site mature, but they are likely to be displaced for a number of years (several kestrel generations). Birds associated with gardens are likely to benefit from the landscape proposals within the new development as the planting matures. In the longer-term the proposed development could support a	Nest boxes compensate for loss of nesting sites in the short-term. Gain in the longer-term as habitats mature.

Habitat/species	Value	Impact and effect	Mitigation/enhancement	Overall effect	Loss/Gain
			that eat nectar, fruit, nuts and seeds will benefit from the new tree and shrub planting. The creation of wetland habitats and the use of native wetland plants will also be of benefit to birds. Birds will also benefit from habitats created within the private gardens and allotments. A proportion of the house holders also likely to feed wild garden birds and may install further nest boxes.	greater diversity of bird species than were present in 2010, including species of conservation concern which have not previously been recorded due to limited suitable nesting sites and foraging habitat.	
Barn owls	Confirmed to be occupying a nest box offsite but may occasionally forage over site; however, the proposed development area is considered to be of limited value to foraging barn owls.	Potential for disturbance to barn owls using nest box during construction.	Nest boxes will be moved to locations that would not be disturbed by current or future development proposals, this will be adjacent to the development but within suitable foraging habitat. Sufficient foraging habitat will be retained outwith the development proposals to ensure that barn owls would persist on the locality. Loss of small areas of habitat within the development site would not be expected to have any effect on their breeding success.	Barn owl may forage within suitable habitat created along the river corridor. Irrespective of this the development proposal would not have a positive or negative effect on barn owls, given the small areas of suitable habitat loss and the low numbers of prey species (voles) that the newly created habitats are likely to generate.	Neutral
Bats	Confirmed bat roost within a bat box installed on a mature tree along the River Bure within the proposed development. Bats forage and commute along watercourses and hedgerows. Limited natural roosting opportunities exist within the site (several of the trees that have the	Roost retained within watercourse buffer. Foraging corridors and commuting routes retained.	Foraging and commuting routes will be maintained as dark corridors. Links to habitats that are suitable for foraging bats outwith the proposal boundary will be retained. Confirmed tree roost retained and other potential roost sites identified during the surveys will also be retained. The creation of	Increase in potential roost sites. Previously the site contained limited roosting opportunities. The development will include the creation of habitats of potential value to foraging bats. Bat commuting routes will be retained.	Gain. New roosting opportunities and new foraging habitats.

Habitat/species	Value	Impact and effect	Mitigation/enhancement	Overall effect	Loss/Gain
	potential to support roosting bats do so because they support roost boxes).		habitats of benefit to invertebrates (see invertebrates above) would be expected to be of benefit to bats. The proposal would lead to an increase in features suitable for use by roosting bats (at least 20 bat roost boxes will be installed on dwellings and on trees, and a further 20 features (bat bricks or similar) will be installed on buildings, which will be suitable for crevice dwelling bats).	Overall there will be a positive effect on the bats that use the proposed development.	
Brown hares	Not recorded on site. Likely to be present in arable fields in the locality, but the proposed development area is not considered likely to be of value to brown hares.	Loss of foraging habitat unlikely to effect local population.	No mitigation or enhancement measures proposed. A pre-construction walkover of arable fields prior to vegetation removal will be undertaken to confirm the continued absence (or otherwise) of brown hares prior to works if works are to be undertaken when brown hares with dependent young may be present.	The effect on brown hares is expected to be neutral.	Neutral
Otters and water voles	Not present within site. Otters may occasionally travel across the watercourses within the proposed development when accessing other parts of their territory.	No effect.	No mitigation or enhancement measures proposed. A pre-construction walkover will be undertaken to confirm the continued absence (or otherwise) of otters and water voles prior to works.	The effect on otters and water voles is expected to be neutral.	Neutral
Dormice	Not present on site.	No effect	No mitigation or enhancement measures proposed	The effect on dormice is expected to be neutral.	Neutral

Habitat/species	Value	Impact and effect	Mitigation/enhancement	Overall effect	Loss/Gain
Badgers	A 'main' sett and an 'outlying' sett badger sett are located within the proposed development. The proposed development is also part of this social group's foraging habitat.	The 'main' sett will be retained within area of open space. The 'outlying' sett will be retained if possible, but may need to be excluded or lost to prevent disturbance during the construction of the proposed bridge across the River Bure. Potential for disturbance to badgers during construction.	Grassland habitat that is used by foraging badgers will be lost; however, this is not considered to be significant in terms of this social group of badgers' territory size. This will be compensated for in part by the creation of woodland, orchard and grassland habitats that would be of value to foraging badgers, particularly as the planting matures and bears fruit. Badgers are also likely to forage within the school playing fields, the allotments and the gardens unless measures are taken to prevent this from occurring. Badgers will be able to forage along the stream corridors beneath the bridges, it is considered unlikely that they would be at risk of mortality on the site roads given the low speeds that vehicles would be travelling. The 'main' sett will be screened from the development and any lighting associated with it through the planting of screening vegetation.	The effect on badgers is expected to be neutral.	Neutral

Encouraging local ownership and community involvement

Once the site is developed there are considerable opportunities to involve local residents more directly in their local environment to increase local ownership and appreciation of an eco-town ethos. Initiatives could include:

- Encouraging local residents to become involved in national recording schemes such as 'I spot' developed by the Open University or the 'Garden Birdwatch' scheme administered by the British Trust for Ornithology (BTO);
- Liaison with the Thames Valley Environmental Records Centre (TVERC) to develop a local wildlife recording scheme specifically focused on the proposed Exemplar development;
- The involvement of local residents in practical habitat management such as the British Trust for Ornithology's (BTCV) 'Green Gym' Initiative; and
- Encouraging the proposed Exemplar development residents to adopt and manage areas of local green space. For example Cumbria County Councils 'Green Space Project' aims to celebrate and enhance the heritage, cultural, environmental and community value of green spaces in Cumbria for all to enjoy and actively promotes local community engagement. Such an initiative could be set-up for the wider NW Bicester eco development.

Further details of these initiatives are presented in Appendix B.

2.4 Integrating biodiversity into the built environment

The following measures will be incorporated into the built environment and as part of hard landscaping to further benefit biodiversity, including areas where biodiversity is not the prime function. Such measures will include:

- Provision of allotments as supplementary, transitional and buffer habitats adjacent to retained hedges, new tree and shrub planting, and areas of green space to increase the overall area of habitat available to fauna. The 'scruffy' habitats created within the allotments, such as fallow areas, compost heaps or when crops are not gathered, coupled with any deliberate interventions to create wildlife habitats will provide habitats of value to fauna. Species and groups that are likely to benefit include invertebrates, reptiles, amphibians, birds and potentially bats. The allotments will also contribute to the function of adjacent wildlife corridors;
- SuDS comprising a combination of permanently and seasonal wet features will provide habitat conditions for a range of wetland plant species, and enhance the value of these areas for a diverse range of fauna, such as invertebrates, amphibians and reptiles. These features will form a network of wetland features across the site;
- Bird boxes will be provided on dwellings and public buildings, and also on mature trees in suitable locations throughout the proposed development, thus incorporating wildlife into the built environment and increasing nesting opportunities for species that are frequently limited by suitable sites. Nest boxes will be installed in strategic places within dwellings and public buildings and will be targeted towards species that have undergone a decline in numbers in recent years, but are still characteristic of the urban fringe environments. Twenty swift boxes, 10 house martin boxes, 10 house sparrow boxes, four starling boxes, and 10 swallow boxes will be installed on dwellings and public buildings, in line with TCPA's Biodiversity Positive: Eco-towns Biodiversity Worksheet guidance (TCPA, 2009).

These boxes will be installed in locations facing suitable habitat to provide nesting opportunities for these colonial nesting species. No provision has been made for peregrine falcon as there are no suitable structures for an appropriate nesting platform. Approximately 100 nest boxes, comprising boxes suitable for hole nesting species and species that use open fronted boxes, will also be installed within retained vegetation and on the buildings. Together with the planting of new native tree and shrubs within the proposed development, this will provide enhancement measures. Nesting opportunities will therefore be provided for both birds that have been recorded on the site and species which are not currently present on the site due to the lack of natural nest sites. These boxes will ensure there is no net loss in available nesting habitat and provide biodiversity gain within the proposed development by accommodating species of conservation concern not previously recorded. Nest boxes will be checked on an annual basis to monitor the success of the mitigation measures;

- Roosting opportunities for bats will also be provided within dwellings and public buildings and on retained trees within the proposed development site. At least 20 bat bricks will be installed singly in dwellings and/or public buildings, in suitable unlit locations and at a variety of aspects, ideally facing suitable foraging habitat. A minimum of 20 bat boxes will also be installed on retained trees and dwellings and public buildings. These will be installed in groups of three on trees, facing north, south-east and south-west to provide a variety of suitable aspects, and in locations adjacent to suitable foraging habitat such as the watercourses, hedgerows and woodland planting. The provision of bat roosting sites incorporates wildlife features within the built environment and increases roosting opportunities for species that are frequently limited by suitable sites, particularly where energy-efficient housing is created. Prior to development there were few natural roost sites;
- At least fifty invertebrate boxes will also be provided suitable for use by ladybirds, lacewings, and solitary bees in suitable areas across the proposed development, including residential areas;
- There will be the provision of a green wall associated with the northern central bus stop and also on the Energy Centre Silo. These features will support plants of value to wildlife and provide habitat suitable for invertebrates and potentially nesting birds;
- Tree and shrub planting will be included as part of the home zones and also to line streets. These will increase the areas of vegetation and green links within the proposed development, softening hard landscaping areas. The planting will comprise native species of benefit to fauna, such as invertebrates, and will also provide nesting opportunities for bird species;
- Habitat areas will be included within school grounds to increase pupils' daily contact with the natural environment, including a nature trail, native tree and shrub planting orchard planting, wetland planting, and other habitat creation measures.

2.5 Increasing biodiversity's resilience to and ability to adapt to climate change

In order to increase the resilience of biodiversity to climate change and ensure it can adapt in the long term the following elements have been incorporated into the masterplan design:

- Maintaining the ecological diversity of habitats already present on site;

- Increasing habitat diversity and the availability of ecological niches by creating new habitat types within the proposed development, such as woodland, ponds and diverse grassland;
- Ensuring that existing watercourses are given sufficient space to adapt by allowing for natural processes of erosion and deposition;
- The provision of ponds and the SuDS treatment system will ensure water resources within the site are controlled and maintained within the proposed development and for the future. It is anticipated that future rainfall events will be more erratic and SuDS features have been designed to cope with such events;
- Ensuring that retained habitats and newly created habitats form linear corridors allowing migration of species across the proposed development and into the wider countryside;
- Measures to control the micro-climate of the proposed development include the provision of interconnected green spaces and corridors which will help to provide evaporative cooling effects;
- The retention and improvement of the riparian corridor, the hedgerows, woodland planting and green spaces such as the Village green and school, and the interconnecting green corridors will help to reduce temperatures across the proposed development;
- Increased quantity of tree and shrub planting across the proposed development as a whole will also provide green networks and retain moisture in the most developed areas;
- The landscape proposals include large numbers of native species that are adapted to the current climate. Many of these native species will cope with the stressed environments that may be created by climate change. Careful consideration has been given to the grassland mixes; those for the SuDS features; and the tree and shrub species.

3 Management

In order to safeguard the future management of the retained and new habitats, a suitable mechanism for ensuring the funded long-term management of the site will be developed and adopted. This will include the production of a Landscape and Ecology Conservation Management Plan which will identify how habitat features are to be managed to maintain their biodiversity interest (see Section 3 and Appendix A). The management plan will include and allow for an ecological review of management activities on a regular basis, particularly regarding the implementation of the management plan prescriptions, and would monitor the success of the mitigation. This monitoring would identify the need to amend the management practices should they not be delivering the required biodiversity gain. The management plan will also aim to involve the local community in the monitoring and management planning process, and to encourage local ownership and involvement in their natural environment through activities such as practical hands on management and biodiversity recording initiatives.

Heads of terms for a Landscape and Ecology Conservation Management Plan are presented in Appendix A.

4 Funding

In order to safeguard the future management of features of benefit to biodiversity, an appropriate mechanism and funding package will be required to ensure that the measures outlined in the Landscape and Ecology Conservation Management Plan can be delivered in perpetuity.

The exact mechanism by which this will be achieved is yet to be agreed and it is likely that a variety of mechanisms will be selected for the different areas of open space and semi-natural habitats. A number of options that could be considered are presented below, but this list is by no means exhaustive and additional measures may be included within the final Landscape and Ecology Conservation Management Plan. There should also be an element of ecological review of management activities, particularly the implementation of the management plan prescriptions, and monitoring the success of the mitigation. This monitoring would enable alterations to management practices if they are not delivering the required ecological gain.

- The local community could undertake some of the management in the Landscape and Ecology Conservation Management Plan through an initiative similar to BTCV's 'Green Gym', or residents could as a group adopt and management portions of the green infrastructure. Funding could be provided by a community charge on the proposed development's new residents. This would encourage local participation and engender a sense of ownership in their local environment;
- A dedicated management company could be appointed with sufficient funds to implement and manage particular habitat enhancement measures, for example the SuDS features. Funding would be provided by a commuted sum (or similar) from the developer secured through a Section 106 Agreement with the Local Planning Authority. The management company, who ideally would have experience in managing ecologically sensitive areas, would be responsible for undertaking the management of the retained habitats and features in accordance with the Landscape and Ecology Management Plan;
- The Local Planning Authority could oversee the implementation of the Landscape and Ecology Conservation Management Plan. Funding being provided by a commuted sum (or similar) from the developer secured through a Section 106 Agreement with the Local Authority; or
- A third party such as the local wildlife trust, with appropriate funding, would undertake the management and implementation of the Landscape and Ecology Conservation Management Plan.

5 Governance and accountability

PPS 1 supplementary guidance on Eco-towns identifies a clear requirement for appropriate governance structures to ensure that there is:

- Continued community engagement;
- Sustainability metrics are monitored; and
- Future development continues to meet Eco-town standards.

The long-term governance structure adopted for the proposed Exemplar development will ensure that biodiversity is a key consideration in all these aspects of governance and accountability. In addition, it is envisaged that a steering group will be set up to ensure that the

measures identified within the Landscape and Ecology Conservation Management Plan to protect and enhance biodiversity continue throughout the life of the proposed development.

6 Conclusions

The key aims and objectives of the proposed Exemplar development ETBS are highlighted below:

- Retain, protect and enhance the 'Key habitats' as identified from the field surveys and assessment process that are present within the proposed development. This has included the protection and enhancement of the hedgerows and River Bure and its tributary within the proposed development;
- Identify opportunities to create additional habitat types to make a positive contribution to local biodiversity initiatives. These have included the proposed creation of broadleaved woodland habitat, diverse grasslands and wetland features;
- Identify supplementary, transitional and buffer habitat creation opportunities. These have included creation of allotments, orchard planting, diverse grassland buffers alongside hedgerows, and wetland features and grassland around SuDS features.
- Identify opportunities for biodiversity within the built environment. Proposals include bat 'bricks' and bat boxes, bird boxes, green walls, and tree and shrub planting within home zones and along streets;
- Provide good wildlife linkages between habitats across the proposed development and to the wider countryside thus allowing the free passage of fauna. The retention and enhancement of the hedgerow network and the River Bure and its tributary riparian corridor;
- Produce a Landscape and Ecology Conservation Management Plan highlighting how habitats and other features will be managed in the long term for biodiversity benefit;
- Identify an appropriate implementation and funding mechanism for the Landscape and Ecology Conservation Management Plan. Heads of terms have been provided within this ETBS;
- Ensure the Landscape and Ecology Conservation Management Plan incorporates an ecological review process, to ensure the conservation objectives are being met, and if required management prescriptions altered;
- Identify opportunities for the new proposed development residents to become involved with their local environment, encouraging ownership of their local environment and a greater understanding of the eco-town ethos; and
- Ensure that biodiversity gains and contributions to the local BAP process arising from the implementation of the proposed development are recorded and documented, potentially through the BARS reporting protocol.

Appendix A

Heads of terms for Landscape and Ecology Conservation Management Plan

The following heads of terms present the various elements and format that a Landscape and Ecology Management Plan is likely to include. It does not at this stage include the individual prescriptions and objectives for each habitat, but provides some generic examples.

Introduction

This will consist of an introduction to the proposed Exemplar development and the aims of the management plan.

Site Description

This will be a description of the habitats and species present on site, incorporating the development proposals outlined in the masterplan.

Evaluation

This section will be an evaluation of the habitats and species that the proposed development supports. This will include for example:

- Retained hedgerows and the River Bure and its tributary;
- New areas of tree and scrub planting;
- Diverse grassland;
- Allotments and orchard planting;
- SuDS and other wetland features;
- Green walls; and
- Bird, bat and invertebrate boxes incorporated in the managed habitat areas and the built environment.

Aims and Objectives of Management

This section will set out the broad aims and objectives for the Landscape and Ecology Management Plan and will consider each habitat type and area.

When considering the setting of management objectives, consideration will be given to involvement from the local community so that they have an ownership of their local environment and an understanding of the requirements and benefits coming from conservation management. The exact mechanism for how this may occur, together with setting of management objectives, will be discussed and agreed with the Local Planning Authority and key stakeholders before finalising the management plan.

Table 2 (below) presents an example of broad management objectives for a management compartment, the habitat features that the conservation management would aim to enhance or create, and the flora and fauna likely to benefit from this management objective. This process would be expanded to include all the 'Key habitats' and valuable features present within the proposed Exemplar development which will require conservation management.

Table 2. Management Objectives (example only)

Management Compartment	Broad management objectives	Habitat features enhanced or created and species likely to benefit
Retained hedgerow network	Objective 1 – Ensure appropriate long-term management of hedgerow network	Likely to improve habitat for invertebrates, nesting birds and foraging bat species.
	Objective 2 – Ensure hedgerows function as wildlife corridors	Will benefit a wide variety of flora and fauna species allowing movement across the Exemplar development.
	Objective 3 – Encourage and maintain a breeding bird assemblage through provision of bird boxes in appropriate areas of retained hedgerow network	Will benefit bird species
Newly created diverse grassland margins	Objective 1 – Adopt an appropriate management regime for grassland margins	Likely to benefit wild flowers and invertebrate species, providing food resource for foraging birds and bat species.
New tree and shrub planting	Objective 1 - Ensure that, where applicable the new tree and scrub planting provides appropriate screening where required.	Likely to benefit invertebrates and bird and bat species.
Wetland features such as SuDS	Objective 1 - Encourage the establishment of wild flower planting around balancing ponds.	.Benefit wild flowers and invertebrate species providing additional foraging resources for other wildlife.
	Objective 2 – Encourage SuDS system to retain areas of permanent water	Will benefit amphibians and aquatic invertebrates

Prescriptions

This section would describe the management prescriptions for each management compartment in order to achieve the management objectives outlined above. The prescriptions detail the management operations that should be carried out, and provide appropriate timing for the

works. This would include retained habitats, newly created habitats and green infrastructure incorporated into the built environment.

Prescriptions would be agreed with the Local Planning Authority and other relevant stakeholders before finalising the management plan. This section would also identify the appropriate governance body and funding mechanism for implementation of the management plan.

For example:

Retained Hedgerows

Objective 1 – Ensure appropriate long-term management of hedgerow network

Prescription 1

[Draw up a long-term rotational programme of hedge-laying for all sections of hedgerow]

Lay Xm of hedge each year on rotation.

Review

In order to assess whether management aims are being met the conservation management should be subject to regular review. The management plan should be reviewed by a suitably qualified ecologist after three years of management activity, to ensure that the broad aims and objectives are being met. Following this it is suggested that the plan is reviewed on a five yearly basis for the duration of the management plan (considered to be 10 years minimum). The actual mechanism for review of the management plan will be agreed with the Local Planning Authority and key stakeholders before finalisation. Whilst this is considered to be an appropriate time period for overall review of the management plan, the routine management prescriptions and any regular monitoring of species will provide more frequent opportunities to identify any problems with the management plan prescriptions and will allow any necessary rectifying actions to take place, should they be required.

Reporting

Another important aspect of the review process will be to highlight conservation success and monitor and record biodiversity. Consideration will be given to initiatives such as the following:

- Monitoring the contribution the proposed Exemplar development is making to national and local BAP initiatives and how this will be reported; and
- Encouraging the local community resident within the proposed development to monitor and record their local biodiversity and pass the records to local and national recording initiatives.

Management Timetable

Table 3 provides an example of the structure of a 10 year management timetable.

Management Compartment Figure or Plan

The management plan would include a large scale Landscape and Ecology Plan of the site divided into appropriate management compartments. The figure would identify areas in which management prescriptions need to occur.

This, in conjunction with the management timetable, will enable the production of a simple 'Job Card' for each management prescription enabling whoever undertakes management activities to have a clear understanding of what is required and when.

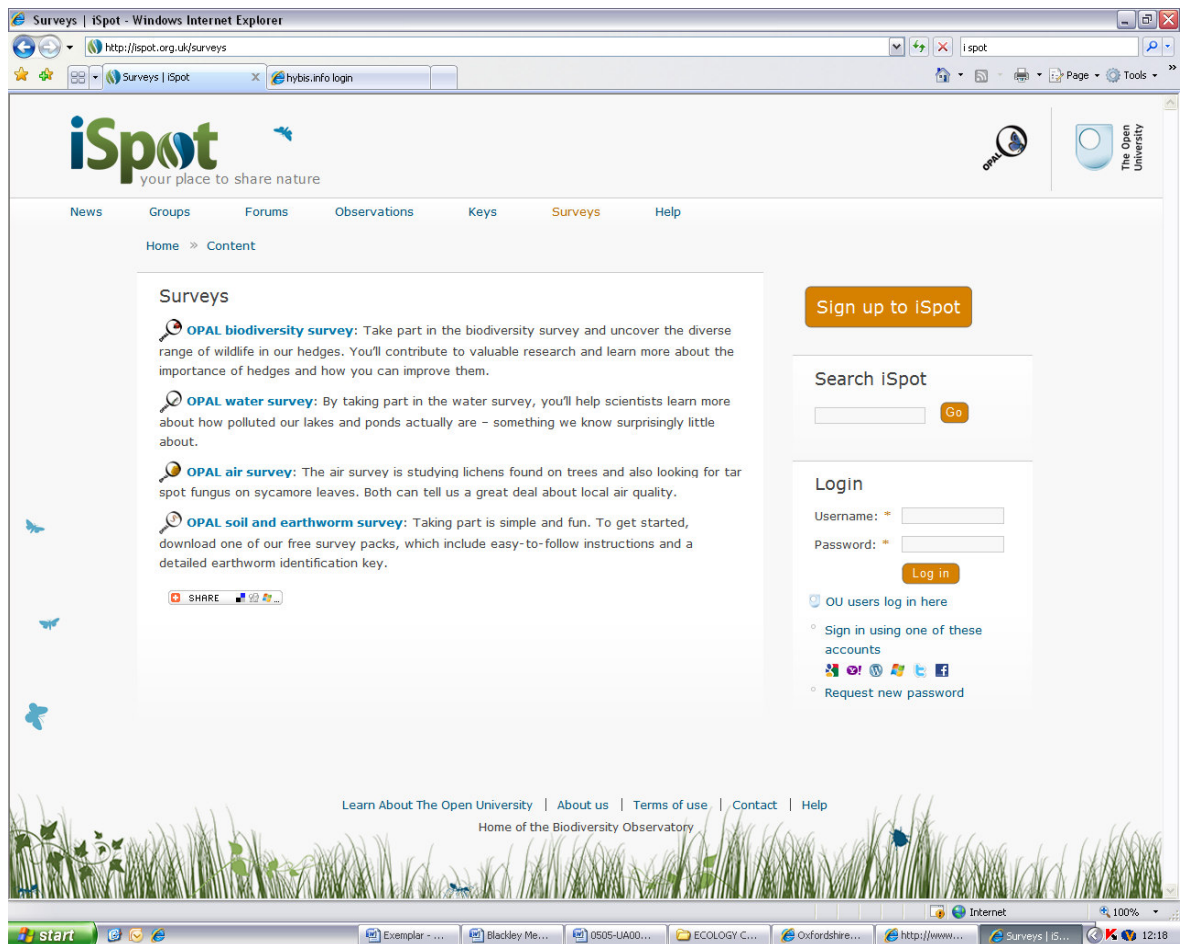
Table 3. Management Timetable.

Objectives	Prescription	Timing	Year									
			1 (2010)	2	3	4	5	6	7	8	9	10
OB1 <i>Ensure appropriate long-term management of hedgerow network</i>	PR1 Lay x m of hedge each year on rotation	Nov to Feb	✓		✓	✓	✓	✓			✓	✓

Appendix B

Examples of initiatives to involve local residents in their local environment





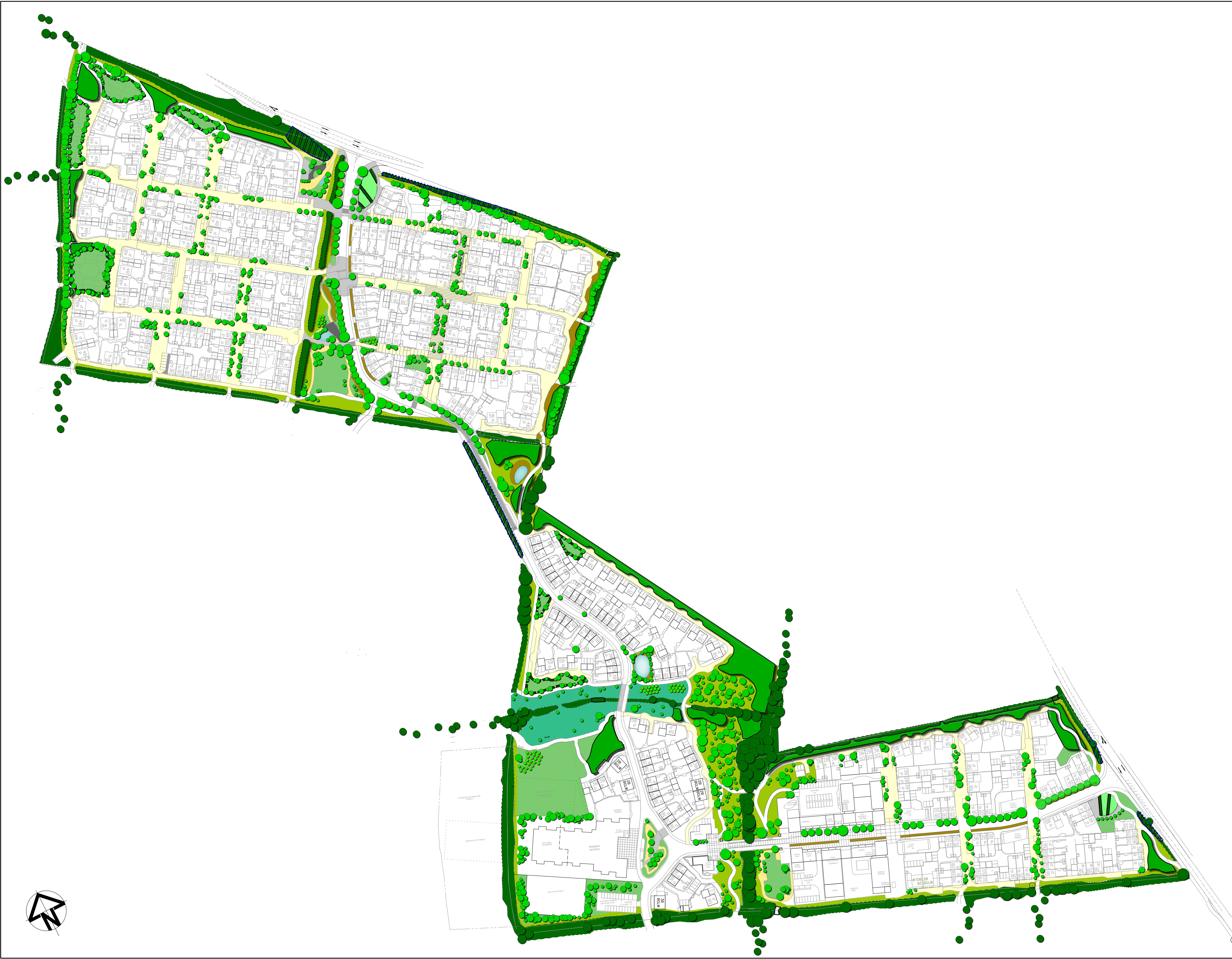




Drawings

Drawing 7M-1 The landscape proposals

Drawing 7M-2 Figure to illustrate biodiversity losses and gains.



- KEY**
- Existing Vegetation
 - Amenity Grassland
 - Species Rich Grassland
 - Wetland Grassland
 - Proposed Tree Planting
 - Proposed Woodland and Shrub Planting
 - Proposed Native Hedgerow
 - Proposed Native Hedgerow with Intermittent Trees
 - Translocated Hedgerows
 - Proposed Orchard Planting
 - Proposed Pond and Wetland Planting
 - Proposed Swale Planting
 - Proposed Agrarian Cell Planting
 - Hard Landscape Elements

01	FOR PLANNING ISSUE	24.11.10
02	DRAFT ISSUE	24.11.10
Issue	Description	Date

Status
NOT TO BE USED FOR CONSTRUCTION

Scales	NTS	Current Issue Signatures
Original Size	A3	Author R GRUBB
Height Datum	DATUM	Checker A ZORLUTUNA
Grid	GRID	Approver SA DAVIES
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Filename: 8999-UA001881-UP23D-01-MASTERPLAN BASE_1_1_0796 SVS.DWG
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Project
**BICESTER
ECO DEVELOPMENT**

Title
**DRAWING 7M-1- LANDSCAPE
PLAN**

Project No. Issue
— UA001881 — 01



KEY		
Item		Count
1	Diverse Grassland	7387 m²
2	Amenity grassland/play area/recreational	9481 m²
3	Wetland Habitat (with Scattered Tree Planting)	3733 m²
4	Biodiversity Grass Strip	2379 lm
5	Allotments (including perimeter native hedging boundary with specimen native tree planting)	3764 m²
6	SuDS Attenuation Pond Dry Swale/Pondside Habitat	1366 m²
7	Translocated Hedgerow	465 lm
8	Proposed Native Woodland/Buffer Strip Planting	8453 m²
	Proposed Tree Planting	Multiple - Individual Trees as Plan
9	Proposed Orchard Planting	605 m²
10	Agrarian Cells (Local Crops within Bands of Native Hedging)	628 m²
11	Lost hedgerow	465 lm
Additional net gain elements proposed		
20 bat boxes in dwellings or public buildings and also on mature trees in suitable locations throughout the proposed development. In groups of three on trees, singly on buildings a variety of aspects ideally facing green space and not directly lit or immediately adjacent to roads (facing water course ideal).		
20 swift boxes (colonial nesters put on side of public buildings facing watercourse)		
10 house martin boxes (colonial nesters put on side of public buildings facing watercourse or other open space)		
10 house sparrow boxes (colonial nesters put on side of public buildings facing open space)		
4 starling boxes (colonial nesters put on side of public buildings facing open space)		
10 swallow boxes (colonial nesters put on side of public buildings facing watercourse or other open space)		
At least 20 bat brick or similar structures in dwelling.		
At least 100 bird boxes suitable for hole-nesting species and open fronted boxes on trees and on buildings		
At least 50 invertebrate boxes suitable for ladybirds, lacewings and solitary bees		
At least 3 Barn owl boxes to be located within the wider eco-development		

01 FOR PLANNING 24.11.10

02 DRAFT ISSUE 24.11.10

Issue Description Date

Status

NOT TO BE USED FOR CONSTRUCTION

Scales

NTS

Current Issue Signatures

Author

R GRUBB

Original Size

A3

Checker

A ZORLUTUNA

Height Datum

DATUM

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SA DAVIES

Grid

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Filename: 8999-UA001881-UP230-01-MASTERPLAN BASE_1_1_0796 SVS.DWG

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BICESTER
ECO DEVELOPMENT

Title

DRAWING 7M-2- BIODIVERSITY
LOSSES AND GAINS

Project No. Issue

UA001881 01

APPENDIX 11A

Exemplar Site Heritage Desk Based Assessment

P3 Eco Ltd and a2dominion
Bicester Eco Town - Exemplar Site
Desk-based Assessment



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Bicester Eco Town - Exemplar Site

Desk-based Assessment

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Approver

Caroline Soubry-Smith

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Report No

0505-UA001881-UE31-R-01-Desk-based Assessment

Date

27 July 2010

This report has been prepared for P3 Eco Ltd and a2dominion in accordance with the terms and conditions of appointment for Desk-based Assessment dated May 2010. Hyder Consulting (UK) Limited (2212959) cannot accept any responsibility for any use of or reliance on the contents of this report by any third party.

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1 Introduction

Hyder Consulting Ltd was commissioned by P3 Eco Ltd and a2dominion to undertake an archaeological and built heritage desk-based assessment of the exemplar site of the proposed Eco town development at Bicester. The research was carried out in July 2010.

The aim of the assessment was to determine the potential for the presence and survival of archaeological remains and historic structures/features within the proposed development site and to assess the extent of modern disturbance.

1.1 Site Location and Land-use

The exemplar site is situated on the outskirts of the town of Bicester. It is irregular in plan and covers an area of c.33ha centred upon NGR 457740, 225111 (Figure 1). It is bounded to the east by the B4100 and Caversfield village and to the north-west and south by open fields. At present the site comprises open fields with a small wooded area in the north-west corner.

1.2 Geology and Topography

The BGS survey 1:625,000 Scale Solid Geology map shows the geology of the site and middle Jurassic Cornbrash. The topography of the exemplar site is generally flat although it dips towards the east-west running watercourse in the south and then rises again to the south on either side of the north-south running watercourse.

1.3 Aims and Objectives

The aim of the study is to assess the cultural heritage resource within the exemplar site through the collation of existing written, cartographic, pictorial, photographic and electronic evidence. It will identify the likely character, extent, quality and significance of the known or potential archaeological and built heritage resource.

The specific aims of the desk-based assessment are:

- To identify known archaeological assets within or in the vicinity of the exemplar site
- To assess the likely survival of buried archaeological deposits across the site, the significance of these deposits, and the potential impact of the development upon them
- To assess the significance of the built heritage resource and the potential impacts of the development on it
- To assess the impact that any former intrusive activities have had on any potential archaeological deposits
- To assess the need for further intrusive and non-intrusive investigative works, where necessary, to determine the potential of the site and
- To formulate a strategy for mitigation, if appropriate.

2 Methodology

2.1 The Study Area

The study area was defined by a 500m radius from the site boundary (Figure 2) as set out in the scoping report (doc ref). this report is based on a search of the Oxfordshire Historic Environment Record (HER), the National Monuments Record (NMR), a selection of historical maps and published and unpublished sources.

2.2 Consultation

The Planning Archaeologist for Oxfordshire Richard Oram and the Conservation Officer at Cherwell District Council Claire Sutton were consulted during the preparation of this document.

2.3 Site Walkover Survey

A site visit to assess the current ground condition and archaeological potential of the site was undertaken on the 23rd July 2010. As assessment of the potential level of disturbance on the site was also carried out. All observations on the present layout of the site are based on this site visit.

2.4 Sources

Oxfordshire Historic Environment Record

Records of all known sites, find spots and buildings of archaeological/historical significance within the study area were obtained from the Oxfordshire HER. These have been identified in this report by a primary record number (PRN) and represented in Figure 2; they are referred to in bold in the text and catalogued in Appendix 1.

National Monument Record

Records of archaeological assets and Listed Buildings within the study area were obtained from the NMR. These have been identified with a PRN and represented in Figure 2: Listed Buildings are referred to in the text prefaced with BH and catalogued in Appendix 2.

Cartographic Sources

A selection of historic maps were analysed in the production of this report. These included the 1853 Caversfield Tithe map and Ordnance Survey editions. These were obtained from the Oxfordshire record office and Landmark Information Group.

3 Planning Policy

This assessment has been undertaken in accordance with current legislation, national, regional and local plans and policies. Outlined below are those elements of current legislation, policy and guidance relevant to archaeology in the context of this assessment.

The relevant parliamentary act which provided the legislation framework for development and archaeology is the Town and Country Planning Act 1990. This assessment also considered the Ancient Monuments and Archaeological Areas Act 1979.

3.1 Ancient Monuments and Archaeological Areas Act 1979

The Ancient Monuments and Archaeological Areas Act 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 Ancient Monuments and their setting are a material consideration in Planning Policy Statement (PPS) 5.

3.2 Planning Policy Statement 5: Planning for the Historic Environment

PPS5 sets out the Government's planning policies on the conservation of the historic environment. These policies should be read alongside other relevant statements of national planning policy. The policies in PPS5 are a material consideration which must be taken into account in development management decisions, where relevant.

The Government's overarching aim is that the historic environment and its heritage assets should be conserved and enjoyed for the quality of life they bring to this and future generations.

Policy HE1: *'Heritage assets and climate change'* states that local authorities should identify opportunities to mitigate, and adapt to, the effects of climate change when making decisions relating to heritage assets (para HE1.1). The policy also states that where proposals that are promoted for the contribution to mitigating climate change have a potentially negative effect on heritage assets, local planning authorities (LPAs) should, prior to determination, help the applicant identify feasible solutions that deliver similar mitigation but with less harm to the significance of the heritage asset or its setting (para HE1.2). Where conflict between climate change objectives and the conservation of heritage assets is unavoidable, the PPS advises that the public benefit of mitigating the effects of climate change should be weighed against any harm to the significance of heritage assets (para HE1.3). It should be noted that English Heritage has also produced guidance entitled *'Wind Energy and the Historic Environment'* (English Heritage, 2005).

Policy HE6: *'Information requirements for applications for consent affecting heritage assets'* deals with the requirement for applicants to provide descriptions of the significance of any heritage assets that may be affected by a proposal, along with a description of the contribution of the setting of the heritage asset to that significance. Where a proposal includes, or is considered to have the potential to include, heritage assets with archaeological interest the LPA should require developers to submit an appropriate desk-based assessment and where desk-based research is insufficient to properly assess the interest, a field evaluation (para HE6.1). The policy also states that LPAs should not validate applications where the extent of the impact of the proposal on the significance of the heritage assets affects cannot adequately be understood from the application and supporting documents (para HE6.3).

Policy HE7: *'Policy principals guiding the determination of applications for consent relating to all heritage assets'* deals with the factors LPAs must take into account when considering applications for developments. It stresses the need to consider the significance of the heritage assets that may be affected and its value for future generations. The policy states that this understanding should be used by the LPA to avoid or minimise conflict between the heritage assets conservation and any aspect of the proposals (para HE7.3).

Policies HE8 and HE9 deal with the additional policy principals guiding the consideration of applications for consent relating to heritage assets. The policies state that the effects of a development proposal are a material consideration in determining planning applications. The policies indicate that there is a general presumption that any previously unidentified heritage assets will be identified during the pre-application stage (para HE8.1). The policies also state that there should be a presumption in favour of the conservation of designated heritage assets and the more significant the heritage asset is, the greater the presumption in favour of its conservation should be (para HE9.1). The policy explains that significance can be harmed or lost through alteration or destruction of the heritage asset or development within its setting (para HE9.1). Where a proposal has a harmful impact on the significance of a designated asset which is less than substantial harm, the policy directs the LPA to consider the public benefit of the proposal (para HE9.4).

Policy HE10: *'Additional policy principles guiding the consideration of applications for development affecting the setting of a designated heritage asset'* states that when considering applications for development that affect the setting of a heritage asset, LPAs should treat favourably applications that preserve those elements of the setting that make a positive contribution to or better reveal the significance of the asset (para HE10.1). LPAs are also directed by the policy to identify opportunities for changes in the setting to enhance or better reveal the significance of a heritage asset and that these opportunities should be seen as a public benefit (para HE10.2).

Policy HE12: *'Policy principles guiding the recording of information relating to heritage assets'* recognises that a documentary record of a heritage asset is not as valuable as the retaining the heritage asset. However it does state that where the loss of the whole or a material part of a heritage assets significance is justified, LPAs should require developers to record and advance understanding of the heritage asset before it is lost using planning conditions or obligations as appropriate (para HE12.3). Developers are required by the policy to publish the information gained and deposit copies of the report with the relevant Historic Environment Record (HER). The policy also requires that an archive is generated and deposited with an appropriate depository (para HE 12.3).

3.3 Planning Policy Statement: Ecotowns

Planning Policy Statements (PPS) set out the Government's national policies on different aspects of spatial planning in England. PPS1 sets out the overarching planning policies on the delivery of sustainable development through the planning system. The PPS on eco-towns supplements PPS1, it does not seek to assemble all national planning policy relevant or applicable to designing new settlements and should be read alongside the national PPS/G series.

The PPS sets out a range of Ecotown targets. ET15 deals with landscape and historic environment. It states:

"Planning applications for eco-towns should demonstrate that they have adequately considered the implications for the local landscape and historic environment. This evidence, in particular that gained from landscape character assessments and historic landscape characterisation should be used to ensure that development complements and enhances the existing landscape character. Furthermore, evidence contained in relevant Historic Environment Records, should be used to assess the extent, significance and condition of known heritage assets (and the potential for the discovery of unknown heritage assets) and the contribution that they may make to the eco-town and surrounding area. Eco-town proposals should set out measures to conserve and, where

appropriate, enhance heritage both assets and their settings through the proposed development.”

3.4 South East Plan

The South East Plan was published in May 2009 and sets out a vision for the future of the South East region to 2026. It covers the areas of Berkshire, Buckinghamshire, East Sussex, Hampshire, Isle of Wight, Kent, Oxfordshire, Surrey and West Sussex. The South East Plan is a full revision of Regional Planning Guidance 9 (RPG9 - the current Regional Spatial Strategy for the South East) to cover the period to 2026. It is not considered a minor amendment of RPG9.

Section D8 of the Plan deals with management of the built and historic environment. Within this section Policy BE7: Management of the Historic Environment states:

“In developing and implementing plans and strategies, local authorities and other bodies should adopt policies and proposals which support the conservation and, where appropriate, the enhancement of the historic environment and the contribution it makes to local and regional distinctiveness and sense of place. Proposals that make sensitive use of historic assets through regeneration, particularly where these bring redundant or under-used buildings and areas into appropriate use, should be encouraged.”

3.5 Cherwell Local Plan

The Cherwell Local Plan was adopted in 1996 and is due to be replaced by the Local Development Framework which will establish planning policy for the district up to 2026. In the meantime existing planning policy for the district is contained in the saved policies of the Cherwell Local Plan, adopted 1996. These are the policies used when making planning decisions.

Of the Saved policies the only one which may apply to the development is policy C25 which states:

“In considering proposals for development which would affect the site or setting of a Scheduled Ancient Monument, other nationally important archaeological sites and monuments of special local importance, the council will have regard to the desirability of maintaining overall historic character, including its protection, enhancement and preservation where appropriate.”

The Plan goes on to say that it must be acknowledged that the character and setting of an archaeological site or monument which may include historic landscapes, parks and gardens may be damaged or even destroyed by certain forms of development. In such cases policy C25 will apply.

4 Site Walkover Survey

A site walkover survey was carried out at the exemplar site on the 23rd July 2010. During the walkover survey the site was observed to be under short grass with field boundaries defined by hedges and post and rail fences. The site was generally flat with the exception of one of the fields adjacent to the southern boundary of the site which was observed to have a slight rise in ground level. This field is named on the tithe map as Little Hill.



Plate 1 : looking across Little Hill showing change in ground level

In the south west corner of the site is an area of woodland and St Lawrence's Church is visible from the exemplar site along a line of sight running from the north west corner of this wood. Home Farmhouse is also visible from some parts of the site, although it is partially secluded behind hedgerows.

The only other feature of note which was observed during the site visit was that the field which extended from the south east corner of the woodland was approximately 1m higher than the field immediately to the north of it. The lower field also has a number of circular depressions 5-7m diameter. This is interpreted as evidence of quarrying activity in this area.

5 Archaeological and Historical Background

The following presents a synthesis of the baseline evidence for the archaeological development of the site and the study area, including information from a number of previous archaeological interventions which have taken place within the defined study area (Figure 2). Significant archaeological and historical features from outside the study area have also been considered, where they have been deemed relevant to establish the site in its wider context.

5.1 Prehistoric

It is known that there was activity in the area around Bicester in the prehistoric period. At Bicester Fields farm approximately 3.5km south of the study area evidence of later prehistoric settlement in the form of sub-rectangular enclosures and associated pits and gullies was recorded. Pottery revealed Middle to Late Iron Age activity and later ridge and furrow was also observed. Evidence for activity dating to the Mesolithic period was also uncovered at this site.

Within the study area itself a Mesolithic flint scatter was found during an evaluation and excavation at Slade Farm (1) to the south of the exemplar site. Over 1000 flint items including a high proportion of blades were recovered from the site. Work at this site also uncovered

numerous late Bronze Age to late Iron Age features including a major north south linear boundary, multi-period pit clusters and at least one sub-circular ditched enclosure.

To the west of the application site examination of aerial photographs has revealed the presence of a rectilinear enclosure thought to date to the prehistoric period (4). At least one curvilinear enclosure may also be present at this location.

5.2 Roman

Alchester was a Roman settlement which lay approximately 1 mile to the south of the centre of modern Bicester. Initially a Marching Camp was established here with a defensive ditch around it. The earliest permanent construction at Alchester was wooden Vexillation Fort which had been established by late AD 43 or early AD.

44. This date is confirmed by analysis of the fort's western gatepost which provides tree ring pattern confirmation (www.blhs.org.uk/romanbicester). This indicates that the Roman settlement at Bicester is amongst the earliest in the country dating to the time of the Claudian invasion. Later the fort had an Annex added on its western side and could then house five thousand troops at its maximum. Whilst the fort was in operation a civilian settlement grew up outside it. When the fort was abandoned in the mid AD 60's as the occupied areas moved north and westward and as the strategic position of the fort became less important. A civilian settlement was able to expand into the fort. Once the fort had been abandoned the civilian settlement continued to grow and expand developing along a regular grid pattern and became an administrative and market focus in the area. Temples and several stone buildings have been identified within the town. The stone town wall was built in the 2nd Century. Outside the walls further rural activity in the form of small farm and industrial units that supplied the settlement with goods have been recorded. Cemeteries have also been located outside the town boundaries (www.blhs.org.uk).

No archaeological remains dating to the Roman period have been recorded either within the exemplar site itself or the surrounding study area.

5.3 Early Medieval

Bicester is recorded in the Domesday Book and there is evidence of a Saxon settlement at Bicester. This settlement is thought to be located to the north of the Roman town but adjacent to the Roman road. The name Bicester is thought to originate from Bernecestre which can be interpreted as meaning 'the fort of the warriors' or 'of Beorna', possibly a notable person in the area in the Anglo Saxon period (Lobel, 1959).

The exemplar site itself lies within the parish of Caversfield. Early records show this area as having five hides and being held originally by Edward, a man of Earl Tosti. However by the time of Domesday it was among the possessions of William de Warenne (Page, 1927).

No archaeological remains dating to the Early Medieval period have been recorded either within the exemplar site or the surrounding study area. St Laurences Church is located in the study area to the east of the exemplar site and has early medieval origins. The church is a Listed Building and is discussed in further detail in the Built Heritage section below.

5.4 Medieval

The town of Bicester developed in the Medieval period and the population in the 11th century was around 200. The town was granted a market in 1239. The early town developed at King's End and Market End, linked by a causeway across the Bure. Evidence of the Medieval town can

be observed in the present property boundaries in the town centre which reflect the medieval burgage plots laid out in the town. Medieval Bicester expanded once Bicester Priory was founded in 1182 AD. The priory became a major employer within the town. Excavations in the 1960s revealed a religious complex containing a large church, which housed the shrine of St Edburg, and other associated monastic buildings, including a hospital (www.blhs.org.uk).

At the beginning of the Medieval period the overlordship of Caversfield was in the hands of the Earls Warenne who continued to hold it until the beginning of the 14th century. By 1317 it had passed to the Earl of Pembroke. This attachment is believed to have continued until the 17th century. The manor Caversfield itself was probably held in the 12th century by the Gargate family. Towards the middle of the 12th century a significant proportion of the land at Caversfield was endowed to the priory of Bicester. Between the 12th and the 15th century the manor at Caversfield was in the hands of the de Wynnecote family and then later the Langstons and then the Moyles.

The property of the Gargates in Caversfield in the 13th century included a windmill and water-mill and 'the capital court of Caversfield.'. In the 16th and 17th centuries the manor-house was included in the Moyle property. A lease made of it in 1588–9 excepted to the use of Thomas Moyle a chamber over the kitchen and inner chamber over the larder and the gallery over the said chamber, the stable near the brew-house with ingress and egress. It is mentioned in the sales in the manorial property in the 18th century, at which time a close called the Park, containing 21 acres, was also included (Page 1927).

There is a Deserted Medieval Village recorded at Caversfield to the east of the exemplar site **(6)**. The village appears to have developed in the medieval period, having a population of 21 and a fishpond in 1086 and 178 by 1841. In 1854 the fields containing the site of Caversfield DMV were called Old Walls. This may indicate that there were some standing remains in this area at this time.

5.5 Post-medieval

Bicester continued to develop in the Post-medieval period although the dissolution of the priory in 1536 caused it to change dramatically with religious affecting the town. Agriculture remained the main economic activity in the area at this time and further unrest occurred when the former open fields were enclosed in the 18th century.

There is no evidence of any archaeological remains either within the exemplar site itself or the surrounding study area in the Post-medieval period. Caversfield House to the east of the exemplar site was constructed in this period. This will be discussed in further detail in the Built heritage section below.

5.6 Modern

In the Modern period the town of Bicester continued to expand with numerous new residential properties being constructed. The first modern housing estates developed in the 1920s and 1940s/50s, mainly comprising public and social housing projects. But from the 1960s there was significant with a rapid increase of large estates located on the outskirts of the town. Improved communications and strategic growth planning have attracted an increased range of industrial units to the town.

In 1917 RAF Bicester was constructed to the west of the exemplar site and became a permanent RAF base. The base contains a number of important examples of early permanent airfield buildings.

No archaeological remains dating to the Modern period have been recorded either within the exemplar site or the surrounding study area.

6 Cartographic Analysis

The following presents an analysis of the cartographic sequence from the 1853 tithe map to the 2010 Ordnance Survey (OS) map.

The 1853 tithe map shows the exemplar site as open fields under either arable or grassland with a small coppice in the south west corner. The field boundaries are the same as the modern boundaries. There are some fieldnames recorded on the tithe award which indicate former activity within the site. For example the field to the north east of the area of woodland is named The Limekiln Ground which may indicate there once was a limekiln in the vicinity. The small narrow field to the east of the woodland is named Stone Pit Pieces which could suggest quarrying activity in the area.

The 1881 1:2,500 scale Ordnance Survey (OS) map shows there has been no change from the tithe map.

The 1885 1:10,560 scale OS map shows the exemplar site as open fields set in a rural landscape and displays no real changes from the tithe map. Home farm is marked, as are St Lawrence's Church and Caversfield House, both of which are surrounded by woodland. The B4100 which forms the eastern boundary of the exemplar site is marked.

The 1899 1:2,500 scale OS maps shows evidence of water management along the stream next to Home Farm with a sluice marked close to the farm buildings.

The 1900 1:10,560 scale OS map shows little change. The site is still open fields although the area of woodland is now shown as being much less dense. The U shaped area of water to the south of Caversfield House is marked on this map as a fish pond. An old quarry is also marked just to the south of the fish pond.

The 1922 1:2,500 scale OS map and the 1923 1:10,560 scale OS map shows the site remained relatively unchanged, however a filter bed is now marked to the north of Home Farm, just outside the site boundary. Further afield the expansion of Bicester is now visible with housing plots marked along the roads to the south of the site.

There is no change on the 1938-1952 1:10,560 scale OS map, the 1955 1:10,000 scale OS map or the 1968 – 1976 1:2,500 scale OS map. By the time of the 1970 1:10,000 scale OS map the development of Bicester has spread up along Srimmingdish Lane to the Old Vicarage south of Home Farm.

The 1999 1:10,000 scale OS map shows the exemplar site in its modern state and also demonstrates how Bicester has by this time expanded almost up to Caversfield House. There is no change up to the 2010 1:10,000 scale OS map.

7 Built Heritage Assessment

7.1 Baseline Conditions

The following section sets out the built heritage baseline conditions for the study area. It identifies designated and undesignated buildings and structures within the study area and provides an assessment of them.

Listed Buildings

There are two Listed Buildings within the study area (Figure 2). One is grade II* listed and the other is Grade II listed.

St Lawrence's Church (Grade II* listed) (BH1)

St Lawrence's Church is located in the grounds of Caversfield House and has a Norman nave with later aisles, an Early English chancel with a north chapel and a gabled west tower. The earliest part of St Lawrence's Church is the Anglo-Saxon tower which is built of courses rag-stone with dressed quoins. In the north and south faces of the tower are round-headed double-splayed windows of late Saxon date. The upper portion of the tower is modern. The rest of the church dates to the 11th, late 12th, 13th and 15th centuries and was restored and partially rebuilt in 1874 by Henry Woodyer.



Plate 2: St Lawrence's Church showing Anglo-Saxon Tower

The church is located within well-defined grounds surrounded by mature planting. The tower of the church is visible from certain key vantage points in the surrounding area. The setting of St Lawrence's Church is defined by its immediate environs and is characterised by its relationship with Caversfield House. The only point where the tower is visible from the exemplar is along the sightline stretching from the church to the south west corner of the site.

Home Farmhouse (Grade II listed) (BH4)

Home Farmhouse is located in a rural setting, but close to the urban development of Bicester. It is adjacent to the B4100. The farmhouse dates to the early/mid 17th century and was extended in the 18th or 19th century. The farmhouse is two storeys constructed of coursed squared limestone with ashlar dressings. It has an old plain-tiled roof with rebuilt brick gable stacks.

The setting of the farmhouse is defined by its function as a working farmhouse within a mainly rural location, however the setting of the farmhouse is significantly characterised by its proximity

to the urban development of Bicester. The Farmhouse is partially screened from the exemplar site by the high hedges which form the field boundaries on the south eastern boundary of the site.

Non-listed buildings

There is one non listed building of historical interest within the study area. It is recorded on the NMR.

Caversfield House (BH6)

Caversfield House was built in 1842 by CR Cockerall on the site of a former manor house. The House is located adjacent to the B4100 within a secluded area of mature planting and separated from the road by a wall. There is a large fish pond to the south of the house which separates it from the area to the south. The setting of the house is defined by its immediate environs and its relationship with St Lawrence's Church. There are no apparent views between the house and the exemplar site.

8 Discussion and Conclusions

8.1 Archaeology

The exemplar site occupies an area of open fields which have remained undeveloped and unchanged since the mid 19th century and possibly before. There is place name evidence from the tithe map of a possible limekiln within the site along with possible quarrying activity. Within the wider study area there is a prehistoric rectilinear enclosure and a possible curvilinear enclosure to the south west of the site (4), a Mesolithic flint scatter and some Bronze Age and Iron Age remains to the south of the site (1) and a Deserted Medieval Village to the east of the site (6). All of these assets are considered to be of local significance. The location of the enclosures (4) and the DMV (6) and the undeveloped nature of the exemplar site suggests that there is the potential for archaeological remains associated with these assets to extend into the site. There is also the possibility that there may be the remains of a limekiln within the site as the place name evidence suggests.

The proposed development has the potential to impact upon any archaeological remains which may exist within the exemplar site. These remains are currently unknown but could relate to the enclosures to the south west of the site or the DMV to the east, they could also be related to the possible limekiln indicated by place name evidence.

8.2 Built Heritage

There are three assets within the study area that have some significance in built heritage terms. The grade II* listed St Lawrence's Church (BH1) can be considered to be nationally significant while the grade II listed Home Farmhouse (BH4) and the non-listed Caversfield House (BH6) are considered to be of local significance. The setting of St Lawrence's Church and Caversfield House is restricted as they are enclosed within an area of mature planting, although the setting of the church does also include some key sightlines to and from the tower. The setting of the grade II listed Home Farmhouse is defined by its location close to both open farmland and the urban development of Bicester.

The proposed development has the potential to have a minor impact upon the setting of St Lawrence's Church and Home Farmhouse. It is not considered that Caversfield House will be impacted upon as it is shielded from the site by mature planting and a roadside wall.

9 Recommendations

9.1 Archaeology

The exemplar site is situated in an area of some archaeological potential and this assessment has shown that there are some known archaeological remains within the area that may extend into the site but overall the potential of the site is not fully defined.

It is recommended that further archaeological investigation is required to fully determine the archaeological potential of the site and give a greater understanding of its significance. Consultation with the Planning Archaeologist at Oxfordshire County Council carried out during the course of this assessment indicates that he is of this opinion as well. A sample archaeological evaluation carried out at the site would enable any possible archaeological remains within the site to be located and from this it may be possible to design the location of structures within the development to avoid any significant remains or devise a programme of mitigation to record the remains. The evaluation will also be able to determine areas within the exemplar site which do not contain any archaeological remains which will allow the development to continue without constraint.

9.2 Built Heritage

On the basis of the built heritage assessment it is recommended that the line of sight from the north east corner of the wooded area to the church tower be preserved. This would significantly lessen the impact of the development of this area on this asset. It is also recommended that some open space is maintained between Home Farmhouse and the development and the development is screened from the asset through careful planning and maintaining the existing hedgerows.

On a more general note sympathetic design of key structures within the development to compliment the historic structures in the area will allow the development to blend well with the existing historic settlements allowing a greater sense of place connecting the new development with important buildings in the area.

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Roman Bicester www.blhs.org.uk

www.bicesterlocalhistorysociety.org.uk

Appendix 1

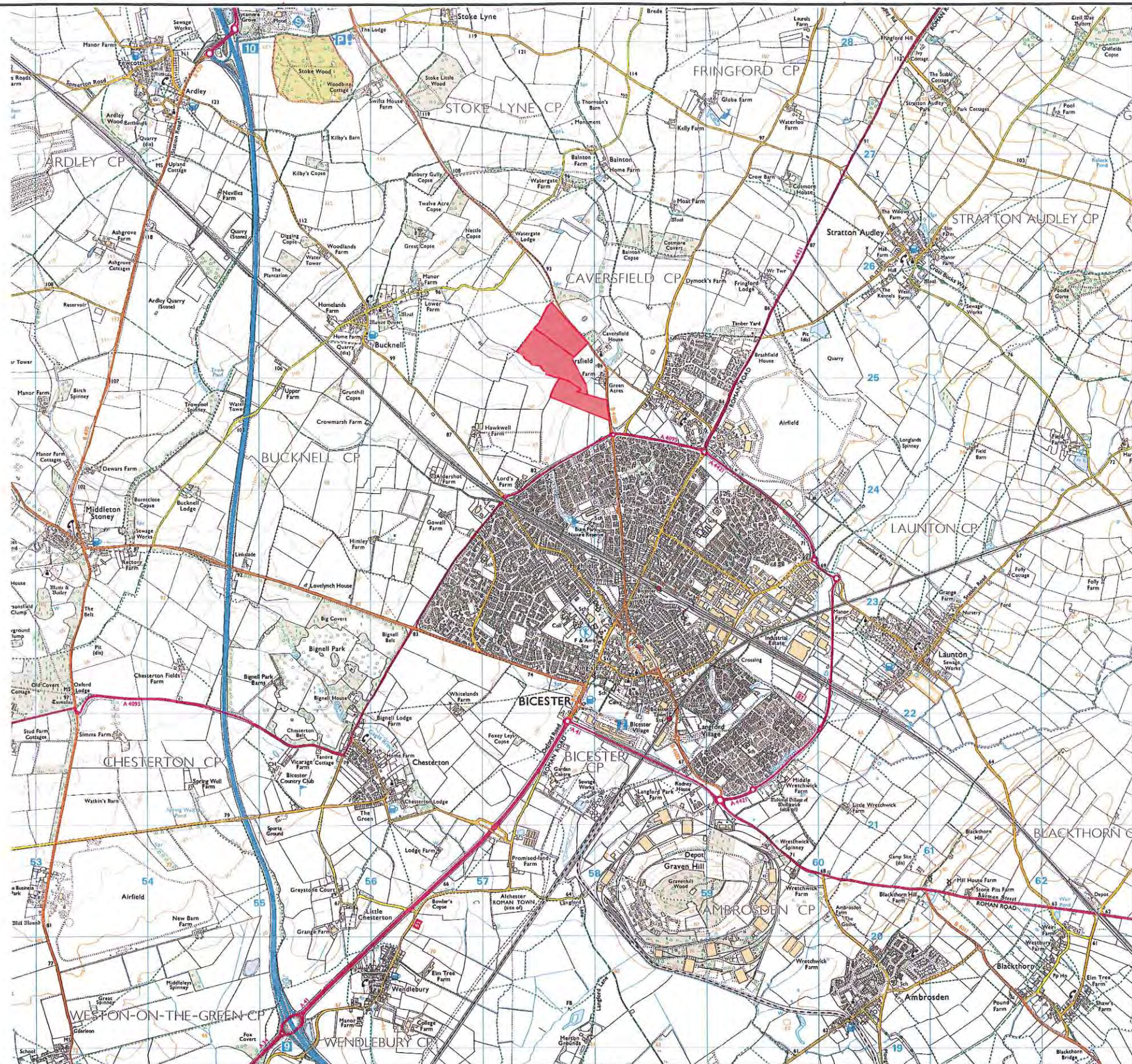
Catalogue of archaeological assets

Hyder Number	HER/NMR Number	Grid Reference	Period	Description
1	1212379, 1097292, 1097296, 1097300	458000, 224000	Prehistoric	A Mesolithic flint scatters were found during an evaluation and excavation at Slade Farm, Bicester. A geophysical survey, evaluation and excavation were undertaken at the site in the 1990s
4	15958 - MOX5633	457300, 224800	Prehistoric	Rectilinear enclosures identified from aerial photographs. Curvilinear enclosures may also be present
6	338860	458400, 225400	Medieval	Caversfield Deserted Medieval Village, had a population of 21 in 1086, 6 in 1524 and 178 in 1841. In 1854 fields containing the site of Caversfield DMV were called Old Walls. The high population in 19th century can be explained by houses scattered in the parish. A fishpond is recorded in Domesday Book.

Appendix 2

Catalogue of built heritage assets

Hyder Number	Grid Reference	Grade	Period	Description
BH1	458063, 225202	II*	Early medieval	St Lawrence Church. Medieval building with Anglo Saxon tower and later additions
BH4	458070, 224974	II	Post medieval	Home Farmhouse dated to 17th centry
BH6	458200, 225300	Non-listed	Post-medieval	Caversfield House



0 100 200 300 400 500 600 700 800 900 1000

KEY

 EXEMPLAR SITE BOUNDARY

Client

a2dominion

P3Eco Ltd

Status

PRELIMINARY

Scales

SHOWN

Current Issue Signatures

Original Size

A3

Height

Datum

Grid

GRID

© Copyright reserved

Filename: 0006-UA001881-UP21D-01.DWG

Project

**BICESTER
ECO TOWN**

Title

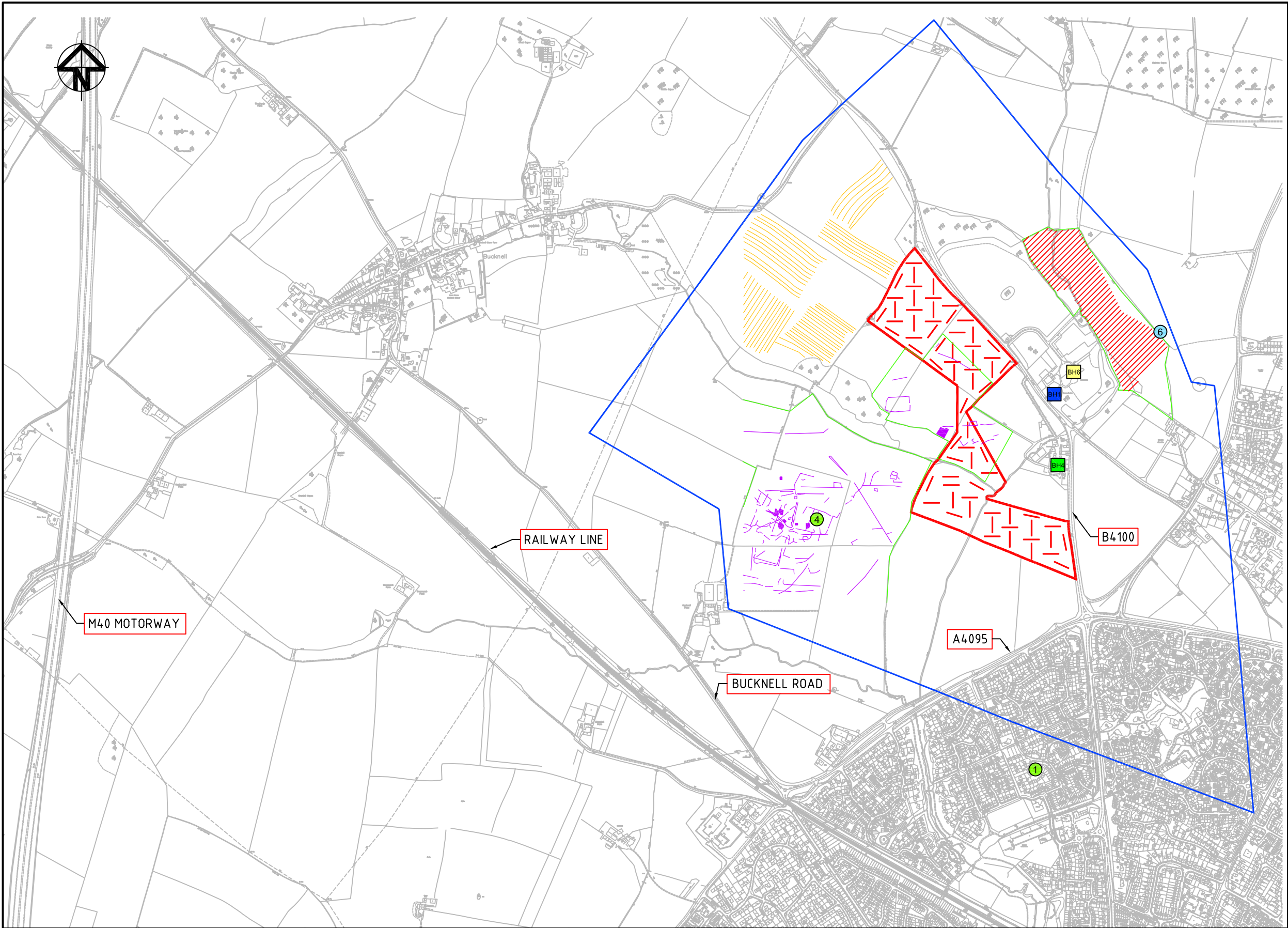
SITE LOCATION PLAN



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Drawing No. Project No. Issue
FIGURE 1— UA001881— 01

Issue	Description	Date
01	FIRST ISSUE	29/07/10



- KEY**
- EXEMPLAR BOUNDARY
 - STUDY AREA
- ARCHAEOLOGY RECEPTORS**
- 1 PREHISTORIC
 - 5 ROMAN
 - 6 MEDIEVAL
 - 7 POST-MEDIEVAL
 - 8 MODERN
- BUILT HERITAGE RECEPTORS**
- BH1 LISTED II*
 - BH2 LISTED II
 - BH6 NON LISTED
- AREAS OF MEDIEVAL PLOUGHING (RIDGE AND FURROW)
 - AP SITE POLYGONS
 - BURIED FEATURES (SHOWN AS MARKS IN CROPS)
 - DESERTED MEDIEVAL VILLAGE (DMV) AT CAVERDFIELD
 - EVALUATION TRENCH

01	FIRST ISSUE	29/07/10
Issue	Description	Date

Client

azdominion

P3Eco Ltd

Client

Project		BICESTER ECO TOWN	
Title		LOCATION OF ARCHAEOLOGY AND BUILT HERITAGE RECEPTORS	

Drawing No.		Project No.	Issue
FIGURE 2 — UA001881 — 01			

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