Luton Rising
Our airport.
Our community.
Our planet.

April 2023

London Luton Airport Expansion

Planning Inspectorate Scheme Ref: TR020001

Volume 5 Environmental Statement and Related Documents

5.02 Appendix 8.1 Ecology Baseline Report - Part A

Application Document Ref: TR020001/APP/5.02

APFP Regulation: 5(2)(a)

The Planning Act 2008

The Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009

London Luton Airport Expansion Development Consent Order 202x

5.02 ENVIRONMENTAL STATEMENT APPENDIX 8.1 ECOLOGY BASELINE REPORT – PART A

Regulation number:	Regulation 5(2)(a)
Planning Inspectorate Scheme Reference:	TR020001
Document Reference:	TR020001/APP/5.02
Author:	Luton Rising

Version	Date	Status of Version
Issue 01	February 2023	Application issue
Revision 01	April 2023	Redacted following section 51 advice

Contents

Tables

Figures

No table of figures entries found.

1 INTRODUCTION

1.1 Background

1.1.1 This report has been prepared by Luton Rising (a trading name for London Luton Airport Limited ('the Applicant')) to inform the Environmental Impact Assessment (EIA) in support of the application for development consent for the expansion of London Luton Airport (the airport) to accommodate 32 million passengers per annum (mppa), (hereby referred to as the 'Proposed Development').

1.1.2 The Proposed Development is centred at London Luton Airport, Bedfordshire and adjacent lands, at approximate OS grid reference TL 12478 21377 and shown at **Appendix A** to this report (Development Areas Plan).

1.1.3 The Main Application Site (as defined in **Chapter 2** The Site and Surroundings of this Environmental Statement (ES) **[TR020001/APP/5.01]** and shown on **Figure 2.2** of this ES **[TR020001/APP/5.03]**), covers approximately 480ha which in addition to the airport infrastructure comprises previously undeveloped, predominantly arable land, with hedgerows, trees and shrub-lined margins. Occasional woodland blocks, copses, tree belts, areas of scrub, rough grassland, ruderal vegetation, conservation headlands and game cover adjacent to field edges. The existing airport is dominated by hardstanding with amenity grassland and small patches of scrub. The Proposed Development also includes highway interventions, car park works and mitigation planting areas outside of the Main Application Site. The highway interventions are restricted to within existing highway boundaries. The proposed off-site car parks are located to the west of the existing airport within brownfield areas, comprising access roads, temporary buildings, area of ephemeral/short perennial vegetation, grassland margins and areas of landscaping comprising scrub and trees. The off-site mitigation planting areas are located to the north east of the Main Application Site, comprising grassland field margins and hedgerows.

1.1.4 The surveys detailed within this report consider the whole Application Site of the Proposed Development as well as any additional areas relevant to the habitats and species concerned, defined within the respective sections as Study Areas.

1.2 Purpose of this report

1.2.1 This report describes the ecological surveys that have been undertaken between 2016 and 2022 and their findings to inform the design and environmental impact assessment of the Proposed Development, including:

a. Habitat classification (Phase 1/UK habitat);
b. Hedgerow survey;
c. Badger (*Meles meles*);
d. Bats;
e. Hazel dormouse (*Muscardinus avellanarius*);
f. Riparian mammals;

g. Breeding birds;
h. Wintering birds;
i. Reptiles;
j. Amphibians;
k. Roman snails (*Helix pomatia*);
l. Terrestrial invertebrates; and
m. National Vegetation Classification (NVC).

1.2.2 The following **Sections 2-12** relate to the ecological surveys listed above undertaken between 2016 and 2021. Each a. details the scope of survey, methodologies used, and summarises the subsequent results. Detailed survey data/results are included as appendices to this report where applicable. **Section 13** provides photos relevant to each of these sections, referenced where appropriate throughout the report.

1.2.3 Independent ecologists were employed to undertake detailed botanical (NVC) and terrestrial invertebrate surveys. The reports for these surveys are included as **Appendix AA** and **Appendix BB** to this report respectively and are not discussed in the main report.

2 EXTENDED PHASE 1 HABITAT SURVEY

2.1 Introduction

2.1.1 This section sets out the methodology and results of the extended Phase 1 Habitat Surveys undertaken in relation to the Proposed Development during 2018, 2019 and 2020. A ground truthing walkover survey of all habitats impacted by the Proposed Development was undertaken in 2022, this survey only amended the previous Phase 1 survey data where a noticeable difference occurred in this habitat from the 2020 surveys.

2.1.2 The Phase 1 Habitat Survey identified habitats present within the Proposed Development boundary and potential for the presence of protected or notable species. As surveys for protected or notable species were undertaken between 2018 and 2022 and have been reported in **Sections 4-12**, this section focusses on any protected or notable flora, habitats present and an assessment against the criteria for habitats of principal importance.

2.2 Study area

2.2.1 The study area of the Phase 1 Habitat Survey covers land within the Proposed Development boundary, as shown on the Phase 1 Habitat Survey Plan in **Appendix B**. The majority of the works associated with the highways interventions would occur in existing habitats within the highway boundary that largely comprise areas of hard standing. As such, a full Phase 1 Habitat Survey has not been undertaken at these locations, only a site walkover. The exception to this is the proposed highways intervention works at junction 10 of the M1, where vegetation clearance would be required – this area was included within the Phase 1 Habitat Survey Study Area.

2.2.2 The study area was split into 11 survey areas (A-K) for the purposes of information recording and reporting. These are referenced in the results section below and shown on the Phase 1 Habitat Survey Plan in **Appendix B**.

2.3 Survey scope

2.3.1 The purpose of the extended Phase 1 Survey work was to:

a. identify known and potential protected or otherwise notable habitats and plant species present within the study area;

b. identify further botanical and habitat surveys required to inform the assessment of the Proposed Development within the ES;

c. identify recommendations for avoidance of habitats or plant species; and

d. identify recommendations should impacts be identified for the species and habitats present within the study area, to inform scheme design, outline design of mitigation, compensation and ecological enhancement measures, to be further refined on the basis of additional ecological surveys.

2.3.2 This section has been prepared in accordance with BS42020:2013: Biodiversity – Code of Practice for Planning and Development (BSI, 2013) (Ref. 1) and should be read in conjunction with the Phase 1 Habitat Survey Plan provided at **Appendix B**, the Phase 1 Habitat Survey Target Notes provided at **Appendix C**, the Botanical Species List provided at **Appendix D** and the NVC Report provided at **Appendix AA**.

2.4 Legislation and local biodiversity context

Designated sites

2.4.1 The national site network (formerly Natura 2000) is the name given to the network of nature conservation sites established under the EC Habitats (Ref. 2) and Birds Directives (Ref. 3) and comprises Special Areas of Conservation (SACs) and Special Protection Areas (SPAs). Ramsar sites are designated under the Convention on Wetlands of International Importance, agreed in Ramsar, Iran, in 1971.

2.4.2 Originally notified under the National Parks and Access to the Countryside Act 1949 (Ref. 4), Sites of Special Scientific Interest (SSSIs), National Nature Reserves (NNRs) and Local Nature Reserves (LNRs) were re-notified under the Wildlife and Countryside Act 1981 (Ref. 5) (as amended). Improved provisions for the protection and management of these sites were also introduced by the Countryside and Rights of Way (CRoW) Act 2000 (Ref. 6).

Habitats and species of principal importance

2.4.3 Habitats and Species of Principal Importance for the conservation of biodiversity in England are listed under the provisions of Section 41 of the Natural Environment and Rural Communities (NERC) Act 2006 (Ref. 7). These include all the habitats and species in England that were identified as requiring action in the now succeeded UK Biodiversity Action Plan (UK BAP), which continue to be regarded as conservation priorities in the subsequent UK Post-2010 Biodiversity Framework.

2.4.4 Section 40 of the NERC Act 2006 places a general duty on all public authorities to pay due regard to conservation and enhancement of biodiversity within their decision making, particularly with reference to those habitats and species listed within Section 41 of the Act.

Notable plants

2.4.5 A range of notable plants, as listed in Schedule 8 of the Wildlife and Countryside Act 1981 (as amended), are afforded legal protection making it an offence to:

a. intentionally pick, uproot or destroy any wild plant listed in Schedule 8; and

b. not being an authorised person, intentionally uproot any wild plant not included in Schedule 8.

Invasive plants

2.4.6 A range of invasive plant species, including Japanese knotweed, are listed on Schedule 9 of the Wildlife and Countryside Act 1981 (as amended) making it an offence to plant or otherwise cause to grow in the wild any invasive plant species listed on Schedule 9 of the Act.

2.4.7 The Invasive Alien Species (Enforcement and Permitting) Order 2019 allows for the enforcement of the EU Invasive Alien Species Regulation 1143/2014 on the prevention and management of invasive alien plant and animal species in England and Wales, including the relevant licenses, permits and rules for keeping invasive alien species. Species on this list are no longer listed on Schedule 9 of the Wildlife and Countryside Act 1981 (as amended).

Local Biodiversity Action Plans

2.4.8 The following Local Biodiversity Action Plans (LBAPs) list habitats and species which are county conservation priorities. The lists include Habitats and Species of Principal Importance, as well as those of county importance.

Bedfordshire and Luton Local Biodiversity Action Plan

2.4.9 Actions for maintaining or enhancing the conservation status of certain habitats and species listed on the Bedfordshire and Luton Local Biodiversity Action Plan (BLBAP) (Ref. 8) have been prepared. Those listed that are likely to be relevant include (but not necessarily limited to):

a. Lowland meadow and calcareous grassland;
b. Hedgerows;
c. Arable field margins;
d. Ponds;
e. Woodland;
f. Great crested newt (*Triturus cristatus*);
g. Hazel Dormouse:
h. European Otter (*Lutra lutra*); and
i. Water Vole (*Arvicola amphibius*).

Hertfordshire Local Biodiversity Action Plan

2.4.10 Actions for maintaining or enhancing the conservation status of certain habitats and species listed on the Hertfordshire Local Biodiversity Action Plan (HLBAP) (Ref. 9) have been prepared. Those listed that are likely to be relevant include (but not necessarily limited to):

a. Woodland;
b. Farmland;
c. Neutral grassland;
d. Chalk grassland;

e. Farmland;
f. Urban;
g. Natterer's bat (*Myotis nattereri*);
h. Tree sparrow (*Passer montanus*);
i. Song thrush (*Turdus philomelos*);
j. Great crested newt;
k. Hazel dormouse;
l. European Otter; and
m. Water Vole.

2.5 Methodology

Desk study

2.5.1 Information about non-statutory designated nature conservation sites and protected or otherwise notable species, recorded from within the last 10 years, were obtained from Bedfordshire and Luton Biodiversity Recording and Monitoring Centre (BRMC) and Herts Environmental Records Centre in February 2018, updated in November 2020, and updated further in June 2022 within a 2km radius of the Main Application Site.

2.5.2 Information about statutory designated nature conservation sites within 2km of the Main Application Site was obtained from the government's MAGIC website (Ref. 10), on 15 August 2022. Maps and aerial photographs were also reviewed to ascertain the location of habitats likely to support species of conservation concern and/or subject to the provisions of legislation.

Field Survey

2.5.3 An extended Phase 1 Habitat Survey including initial protected species assessment, was undertaken following standard methods as described in the Guidelines for Preliminary Ecological Appraisal (Ref. 11) and the Phase 1 Habitat Survey Methodology (Ref. 12).

2.5.4 The initial survey was conducted by two experienced ecologists in suitable weather conditions over six days between 21 May and 29 June 2018 with a small additional area surveyed on 18 May 2019. Additional land for off-site mitigation planting was incorporated into the Proposed Development in late 2019 (Area C). This area was subject to survey between 7 November and 13 November 2019. All surveys included:

a. Mapping of the habitats present on site and recording characteristic plant species, with target notes used to identify particular areas, potentially important or otherwise notable habitats or plant species;
b. Identification of features which have the potential to support protected and/or notable species; and

c. Searches for non-native invasive plant species listed on Schedule 9 of the Wildlife and Countryside Act 1981 (as amended).

2.5.5 An updated extended Phase 1 Habitat Survey was conducted on land within the Main Application Site on four dates between 21 May and 2 June 2020. Further ground truthing occurred in June and July 2022 on all habitats impacted by the Proposed Development. This report reflects the most up to date habitat survey information available, and where discrepancies are identified between the original surveys, the 2020 updates and the 2022 ground truthing, these are clearly outlined within the appropriate sections.

2.5.6 Additionally, to account for alterations to the Proposed Development incorporating previously un-surveyed areas, extended Phase 1 Habitat Surveys were conducted at the M1 Junction 10 compound and areas impacted by the inclusion of the Airport Access Road. These surveys were conducted on the 8 August and 16 September 2020 respectively.

2.5.7 The ground truthing surveys were conducted between the 26 May to the 17 June 2022. Where the habitat had noticeably changed, a full extended Phase 1 Habitat Survey was undertaken on the habitat that had changed.

2.5.8 All extended Phase 1 Habitat Surveys conducted in 2020 and the ground truthing surveys in 2022 were carried out by pairs of experienced surveyors in suitable weather conditions during the optimal period for botanical survey. All surveys were conducted utilising the same methodology as previous surveys.

Assessment methodology

2.5.9 The nomenclature used in this report follows Stace (2019) New Flora of the British Isles Fourth edition (Ref. 13). A collated botanical species list, which includes common and scientific names, is provided within **Appendix D**. As such, scientific names for botanical species have been removed from the body text of this report.

2.5.10 Plant species found within the site during the field survey were reviewed against the following National and County Rare Plant Registers:

a. Red Data List for Bedfordshire (Ref. 14): This list aligns with The England Red List, (Ref. 15) and provides details of key known sites within the county.

b. Herts Plant List and Statuses (Ref. 16): This register details the list of plants present in Hertfordshire VC20, concurring with those listed in JNCC Red List, Cheffings and Farrell (2005) and species considered as locally rare for Hertfordshire, with their respective status' taken from Trevor James's Flora of Hertfordshire (2008).

c. The England Red List, P.A. Stroh et al. (2014) (Ref. 15): This list details the rarity status of England's flora using International Union for the Conservation of Nature (IUCN) rarity criteria and provides the rarity of these plants in Great Britain.

d. The GB Red List for Vascular Plants (2018) (Ref. 17): This lists the current GB rarity status using IUCN criteria and gives the component

countries of England Wales or Scotland to which the criteria apply e.g. for Scots pine (*Pinus Sylvestris*) there is only reference to the IUCN criteria applying for Scotland and not elsewhere in GB.

2.5.11 Fungi species found were reviewed against:

a. Red Data List of Threatened British Fungi (2006) (Ref. 18). This gives a rarity status for fungi species within Great Britain.

2.5.12 In addition to the extended Phase 1 Habitat Survey, all 2020 habitat surveys were followed by conversion to UK Habitat Classification (UK Hab) codes to allow for subsequent Biodiversity Net Gain evaluation and assessment to inform mitigation proposals. Conversion of Phase 1 habitat data to UK Hab codes was conducted using the Defra Biodiversity Metric 3.1 calculation tool (Ref. 19), which contains conversion tables for all Phase 1 habitat codes. Where conversion using these habitat tables does not align with habitat types identified during the field survey (e.g. variant botanical communities or physical features), professional judgement has been used to identify the correct habitat type using UK Hab. Where possible, information gained from the 2020 surveys has been used to identify UK Hab codes to a greater classification level than provided by the conversion tables. The ground truthing surveys that occurred in 2022, ensured that the conversion previously undertaken matched correctly with current habitat baseline.

Survey limitations

2.5.13 Some areas within the Proposed Development boundary were not able to be surveyed due to access restrictions and/or health and safety concerns, these are listed below and shown on the Phase 1 Habitat Survey Plan in **Appendix B**:

a. within the main airport due to restricted security access/safety issues (Area D);

b. industrial units and associated compounds outside of public access to the north and west of the airport associated with local businesses (Area E);

c. the allotment within Wigmore Valley Park (Area G); and

d. land to the west of the airport complex associated with the construction of the Luton DART (Direct Air-Rail Transit) project (Areas A and B).

2.5.14 The four areas listed above generally comprise hardstanding and buildings, which are highly unlikely to support any habitats of high ecological value; therefore, this is not considered to be a substantial limitation or compromise the robust baseline reported.

2.5.15 Whilst access was granted to the enclosed Dairyborn Scarp District Wildlife Site (DWS), the majority of this site was inaccessible for survey given the extremely steep gradient of the escarpment, as well as impenetrable vegetation covering many other areas. Where possible, inaccessible habitats were viewed from multiple angles, using binoculars and through site fencing at suitable viewpoints. This is considered a significant limitation and accordingly these

habitats have consequently been assessed conservatively to support a worst case scenario assessment of potential impacts.

2.5.16 The weather conditions during the 2018 surveys were variable and during the year extremes of weather were experienced. Spring was very wet and summer had prolonged dry periods. Some grass species may not have been as evident due to burn-off effects of the prolonged summer. However, this is not anticipated to have significantly affected the results or professional judgements made in this report, particularly as updated surveys during 2020 and ground truthing surveys in 2022 were conducted within optimal survey conditions.

2.5.17 The survey of the mitigation planting areas was undertaken in November 2019, outside of the optimum survey period for botanical surveys which is broadly taken as being April to mid-October (Ref. 12). This period was used in order to gather baseline information as access allowed. Whilst outside of the optimal period for botanical identification, woody species and most key hedgerow features were still clearly identifiable, with approximately half (9 of 20) of hedgerows surveyed within the area identified as Important based on their biodiversity and landscape value. This is therefore not considered to be a significant limitation.

2.5.18 Desk study data supplied for Herts Environmental Records Centre did not yield any plant records under ten years old, with records over ten years of age deemed to be no longer relevant, so these are omitted from the results.

2.5.19 The rare plant register for Hertfordshire is based on the International Union for Nature Conservation (IUCN) categories of rarity stated within the Joint Nature Conservation Committee's Red Data List by Cheffings and Farrell (Ref. 20), this information is now out of date. Changes to this list have been made (by the species statement Assessment Group in 2018) and this is available as an excel file via the BSBI website (Ref. 21) and the findings are discussed in this report where relevant.

2.5.20 Hedgerow checks were made from the field facing sides in general due to health and safety constraints posed by narrow undulating country lanes and relatively frequent traffic, therefore some species may have been missed. However, further detailed hedgerow surveys were conducted, the results of which can be found within **Section 3** of this report.

2.5.21 A number of cotoneaster species have been identified to species level during the Phase 1 habitat survey including three of the invasive cotoneaster species; wall cotoneaster, small-leaved cotoneaster and Himalayan cotoneaster. Additional areas of invasive cotoneaster may be present within areas of amenity planting or may be present and potentially overlooked within other semi-natural habitats.

2.5.22 Desk study records obtained relating to designated sites which were last updated in June 2022 relate to the Main Application Site, excluding the off-site highway interventions. This is not considered to be a significant limitation given that the majority of highway interventions are restricted to areas of existing hardstanding and those areas highlighted as not being hardstanding such as the M1 compound location have been subject to a walkover survey.

2.6 Results

Desk study

Designated nature conservation sites

2.6.1 There are no national site network sites ((i.e. Special Areas of Conservation (SACs), candidate SACs (cSACs), Special Protection Areas (SPAs), potential SPAs (pSPAs) or Ramsar sites within 10km of the Main Application Site, and no sites designated for bat species within 30km.

2.6.2 The closest international designated site is Chiltern Beechwoods SAC, designated for its beech forests (*Asperulo-Fagetum)*, which is located approximately 13km south west of the Main Application Site. The closest international designated site designated for its bird assemblage is Lea Valley SPA, located approximately 24km south east of the Main Application Site.

2.6.3 There are a further 21 statutory designated sites within 10km of the Main Application Site. Thirteen of these sites are Sites of Special Scientific Interest (SSSIs), one of which is also designated as a National Nature Reserve (NNR), another is also designated as a Local Nature Reserve (LNR). Eight are LNRs, as detailed in **Table 2.1**. None of these lie within the Main Application Site. The closest is Galley and Warden Hills at 4.5km to the north west of the Main Application Site. This is a SSSI and LNR comprising chalk downland which supports a huge variety of wildflowers and associated assemblage of butterflies and other invertebrates.

Table 2.1: Statutory designated nature conservation sites within 10km of the Main Application Site.

Site Name	Distance and orientation from Main Application Site	Reason for Designation
Sites of Special Scientific Interest (SSSIs)		
Dallow Downs and Winsdon Hill SSSI	2.9km west	Unimproved calcareous grassland supporting a characteristic downland flora, including many locally uncommon species and nationally rare plants.
Cowslip Meadow SSSI	4.1km north west	Unimproved neutral grassland supporting a characteristic downland flora, including many locally uncommon species and nationally rare great pignut.
Wain Wood SSSI	4.3km north east	An ancient semi-natural oak/hornbeam woodland, approaching the northern limit of its natural range, it represents an example of a habitat now much reduced in extent nationally.

Site Name	Distance and orientation from Main Application Site	Reason for Designation
Galley and Warden Hills SSSI/LNR	4.5km north west	Unimproved neutral and calcareous grassland supporting a characteristic downland flora, including many locally uncommon species and nationally rare plants, both within Bedfordshire and nationally. Chalk downland is a habitat that has been greatly reduced in extent and quality through changes in agriculture.
Deacon Hill SSSI	6.8km north	Remnant of chalk downland with a characteristic species rich, calcareous grassland flora. Many of the plants are now uncommon in Bedfordshire. Nationally this is a habitat that has been greatly reduced in extent and quality through changes in agriculture.
Blow's Down SSSI	7.0km west	A rich and varied site with a large area of open, unimproved grassland. Such sites have declined nationally and this site is a fine example of what little remains of this important habitat.
Knebworth Woods SSSI	7.2km east	This woodland site is of a type nationally rare, but well represented in Hertfordshire. It is a most important woodland in the north of the county, almost all ancient in origin and is ecologically diverse with rides, ponds and small areas of both acidic and neutral grassland.
Barton Hills SSSI	7.7km north	Chalk escarpment retaining an extensive cover of unimproved chalk grassland supporting many species of grasses and flowering plants. Opposite, a small ancient beech wood.
Kensworth Chalk Pit SSSI	7.8km west	Designated for its geological interest.
Oughtonhead Lane SSSI	8.0km north east	Designated for its geological interest.
Knocking Hoe SSSI/NNR	8.1km north	Lower Chalk escarpment retaining areas of unimproved calcareous grassland supporting a downland flora, which includes several nationally rare plants and other species rare in Bedfordshire.
Smithcombe, Sharpenhoe and Sundon Hills SSSI	8.3km north west	Lower Chalk escarpment with areas of unimproved calcareous grassland with a rich assemblage of characteristic plants. Many of the plants associated with this site are now uncommon in Bedfordshire and nationally. This is

Site Name	Distance and orientation from Main Application Site	Reason for Designation
		a habitat that has been greatly reduced in extent and quality through changes in agriculture.
Sundon Chalk Quarry SSSI	8.5km north west	Part of a large disused complex of chalk pits just to the west of Upper Sundon in Bedfordshire. Within the quarries is found a range of habitats including small areas of fen, lakes, chalk grassland. Species-rich scrub and developing woodland. The variety of habitat has enabled a rich and varied insect fauna to develop.
Dunstable and Whipsnade Down SSSI	10km west	A steep escarpment extending three kilometres between Dunstable and Whipsnade. The steep slopes support a typical chalk downland flora, a habitat greatly reduced in extent both within Bedfordshire and nationally.
Houghton Regis Marl Lakes SSSI	10km west	A large disused quarry within the Lower Chalk north of Dunstable. A mosaic of wetland communities have developed associated both with open water and water-logged areas surrounding the lakes including examples of base rich fen. Supports a notable assemblage of dragonfly and is an important ornithological site.
Local Nature Reserves (LNR)		
Batford Springs LNR	5.6km south	Fresh springs that serve a small network of chalk lined streams and ponds. The River Lea flows through the site and there is open grassland and a small wooded area.
Marshalls Heath LNR	6km south	A small fragment of acid grass heath dominated by secondary woodland and scrub, with more than 1,300 species of plant and animal recorded in recent years, including more than 40 species now on national lists of threatened species. The site is well-known locally for its large anthills constructed by yellow hill ants.
Cottage Bottom Fields LNR	6.5km west	Flower-rich grassland rich in wildlife and full of colour with areas of scrub providing shelter for birds and insects. The slopes are home to possibly the largest population of great pignut in the country.
Oughtonhead Common LNR	7.9km north east	Supports a range of riverside habitats including reed, sedge beds, wet grassland, ditches, dry grassland, woodland and hedgerows. These

Site Name	Distance and orientation from Main Application Site	Reason for Designation
		habitats support a range of invertebrates and birds.
Wheathampstead LNR	8.6km south	Secondary ash woodland grades with mature hedgerow bounding the western edge of the site and areas of rough unimproved neutral grassland, ruderal habitat and a pond/scrape area.
Purwell Meadows LNR	9.2km north east	A series of wet grassland and marsh in the Purwell Valley. Supports a population of wetland birds and water voles.
Danesbury Park LNR	9.3km south east	Historic parkland supporting a species rich neutral to acidic semi-improved grasslands under a low intensity grazing regime. The site also supports mature parkland trees, plantation woodland and hedgerows. These habitats support a diverse range of invertebrates and birds.
Singlers Marsh LNR	9.4km south east	A site adjacent to the River Mimram that supports a range of habitats including species-rich neutral grassland, wet grassland, marsh, mixed scrub, hedgerows and stands of willow.

Non-statutory designated sites

2.6.4 There are 30 non-statutory designated sites within 2km of the Main Application Site. These include County Wildlife Sites (CWS), District Wildlife Sites (DWS) and Local Wildlife Sites (LWS), details of which are included in **Table 2.2**. Of these, three are within the Application Site (Wigmore Park, Winch Hill Wood and Dairyborn Scarp) and one is immediately adjacent (Burnt Wood).

Table 2.2: Non-statutory designated nature conservation sites within 2km of the Main Application Site.

Site Name	Distance, connectivity and orientation from Main Application Site	Reason for Designation
Wigmore Park CWS	Within	This site, which covers the southern half of Wigmore Park (15.4ha), has species rich neutral grassland with scattered scrub, ruderal vegetation and a length of green lane. The site is recognised for its neutral grassland, calcareous grassland and hedgerows. The

Site Name	Distance, connectivity and orientation from Main Application Site	Reason for Designation
		northern part of the park is comprised of amenity grassland with public facilities and is not covered by the designation.
Winch Hill Wood CWS/LWS	Within	Winch Hill Wood CWS and Local Wildlife Site (LWS) straddles the Bedfordshire and Luton/Hertfordshire border. This site is designated within both Bedfordshire (as a CWS) and Hertfordshire (as a LWS). It comprises ancient semi-natural broadleaved woodland with ancient woodland indicator species and hedgerows of value. The site is a remnant (less than 2ha) of a larger ancient semi-natural woodland comprising Pedunculate Oak /Hornbeam with birch species woodland with ground flora dominated by bluebell.
Dairyborn Scarp DWS	Within	This site was formerly part of a larger site called Dairyborn Scarp CWS which had additional grassland interest (no longer present within this designation). It comprises a steep chalk scarp dominated by ruderal vegetation and scrub, with a small remnant of ancient woodland to the north of the site. The site is a habitat mosaic likely to be of value for invertebrates, based on the diversity of habitat features.
Burnt Wood LWS	Immediately adjacent	Ancient Woodland Inventory site; remnant semi-natural canopy; ancient physical features; woodland indicators. Ancient semi-natural pedunculate/hornbeam woodland largely replanted with conifers. Old pits, wood banks and quite diverse ground flora, including bluebells, add to interest.
Luton Parkway Verges DWS	120m west	This site is recognised for its calcareous and neutral grassland with several calcareous /neutral grassland indicators recorded.
Luton Hoo Park CWS	150m south west	This site is recognised for its ancient woodland, special woodland interest and diversity of habitats. Habitats present include lowland mixed deciduous woodland, standing open water, plantation, neutral grassland, parkland, ruderal vegetation and bracken.

Site Name	Distance, connectivity and orientation from Main Application Site	Reason for Designation
Vauxhall Way LWS	190m north	Habitat mosaic consisting of amenity, improved and semi-improved neutral grassland, plantation and semi-natural woodland, hedgerows and scrub. It also acts as a wildlife corridor.
River Lea CWS	270m south west (but immediately adjacent to the highway intervention on the A1081)	River with associated riparian habitats with fen, marsh and swamp in addition to neutral grassland, scrub, hedgerows and trees. The river supports a population of water vole.
Diamondend Springs, Limekiln Wood, Pondcroft LWS	430m south east	Ancient woodland with a semi-natural canopy suggesting ancient origin; woodland indicators. Ancient semi-natural pedunculate oak with hornbeam, beech and wild cherry to the east and ash, hornbeam and hazel to the west with a ground flora dominated by bluebell and dog's mercury.
Slaughter's Wood and Green Lane CWS	440m north (within 200m of the Affected Road Network (ARN)	Ancient semi-natural woodland with an understorey of coppiced hazel. The site is recognised for ancient woodland and hedgerows with historical importance. Also present are neutral grassland, scrub and bracken.
Withstocks Wood LWS	580m south	Ancient Woodland Inventory site; woodland indicators. Ancient semi-natural pedunculate oak/hornbeam coppice woodland. Dense growth of silver birch with some wild cherry. Planted Scots pine, European larch and a few old Norway spruce. Quite diverse ground flora with a number of ferns recorded.
Watkins Wood and Lords Wood LWS	660m east	Ancient Woodland Inventory site with areas of semi-natural canopy and ancient physical features. Ancient semi-natural pedunculate oak/ hornbeam coppice with standards woodland largely replanted with broadleaved and coniferous species. Ground flora dominated by bluebell.
Sloughs Wood LWS	680m south	Former oak/hornbeam coppice woodland. Small area of hornbeam coppice to the west, mainly replanted with conifers. Small area of

Site Name	Distance, connectivity and orientation from Main Application Site	Reason for Designation
		hornbeam coppice. Main area has been replanted with conifers.
George Wood CWS	740m south (within 200m of the ARN)	Ancient semi-natural woodland with mixed plantation and coniferous plantation.
River Lea DWS	790m west	Undeveloped floodplain associated with the river. Also present are neutral grassland, scrub, trees, hedgerows and allotments.
Sewett's Wood and Sellbarn's Dell LWS	790m south east	Ancient Woodland Inventory site; woodland indicators. Ancient semi-natural pedunculate oak/hornbeam coppice with standards woodland. Part replanted with conifers and mixed plantation. Ground flora dominated by bluebell and bramble aggregate Rubus fruiticosus agg.
Kidney and Bull Woods CWS	840m south west (within 200m of the ARN)	Ancient semi-natural woodland with conifer and mixed plantation and neutral and marshy grassland.
Church Cemetery CWS	920m west	The cemetery is recognised for its neutral grassland with trees and shrubs.
Hurst Wood LWS	1120m south east	Ancient Woodland Inventory site; woodland indicators. Ancient semi-natural pedunculate oak/hornbeam coppiced woodland with wild cherry and ash. Species rich ground flora with bluebell.
Haringdell and Fernell's Wood CWS	1140m south	The majority of the site is ancient woodland with broadleaved woodland and plantation.
Chiltern Green CWS	1180m south	Lowland mixed-deciduous woodland with ancient semi-natural woodland, neutral grassland scrub and standing water.
Stubbock's Wood LWS	1230m north (within 200m of the ARN)	Ancient Woodland Inventory site (part); remnant semi-natural canopy; ancient physical features; woodland indicators. Ancient semi-natural woodland part replanted with broadleaved and coniferous species. Thought to be oak and hornbeam in origin with hazel, ash and elm species. Further woody species and a field layer of bluebell and dog's mercury.

Site Name	Distance, connectivity and orientation from Main Application Site	Reason for Designation
Laysbury Dells LWS	1300m south east	Semi-natural broadleaved woodland supporting oak, ash, hazel and beech. Hazel dormouse has been recorded.
Horsley's Wood CWS	1310m south	Ancient semi-natural woodland largely replanted with conifers. Mixed plantation with tall herb and fern.
Wandon End Park CWS	1360m north	The site is recognised as meeting the criteria for a hedgerow system and containing biologically significant trees.
Hitchin Road Spinney DWS	1380m north west	Semi-natural broadleaved woodland with veteran trees.
Whiteway Bottom Copse LWS	1700m south east	Ancient woodland with a semi-natural canopy. Ancient semi-natural pedunculate oak/ hornbeam woodland with beech. Field layer dominated by bluebell.
Long Lane LWS	1830m east	Wooded green lane with features and structure indicative of ancient origins; woodland indicators. Old hedgerows and open areas of grassland with scattered trees and scrub. Hedges comprise range of woody species including field maple, hazel, hawthorn, ash, holly. A good diversity of woodland indicators recorded including bluebell, moschatel and dog's mercury.
The Chase CWS	1900m north west	A belt of broadleaved woodland grading into dense scrub to the north. The woodland contains coppiced hazel and field maple and has a grassland ground flora in its more open areas.
Stockwood Park DWS/CWS	1940m south west	A public park within the grounds of a former stately home, the site comprises formal gardens, golf course and areas of broadleaved woodland, lowland meadow and parkland with mature trees.
Great Hayes Wood DWS	2000m north	A site comprising semi-natural broadleaved woodland and wood pasture at the edge of Luton.

Botanical species records

2.6.5 The data search revealed a range of protected and/or notable plant species within 2km of the Main Application Site as summarised within **Table 2.3**.

Table 2.3: Protected and/or otherwise notable plant species records

Common and Scientific Name	Reason notable	Location and National Grid Reference (NGR) (per year)	Date	Proximity/ connectivity to study site
Bluebell	WCA Sch 8	1 record from The Chase CWS (east) TL1023	24/04/2016	Outside Main Application Site boundary and not connected.
Bluebell	WCA Sch 8	1 record from Chiltern Green CWS TL136192	15/06/2013	Outside Main Application Site and not connected.
Bluebell	WCA Sch 8	1 record from Wigmore Park CWS TL1221	18/07/2016	Within Main Application Site and connected.
Box	Notable where native populations found	1 record from Luton Occasional plants TL105235	21/07/2010	Outside Main Application Site and not connected.
Bee orchid	Of local interest only but forms part of the reason for designation of Wigmore Park CWS	3 records for Luton Parkway Verges DWS 1 no. TL106202 (2011) 3 no. TL10612032 (2013) 15 no. TL10612031 (2014)	2011-2014	Immediately adjacent to Main Application Site.
Bee orchid	Of local interest only but forms part of the reason for designation of Wigmore Park CWS	19 records for Wigmore Park 3 no. TL127217 (2010) 1 no. TL126216 (2013) 2 no. TL12572153 (2013) 2 no. TL12672173 (2013) 1 no. TL12522174 (2013) 7. no. TL12822163 (2013) 8 no. TL12572153 (2013)	2010-2016	Within Main Application Site and connected.

Common and Scientific Name	Reason notable	Location and National Grid Reference (NGR) (per year)	Date	Proximity/ connectivity to study site
		1 no. TL126215 (2013) 2 no. TL12362184 (2013) 1 no. TL12392200 (2014) 3 no. TL12432207 (2014) 22 no. TL12382202 (2014) 1 no. TL12512173 (2014) 1 no. TL12572153 (2014) 1 no. TL126215 (2014) 1 no. TL12672164 (2014) 4 no. TL12512173 (2014) 40 no. TL1221 (2016) Unknown number TL1221 (2016)		
Bee orchid	Of local interest only but forms part of the reason for designation of Wigmore Park CWS	2 records for Luton Airport Unknown number TL1221 (2014) 6 no. TL1221 (2016)	2014-2016	Within Main Application Site and connected.
Bee orchid	Of local interest only but forms part of the reason for designation of Wigmore Park CWS	5 records for Luton Unknown number TL1221 (2014) Unknown number TL1020 (2014) 1 no. unknown number TL101232 (2014) 6 no. TL1222 (2014)	2014-2016	Within Main Application Site and connected.

Common and Scientific Name	Reason notable	Location and National Grid Reference (NGR) (per year)	Date	Proximity/ connectivity to study site
Galingale	Nationally threatened	Large patch in damp area of Wigmore Park. TL12442176	18/07/2016	Within Main Application Site and connected.
Invasive non-native species				
Few-flowered garlic	WCA Sch 9	1 record from Luton Bradgers Hill Rd TL0923	24/04/2016	Outside Main Application Site and not connected.
Giant hogweed	WCA Sch 9	1 record from Manor Park Rd, Luton TL109202	12/06/2013	Adjacent to Main Application Site but not connected.
Indian balsam	WCA Sch 9	1 record from Manor Park Rd, Luton from stream at top of park TL098210	12/06/2013	Outside Main Application Site and not connected.
Japanese Knotweed	WCA Sch 9	1 record from Dairyborn Scarp DWS, steep scarp south of car park occasional presence on scarp TL111212.	01/08/2012	Within Main Application Site and connected.
Japanese Knotweed	WCA Sch 9	4 records from 2013 at Wigmore Park CWS all have had prior treatment at TL12292194; TL128216; TL127217; and TL127218.	2013	Within Main Application Site and connected.
Japanese Knotweed	WCA Sch 9	12 records from Luton: Large stand Bute Street Car Park, treated, TL0939921470 (2013); Stand in scrub habitat on London Rd adjacent to Matalan,	2013-2014	One location within Main Application Site and connected, others outside and not connected.

Common and Scientific Name	Reason notable	Location and National Grid Reference (NGR) (per year)	Date	Proximity/ connectivity to study site
		TL0913820846 (2013); Silver Street at corner of building/pavement, treated, TL0921621352 (2013); Vauxhall Way adjacent to 12 Saywell Rd, TL1050922627 (2013); Vauxhall / Stopsley Roundabout within scrub habitat, treated, TL10172308 (2013); Ashcroft, in bushes at lady Zia Werner School, treated, TL105231 (2013); Chapel Street, roadside in front of private parking area, treated, TL090209 (2013); Crawley Rd/Vauxhall Way Roundabout on subway bank, treated, TL109222 (2013); Wenlock Street, rear of Highton Rd Church, treated, TL093218 (2013); Wigmore park near Eaton Green Roundabout on bank adjacent to fencing, treated, TL122221 (2013); Windmill Roundabout in centre of roundabout, treated,		

Common and Scientific Name	Reason notable	Location and National Grid Reference (NGR) (per year)	Date	Proximity/ connectivity to study site
		TL097211 (2013); and Midland Rd, re-growth from prior treated stand, TL0929321684 (2013).		
Japanese rose	WCA Sch 9	1 record from Wigmore park large bush on bank (white flowered). TL12432177	18/07/2016	Within study area
Variegated yellow archangel	WCA Sch 9	2 records for Luton: Hart Lane Reservoir field layer of woodland in south-west corner TL099218 (2012); Bradgers Hill Rd, Luton TL1923 (2016).	2012-2016	Outside Main Application Site and not connected.

Field study

Habitats

2.6.6 The Study Area includes all areas of the Proposed Development as shown on the Development Areas Plan in **Appendix A**, which comprises London Luton Airport, the Airport Access Road two off-line areas to the east of Luton Airport Parkway Train Station, industrial estates, outdoor public space at Wigmore Park, arable farmland surrounding Winch Hill, arable fields to the north of the Main Application Site for offsite planting and the off-site compound. The western edge of the airport is demarcated by a steep sided valley and the landscape to the east of the airport is undulating with an uneven topography.

2.6.7 The proposed highway intervention works would be largely restricted to within the existing highway boundaries. Each of these locations comprised hard standing associated with the road and associated pavement, with verges of amenity grassland with ornamental shrub and tree planting or backing directly onto boundary fencing or the walls of adjacent properties. No ecological constraints were identified, and these locations are not discussed further within this report.

2.6.8 A description of Areas A-K is provided below, with the habitat's present mapped in accordance with Phase 1 Habitat Survey codes (Ref. 12) on the

Phase 1 Habitat Survey Plan within **Appendix B** and associated target notes provided within **Appendix C**:

2.6.9 Area A is east of Luton Airport Parkway train station and comprises access roads, temporary buildings, car park and rail tunnels, with areas of ephemeral/ short perennial vegetation, semi-improved grassland, tall ruderal and areas of landscaping comprising scrub and trees to be used for off-line car parks. Luton Parkway Verges DWS is within area A, this site has not been managed and is now predominantly dense scrub, with only small patches of neutral grassland remaining around the edges of the DWS.

2.6.10 Area B comprises businesses and highways, ephemeral/ short perennial vegetation, calcareous grassland, tall ruderal and areas of landscaping comprising dense ivy cover or scrub and trees.

2.6.11 Area C comprises arable fields and existing field margins which contain intact and defunct hedgerows varying in species composition, with some stretches qualifying as species rich hedgerow. The field layer and grass margins in these areas is dominated by species poor semi-improved grassland

2.6.12 The main body of the study area, referred to as the Main Application Site, can be further described by Areas D to J below.

2.6.13 Area D comprises London Luton Airport airfield and associated infrastructure (airside complex, terminal and other ancillary buildings, hard standing and managed and unmanaged areas of grassland, tall ruderal, wetland and hedgerow habitats), with habitats of short calcareous grassland, semi-improved calcareous grassland, tall ruderal, semi-improved neutral grassland and bare soils some with ephemeral short perennial vegetation. Some areas of the active airfield were inaccessible for survey, this was generally limited to hardstanding and buildings associated with moving aircraft.

2.6.14 Area E comprises industrial hangars and structures associated with the airport, these are situated largely to the north and west of London Luton Airport and comprise buildings, hardstanding (pavements, roadways and car parks) with areas of amenity planting, relict semi-natural scrub and grassland habitats and bare soils some with ephemeral short perennial vegetation.

2.6.15 Area F comprises Wigmore Valley Park including buildings, hardstanding car park and play area, a large area of amenity grassland, amenity planting, scattered broad-leaved and coniferous trees, mixed plantation and more natural areas with semi-natural woodland, plantation woodland, dense and scattered scrub, tall ruderal, rank semi-natural calcareous and neutral grassland.

2.6.16 Area G comprises Wigmore Allotment, which was not accessible for survey and was viewed from external areas, but contains temporary buildings, allotment plots with areas of managed planting and areas of relict semi-natural habitats of tall ruderal and semi-improved neutral grassland.

2.6.17 Area H comprise fields east of Winch Hill which are large, open undulating arable fields and wide field margins of neutral to calcareous grassland and hedgerows. A large buffer strip/set aside area with scattered broad-leaved trees and rank semi-improved neutral grassland, with valley areas of damper

neutral grassland divides the fields. There are two semi-natural woodlands and one plantation. There are also occupied and unoccupied dwellings, with associated garden habitats.

2.6.18 Area I comprises fields west of Winch Hill which are large, open undulating arable fields, bordered by intact native species-rich hedgerows to species-poor defunct hedges. In this location the field edge habitats are narrower or take the place of gaps in the hedgerows comprising neutral grassland with occasional areas of calcicoles. There are also occupied dwellings with associated garden habitats and unoccupied farm buildings (sheds).

2.6.19 Area J comprises the land to the north west of the Main Application Site. This area is to the north west of the airport and comprises a number of businesses, highways and hardstanding areas, as well as a large section of Dairyborn Scarp DWS.

2.6.20 Area K is the location for the proposed compound, west of Junction 10 of the M1. The area comprises of a fallow field bordered by the vegetated motorway verge to the east, a country road to the south and wooded areas to the west and north.

2.6.21 Following completion of the updated 2020 extended Phase 1 Habitat Surveys and the ground truthing undertaken in 2022, each major Phase 1 habitat area was converted to the most appropriate UKhabs code (Ref. 19) for use within the Biodiversity Net Gain (BNG) calculations as detailed in **Appendix 8.5** of this ES **[TR020001/APP/5.02]**.

Woodland

2.6.22 The Main Application Site incorporates 15 wooded parcels that vary from native semi-natural woodland to replanted woodland to plantation woodlands (mixed, broadleaved and coniferous). Only two appear to have relatively natural and undisturbed habitats. Each of the 15 wooded parcels are described below and are numbered as shown on the accompanying Phase 1 Habitat Survey Plan in **Appendix B**. These habitats are likely to have interest for faunal species (bird species, bat species, badger, hedgehog and for invertebrate species).

Broadleaved semi-natural woodland

2.6.23 Woodland 1 comprises ash woodland on a slight north east facing hill. To the eastern end, the wood is relatively undisturbed and has a wet flush, making this woodland slightly damper than the others within the Main Application Site.

2.6.24 This woodland canopy is dominated by hornbeam, with abundant ash, with the following in canopy and understorey: occasional dog rose aggregate, English elm, field maple, cherry laurel, hawthorn and hazel. Wild cherry and holly are frequent and field rose is rare. Honeysuckle and ivy are locally frequent as climbers through the understorey and canopy.

2.6.25 The ground flora to the east has a greater grass presence with frequent stands of wood melick and wood false brome and giant fescue. Forbs include locally abundant ground-ivy and cleavers, with occasional herb-Robert. To the central

and western end of the wood the ground flora is dominated by pignut with frequent to occasional patches of three-nerved sandwort and cow parsley.

2.6.26 This woodland is listed within desk data available via the MAGIC website (Ref. 10) as the habitat of principal importance 'lowland mixed deciduous woodland' and is likely to still qualify as the habitat of principal importance 'lowland mixed deciduous woodland'.

2.6.27 In addition, at least five regionally (South East/East) and UK listed ancient woodland indicator species (Ref. 22) are present including hornbeam, field maple, holly, pignut and wood melick are present, together with an apparent lack of recent disturbance.

2.6.28 This woodland has been subject to detailed NVC surveys as reported in **Appendix AA**.

2.6.29 Woodland 5 has patches of replanted semi-natural woodland with infill plantation woodland. The replanted semi-natural woodland comprises hornbeam, oak, elder and hazel. The ground here is very flat but the ground flora in patches is reminiscent of semi-natural woodland. To the periphery are locally abundant patches of common hemp nettle.

2.6.30 Undisturbed areas of this woodland are likely to qualify as the habitat of principal importance 'lowland mixed deciduous woodland'. Three regionally (South East/East) and UK listed ancient woodland species (Ref. 22) are present: hornbeam, bluebell and dog's mercury. In 2020 pignut was additionally identified within the undisturbed areas of this woodland, another indicator species of ancient woodland (Ref. 22).

2.6.31 Woodland 6, called Winch Hill Wood, is an area of ancient and semi-natural woodland in the eastern section of the Main Application Site, north of the airside complex adjacent to the country road through Winch Hill. The broadleaved woodland found here varies in its composition from east to west; the most western section is replanted with hornbeam but is of sufficient age to have developed into semi-natural woodland.

2.6.32 The canopy is dominated by pedunculate oak with abundant hornbeam, frequent silver birch, with rare Dutch elm. The understorey comprises frequent elder with occasional hawthorn and holly. The ground flora comprises dominant bluebell, bracken, bramble aggregate., and common nettle, with abundant yellow archangel and dog's mercury, with frequent creeping bent, cow parsley, hornbeam saplings, ground ivy, three-nerved sandwort, smooth meadow-grass, and greater stitchwort, with occasional holly saplings, honeysuckle, and oak saplings, with rare wild arum and hawthorn saplings.

2.6.33 This woodland is listed on the MAGIC website (Ref. 10) as the habitat of principal importance 'lowland mixed deciduous woodland', the field survey supports this. Winch Hill Wood is the only ancient woodland inventory site within the Main Application Site. Only part of the woodland is shown as being on the ancient woodland inventory, potentially due to the replanted area, however the whole woodland is designated as a CWS and LWS. This woodland is likely to

still qualify as the habitat of principal importance ‘lowland mixed deciduous woodland’.

2.6.34 This woodland was noted during the survey to be characteristic of NVC (Ref. 23) W10 oak dominated woodland with the typical associated understory and field layer and retained presence of at least six regionally (South East/East) and UK listed ancient woodland indicator species (Ref. 22): hornbeam, field maple, holly, bluebell, yellow archangel and greater stitchwort.

2.6.35 This woodland has been subject to detailed NVC surveys as reported in **Appendix AA**.

2.6.36 Woodland 7 is located to the south east of Wigmore Park ,to the north is adjacent to Woodland 8 plantation habitat and adjoins arable habitat to the east.

2.6.37 Woodland 7 canopy is locally dominated by pedunculate oak and ash, with occasional wild cherry and field maple. The understorey is well developed and at times dense with abundant hawthorn, elder and blackthorn, frequent hazel and occasional beech, domestic apple, ash, holly and cherry sp. The ground flora is locally dominated by common nettle, cleavers, with locally abundant patches of the ancient woodland indicator species dog’s mercury, hedge garlic, bluebell and three-nerved sandwort.

2.6.38 Woodland 7 is likely to qualify as the habitat of principal importance ‘lowland mixed deciduous woodland’. At least five regionally (South East/East) and UK listed ancient woodland indicator species (Ref. 22) are present: holly, wild cherry, field maple, dog’s mercury and bluebell.

2.6.39 This woodland has been subject to detailed NVC surveys as reported in **Appendix AA.**

2.6.40 Woodland 10 is located within the northern area of Wigmore Park, the central area of which (surrounding Pond 2) is also comprised of semi-natural broadleaved woodland. This woodland is enclosed by a fence to prevent access and is clearly separate in age and composition from the surrounding broadleaved plantation woodland, though the canopies are connected and the semi-natural woodland extends beyond the fence for approximately 10m to the west. The canopy is dominated by ash, with frequent pedunculate oak and wild cherry. There is an understorey of bramble, and elder. This habitat supports the non-native invasive species Japanese knotweed that is listed within Schedule 9 part II of the Wildlife and Countryside Act 1981 (as amended).

2.6.41 The central area of Woodland 10 is likely to qualify as the habitat of principal importance ‘lowland mixed deciduous woodland’.

2.6.42 Woodland 11 is a small parcel of woodland located south of Woodland 5 immediately south of the runway approach lights. The canopy comprises of abundant hornbeam, frequent oak, blackthorn and elder with occasional hazel. There is an understory of bramble, blackthorn and hazel. The ground flora includes bluebell, false oat-grass, soft brome and cock’s-foot, hedge garlic, common hemp-nettle, bracken and common nettle.

2.6.43 Woodland 11 is likely to qualify as the habitat of principal importance 'lowland mixed deciduous woodland'. Two regionally (South East/East) and UK listed ancient woodland indicator species (Ref. 22) are present: hornbeam and bluebell.

2.6.44 Woodland 12 is a small parcel of broadleaved woodland approximately 0.36ha in size, located on the periphery of the Main Application Site, due north east of Woodland 3. The connected canopy comprises of abundant oak frequent hornbeam, holly and silver birch with occasional cherry species and poplar trees. There is an understory of bramble, and hazel.

2.6.45 Woodland 12 is likely to qualify as the habitat of principal importance 'lowland mixed deciduous woodland'. At least four regionally (South East/East) and UK listed ancient woodland indicator species (Ref. 22) are present: hornbeam, holly, bluebell, wood millet.

2.6.46 Woodland 14 is an area of broad-leaved semi-natural woodland within the boundary of the Dairyborn Scarp DWS. No access was available to this wooded strip and it was only viewed from external areas, including from the eastern boundary (top of slope) and a limited view at the base of the slope adjacent to the Cougar Accident Repair shop. The following canopy species were recorded present (with omitted abundance scores): goat willow, hazel, hawthorn, a cherry species, sycamore and field maple. This woodland is interspersed by patches of scrub habitat of wild privet and dogwood, with climbers including ivy, dog rose and clematis.

2.6.47 Woodland 14 may qualify as the habitat of principal importance 'lowland mixed deciduous woodland', with the presence of four regionally (South East/East) and UK listed ancient woodland indicator species referenced in the DWS citation. Further survey to confirm the presence of these species was not possible due to the extremely steep gradient of the escarpment, as well as impenetrable vegetation covering many other areas as detailed within the survey limitations.

Mixed plantation woodland

2.6.48 This woodland type was associated with historic areas of amenity planting within Wigmore Park.

2.6.49 Woodland 4 is situated at the eastern extent of the Main Application Site, east of Winch Hill. The woodland is mixed in species composition. Towards the western end species comprise abundant larch, a cedar species, whitebeam, beech, Norway maple and rare large-leaved lime. At the eastern end the woodland becomes more broadleaved in species composition where frequent field maple, hawthorn and beech is recorded. Within the woodland there is an understorey of elder, with occasional field rose and dog rose although where dominated by cedars then this becomes less apparent. Climbers include travellers joy and ivy. The field layer is dominated with nettles with frequent herb-Robert and occasional wood false brome, rough meadow grass, red campion and common dog violet. At the southern wood edge there are species more commonly associated with species-poor grassland such as perennial rye grass, daisy, dandelion aggregate (which may have self-seeded from the area

adjacent to the landing strip infrastructure area to the south of this location) and an area of bare chalk with ox-eye daisy, wild basil and field scabious.

2.6.50 Woodland 4, in part qualifies as the habitat of principal importance 'lowland deciduous woodland'. At least two ancient woodland indicator species field maple and field rose are recorded present. In addition, large-leaved lime is nationally scarce (Ref. 24).

2.6.51 Woodland 15, the woodland at the northern periphery of Dairyborn Scarp DWS is noted to have a high coniferous content and appears more like deliberate ornamental/landscape planting (potentially screening). Cypress species dominate this area, with larch and other coniferous species and areas with sycamore, hawthorn, hazel and goat willow.

2.6.52 Mixed plantation woodland does not qualify as a habitat of principal importance.

Broadleaved plantation

2.6.53 Woodland 5 has patches of replanted semi-natural woodland with infill broadleaved plantation woodland. The plantation here is of silver birch, hawthorn, hazel and blackthorn. It is very dense and with a dark ground layer, where light penetrates and at peripheries there are patches of ground-ivy and cleavers. Areas of tall ruderal and dense to scattered scrub vegetation are also present at the peripheries.

2.6.54 A further area of broadleaved plantation is present to the southern end of the amenity grassland at Wigmore Park, near to Target Notes 4 and 5. This has abundant field maple, blackthorn, elder, Italian alder, wild cherry and goat willow, with occasional wayfaring tree, a whitebeam aggregate, grey poplar and a few stands of the invasive species Japanese rose. Beneath the plantation the soils are largely bare but with frequent patches of hedge garlic, cleavers, common chickweed and occasional patches of red campion, pignut and ground-ivy. Rare are field forget-me-not and wild arum.

2.6.55 Woodland 8 comprises locally frequent pedunculate oak, Scots pine, Norway maple, wild cherry, Italian alder, silver birch, larch and ash, with occasional red oak, horse chestnut, blackthorn and dogwood.

2.6.56 Woodlands 9 and 10 are areas of broad-leaved plantation within the northern area of Wigmore Park. Woodland 9 supports a range of native and ornamental species both with sparse ground flora. The canopy and understorey species include wild cherry, horse chestnut, field maple, blackthorn, goat willow, Wilson's honeysuckle, dogwood, silver birch, wayfaring tree, holly, pedunculate oak, alder species, rowan, western hemlock, and roble beech. Woodland 10 supports dominant wild cherry, with frequent horse chestnut and hawthorn and occasional ash, poplar species., Norway maple and a variegated variety of holly.

2.6.57 Woodland 13 is an area of young plantation woodland located to the south west of the airport. This woodland is comprised of immature to semi-mature sycamore, beech, pedunculate oak, lime, hazel and Norway maple planted in straight rows. There is no significant understorey or ground flora present within this woodland.

2.6.58 Woodland 13 also supports the non-native invasive species Japanese rose that is listed within Schedule 9 part II of the Wildlife and Countryside Act 1981 (as amended).

2.6.59 Small areas of Woodland 14 at Dairyborn Scarp DWS supported broad-leaved plantation habitats. One area was to the south of the eastern sliver of Dairyborn Scarp DWS, with a narrow section of plantation dominated by ash, with abundant sycamore, hawthorn and occasional dogwood and a cherry species. A more extensive area of broad-leaved plantation is to the west of the Cougar Accident Repair Centre on the west facing slope down to the airport car park (currently used by Easy-Jet staff). These were dominated by sycamore, with abundant hawthorn and elder and a locally frequent balsam poplar variety. The field layer is dominated by bramble and ivy, with white dead-nettle and ground elder. Vestiges of calcicoles are also present, where the soils are thin including blue fleabane and rare occurrences of ploughman's spikenard.

2.6.60 Broad-leaved plantation habitat does not qualify as a habitat of principal importance.

Coniferous plantation

2.6.61 Woodland 2 is located to the east of Wigmore Park, beyond an arable field, and is dominated by a mix of coniferous species including Norway spruce, a cedar. and Scot's pine, with rare beech. The understorey is limited and largely comprises Wilson's honeysuckle within a band through the central part of the wood (likely game cover for pheasant, with rearing pens noted inside the southern part of the wood). The understorey also includes very occasional to rare stands of elder and holly, towards the wood edge are rare wild cherry, pedunculate oak with traveller's joy and ivy cover. The ground flora is sparse to non-existent but where present it is dominated by common nettle and rough meadow grass. This woodland is highly disturbed. This habitat is likely to have interest for faunal species (bird species and bat species).

2.6.62 Woodland 3 is located to the south east of Winch Hill. It has a tall canopy of cypress species with occasional beech trees and rare pedunculate oak. The shrub layer is largely absent except for a few remnant elder shrubs in the centre of the woodland and stands of introduced Wilson's honeysuckle, as likely game cover. The ground flora is largely bare or composed of leaf litter within which are a few small stands of common nettle. Dead wood habitat is also lacking and only a few pieces present. This woodland is highly disturbed.

2.6.63 Woodlands 2 and 3 do not qualify as a habitat of principal importance, due to their disturbed nature and lack of typical canopy species or ground flora.

Scattered broadleaved trees

2.6.64 Scattered broadleaved trees are found within areas of defunct hedgerows with pedunculate oak and ash trees left as semi-mature to mature standards.

2.6.65 Further scattered broadleaved trees are present throughout the scrub dominated areas surrounding the area where the derelict Winch Hill House had

previously stood. Mature scattered trees within this area include horse chestnut, ash, pedunculate oak and walnut.

2.6.66 There are also amenity tree belts at the western edge of Wigmore Park, roadside amenity tree planting to the north of Wigmore Park, and other roadside planting and amenity areas within the industrial areas of the airport. Amenity planting includes the following species ash, Italian alder, field maple, silver birch, walnut, wild cherry, rowan, goat willow, London plane, and small leaved lime.

2.6.67 This habitat does not qualify as a habitat of principal importance, but mature trees are of importance and may qualify as veteran/ancient trees. Scattered trees are shown on the Phase 1 Habitat Survey Plan in **Appendix B** to this report, and an assessment of the trees within the Proposed Development is provided in the Arboricultural Impact Assessment report within **Appendix 14.3** of this ES **[TR020001/APP/5.02]**. This habitat is likely to have interest for faunal species (bird and bat species).

Scattered coniferous trees

2.6.68 This habitat is present within garden habitats east and west of Winch Hill and within amenity woodland planting within Wigmore Park. There are also some examples within amenity planting to the north of the airport, surrounding industrial developments and examples of planted conifers in between hedgerows gaps around Darley Road.

2.6.69 Within Wigmore Park these trees are dominated by Scots pine with some larch. Amenity garden planting includes various cultivars of cypress species. and occasional spruces.

2.6.70 This habitat does not qualify as a habitat of principal importance. This habitat is likely to have interest for faunal species (bird species).

Scrub

Dense scrub

2.6.71 Dense scrub is found within areas of Wigmore Park where a lack of management has resulted in stands of dense hawthorn, blackthorn, willow or bramble scrub. It is likely these are formed over soils that may have a good seed bank of neutral to calcareous loving grassland species.

2.6.72 Dense scrub is found within areas of derelict farmland, either outgrown from hedgerows or adjacent to derelict farm buildings (east of Winch Hill) adjacent to the derelict houses (and associated gardens) to the west of Winch Hill.

2.6.73 Extensive patches of dense scrub dominated by low growing bramble are also present within open areas immediately east of Woodlands 1 and 2 respectively.

2.6.74 There are patches of dense scrub within a small area that is maintained as part of the airstrip lighting infrastructure at the end of the runway adjacent to Woodland 5 to the east of the site. This is dominated by either bramble aggregate or raspberry.

2.6.75 Dairyborn Scarp DWS has extensive areas of dense scrub mostly dominated by hawthorn, elder and bramble on the steep areas of west facing escarpment. Occasionally this also includes young hazel, dogwood and wild privet.

2.6.76 Luton Parkway Verges DWS has extensive areas of dense scrub comprising sycamore, ash, elder, bramble and buddleia. Small remnants of grassland remain where the scrub is frequently cut back alongside the road/pavement edge.

2.6.77 This habitat does not qualify as a habitat of principal importance and is of low value. This habitat is likely to have interest for faunal species (bird species, bat species, hedgehog, or for concealment of setts for badger).

Scattered scrub

2.6.78 Scattered scrub is found within areas of Wigmore Park where a lack of management has resulted in areas of scattered scrub of either hawthorn, blackthorn, willow species or bramble.

2.6.79 Scattered scrub is found within farmland set aside and areas of derelict farmland, either as relicts of former hedgerows, outgrown from unmanaged hedgerows or adjacent to derelict farm buildings (east of Winch Hill). It is also found adjacent to the derelict houses (and associated gardens) to the west of Winch Hill. These areas have the following species present: hawthorn, willow species or bramble aggregate. but are dominated by blackthorn, bramble aggregate or elder.

2.6.80 There are patches of scattered scrub within a small area that is maintained as part of the airstrip lighting infrastructure at the end of the runway adjacent to the woodland to the east of the site. Scattered scrub is dominated by bramble aggregate or raspberry.

2.6.81 Scattered scrub is also present as outgrowth and colonised from adjacent amenity tree planting on highway verges surrounding the airport and particularly evident on the soft chalk cuttings that have been replanted in the recent past.

2.6.82 Scattered scrub is also found within damp habitats both within and to the north of Wigmore Park around pond 2. These areas are typically dominated by goat willow, with occasional crack willow and osier. Guelder rose is rare.

2.6.83 Small patches of scattered bramble scrub are present within the grassland dominating the off-site compound in Area J.

2.6.84 This habitat does not qualify as a habitat of principal importance. This habitat is likely to have interest for faunal species (bird species or for concealment of setts for badger, hedgehog, brown hare, foraging areas for bat species and for invertebrate species).

Hedgerows

2.6.85 Hedgerows are a habitat of principal importance and some may be classed as important under the Hedgerow Regulations 1997 (Ref. 26). A summary of the hedgerow habitats identified during the Phase 1 habitat survey is provided

below. Detailed hedgerow surveys have also been undertaken the results of which are provided within **Section 3** of this report.

2.6.86 Hedgerows can offer important foraging, shelter and dispersal opportunities for a range of faunal species (bird species, bat species, brown hare, hedgehog and for invertebrate species).

Native species-rich intact hedge

2.6.87 There are 12 identified locations of this habitat within the surveyed areas, five of which are within the Main Application Site. Whilst these hedgerows are intact, some sections of hedgerow are defunct in areas.

2.6.88 Hawthorn is the dominant species with locally dominant elder and frequent presence of ash, blackthorn, field maple, hazel, wild cherry, dogwood, holly, dog rose aggregate and bramble agg, with rare to occasional spindle.

2.6.89 These hedges have an associated ground flora typically composed of rough grassland to tall ruderal ground flora and occasionally including ancient woodland indicator species. Species present include; common nettle, creeping thistle, cow parsley, upright hedge parsley, cock's-foot, dog's mercury, hedge garlic, hedge woundwort, wood dock, woody nightshade, white dead nettle, with ivy, white bryony and clematis as climbers. In one location there is presence of a more diverse ground flora including species such as hairy violet.

Native species-rich defunct hedge

2.6.90 There are five identified locations of this habitat within and adjacent to the Main Application Site, these are mostly located west of Winch Hill and a few adjacent to Winch Hill.

2.6.91 Hawthorn is the dominant species with variable content of the following species ash, blackthorn, dogwood, elder, field maple, hazel, holly, dog rose aggregate and bramble aggregate.

2.6.92 To the north of the Main Application Site at Darley Road the defunct hedge was surveyed from the field edge only, but the ground flora appeared to be relatively species-rich with greater stitchwort, ladies' bedstraw, wild strawberry, lesser hop trefoil, meadow vetchling and smooth tare. Several of these hedges have an associated ground flora typically composed rough grassland to tall ruderal ground flora including common nettle, creeping thistle, cow parsley, upright hedge parsley, cock's-foot, dog's mercury, hedge garlic, hedge woundwort, wood dock, woody nightshade, white dead nettle, with ivy, white bryony and clematis as climbers.

Native species-poor intact hedge

2.6.93 A total of 23 hedgerows were surveyed which are classed as intact species-poor. Typical ground flora includes false-oat grass, soft brome, common nettle, cleavers and hogweed.

Native species-poor defunct hedge

2.6.94 There are four identified locations of this habitat within the Main Application Site and the mitigation planting areas to the northeast.

2.6.95 One is located adjacent to the southern boundary of Darley Road and consists of short hedge sections with three woody species present; pedunculate oak, blackthorn and field maple, with a varied ground flora including wild strawberry. The hedgerow is raised from the roadside on a bank. The wider area of this same old hedge line is native species-rich.

2.6.96 The second is between the large fields due east of Wigmore Park and the Airfield. This is very much defunct and restricted to a few areas where large outgrown shrubs and trees are present with deadwood resource.

2.6.97 The third divides large fields between Darley road and Brownings Lane, between Area C and Area H. This is an unconnected hedge with one mature oak tree along its length. Within the hedge gaps there is remaining evidence of hedge root-balls which were likely removed during management of this hedgerow.

2.6.98 The fourth hedge is located due east of Tankard's Farm within Area C. It is an unconnected hedgerow with gaps, there are four mature trees within the length of the hedgerow.

2.6.99 A short hedgerow section of this type present to the south of Woodland 5 comprises of frequent hornbeam, hazel, oak, hawthorn and bramble. Ground flora include false oat-grass, soft brome and cock's-foot.

Native species-rich hedge with trees

2.6.100 There are 17 sections of native species-rich hedgerows with trees, scattered within the area surveyed. most near to or flanking Winch Hill and the others along Darley Road to the north-east of and to the very eastern peripheries of the Main Application Site.

2.6.101 These hedges are often dominated by hawthorn or locally dominated by hawthorn and field maple, with abundant dog rose aggregate and frequent holly and hazel. Ash or pedunculate oak as mature or semi-mature standards and some younger trees of field maple or pedunculate oak. The ground flora contains abundant red fescue, false oat-grass and common bent, with abundant cow parsley, white dead nettle and locally frequent common knapweed, dog's mercury and greater stitchwort. Tall ruderal stands are also present adjacent to this habitat typically dominated by common nettle.

Species-poor hedge with trees

2.6.102 There are three locations of species-poor hedge with trees recorded on site, one flanks Winch Hill and leads up to the disused farm buildings. This hedge is dominated by hawthorn, with frequent ash, occasional hazel and abundant bramble. The second location is found behind domestic dwelling, between the properties' gardens and the adjacent arable field along Darley road, in Area C. This hedge is dominated by hawthorn, with frequent ash and occasional willow

species. The third hedge location is east of Tankards Farm, the hedge is dominated by ash and hazel, there are four mature ash trees along its length.

Introduced shrub

2.6.103 Introduced shrub habitats are found in abundance to the north of the airport within areas of amenity planting at the airport business park, roadside planting and at Wigmore Park adjacent to Wigmore Hall. This habitat is also present within the gardens of occupied and unoccupied properties due east and west of Winch Hill. Introduced shrub is also present within sections of hedgerow across the surveyed area.

2.6.104 In Wigmore Park the planting includes locally dominant stands of the following shrubs; Oregon-grape, firethorn species, a barberry species, wall cotoneaster, Himalayan cotoneaster, small-leaved cotoneaster, a hebe species, dogwood, wiegela, Wilson's honeysuckle, cherry laurel, white-stemmed bramble, a gorse species, Duke of Argyll's teaplant, orange-ball-tree, Evergreen spindle and garden lavender.

2.6.105 Garden shrubs include Waterer's cotoneaster (a non-invasive species of cotoneaster), a barberry species, buddleia, spindle and snowberry.

2.6.106 There is a short roadside hedge of barberry species at Winch Hill, adjacent to the unoccupied housing at the brow of the hill.

2.6.107 To access Dairyborn Scarp DWS there is an access gate at the southern end of Prospect Way, leading to parking for Luton Borough Council staff. Within this fenced area are old chalk grassland habitats dominated by dense to scattered cover of buddleia scrub, some areas have been cleared to show once again the chalk grassland beneath, but during the survey in 2020 it was considered that the buddleia is threatening to invade these habitats and become the dominant species and has therefore been mapped as an area of introduced shrub (although not ornamental in origin).

2.6.108 There is an area of an unidentified ornamental shrub species (suspected False-spirea) within native scrub habitats, adjacent to the neutral grassland habitats at Dairyborn Scarp DWS, and due south of the Shell Petrol Station on Eaton Green Rd.

2.6.109 This habitat does not qualify as a habitat of principal importance. This habitat is likely to have interest for faunal species (bird species, hedgehog, and for invertebrate species). In addition, this habitat supports several non-native invasive species that are listed within Schedule 9 part II of the Wildlife and Countryside Act 1981 (as amended): wall cotoneaster, Himalayan cotoneaster, and small-leaved cotoneaster.

Tall ruderal

2.6.110 Tall ruderal habitat is found adjacent to areas of scrub habitats, woodland, hedgerows and over grassland habitats where a lack of management is apparent or where soils have been recently disturbed.

2.6.111 Whilst most stands of tall ruderal vegetation within the Main Application Site are associated with the edges of larger dominant habitats, significant areas of ruderal vegetation are located to the south of Winch Hill, within Wigmore park around grassland 9, within grassland 16 and to the southern extent of the runway.

2.6.112 This habitat typically has stands of monospecific to mixed species but in most cases within the study area it is dominated by common nettle, hemlock, cow parsley, rosebay willowherb or creeping thistle.

2.6.113 Where more scattered and forming small patches within other habitats, tall ruderal species include broad-leaved, hedge garlic, black horehound, hedge woundwort, spear thistle, upright hedge parsley, sweet cicely or rarely welted thistle.

2.6.114 Within Dairyborn Scarp areas of tall ruderal habitat are again dominated by common nettle, hemlock, cow parsley, rosebay willowherb or creeping thistle, with abundant ground-ivy and occasionally mixed with frequent teasel and spear thistle. In mixed areas of this habitat perennial sow-thistle, prickly sow-thistle, great mullein and great willowherb are occasional, and rare are common figwort and red bartsia.

2.6.115 This habitat does not qualify as a habitat of principal importance. This habitat is likely to have interest for faunal species (bird species, brown hare, hedgehog, reptile species and for invertebrate species). In addition, this habitat supports the non-native invasive species Japanese knotweed that is listed within Schedule 9 part II of the Wildlife and Countryside Act 1981 (as amended).

Bracken

2.6.116 There are a few areas of hedgerows where bracken is evident and forms the dominant vegetation, most notably along the lower field edge leading from Woodland 1 to Darley Road and along the hedgerow at the top of Darley Road. There is also an extensive bank of bracken between two arable fields in Area C.

2.6.117 Bracken dominated habitat with common nettle, bramble aggregate, saplings of hazel, oak, blackthorn and scattered semi-mature trees of hawthorn is found west of Woodland 6 and a strip of bracken is present in the field margin within the off-site planting area to the north of Darley road.

2.6.118 This habitat does not qualify as a habitat of principal importance. This habitat may have interest for faunal species (bird species, brown hare, hedgehog reptile species and for invertebrate species).

Grassland habitats

Semi-improved neutral grassland

2.6.119 This grassland habitat is the dominant grassland habitat type within the Main Application Site and surrounding areas within the Proposed Development and covers a variety of grasslands from species-rich to species-poor. This habitat is likely to have interest for faunal species (bird species, foraging habitat for bat

species, brown hare, hedgehog, reptile species, amphibian species and for invertebrate species).

2.6.120 The largest areas of this habitat are associated with the southern part of Wigmore Park and four set aside areas within arable fields. Elsewhere this habitat is fragmented and present adjacent to hedgerows, roadside verges, set aside or headlands, or areas of unmanaged habitat within the airfield.

2.6.121 Grassland 1 is a thin strip at the base of a small chalk slope between two large arable fields. Barren brome is the dominant grass, characteristic of the bare earth patches along the slope, as well as frequent red fescue and common bent. Forbs are characterised primarily by scattered ruderal patches, with frequent white dead nettle, cow parsley, hedge mustard, common nettle, creeping thistle and common fumitory.

2.6.122 Grassland 2 is a small section of set-aside with a moderate diversity. It is characterised by dominant false oat grass, with occasional red fescue, smooth meadow-grass, crested dogs-tail, barren brome, soft brome and Yorkshire fog. Frequent forbs include dove's-foot cranesbill, bird's-foot trefoil and smooth tare, with occasional cow parsley, meadow buttercup, creeping buttercup and greater stitchwort.

2.6.123 Grassland 3 is a widened strip of set-aside with a moderate to low diversity. It is dominated by red fescue aggregate, with abundant Yorkshire-fog, frequent rough meadow-grass and common bent. Soft brome and barren brome are occasional. The forbs include some arable weeds and species typical of this habitat including abundant cut-leaved crane's-bill, creeping buttercup, and frequent field forget-me-not, common mouse-ear, bristly ox-tongue, cow parsley, hogweed, common knapweed, occasional meadow buttercup, spear thistle, hoary ragwort and rare brown sedge. This area of grassland has been subject to detailed NVC surveys as described within **Appendix AA**.

2.6.124 Grassland 4 is a small area of agricultural set aside to the immediately south of Darley road. It is characterised by a low diversity and is suffering significant encroachment by early successional scrub, particularly towards the eastern end. Dominant grass species are cock's foot and rough meadow-grass, with frequent red fescue and common bent. Frequently occurring forbs include ribwort plantain, creeping buttercup, and creeping thistle.

2.6.125 Grassland 5 is a relatively species-rich area of grassland with a damp flush at the eastern end which may be due to over ground flow from the adjacent woodland flush (Woodland 1) or a further spring or flush from the grassland itself. The dominant species is red fescue aggregate. and rough meadow-grass with abundant meadow buttercup and Yorkshire fog. Common bent, wild carrot, red clover and creeping buttercup are locally abundant. Cock's-foot, dandelion aggregate and hogweed are frequent with locally frequent broad-leaved dock, wood dock, common spotted orchid and hoary ragwort. Occasional are cut-leaved crane's-bill, remote sedge, crested dog's-tail, willow saplings, false-oat grass, goat's-beard, smooth tare, field mouse ear, lesser hop trefoil, ribwort plantain. Yellow-rattle and daisy are rare. This area of grassland has been subject to detailed NVC surveys as described within **Appendix AA**.

2.6.126 Grassland 6 is slowly becoming encroached by scattered and dense scrub habitat but is formed within a slightly damp hollow with undulating topography and many ant hills. The area is dominated by red fescue aggregate, with abundant false-oat grass, smooth meadow-grass and Yorkshire-fog. Abundant are cleavers and creeping bent with locally abundant common nettle, cock's-foot, yarrow and common mouse-ear. Occasional are cut-leaved crane's-bill, hogweed, broad-leaved dock, cow parsley, white dead nettle, common knapweed, ribwort plantain and field scabious. This area of grassland has been subject to detailed NVC surveys as described within **Appendix AA**.

2.6.127 Grassland 8 is a small area of grassland that appears to have had some recent scrub removal it is dominated by red fescue aggregate, with locally dominant cock's-foot, abundant are lesser hop trefoil, red clover, wild carrot, yellow rattle and hawthorn saplings. Creeping cinquefoil is locally abundant and frequent are Yorkshire-fog, rough meadow-grass and bramble aggregate. Ribwort plantain, white clover and cock's-foot are locally frequent with occasional smooth tare, hoary ragwort, goat's-beard, common spotted orchid and dog rose aggregate. Common mouse-ear and common sorrel are rare. This area of grassland has been subject to detailed NVC surveys as described within **Appendix AA**.

2.6.128 Grassland 9 is species-rich and typifies much of the grassland habitat at the southern part of Wigmore Park. This grassland is reduced due to scrub encroachment and encroachment from tall ruderal species.

2.6.129 It is dominated by red fescue, with abundant smooth meadow grass and Yorkshire-fog. Rough meadow grass and cock's-foot are frequent with occasional barren brome. Forb species are diverse with abundant to locally abundant common knapweed, common spotted orchids (over 140 flowering spikes), perforate St John's-wort, birds-foot trefoil, wild carrot, smooth tare, field forget-me-not, colt's-foot, red clover, white clover, yarrow, yellow-rattle. Goat's-beard, meadow vetchling and common teasel are frequent. There are also frequent presence of calcicolous forb species including hoary ragwort, bladder campion, fragrant agrimony and wild parsnip. This area of grassland has been subject to detailed NVC surveys as described within **Appendix AA**.

2.6.130 Grassland 10 is a species-rich area to the west of Wigmore Park with rank and unmanaged neutral grassland with abundant common spotted orchids (80 spikes). This area is dominated by red fescue aggregate, with abundant false-oat grass, smooth meadow-grass and Yorkshire-fog and occasional timothy. The forbs include abundant wild carrot, ox-eye daisy, yarrow, common knapweed, creeping buttercup, mugwort, wild parsnip, field mouse-ear, cut-leaved crane's-bill, smooth tare, ribwort plantain, creeping cinquefoil with locally frequent meadow vetchling and spear thistle and occasional hard rush.

2.6.131 On a bank further west of the narrow well-worn path running north-south through this area is a small open area with a south-east facing bank and ant hills. This has abundant yellow-rattle, frequent goat's-beard and common spotted orchid (11 spikes). Occasional lucerne, grass vetchling is rare here. This area of grassland has been subject to detailed NVC surveys as described within **Appendix AA**.

2.6.132 Grassland 12 forms a band along a ridge running north-south in the central section of Wigmore Park. It is becoming scrub encroached but has areas with species-rich grassland and ant-hills. It is dominated by red fescue and false oat-grass, with locally dominant patches of common bent and cock's-foot. Cleavers, Yorkshire-fog, creeping bent and cow parsley are abundant with locally abundant colt's-foot. Field bindweed, creeping buttercup, rough meadow-grass, smooth tare, cut-leaved crane's-bill, germander speedwell, white dead nettle, hedge woundwort are frequent with occasional yarrow, ribwort plantain, hogweed, broad-leaved dock, cow parsley, ribwort plantain and common knapweed. Meadow buttercup, ground-ivy and thyme-leaved speedwell are rare.

2.6.133 Grassland 15 is present as a narrow and very steep embankment adjacent to the roadside. It is not known if this is natural or planted but contains a relatively high species diversity for a small area and retains some calcicolous species. The adjacent scrub and plantation belt is shading parts of this habitat, with bramble aggregate encroachment in places.

2.6.134 Species present include dominant red fescue, with abundant false oat-grass, creeping cinquefoil, wild carrot, bird's-foot trefoil, hairy violet, common centaury and frequent couch grass, Yorkshire-fog, common knapweed, daisy, common teasel, ladies bedstraw, lesser hop trefoil, large-flowered evening primrose and field forget-me-not. Goat's-rue, smooth tare, wild parsnip, hoary willowherb, musk mallow, yellow-wort and spear thistle are occasional. Great mullein and dark mullein are rare.

2.6.135 Grassland 18 is a narrow strip of grassland adjacent to a species rich hedgerow (Hedgerow 57). It appears to be a planted strip of neutral grassland with a relatively high species diversity when compared to grasslands within the wider area. It is likely that grassland 18 is managed as part of an agricultural stewardship scheme. The sward height varies throughout the grassland and sustains an average height of approximately 25 cm.

2.6.136 Species present include dominant Yorkshire-fog, cock's foot, and red fescue, with abundant false oat-grass, crested dog's tail, creeping cinquefoil, bird's-foot trefoil, common centaury and frequent, common knapweed, daisy, a bedstraw species, field forget-me-not, bush vetch, smooth tare, a willowherb species and spear thistle, creeping thistle and common teasel are occasional.

2.6.137 Grassland 19 is a wide area of managed grassland south of the airport complex but is mown as part of management by the airport, though not as regularly as the runway itself. Scrub encroachment was noted along the eastern extent of this grassland.

2.6.138 Despite being mown on a semi-regular basis, this grassland shows a moderate diversity of grasses. Dominant species include perennial rye and Yorkshire fog, though cock's foot, downy oat grass, rough and smooth meadow-grass are all occasional throughout the sward. Forb diversity is lower and representative of the level of management, with creeping buttercup, ribwort plantain, hogweed and curled dock all frequent.

2.6.139 Grassland 20 is to the immediate east of the Wigmore Park allotments, surrounded by Woodland 8. Though it is directly connected to Grassland 11 which makes up the majority of Wigmore Park and is heavily managed as amenity grassland for recreational purposes, Grassland 20 is clearly distinct in botanical composition resulting from less intensive management, with a sward height of approximately 30cm.

2.6.140 Dominant grass species include Yorkshire fog, cock's foot and smooth meadow-grass, with occasional soft brome and barren brome mostly towards the grassland peripheries. Forb diversity is relatively low, characterised by occasional creeping thistle, common vetch, ribwort plantain, hogweed and meadow buttercup.

2.6.141 Grassland 21 is a small area of likely agricultural set aside directly north east of Woodland 12, with several mature standard trees within the grassland.

2.6.142 It has a relatively low species diversity in comparison to other grasses in the area, with a tall sward dominated by false oat grass and frequent cock's foot, smooth meadow-grass and Yorkshire fog. Forbs diversity is also relatively reduced, with frequent common cat's ear, ox-eye daisy, and creeping buttercup.

2.6.143 Grasslands 22 and 23 make up the majority of Area G and are located to the east of Wigmore Park and the north of the runway respectively. These extensive fields were originally mapped as arable land during 2018, but in the interceding years have been taken out of commission and allowed to become vegetated, with the species present indicating a mixture of sown seed mix and natural colonisation from adjacent habitats. As a result, the floral communities are relatively diverse, with a large diversity and proportion of forbs to grasses and numerous bare earth patches. Many of the colonising forbs, particularly on the bare earth where the seed mix has not taken, also reflect the lands recent prior arable nature.

2.6.144 Grasses are relatively sparse but include abundant red fescue and Yorkshire fog, with more occasional sweet vernal and soft brome. Barren brome and annual meadow-grass are more frequent in bare patches. Frequent forbs include common knapweed, meadow buttercup, bulbous buttercup, spear thistle, broad-leaved dock, bristly ox-tongue, groundsel and ribwort plantain, with arable associated species such as fat hen, charlock and American winter cress also present. Species found occasionally to frequently indicating a sown seed mix include yellow rattle, cowslip and common poppy.

2.6.145 Grassland 24 lies to the north of Dairyborn Scarp and is a large area of neutral grassland. No access was available to this grassland, but from the periphery appeared to be rank and un-managed and a mesotrophic grassland from the dominance of false oat-grass, abundant cock's-foot. In the absence of detailed survey, this grassland is currently and precautionarily classed as semi-improved neutral grassland, due to areas where bare earth prevailed immediately bordering this grassland but outside the boundary of Dairyborn Scarp, being more reflective of species-rich calcareous grasslands, so it is thought that this habitat could contain more species when studied in detail and in an earlier season. It also implies suitable management such as winter grazing may help this return to calcareous grassland habitat.

2.6.146 Grassland 25 comprises the field for the off-site compound area to the west of M1 Junction 10. The field appears largely unmanaged with significant patches of encroaching scrub into the grassland, and areas of ruderal vegetation around the fringes of the field.

2.6.147 Dominant grass species consist false oat grass and cock's foot, with occasional common bent, red fescue with patches of rare common couch. Forbs are abundant throughout the sward but limited in diversity, with abundant rose bay willowherb, creeping thistle, hogweed and ox-eye daisy, occasional common ragwort and curled dock, and rare short fruited willowherb. Encroachment of scrub is predominantly low growing bramble, with a single willow species. Ruderal vegetation on the grassland fringes is sparse and comprised of common nettle, hemlock and hedge mustard.

2.6.148 Grasslands 5, 6, 8, 9, 10, 15, 18, 19, 20 and 25 qualify as a habitat of principal importance 'neutral grassland'. Grassland 24 may also qualify as a habitat of principal importance 'neutral grassland'.

Calcareous grassland

2.6.149 Calcareous grassland was less apparent than anticipated within the study area which was mostly restricted to small areas of disturbed ground/calcareous exposures, including highway cutting embankments where not scrubbed over (latter observed during 2018 surveys). The exceptions were a restricted grassland area east of Dairyborn Scarp DWS, at a rabbit grazed south-facing slope within arable land and at the south-western periphery of the airport runway. Elsewhere evidence of prior calcareous grassland habitats is reflected in occasional presence of calcicolous plants across the study area. Calcareous grassland habitats were anticipated to the south of Wigmore Park (based on the citation for this area received through desk data review but these areas have not been under recent management and are not grazed. It is likely that the build-up of plant litter has resulted in a more neutral sward being present in this location. This habitat is likely to have interest for faunal species (bird species, foraging habitat for bat species, brown hare, hedgehog, reptile species, amphibian species and for invertebrate species).

2.6.150 Grassland 7 is a small area of south-facing chalk exposure with good diversity of calcareous species present it appears to be grazed by rabbits and generally has a low sward height.

2.6.151 The grassland is typified with circumneutral grass species. It is dominated by red fescue aggregate with locally abundant common bent, with frequent Yorkshire-fog, crested dog's-tail and cock's-foot. Timothy is rare. The forbs have more calcareous influences and include locally dominant yarrow and common mouse-ear, abundant lesser trefoil, perforate St John's-wort, meadow buttercup and locally abundant ladies' bedstraw. Thyme-leaved speedwell is frequent and occasional species include red clover, fairy flax, wild carrot and cut-leaved crane's-bill. Rare are agrimony, great mullein and hop trefoil. This area of grassland has been subject to detailed NVC surveys as described within **Appendix AA**.

2.6.152 Grassland 14 has moderate species diversity for a small area and is found within Area A. Calcareous grassland is present at a levelled section at the base of the southern face of the slope (possible old cliff fall) but it also has some more circumneutral species present in the sward. Species present include dominant red fescue, with abundant ground-ivy, creeping cinquefoil, wild carrot, bird's-foot trefoil, black medick, hairy violet, common centaury and frequent Yorkshire-fog, common knapweed, daisy, biting stonecrop, perforate St John's-wort, common teasel, ladies bedstraw, yellow-wort, lesser hop trefoil, yellow toadflax, large-flowered evening primrose and field forget-me-not. Goat's-rue, false oat-grass, smooth tare, wild parsnip, musk mallow, common figwort and spear thistle are occasional. Great mullein is rare.

2.6.153 Elsewhere this embankment has been modified to stabilise it and is covered with a geotextile material. Small sections of chalk are visible on the eastern slopes of Area A, between areas of scattered and dense scrub with similar species present to those described within Grassland 14.

2.6.154 Grassland 26 this is an area of west/south west facing slope and open level ground due south-west of Percival Way as it approaches the easternmost strip of Dairyborn Scarp DWS. This area is becoming encroached by buddleia with obvious small areas of recent management to the buddleia, exposing the species-rich calcareous grassland beneath. Grassland 26 is characterised by a dominance of red fescue aggregate, with abundant creeping bent, birds-foot trefoil, rough hawkbit, locally abundant salad burnet, creeping cinquefoil, ladies bedstraw, ground-ivy and self-heal. Frequent are scarlet pimpernel and a campion species, locally frequent are wild basil, field scabious, small scabious, thyme-leaved speedwell. Occasional are creeping buttercup, fairy-flax, yellow-wort, harebell, cowslip, common centaury, common figwort, daisy, perforate St John's-wort and yarrow. Rare are basil thyme, common teasel and common nettle.

2.6.155 There are subtle differences between the areas of this habitat within sloping west facing ground and flat ground with no aspect, but this may be due to dryness and any vegetation being more interspersed with bare chalk substrate on the slopes. Further detailed NVC survey is recommended of these areas in a suitable season to determine the community type and extent to inform impact assessment, mitigation and any habitat restoration (scrub clearance/soil exposure) proposed through mitigation actions.

2.6.156 At the base of the slope a waxcap fungus was found and was determined by a waxcap fungus expert (David Harries, Pembrokshire Fungus Recording Network) to be Persistent waxcap Hygrocybe autoconica. This is not listed as important on a national scale under IUCN guidelines, but due to a paucity of local records for the county of Bedfordshire, it may be valued up to county significance.

2.6.157 During 2020 large areas of previously identified calcareous grassland (previously referred to as Grassland 13) outside the western extent of the airport complex was encompassed by the construction footprint of the Luton Dart. Whilst access to this active construction area was restricted, it appeared unlikely that significant areas of the calcareous grassland remain due to the

scale of the works, though representative species could persist on and around the steep exposed chalk slopes to the north and west of this construction area.

2.6.158 This habitat (Grasslands 7, 14, 26 and any persisting areas of 13) qualifies as a habitat of principal importance 'calcareous grassland'. Several noteworthy species are present within this habitat including basil thyme and a fungus: Persistent waxcap potentially of up to county significance.

Species-poor grassland

2.6.159 Species-poor grassland forms most of the grassland habitats within the airport complex and at the bases of the hedgerows within Area C, areas of low diversity grassland associated with fallow fields or areas of set aside. These areas are either dominated with perennial rye grass, false oat-grass or smooth meadow grass; or are dominated by red fescue and/or false oat-grass but are relatively species-poor examples. This habitat is likely to have interest for faunal species (bird species, foraging habitat for bat species, brown hare, hedgehog, reptile species, amphibian species and for invertebrate species).

2.6.160 The grasslands within the active airstrip are heavily mown in order to maintain a low sward height, whilst also creating large patches of bare earth amongst the grassland. Species tolerant of such intensive management dominate, particularly perennial rye grass, rough meadow-grass and red fescue. Scattered occasional forbs include creeping thistle, ribwort plantain, creeping buttercup, red clover, shepherds purse and curled dock, with rare patches of common vetch and bird's-foot trefoil present of the slopes around Ponds 5 and 6. The steep slopes towards the southern edge of the runway complex and towards the outer extents of the runway complex are less intensively managed, with a greater sward height with similar dominant grasses and occasional soft brome, Yorkshire fog and barren brome. Additional forbs within these areas include occasional scarlet pimpernel, weld, scented mayweed, white dead nettle and white campion.

2.6.161 Grassland 16 is a large expanse of undulating set-aside between arable fields due west of Winch Hill. It is fenced with stock proof wire but in a few locations this is breached by mammal pathways. There are what appear to be deliberately planted trees including two willow trees and a red leaved variety of hazel, with additional natural encroachment of tall ruderal and scattered/dense scrub within this grassland. The mid-section has damper grassland but does not qualify as marshy grassland.

2.6.162 The grassland is dominated by red fescue aggregate with abundant false oat-grass, Yorkshire-fog and creeping bent. Forbs include abundant wild carrot, hogweed, lesser hop trefoil and cut-leaved crane's-bill with locally abundant patches of cleavers, rosebay willowherb and great willowherb. Mugwort, dandelion aggregate and creeping thistle are frequent.

2.6.163 The damper central areas have locally dominant Yorkshire-fog and soft brome, with abundant wild carrot and hoary ragwort and locally abundant mugwort. Smooth hawk's-beard is rare.

2.6.164 This area of grassland has been subject to detailed NVC surveys as described within **Appendix AA**.

2.6.165 Grassland 17 is an area of set-aside located to the east of Winch Hill within the Main Application Site. This grassland appears to be frequently disturbed and bare in places, grass species dominate with presence of tall ruderal species and scattered/fewer patches of forbs, many of which are likely to have colonised from Woodland 4 to the south. Cock's-foot is dominant with frequent rough meadow-grass and occasional false wood brome and barren brome. Broad-leaved dock, common nettle and bristly ox-tongue are frequent with locally frequent creeping buttercup, hemlock and clematis. Occasional are germander speedwell, field forget-me-not, field mouse-ear, tufted vetch, cut-leaved crane's-bill, bird's-foot trefoil and hoary ragwort. Male fern is rare.

2.6.166 The grassland strip, that follows the runway approach lights, forms a boundary between two arable wheat fields and comprises of abundant false oat-grass, soft brome and cock's-foot.

2.6.167 This habitat does not qualify as a habitat of principal importance. This area of grassland has been subject to detailed NVC surveys as described within **Appendix AA**.

Amenity grassland

2.6.168 Grassland 11 forms a large expanse within Wigmore Park, it is largely amenity grassland though the species list within it (likely from historic disturbance and soil mixing) yields occasional presence of a slightly more diverse flora.

2.6.169 This grassland is locally dominated by perennial rye-grass and rough meadow-grass, with abundant cock's-foot and locally frequent patches of Yorkshire-fog and meadow foxtail. Forbs include dandelion aggregate, daisy, white clover, greater plantain and shepherd's purse.

2.6.170 There are patches of amenity grassland scattered throughout the hardstanding areas of the airport terminal buildings, within the airside complex, and an area that is maintained as part of the airstrip lighting infrastructure at the end of the runway. Some areas managed as amenity grassland are labelled as neutral or calcareous grassland rather than amenity as this reflects their species composition and condition rather than management.

2.6.171 Typically this habitat is dominated by perennial rye-grass or smooth meadow-grass, with abundant to locally frequent red fescue aggregate., creeping bent, smooth meadow-grass, with frequent meadow foxtail, common daisy, Yorkshire-fog and greater plantain, bird's-foot trefoil, and white clover, with occasional common mouse-ear, cut-leaved crane's-bill, ribwort plantain and dandelion aggregate, with rare black medick.

2.6.172 This habitat does not qualify as a habitat of principal importance.

Arable

2.6.173 Large arable fields are present to the east and west of Winch Hill. The fields east of Winch Hill were all sown with wheat with patches of black grass during the most recent survey in 2020.

2.6.174 The three fields south of Woodland 5 in proximity to the runway approach lights comprise of wheat.

2.6.175 Fields north of Woodland 12 which are encompassed by Darley Road and Browning's Lane had been recently ploughed when surveyed during the November 2019 site walk over. However, there are approximately 2m x 2m wide semi-improved grassland strips in between fields which currently serve as a public right of way.

2.6.176 Fields south west of Woodland 12 were also recently ploughed when surveyed during the November 2019 site walk over. However, within the margins of these fields are several mature oak trees which are included on the Phase 1 Habitat Survey Plan in **Appendix B**.

2.6.177 Several of the fields have been left fallow and support a mixture of grassland species, which have been mapped as species-poor grassland, or are sown with wild radish. As previously described, several of the larger fields west of Winch Hill have been taken out of agricultural use from 2018 to 2020, with several sown and now establishing as Grasslands. The field to the north of Woodland 1 and Grassland 5 has also been taken out of agricultural use and has been colonised by a range of agricultural associated species with patches of bare ground, described in a later section. The fields east of Winch Hill and some of the fields west of Winch Hill, support a less diverse range of arable weeds due to herbicide application at the field edges but a few locations of field madder and wild pansy were observed.

2.6.178 In general the arable fields to the east of Winch Hill support a diverse range of arable weed species including bristly ox-tongue, swine-cress, soft brome, smaller cat's-tail, Timothy Italian rye-grass, barren brome, Yorkshire-fog, wild oat, crested dog's-tail, common field speedwell, thyme-leaved speedwell, smooth tare, curled dock, common orache, fat hen, red bartsia, pale persicaria, a winter cress species, parsley piert, redshank, red dead nettle, scarlet pimpernel, cut-leaved crane's-bill, woody nightshade, prickly sow thistle, common mallow, wild carrot, mugwort, common fumitory, field forget-me-not, shepherd's-purse, charlock and common sorrel.

2.6.179 While at least two of the arable fields appears to have been sown with wildflower seeds, a number of the arable fields supported notable plant species, particularly at their margins; these habitats may qualify in part as the habitat of principal importance 'arable field margins'. In addition, this habitat supports the notable species cornflower listed within the England Red List (Ref. 17) (BSBI, 2018). This is further described in **Table 2.3**. A survey of arable plants was undertaken during the detailed NVC survey as reported within **Appendix AA**.

Standing water (eutrophic)

2.6.180 Within the Main Application Site there are ten named pond habitats (Ponds 1, 2, 5, 6, 8, 9, 12, 13, 14 and 15), with a further ten ponds located within 500m of the Main Application Site as detailed in **Section 11**.

2.6.181 Two Thames Water surface water attenuation ponds are present to the north west of Wigmore Park (Pond 1) and north of Wigmore Park (Pond 2). These ponds have no apparent aquatic vegetation and limited marginal vegetation, including a mint species and woody nightshade. They are both surrounded by scrub and broadleaved plantation habitats.

2.6.182 Ponds 5, 6, 8, 9, 13, 14 and 15 are present within the airport infrastructure and are associated with airfield drainage or used as fire training pools. Ponds 5 and 6 are lined and have limited vegetation restricted to a few stands of a willowherb species. Pond 8 is a deep brick and concrete walled drainage pond overgrown with macrophytes. Pond 9 is a dry pond with representative early colonising vegetation species, with Ponds 13, 14 and 15 also holding water extremely infrequently and appearing in the early stages of succession. Consequently, these ponds have been described and mapped as short ephemeral/perennial vegetation.

2.6.183 Pond 12 is situated within semi-improved neutral grassland habitat at the western side of Wigmore Park. In mid-2018, this appeared to be very shallow, recently formed and regularly dries, with only stands of terrestrial species present; including clustered dock, creeping buttercup and creeping bent.

2.6.184 None of the pond habitats present qualify as the priority habitat due to the absence of diverse macrophytes, and a lack of notable plant or faunal species.

Marshy grassland

2.6.185 There is a small damp area adjacent to willow scrub at the western side of Wigmore Park which includes a stand of flag iris adjacent to its margins. This area has held a small amount of standing water at various times. A few other damp loving species are present in the immediate vicinity including water mint, spiked sedge and a small stand of galingale.

2.6.186 This habitat does not qualify as a habitat of principal importance. The presence of galingale as a notable species, is further discussed in **Table 2.4** of this report. This habitat may have interest for faunal species (reptile species and for invertebrate species).

Marginal

2.6.187 Marginal vegetation was very poorly represented within the waterbodies present and limited to a mint species Mentha sp., common figwort and woody nightshade.

2.6.188 This habitat does not qualify as a habitat of principal importance.

Wet ditch

2.6.189 There is a damp ditch or swale to the east of the airfield car park, west of Wigmore park, with a small stand of bulrush.

2.6.190 There are also wet ditches present along some of the hedgerow bases which are adjacent to byways in Area C, particularly hedgerows which run alongside Darley Road and Brownings Lane.

2.6.191 This habitat does not qualify as a habitat of principal importance. This habitat may have interest for faunal species (invertebrate species).

Dry ditch

2.6.192 Dry ditch habitat is present at the road-side peripheries and hedge lines of a number of arable fields, notably through Winch Hill and along Darley Road. There is also a dry ditch that likely forms an outfall from the Thames Water surface water attenuation pond, situated to the north of Wigmore Park. No specific species are associated with this habitat, but contains a mix of bracken, grassland, tall ruderal and short ephemeral/perennial species where these species are adjacent to ditch habitats.

2.6.193 This habitat does not qualify as a habitat of principal importance. This habitat may have interest for faunal species (reptile species and for invertebrate species).

Short ephemeral/perennial

2.6.194 Short ephemeral perennial habitat is found in areas of recent or high disturbance across the site on a variety of soil types. Within the Airfield an area of recently disturbed grassland was shown to support abundant annual meadow-grass, red fescue aggregate, American willowherb. broad-leaved willowherb, white clover, red clover, dandelion aggregate, creeping buttercup, meadow buttercup, cut-leaved crane's-bill, common field speedwell, grey field speedwell, peforate St John's-wort, red dead nettle, shepherd's purse, field pansy, mugwort, pineapple weed, scentless mayweed and occasional spear thistle, field bindweed, scarlet pimpernel, along with rare presence of rat's-tail fescue, round-leaved fluellen, sun spurge and small toadflax.

2.6.195 This early colonisation vegetation had also shown significant encroachment into the basins associated with Ponds 9, 13, 14 and 15 within the airport complex when observed in 2020.

2.6.196 One section of short ephemeral/perennial vegetation on disturbed ground to the north of Ponds 13, 14 and 15 was represented by a different community to that throughout the majority of the airport complex. This area was characterised by a scarcity of grasses, with spear thistle, creeping thistle, bristly ox-tongue, curled dock, great mullein and annual sowthistle all abundant. Occasional to rare species include opium poppy, hemlock, American winter cress, common cat's ear and pendulous sedge.

2.6.197 As previously described, the large arable field south of Darley road, has been left fallow as have Grasslands 22 and 23, although the latter for a shorter period

of time. This has led to colonisation primarily by agricultural weeds and ruderal vegetation, with virtually no grasses colonising the bare earth patches between the previous planting lines. Cultivated barley dominates as an indication of recent land use, with frequent spear thistle, creeping thistle, frequent prickly sowthistle and groundsel, with rarely occurring common ragwort.

2.6.198 This habitat does not qualify as a habitat of principal importance. Some of the plant species found within this habitat are noteworthy. This habitat may have interest for faunal species (invertebrate species).

Bare ground

2.6.199 Bare ground is found in areas of recent or high disturbance across the site on a variety of soil types. Large areas within the airport are subject to current works such as the area between the airfield and the northern-eastern car parks. Within Area C strips of bare ground are present along public rights of way (PRoW) where footfall has prevented a vegetation community from developing.

2.6.200 A significant area of bare ground is present outside of the airport complex to the west, associated with construction of the Luton DART. Whilst access to this active construction area was extremely limited, clear views through fencing enabled assessment from outside the construction boundary. It is assumed that the vast majority of this area is currently occupied by bare earth created by construction activities, though it is recognised that limited patches of the previous calcareous grassland habitat could persist on and around the steep exposed chalk slopes to the north and west of this construction area.

2.6.201 Additionally, further patches of bare earth associated with construction are present within the runway complex to the east, between Pond 8 and 15, which had previously been occupied by the short sward species poor grassland found throughout the runway area.

2.6.202 This habitat does not qualify as a habitat of principal importance.

Fence

2.6.203 Fences are present surrounding the airport and these are metal chain link fences for security purposes. There are also fences surrounding the Thames Water surface water attenuation pond to the north of the study area.

2.6.204 This habitat does not qualify as a habitat of principal importance.

Wall

2.6.205 Wall habitats are present in the following locations:

a. to the bases of highway cutting embankments often as gabion baskets and surrounding areas of more formal planting to the north of Wigmore Park;

b. a walled garden is present adjacent to housing to the mid-section of Winch Hill;

c. wall habitats are present within the offline area at Area A, which was an old car park with concrete walled tiered parking bays; and

d. to the northern boundary of the off-line area at Area A associated with the raised railway line.

2.6.206 This habitat does not qualify as a habitat of principal importance. In limited areas this habitat may have interest for faunal species (reptile species and for invertebrate species).

Buildings

2.6.207 There are many buildings within the study area, mainly associated with airport infrastructure, businesses, farm buildings or private dwellings (occupied and unoccupied). These have a range of structural components and none have value for or appear to support plant species not described elsewhere in this report.

2.6.208 The vast majority of land within Area J (excluding Dairy borne Scarp DWS) is comprised of relatively modern buildings associated with airport infrastructure.

2.6.209 This habitat does not qualify as a habitat of principal importance. This habitat has been appraised for interest for faunal species e.g. bat species and bird species as detailed in **Section 5** and **Section 8** below respectively.

Protected and notable plant and fungi species

2.6.210 **Table 2.4** below includes the national, regional and local rarity statuses for plant species of interest, and notable plant species, recorded during the field study. While the orchid species identified are not rare, they are of considerable local interest and form part of the reason for the designation of Wigmore Park CWS, hence their inclusion within **Table 2.4**.

2.6.211 To describe the origin of a vascular plant the following four terms are used: archaeophyte, native, neophyte and casual, the terms archaeophyte and native are used in **Table 2.4** below. Archaeophyte refers to a plant species not native to the UK which has become established/naturalised prior to AD1500. Native species are those that have arrived in the UK naturally without any human intervention.

2.6.212 Bluebell recorded in association with woodland sites throughout the Main Application Site is consistent with the widespread desk study records, as are records of bee orchid and galingale from within Wigmore Valley Park.

2.6.213 Invasive non-native species identified within the Main Application Site also largely align with desk study records, including records of Japanese knotweed and Japanese rose from Wigmore Valley Park. Japanese knotweed was further recorded within Woodland 7 and 10 during the field survey. Various invasive cotoneaster species were also identified within the Main Application Site, especially as an introduced shrub to the north of Wigmore Valley Park.

2.6.214 **Table 2.5** below includes the national, regional and local rarity statuses for fungal species of interest, and notable fungal species, recorded during the field study.

Table 2.4: Protected and/or otherwise notable plant species (field records) checked against national, regional and local rarity status reports.

Common and Scientific Name Habitat, Location	Vascular Plant and Rarity Status	Phase 1 Plan Target Note, and Date	Location (NGR) and Proximity/ Connectivity to Study Area
Cornflower One plant in one location. Arable (but may have been sown as part of a wildflower mix).	Archeophyte S41 Priority Species GB status (2018) Least Concern GB status (2014) Least Concern England status (2014) Least Concern RPB Appendix 6c Endangered Herts BAP listed species	Target Note 13 21.05.18	TL1305722116 Within Main Application Site.
Hoary plantain Many plants in one location. Calcareous grassland	Native GB status (2018) Least Concern GB status (2014) Least Concern England status (2014) Near threatened RPB not listed HPL&S listed and null local status	Target Note 19 21.05.18	TL1308722130 Within Main Application Site.
Wild strawberry Several plants in one location. Hedgerow along Darley Road near junction with Winch Hill.	Native GB status (2018) Least Concern GB status (2014) Least Concern England status (2014) Near Threatened RPB not listed HPL&S listed and null local status	Target Note 16 21.05.18	TL1375122209 Within Main Application Site.
Basil thyme Few plants in one location. Edge of arable	Native S41 Priority Species GB status (2018) Vulnerable GB status (2014) Vulnerable	Target Note 5 21.05.18	TL1267821806 TL1232121912 TL1400021487 Within Main Application Site

Common and Scientific Name Habitat, Location	Vascular Plant and Rarity Status	Phase 1 Plan Target Note, and Date	Location (NGR) and Proximity/ Connectivity to Study Area
Calcareous Grassland 26 within CPAR land. Multiple plants present at each location.	England status (2014) Vulnerable RPB status Vulnerable native HPL&S listed and null local status		TL1122221088 TL1118621013 TL1122321045 TL1120621045
Field scabious Multiple plants in multiple locations. Neutral grassland both open and areas beneath hedgerows. Calcareous Grassland 26 within CPAR land.	Native GB status (2014) Least Concern GB status (2014) Least Concern England status (2014) Near threatened RPB not listed HPL&S listed and null local status	Target Note 18 21.05.18	TL1427322022 TL1432321904 TL1397721490 TL1307822177 Within Main Application Site. TL1119121017 TL1121921084
Galingale One clump in one location. Large patch in damp area of Wigmore Park.	Native GB status (2014) Near threatened England status (2014) Near threatened RPB listed but no local status HPL&S listed and null local status	Target Note 20 21.05.18	TL1244421747 Within Main Application Site.
Common twayblade (orchid) 17 flowering spikes in one location. Dense scrub	Native GB status (2018) Least Concern GB status (2014) Least Concern England status (2014) Least Concern RPB not listed HPL&S listed and null status	Target Note 6 21.05.18	TL1268621686 Within Main Application Site.
Bee orchid	Native	Grassland 11	TL 12343 22012

Common and Scientific Name Habitat, Location	Vascular Plant and Rarity Status	Phase 1 Plan Target Note, and Date	Location (NGR) and Proximity/ Connectivity to Study Area
11 flowering spikes Neutral grassland habitat and species-poor semi-improved grassland	GB status (2018) Least Concern GB status (2014) Least Concern England status (2014) Least Concern RPB not listed HPL&S listed and null status	21.05.2018	Within Main Application Site.
Common spotted orchid Over 200 flowering spikes within rank neutral grassland habitat at the western areas and southern areas of Wigmore Park.	Native GB status (2018) Least Concern GB status (2014) Least Concern England status (2014) Least Concern RPB not listed HPL&S listed and null status	No specific Target Note as covers a large area, but over 80 spikes in Grassland 10. 21.05.18	Covers large area between Grasslands 10 and 12. Within Main Application Site.
Pyramidal orchid Neutral grassland habitat	Native GB status (2018) Least Concern GB status (2014) Least Concern England status (2014) Least Concern RPB not listed HPL&S listed and null status	No Target Note as not found during field surveys, but reported present adjacent to bee orchid locations	Unknown, further checks required.
Wild basil A few plants in a few locations. Calcareous and neutral grassland	Native GB status (2018) Least Concern GB status (2014) Least Concern England status (2014) Least Concern RPB not listed HPL&S no local status	Target Note 4 21.05.18	TL1267321802 TL1408921531 Within Main Application Site.
Rat's-tail fescue	Archeophyte	Target Note 21	TL1190020993 Within Main Application Site.

Common and Scientific Name Habitat, Location	Vascular Plant and Rarity Status	Phase 1 Plan Target Note, and Date	Location (NGR) and Proximity/ Connectivity to Study Area
One plant in one location. Short/ephemeral perennial	GB status (2018) Least Concern GB status (2014) Least Concern England status (2014) Least Concern RPB not listed HPL&S listed and null status	21.05.18	
Small toadflax A few plants in a few locations. Short/ephemeral perennial	Archeophyte GB status (2018) Least Concern GB status (2014) Least Concern England status (2014) Least Concern RPB not listed HPL&S listed and null status	Target Note 10 21.05.18	TL1163620796 TL1212121962 Within Main Application Site.
Round-leaved fluellen One plant in one location. Calcareous grassland/short/ ephemeral perennial	Archeophyte GB status (2018) Least Concern GB status (2014) Least Concern England status (2014) Least Concern RPB not listed HPL&S listed and null status	Target Note 11 21.05.18	TL1114520448 Within Main Application Site.
Large-leaved lime One tree in one location. Coniferous plantation	Native GB status (2018) Least Concern GB status (2014) Least Concern England status (2014) Least Concern RPB Appendix 6B Nationally scarce HPL&S not listed.	Target Note 19 21.05.18	TL1383221538 Within Main Application Site.
Invasive non-native species			

Common and Scientific Name Habitat, Location	Vascular Plant and Rarity Status	Phase 1 Plan Target Note, and Date	Location (NGR) and Proximity/ Connectivity to Study Area
Japanese knotweed Several stands in a few locations Dense scrub	Schedule 9 part II non-native invasive RPB not listed HPL&S listed and null status Dense scrub	Target Note 7 21.05.18	TL1221622190 TL1221222188 TL1278521841 TL1277721824 TL1277021806 TL1276621787 TL1277721751 TL1279521741 TL1281021731 TL1282921719 Within Main Application Site.
Japanese rose Understorey within plantation habitat	Schedule 9 part II non-native invasive RPB not listed HPL&S listed and null status	Target Note 1 21.05.18	TL1267521822 TL1123921279 TL1261621782 TL1254921808 Within Main Application Site.
Cotoneaster species, including the invasive species: Wall Cotoneaster Himalayan Cotoneaster Small leaved Cotoneaster Many plants in several locations. Amenity planting/ introduced shrub	Noting some Cotoneaster species are Schedule 9 part II non-native invasive species RPB not listed HPL&S listed and null status	Target Note 12 21.05.18	TL1305722116 TL1237022236 TL1241422235 TL1241922225 TL1239522243 TL1243722242 TL1244822232 TL1245022251 TL1236222235 Within Main Application Site.

Table 2.5: Protected and/or otherwise notable fungal species (field records) checked against national, regional and local rarity status reports.

Common and Scientific Name Habitat, Location	Fungal Rarity Status	Target Note, and Date	Location (NGR) and Proximity/ Connectivity to Study Area
Persistent Waxcap Several fruiting bodies within calcareous grassland due east of Dairyborn Scarp DWS.	Red Data List of Threatened British Fungi (2006) - not listed. Noting paucity of county records via NBN Atlas data searches.	Target Note 23 16.09.2020	TL1119121017 Within Main Application Site.

Mature trees

2.6.215 There are at least five mature pedunculate oak trees within the Main Application Site (including those immediately adjacent and for which root spread could likely be within the Main Application Site) that appear to have significant diameter at breast height (DBH) and may potentially qualify as ancient or veteran trees. These are primarily located within hedgerow habitats and are listed in **Table 2.6** below.

Table 2.6: Mature Trees with significant DBH

Common and Scientific Name Habitat, Location	Rarity Status	Target Note, and Date	Location (NGR) and Proximity/ Connectivity to Main Application Site
Pedunculate oak Species-rich hedge with trees. Adjacent to Grassland 3, due east of Winch Hill.	Potentially veteran or ancient	Mature Oak 21.05.18	TL1413921769, within the Main Application Site
Pedunculate oak Arable field edge as a standard. Adjacent to Woodland 3, due east of Winch Hill.	Potentially veteran or ancient	Mature Oak 21.05.18	TL1422321570, within the Main Application Site
Pedunculate oak Species-rich hedge with trees.	Potentially veteran or ancient	Mature Oak 21.05.18	TL1319722364, within the Main Application Site

Common and Scientific Name Habitat, Location	Rarity Status	Target Note, and Date	Location (NGR) and Proximity/ Connectivity to Main Application Site
Darley Road			
Pedunculate oak Tree at western edge of Woodland 2.	Potentially veteran or ancient	Mature Oak 21.05.18	TL1332921943, within the Main Application Site
Oak Species Tree adjacent to workshop/garage at Winch Hill house	Potentially veteran or ancient	Mature Oak (23) 12.11.19	TL1380921589 East of the Main Application Site, near Winch Hill house

2.6.216 Since the Phase 1 Habitat Surveys were completed a full arboricultural assessment of the trees within the Proposed Development has been undertaken. The Arboricultural Impact Assessment is provided as **Appendix 14.3** of this ES **[TR020001/APP/5.02]**

2.7 Conclusions and recommendations

2.7.1 The Phase 1 Habitat Survey of the study area identified several protected or otherwise notable habitats or species. The following further surveys have been conducted between 2016 and 2021 based on the findings of the Phase 1 Habitat Survey, informing any potential development proposals to allow a full assessment of the Proposed Development:

a. NVC surveys of grassland and woodland habitats to identify the plant communities present to further determine their ecological status including their validity as habitats of principal importance, or ancient woodland. The results of these surveys are included within **Appendix AA** of this report.

b. Further arboriculture surveys to map significant trees, including those which may qualify as ancient or veteran trees. The Arboricultural Impact Assessment is provided as **Appendix 14.3** of this ES **[TR020001/APP/5.02]**.

c. Further surveys of faunal species of interest which include the following: bird surveys, bat surveys, badger surveys, hazel dormouse surveys, otter surveys, water vole surveys, reptile surveys, amphibian surveys, invertebrate surveys including specific Roman snail surveys. The results of these surveys are presented within **Sections 4-12** of this report.

2.7.2 Given the limitations to survey of Dairyborn Scarp DWS and its immediate environs, a precautionary approach has been made in determination of the type, extent and condition of habitats present.

3 HEDGEROWS

3.1 Introduction

3.1.1 This section sets out the methodology and results of the hedgerow survey work undertaken in relation to the Proposed Development during 2019.

Study area

3.1.2 The study area for Hedgerow surveys is limited to the Main Application Site and the off-site mitigation planting areas given that qualifying hedgerows within the Proposed Development are largely confined across the arable areas to the east. The Hedgerow Survey Plan in **Appendix E** should be referenced in the reading of this section.

Survey scope

3.1.3 A detailed Hedgerows Regulations assessment was undertaken between 02 and 18 July 2019 and 07 and 11 November 2019.

3.1.4 The aim of the survey was to identify any hedgerows which would qualify as 'important' under the criteria of the Hedgerow Regulations 1997 (Ref. 26) with an objective to provide sufficient information to inform an assessment of the potential impacts to important hedgerows as a result of the Proposed Development and allow the design of appropriate mitigation measures.

Legislation and local biodiversity context

3.1.5 For the purposes of this report and in accordance with the Hedgerow Survey Handbook (Ref. 25), a hedgerow has been defined as:

"Any boundary line of trees or shrubs over 20m long and less than 5m wide at the base, provided that at one time the trees or shrubs were more or less continuous".

3.1.6 To qualify as 'Important' under the Hedgerows Regulations 1997 (Ref. 26), a hedgerow must be at least 30 years old and meet at least one of the following three wildlife and landscape criteria, which identify hedgerows of particular wildlife value:

a. The hedgerow contains a species listed in the Wildlife and Countryside Act 1981 (as amended) (Ref. 5), either in Part I of Schedule 1 (birds protected by special penalties), or Schedule 5 (other animals) or Schedule 8 (plants). In addition, species listed in British Red Data Books qualify.

b. A 30m length of hedgerow includes, on average, one of the following:

   i. at least seven 'woody' species; or
   ii. at least six 'woody' species and has at least three associated features; or
   iii. at least six 'woody' species including a black poplar, large-leaved lime, small-leaved lime or wild service tree; or
   iv. at least five 'woody' species and has at least four features

And the following are considered as associated features:

v. a bank or wall supporting the hedgerow along at least half of its length;
vi. less than 10% gaps within the hedgerow;
vii. on average, at least one tree per 50m of hedgerow;
viii. at least three species from a list of 57 herbaceous 'woodland' plant species are noted as being present;
ix. a ditch along at least a half of the length of the hedge;
x. a number of connections with other hedgerows, ponds or woodland; and
xi. a parallel hedge within 15m of the hedgerow.

c. The hedgerow runs alongside a bridleway, footpath, road used as a public path or as a byway open to all traffic, and includes at least four 'woody' species, on average, and has at least two associated features.

3.1.7 Subject to exceptions outlined in Regulation 6 of The Hedgerows Regulations 1997 (Ref. 26), the removal of a hedgerow to which these Regulations apply is prohibited.

3.1.8 Hedgerows are a priority habitat of the Luton and Bedfordshire LBAP.

3.2 Methodology

Field survey

3.2.1 All hedgerows surveyed and included within this report are referred to by their hedgerow identification number, as shown in **Appendix E**.

3.2.2 Detailed Hedgerows Regulations assessment were undertaken based on field survey data collected by experienced ecologists between 02 July and 18 July and 07 and 11 November 2019. The survey recorded information on the botanical composition of the hedgerows and their associated habitat features in accordance with the current legislation.

3.2.3 Of the 66 hedgerows identified from the Phase 1 Habitat survey, eight were found not to meet the criteria for Hedgerow Regulations assessment due to being less than 20m in length or greater than 5m in width. These were therefore scoped out leaving a total of 58 hedgerows which were subject to a detailed Hedgerows Regulations assessment.

Survey limitations

3.2.4 This Hedgerows Regulations assessment only takes into consideration the wildlife and landscape criteria (criteria 6, 7 and 8 as outlined in Section 1.3), in order to define a hedgerow as 'Important' or 'Non-Important'. An assessment of the historic value of a hedgerow does not form part of the scope of this report.

3.2.5 Surveys within the Main Application Site were undertaken in July, which is within the recommended survey period for hedgerow assessments (Ref. 27), however there is the potential that vernal species of ground flora may not be apparent and therefore under recorded.

3.2.6 Surveys of the hedgerows within the proposed habitat creation and offsite planting areas were undertaken in November, which is a sub-optimal period for botanical survey therefore the diversity of ground flora may be under recorded. These hedgerows would not be subject to direct loss as a result of the Proposed Development, they would be subject to enhancement; therefore the timing of these surveys is not considered to be a significant limitation.

3.3 Results

Field Survey - important hedgerows

3.3.1 Hedgerow 20 is west of Winch Hill House and is approximately 150m in length. Two sections were sampled, and the average number of woody species was seven. The hedgerow is comprised of field maple blackthorn crab apple pedunculate dogwood and rose, spindle, elder, hazel and holly. The ground flora is dominated by false oat-grass, bramble, white bryony and common nettle. Hedgerow 20 is considered 'Important' according to the wildlife criteria of The Hedgerows Regulations 1997 for the following reasons:

a. it has seven woody species present;
b. it is intact (hedgerow where gaps in aggregate do not exceed 10% of the length of the hedgerow) ; and
c. it is adjacent to a parallel hedge (within 15m).

3.3.2 Hedgerow 27 is north of the runway approach lights and is approximately 120m in length. Two sections were sampled, and the average number of woody species is five. The hedgerow is comprised of hawthorn, hornbeam, hazel, silver birch and holly. Ground flora is dominated by false oat-grass, common nettle and barren brome. Hedgerow 27 is considered 'Important' according to the wildlife criteria of The Hedgerows Regulations 1997 for the following reasons:

a. it has five woody species present;
b. there is a bank >50% of its length;
c. it is intact;
d. it contains one standard tree per 50m; and
e. it has a parallel hedge (within 15m)..

3.3.3 Hedgerow 31 is south of Darley Road and is approximately 100m in length. It is comprised of blackthorn, hazel, ash and pedunculate oak. The ground flora is dominated by cleavers, hogweed and cock's-foot. Hedgerow 31 is considered 'Important' according to the wildlife criteria of The Hedgerows Regulations 1997 for the following reasons:

a. it has four woody species present;
b. it is adjacent to a footpath;
c. it is intact;
d. it contains at least one standard tree per 50m; and

e. there is a ditch running at least half its length.

3.3.4 Hedgerow 33 is located south west of Darley Road and is approximately 200m in length. Two sections of the hedgerow were sampled, and the average number of species were 4. The hedgerow is comprised of ash, hawthorn, rose, holly and elm. The ground flora is dominated by false oat-grass, soft-brome and bramble. Hedgerow 33 is considered 'Important' according to the wildlife criteria of The Hedgerows Regulations 1997 for the following reasons:

a. it has four woody species present;
b. it is adjacent to a footpath;
c. there is a bank running more than half its length;
d. it is intact;
e. it contains at least one standard tree per 50m; and
f. there is a parallel hedge (within 15m)..

3.3.5 Hedgerow 34 is located alongside Darley Road and is approximately 100m in length. It is comprised of blackthorn, rose, hazel and field maple. The ground flora is dominated by false oat-grass, hogweed and Yorkshire fog. Hedgerow 34 is considered 'Important' according to the wildlife criteria of The Hedgerows Regulations 1997 for the following reasons:

a. it has four woody species;
b. it is adjacent to a footpath;
c. it is intact; and
d. there is a parallel hedge (within 15m)..

3.3.6 Hedgerow 37 is located to the south west of Darley Road and is approximately 90m in length. The hedgerow is comprised of dogwood, hazel, pedunculate oak, hawthorn, rose, holly and blackthorn. The ground flora is dominated by false oat-grass, cock's-foot and spear thistle. Hedgerow 37 is considered 'Important' according to the wildlife criteria of The Hedgerows Regulations 1997 for the following reasons:

a. it has seven woody species;
b. it is intact;
c. there is at least one standard tree per 50m; and
d. there is a parallel hedge (within 15m)..

3.3.7 Hedgerow 38 is located to the south west of Darley Road and is approximately 100m in length. The hedgerow is comprised of hawthorn, field maple, hazel, rose, blackthorn, dogwood, elder and ash. The ground flora is dominated by false oat-grass, cleavers and knapweed. Hedgerow 38 is considered 'Important' according to the wildlife criteria of The Hedgerows Regulations 1997 for the following reasons:

a. it has eight woody species;

b. there is a bank >50% of its length;
c. it is intact;
d. there is at least one standard tree per 50m; and
e. there is a parallel hedge (within 15m)..

3.3.8 Hedgerow 46 is located at the northern end of Brownings Lane and is approximately 110m in length. It is an intact managed hedgerow comprising of hawthorn, elm, field maple, hazel, blackthorn, and holly. The ground flora is dominated by Yorkshire fog, false oat-grass, cleaver and occasional dog's mercury. Hedgerow 46 is considered 'Important' according to the wildlife criteria of The Hedgerows Regulations 1997 for the following reasons:

a. it has at least seven woody species along the average of sections;
b. it is adjacent to a footpath;
c. it is intact; and
d. there is a parallel hedge (within 15m)..

3.3.9 Hedgerow 47 is located at Heath Road, opposite to the junction of Church Road and is approximately 34m in length. It is a managed hedgerow comprising of ash, blackthorn, elm, field maple and oak. The ground flora is dominated by Yorkshire fog, false oat-grass, cleaver and occasional dog's mercury. Hedgerow 46 is considered 'Important' according to the wildlife criteria of The Hedgerows Regulations 1997 for the following reasons:

a. it has at least four woody species along the average of sections;
b. It is adjacent to a footpath;
c. It contains one standard tree per 50m; and
d. gaps along the hedgerow do not aggregately exceed 10%;
e. it is intact; and
f. there is a parallel hedge (within 15m)..

3.3.10 Hedgerow 49 is located along Darley Road, adjacent to Mill Way, opposite to the junction of Church Road and is approximately 119m in length. It is a managed hedgerow with a wet ditch running along its length. The species comprise of alder, hazel, blackthorn, dogwood, elm, field maple, rose and oak. The ground flora is dominated by Yorkshire fog and hogweed. Hedgerow 49 is considered 'Important' according to the wildlife criteria of The Hedgerows Regulations 1997 for the following reasons:

a. it has at least four woody species along the average of sections;
b. it is adjacent to a footpath;
c. it contains a ditch running over half its length;
d. it is intact; and
e. there is a parallel hedge (within 15m).

3.3.11 Hedgerow 50 is located along Darley Road, south of the Fox Public House and is approximately 85m in length. It is an intact managed hedgerow. The species present comprise of ash, hornbeam, hazel, dogwood, field maple, rose and oak. The ground flora is dominated by Yorkshire fog. Hedgerow 50 is considered 'Important' according to the wildlife criteria of The Hedgerows Regulations 1997 for the following reasons:

a. it has at least seven woody species along the average of sections;
b. It contains a bank supporting at least half its length; and
c. it is intact.

3.3.12 Hedgerow 51 is located along Darley Road, south of the Fox Public House and is approximately 85m in length. It is an intact managed hedgerow. The species present comprise of ash, hazel, blackthorn, field maple, rose and oak. The ground flora is dominated by Yorkshire fog. Hedgerow 51 is considered 'Important' according to the wildlife criteria of The Hedgerows Regulations 1997 for the following reasons:

a. it has at least six woody species along the average of sections;
b. it contains at least one standard tree per 50m;
c. It contains a bank supporting at least half its length; and
d. it is intact.

3.3.13 Hedgerow 56 is located along Darley Road, south of the Fox Public House and is approximately 58m in length. It is a "gappy" managed hedgerow. The species present comprise of ash, hazel, holly, and hornbeam. The ground flora is dominated by Yorkshire fog. Hedgerow 56 is considered 'Important' according to the wildlife criteria of The Hedgerows Regulations 1997 for the following reasons:

a. it has at least four woody species along the average of sections;
b. it is adjacent to a footpath;
c. it contains at least one standard tree per 50m; and
d. It contains a bank supporting at least half its length.

3.3.14 Hedgerow 60 is located along a bridleway south of Coleman's Road, and is 67m in length. It is a managed hedgerow with occasional shrubs along its length. The species present comprise of ash, hazel, blackthorn, dogwood, field maple and oak. The ground flora is dominated by Yorkshire fog. Hedgerow 60 is considered 'Important' according to the wildlife criteria of The Hedgerows Regulations 1997 for the following reasons:

a. it has at least six woody species along the average of sections;
b. it is adjacent to a footpath;
c. It is intact;
d. it contains at least one standard tree per 50m; and
e. It has hedgerow connection points scoring 4 or more.

3.3.15 Hedgerow 61 is located approximately 50m south of Hedgerow 61 and is approximately 78m in length. It is a managed hedgerow with mature trees. The species present comprise of hornbeam, wild cherry, hazel, blackthorn, hawthorn, dogwood, field maple, rose and oak. The ground flora is dominated by Yorkshire fog. Hedgerow 61 is considered 'Important' according to the wildlife criteria of The Hedgerows Regulations 1997 for the following reasons:

a. it has at least seven woody species along the average of sections;
b. it is adjacent to a footpath; and
c. it is intact.

3.3.16 Hedgerow 62 is located approximately 30m west of Hedgerow 61 and is 98m in length. It is a managed hedgerow with mature trees. The species present comprise of ash, hazel, blackthorn, hawthorn, spindle, rose and oak. The ground flora is dominated by perennial rye grass. Hedgerow 62 is considered 'Important' according to the wildlife criteria of The Hedgerows Regulations 1997 for the following reasons:

a. it has at least seven woody species along the average of sections; and
b. it is adjacent to a footpath; and
c. it is intact.

3.3.17 Hedgerow 66 is located along at the back of the properties along Lye Hill. It is approximately 363m in length and is classified as a managed hedgerow with mature trees. The species present comprise of ash, elm, hazel, blackthorn, holly, spindle dogwood, field maple and oak. The ground flora is dominated by Yorkshire fog, cock's foot and cleavers. Hedgerow 66 is considered 'Important' according to the wildlife criteria of The Hedgerows Regulations 1997 for the following reasons:

a. it has at least seven woody species along the average of sections; and
b. It is intact.

Field Survey – non-important hedgerows

3.3.18 The remaining hedgerows were assessed as 'Non-Important' from the field survey of their botanical composition and associated features. These hedgerows are summarised below.

3.3.19 Hedgerow 1 is located south of Darley Road, north of Winch Hill and is approximately 140m in length. Two sections were sampled, and the average number of woody species is five. The hedgerow is comprised of pedunculate oak, rose, holly, hazel, field maple, blackthorn and hawthorn. The ground flora is dominated by false oat-grass, common nettle and soft-brome. Notable features include the hedgerow is intact and include a bank >50% of its length.

3.3.20 Hedgerow 2 is in Winch Hill, north of Winch Hill farm barns and is approximately 100m in length. The hedgerow is comprised of blackthorn and hawthorn. The ground flora is dominated by common nettle, soft-brome and barren brome. Notably, the hedgerow is intact.

3.3.21 Hedgerow 3 is located east of hedgerow 2 in Winch Hill and is approximately 90m in length. The hedgerow is comprised of blackthorn and hawthorn. The ground flora is dominated by common nettle, cock's-foot and cleavers. Notably, the hedgerow is intact.

3.3.22 Hedgerow 4 is located north of Winch Hill farm barns and is approximately 130m in length. Two sections were sampled and the average number of woody species is four. The hedgerow is comprised of hawthorn, blackthorn, ash, hazel, elm and rose. The ground flora is dominated by common nettle, false oat-grass, cock's-foot and soft-brome. Notable features include the hedgerow is intact, contains at least one standard tree per 50m and is adjacent to a parallel hedge.

3.3.23 Hedgerow 5 is located east of Winch Hill farm barns and is approximately 55m in length. The hedgerow is comprised of hawthorn and elder. The ground flora is dominated by common nettle, false-brome and barren brome. Notably, the hedgerow contains at least one standard tree per 50m.

3.3.24 Hedgerow 6 is located west of hedgerow 2 in Winch Hill and is approximately 55m in length. The hedgerow is comprised of elder and hawthorn. The ground flora is dominated by false oat-grass, common nettle and barren brome. Notably, the hedgerow is intact.

3.3.25 Hedgerow 7 is located east of Winch Hill farm barns and is approximately 360m in length. Three sections were sampled and the average number of woody species is four. The hedgerow is comprised of blackthorn, hazel, silver birch, pedunculate oak, hawthorn and hazel. Ground flora is dominated by common nettle, barren brome, false oat-grass, soft-brome and creeping thistle. Notable features include the hedgerow is intact, a bank >50% of its length and contains at least one standard tree per 50m.

3.3.26 Hedgerow 8 is connected to hedgerow 7 in Winch Hill and is approximately 80m in length. The hedgerow is comprised of blackthorn, hazel, elder, field maple and holly. Ground flora is dominated by common nettle, broad-leaved dock and false oat-grass. Notably, the hedgerow is intact.

3.3.27 Hedgerow 9 is connected to the east of hedgerow 8 and is approximately 100m. The hedgerow is comprised of pedunculate oak, blackthorn, hazel and crab apple. Ground flora is dominated by common nettle, broad-leaved dock and scentless false mayweed. There are no additional hedgerow features.

3.3.28 Hedgerow 10 is connected to hedgerow 8 and is approximately 80m in length. Two sections were sampled and the average number of woody species is five. The hedgerow is comprised of blackthorn, hazel, hornbeam, hawthorn, pedunculate oak, elder and field maple. The ground flora is dominated by soft-brome, bramble, common nettle, cock's-foot and creeping thistle. Notably, the hedgerow contains at least one standard tree per 50m.

3.3.29 Hedgerow 12 is the eastern boundary of a small coniferous woodland plantation in Winch Hill and is approximately 145m in length. Two sections were sampled and the average number of woody species is comprised of field maple, blackthorn, elder, hazel, ash and beech. The ground flora is dominated by

barren brome, soft-brome and bracken. Notable features include the hedgerow is intact and contains at least one standard tree per 50m.

3.3.30 Hedgerow 13 connects two coniferous woodland plantations in Winch Hill and is approximately 60m in length. The hedgerow is comprised of blackthorn, elder, hazel, holly and field maple. The ground flora is dominated by false oat-grass, common nettle and broad-leaved dock. Notable features include the hedgerow is intact and contains at least one standard tree per 50m.

3.3.31 Hedgerow 14 is south east of Winch Hill farm barns and is approximately 130m in length. Two sections were sampled and the average number of woody species is three. The hedgerow is comprised of elder, blackthorn, hawthorn and hazel. The ground flora is dominated by common nettle, barren brome, white bryony and hogweed. Notable features include the hedgerow is intact and contains at least one standard tree per 50m.

3.3.32 Hedgerow 15 is north east of Winch Hill farm barns and is approximately 130m in length. Two sections were sampled and the average number of woody species is four. The hedgerow is comprised of blackthorn, elder, hazel, hornbeam and rose. The ground flora is dominated by common nettle, barren brome and cleavers. Notably, the hedgerow contains at least one standard tree per 50m.

3.3.33 Hedgerow 16 is north of Winch Hill House and is approximately 150m in length. Two sections were sampled and the average number of woody species is five. The hedgerow is comprised of pedunculate oak, elder, blackthorn and hazel. The ground flora is dominated by common nettle, scentless false mayweed, spear thistle, common comfrey and barren brome. Notable features include the hedgerow is intact and contains at least one standard tree per 50m.

3.3.34 Hedgerow 17 is south west of Winch Hill farm barns and is approximately 100m in length. The hedgerow is comprised of blackthorn, elder, field maple, hazel and holly. The ground flora is dominated by common nettle, false oat-grass and hemlock. Notable features include the hedgerow is intact, contains at least one standard tree per 50m and is adjacent to a parallel hedge.

3.3.35 Hedgerow 18 is north west of Winch Hill farm barns and is approximately 30m in length. The hedgerow is comprised of wild cherry, elder and hawthorn. The ground flora is dominated by hemlock, common nettle and false oat-grass. Notable features include the hedgerow is intact, a bank >50% of its length and at least one standard tree per 50m.

3.3.36 Hedgerow 19 is north of the runway approach lights in Winch Hill and is approximately 175m in length. Two sections were sampled and the average number of woody species is four. The hedgerow is comprised of hawthorn, hazel, elder, field maple, spindle and ash. The ground flora is dominated by common nettle, bracken, false oat-grass and barren brome. Notably, the hedgerow contains at least one standard tree per 50m.

3.3.37 Hedgerow 21 is south-west of Winch Hill House and is approximately 130m in length. Two sections were sampled and the average number of woody species is five. The hedgerow is comprised of blackthorn, dogwood, rose, pedunculate

oak, field maple, elder and hazel. The ground flora is dominated by false oat-grass, hogweed, bramble, barren brome and common nettle. Notable features include the hedgerow is intact and a bank >50% of its length.

3.3.38 Hedgerow 23 is north of the runway approach lights and is approximately 180m in length. Two sections were sampled and the average number of woody species is two. The hedgerow is comprised of blackthorn and hawthorn. The ground flora is dominated by cleavers, common nettle, hogweed, false oat-grass, barren brome and soft brome. Notable features include the hedgerow is intact and there is a parallel hedge.

3.3.39 Hedgerow 24 is south of the runway approach lights and is approximately 150m in length. Two sections were sampled and the average number of woody species is two. The hedgerow is comprised of blackthorn and hawthorn. The ground flora is dominated by false oat-grass, bramble, soft-brome, cleavers and cock's foot. Notable features include the hedgerow is intact and there is a parallel hedge.

3.3.40 Hedgerow 25 is located south of the runway approach lights and is approximately 160m in length. Two sections were sampled and the average number of woody species is four. The hedgerow is comprised of hawthorn, holly, hazel, pedunculate oak and blackthorn. The ground flora is dominated by common nettle, bramble, barren brome, cock's-foot and yarrow. Notable features include the hedgerow is intact and there is a parallel hedge.

3.3.41 Hedgerow 26 is located north of the runway approach lights and is approximately 30m in length. The hedgerow is comprised of hawthorn and hazel. The ground flora is dominated by bramble, common nettle and barren brome. The hedgerow is intact and there is a parallel hedge.

3.3.42 Hedgerow 28 is located north of the runway approach lights and is approximately 210m in length. Three sections were sampled and the average number of woody species is four. The hedgerow is comprised of holly, blackthorn, hawthorn, field maple, rose, elder and hazel. The ground flora is dominated by false oat-grass, mugwort, hogweed, barren brome, wild carrot and rye grass. There are no notable features associated with this hedgerow.

3.3.43 Hedgerow 29 is located south-west of Winch Hill farm barns and is approximately 115m in length. The hedgerow is comprised of rose, blackthorn and field maple. The ground flora is dominated by false oat-grass, bramble and mugwort. Notable features include the hedgerow is intact and there is one standard tree at least every 50m.

3.3.44 Hedgerow 30 is north-west of Winch Hill farm barns and is approximately 100m in length. The hedgerow is comprised of hawthorn and elder. The ground flora is dominated by false oat-grass, common nettle and bramble. Notable features include an adjacent footpath and at least one standard tree every 50m.

3.3.45 Hedgerow 32 is located south-west of Darley Road and is approximately 60m in length. The hedgerow comprises of elm and willow. The ground flora is dominated by common nettle, hogweed and creeping thistle. Notably, there is at least one standard tree every 50m.

3.3.46 Hedgerow 35 is located along Darley Road, north-west of Winch Hill farm barns and is approximately 60m in length. The hedgerow is comprised of hazel, pedunculate oak, blackthorn, field maple and silver birch. The ground flora is dominated by false oat-grass, bramble and hogweed. Notable features include the hedgerow is intact and there is a standard tree at least every 50m.

3.3.47 Hedgerow 36 is located along Darley Road, north-west of Winch Hill farm barns, and is approximately 110m in length. Two sections were sampled and the average number of woody species is three. The hedgerow is comprised of pedunculate oak, hazel, blackthorn and field maple. The ground flora is dominated by false oat-grass, bracken, soft-brome and bramble. Notably, there is a footpath which runs alongside the hedgerow.

3.3.48 Hedgerow 39 is located north-west of Winch Hill farm barns and is approximately 70m in length. The hedgerow is comprised of hazel, holly, elder and hawthorn. The ground flora is dominated by common nettle, false-oat grass and bramble. Notable features include a bank and a ditch which runs along >50% of the hedgerow, at least one standard tree every 50m, a parallel hedgerow and the hedgerow is intact.

3.3.49 Hedgerow 43 is located north of the runway approach lights and is approximately 30m in length. The hedgerow is comprised of hazel, pedunculate oak, hawthorn and hornbeam. The ground flora is dominated by bramble, false oat-grass and common nettle. Notable features include at least one standard tree every 50m and >4 connection points.

3.3.50 Hedgerow 44 is located along Darley Road and is approximately 64m in length. It is an intact managed hedgerow with small gaps within the woody species which have become colonised by patches of scrub. Species comprise hawthorn, willow (Salix sp.) holly, and ash. The ground flora is dominated by false oat-grass and cleavers. There are semi-mature trees within the hedgerow.

3.3.51 Hedgerow 45 is located west of Darley Road, but east of the village of Breachwood Green. The hedgerow is approximately 63m in length. It is a managed ‘gappy’ with one mature oak along its length. Species within the hedgerow comprise alder, dogwood, oak, rose, and field maple. The ground flora is dominated by false oat-grass, Yorkshire fog, cow parsley and cleavers.

3.3.52 Hedgerow 48 is located along the north end of Darley Road, adjacent to the Windmill Road junction. The hedgerow is approximately 34m in length. It is a managed hedgerow with no trees along its length. Species within the hedgerow comprise blackthorn, and ash. The ground flora is dominated by false oat-grass, cow parsley and cleavers.

3.3.53 Hedgerow 52 is located along the north end of Darley Road, adjacent to the Windmill Road junction. The hedgerow is approximately 303m in length. It is a managed hedgerow dominated by hornbeam, although hazel, hawthorn and blackthorn are also present within the hedge. The ground flora is dominated by false oat-grass, cow parsley and cleavers.

3.3.54 Hedgerow 54 is located west of Stony Lane. The hedgerow is approximately 100m in length. It is a managed hedgerow with semi mature trees spread

throughout its length, dominant species include hazel, hawthorn and blackthorn. The ground flora is dominated by false oat-grass and nettle.

3.3.55 Hedgerow 55 is located on the edge of arable field north of Darley Wood, west of Stony Lane. The hedgerow is approximately 67m in length. It is a managed intact hedgerow dominated by dogwood and blackthorn.

3.3.56 Hedgerow 56 is located along Darley Road, south of the Fox Public House and is approximately 58m in length. It is an "gappy" managed hedgerow. The species present comprise of ash, hazel, holly, and hornbeam.

3.3.57 Hedgerow 57 is located on the edge of arable field north of Darley Wood, west of Stony Lane. The hedgerow is approximately 85m in length. It is a managed "gappy" hedgerow dominated by dogwood.

3.3.58 Hedgerow 58 is located along a farm access within Tankards Farm. The hedgerow is approximately 53m in length. It is a managed intact hedgerow dominated by hawthorn and hazel.

3.3.59 Hedgerow 59 is located on the edge of arable field within Tankards Farm. The hedgerow is approximately 116m in length. It is a managed intact hedgerow dominated by hawthorn.

3.3.60 Hedgerow 64 is located behind a domestic property along Colemans Road. The hedgerow is approximately 34m in length. It is a managed intact hedgerow dominated by ash and hawthorn.

Field Survey – linear boundaries not assessed

3.3.61 Field survey noted that the following linear boundaries are not hedgerows as they are <20m in length and/or >5m width, and/or a treeline or garden hedge:

a. Hedgerow 11;
b. Hedgerow 22;
c. Hedgerow 40;
d. Hedgerow 41;
e. Hedgerow 42;
f. Hedgerow 53;
g. Hedgerow 63; and
h. Hedgerow 65.

3.4 Conclusions and recommendations

3.4.1 Based on the field survey of the botanical composition and associated features, 16 hedgerows meet the wildlife and landscape criteria of The Hedgerows Regulations 1997 for an 'Important' Hedgerow, as detailed in **Table 3.1** below.

3.4.2 The 42 remaining hedgerows do not meet the wildlife criteria of The Hedgerows Regulations 1997 for an 'Important' Hedgerow, based on their botanical composition and associated features. The remaining eight features identified as

hedgerows from aerials and maps were found to not meet the criteria of a hedgerow when surveyed on the ground. **Table 3.1** Below summaries each hedgerow status as recorded on site

Table 3.1. Summary table of hedgerows recorded on site

Hedgerow Number	Species Rich/Species Poor	Important/Not Important	Not Assessed
1	Species Rich	Not Important	
2	Species Poor	Not Important	
3	Species Poor	Not Important	
4	Species Poor	Not Important	
5	Species Poor	Not Important	
6	Species Poor	Not Important	
7	Species Poor	Not Important	
8	Species Rich	Not Important	
9	Species Poor	Not Important	
10	Species Rich	Not Important	
11	-	-	Not a hedge
12	Species Rich	Not Important	
13	Species Rich	Not Important	
14	Species Poor	Not Important	
15	Species Rich	Not Important	
16	Species Rich	Not Important	
17	Species Rich	Not Important	
18	Species Poor	Not Important	
19	Species Rich	Not Important	
20	Species Rich	Important	
21	Species Rich	Not Important	
22	-	-	Not a hedge
23	Species Poor	Not Important	
24	Species Poor	Not Important	
25	Species Poor	Not Important	
26	Species Poor	Not Important	
27	Species Rich	Important	
28	Species Rich	Not Important	
29	Species Poor	Not Important	
30	Species Poor	Not Important	
31	Species Poor	Important	

Hedgerow Number	Species Rich/Species Poor	Important/Not Important	Not Assessed
32	Species Poor	Not Important	
33	Species Rich	Important	
34	Species Poor	Important	
35	Species Rich	Not Important	
36	Species Poor	Not Important	
37	Species Rich	Important	
38	Species Rich	Important	
39	Species Poor	Not Important	
40	-	-	Not a hedge
41	-	-	Not a hedge
42	-	-	Not a hedge
43	Species Poor	Not Important	
44	Species Poor	Not Important	
45	Species Rich	Important	
46	Species Rich	Important	
47	Species Rich	Not Important	
48	Species Rich	Not Important	
49	Species Poor	Important	
50	Species Poor	Important	
51	Species Rich	Important	
52	Species Poor	Not Important	
53	Species Poor	-	Not a hedge
54	Species Poor	Not Important	
55	Species Poor	Not Important	
56	Species Poor	Not Important	
57	Species Poor	Not Important	
58	Species Poor	Not Important	
59	Species Poor	Not Important	
60	Species Rich	Important	
61	Species Rich	Important	
62	Species Rich	Important	
63	-	-	Not a hedge
64	-	Not Important	
65	-	-	Not a hedge

Hedgerow Number	Species Rich/Species Poor	Important/Not Important	Not Assessed
66	Species Rich	Important	

4 BADGER

4.1 Introduction

4.1.1 This section sets out the methodology and results of badger survey work undertaken in relation to the Proposed Development during 2018, 2019, 2020 and 2022.

4.1.2 It should be noted that, due to the persecution of badgers, any reference to the precise location of badger setts has been removed from this publicly accessible version of the report. A non-redacted version of the report and accompanying plans will be made available to the appropriate statutory bodies where required.

Study area

4.1.3 The study area of the badger survey covers land within the Main Application Site, encompassing parkland, woodlands and arable land to the eastern extent. However, with the exception of junction 10 of the M1, the highway intervention and car parking locations do not include suitable habitats for badger and were therefore scoped out of further survey.

4.1.4 The Main Application Site is set within a largely agricultural landscape context, with arable land bordering to the north, south and east; and residential areas of Luton to the north and west of the existing airport.

4.1.5 For the purposes of the badger territory mapping exercise the study area was extended into the suitable habitats within the arable landscape to the east and north, to identify the extent of the territories of the badger groups that may extend beyond the boundary of the Main Application Site.

4.1.6 A Badger Survey Plan is included within **Appendix F** and a Badger Territory Mapping Plan is provided within **Appendix G** (removed from this report for confidentiality). It should be noted that **Appendix F** includes the most recent updates of sett activity from the 2022 surveys.

Survey scope

4.1.7 A series of badger surveys were undertaken between May 2018 and November 2020.

4.1.8 The objectives of the survey were to:

a. undertake a desk-based review of badger records within 2km of the Main Application Site to identify those that may be relevant to the development proposals;

b. determine the presence or likely absence of badgers within the study area;

c. identify the presence, classification and activity levels of any badger setts within or directly adjacent to the study area;

d. determine badger activity levels and identify the extent of the territories of any badger groups present; and

e. provide sufficient information to inform an assessment of the potential impacts to badgers as a result of the Proposed Development and allow the design of appropriate mitigation measures.

4.1.9 Surveys covered all accessible areas of suitable badger habitat within the study area of the Main Application Site and immediately adjacent land.

4.1.10 In addition, a ground truthing exercise was undertaken in 2022 to update the current status of setts within the Main Application Site and to identify any new setts within areas subject to site clearance.

Legislation

4.1.11 Badgers (*Meles meles*) and their setts are afforded legal protection under the Protection of Badgers Act 1992 (Ref. 28), which states that it is an offence to wilfully kill, injure or take (capture) or to cruelly ill-treat a badger. It is also an offence to damage, destroy or obstruct access to a badger sett or to disturb a badger when it is occupying a sett.

4.1.12 A licence can be obtained from Natural England to permit activities that would otherwise cause an offence under the legislation, including for the purpose of development. A licence can usually only be granted where the development is in receipt of full planning permission (with relevant conditions discharged).

4.2 Methodology

Desk study

4.2.1 A desk study exercise was undertaken in February 2018 (and updated in June 2022) to obtain existing records of legally protected and notable species, including badgers. Species records within 2km of the Main Application Site and Luton Biological Recording and Monitoring Centre (BRMC) and Herts Environmental Records Centre (HERC). Badger records are provided to BRMC by the Bedfordshire Badger Network. Badger records are provided to HERC by the Hertfordshire Badger Group (HBG).

4.2.2 Results from surveys undertaken by Capita in 2017 (Ref. 29), in relation to the New Century Park development near the airport, were also used to inform the planning of further surveys required within 2018/19.

Field survey

Badger field signs survey

4.2.3 All surveys were undertaken by experienced ecologists in line with current best-practice guidance produced by The Mammal Society (Ref. 30) and Natural England (Ref. 31).

4.2.4 Suitable habitats for badger were recorded during the desk study and extended Phase 1 Habitats Survey, with knowledge of some badger setts from the Capita 2017 reports (Ref. 29).

4.2.5 To record the current evidence of badgers within the study area, eight survey visits were undertaken between 3 May 2018 and 12 November 2019. Each visit

involved a systematic walkover of the survey area, during which habitats were assessed for their suitability for badgers and any signs of badger activity noted.

4.2.6 The following field signs were recorded where found:

a. dung pits and latrines; these are characteristic features created by badger, they are often found near to setts and are also used by badger to demarcate their territories;
b. foraging signs such as snuffle holes;
c. paths and tracks created by badgers passing through vegetation;
d. badger footprints;
e. badger hairs snagged on fences or vegetation; and
f. badger setts.

4.2.7 Where badger setts were identified the number and level of usage (well used, partially used or disused) of each entrance hole was recorded. Any setts identified were recorded and considered against the criteria laid out in The Mammal Society guidance (Ref. 30), as either a 'main', 'annexe', 'subsidiary' or 'outlier' sett as summarised below:

a. **Main sett:** these usually have a large number of holes, conspicuous spoil heaps, and well-worn used paths into the main sett area and between entrance holes, theses setts will appear very active;
b. **Annexe sett: these** usually have multiple holes and are within close proximity (<150m) of the main sett with well-worn paths to the main sett;
c. **Subsidiary sett:** usually with 3-5 entrance holes and located greater than 150m from a main sett with no well-worn path to the main sett, these setts are not continuously active;
d. **Outlier sett:** usually with 1 or 2 entrance holes, little spoil apparent outside the holes, usually located at a distance from, and with no obvious connection to, another sett, these setts are only used sporadically throughout the year.

4.2.8 The ground truthing exercise undertaken in May and June 2022, covered those habitats subject to site clearance, and included checking the activity level of all previously recorded setts within the Main Application Site. The results of this resurvey supersede those of previous years and are shown on the Badger Survey Plan in **Appendix F**.

Territory mapping

4.2.9 A number of badger field signs were identified across the survey area including main setts. To understand how badgers are utilising the Main Application Site, in order to assess the impact of the Proposed Development, it is necessary to identify the number of badger groups and extent of their territories within the survey area. To achieve this a territory mapping exercise was undertaken within the Main Application Site and accessible adjacent lands to the east and north up to 500m.

4.2.10 Territory mapping is dependent on the discovery of active dung pits, known as latrines, in use by each clan of badgers. The latrines are identified in the initial surveys and 'bait-marking' reveals which latrines belong to which clan (Ref. 32).

4.2.11 A mixture of peanuts, peanut butter and golden syrup was placed outside each of the 'Main' badger setts. Each sett also had a designated colour of indigestible, food-safe plastic pellets mixed into the food source (red, blue, yellow or green). As badger 'clans' mark the extent of their territories with aggregations of latrines, it is possible to map the latrines with the undigested coloured pellets present, and subsequently interpret the range of the clans associated with each main sett.

4.2.12 Bait marking methods are most effective in spring (between late February and early April) and autumn (October to November) as badgers are active and exhibit a peak in territorial behaviour during these periods.

4.2.13 To map current territories of badgers within the Main Application Site and adjacent land, specific survey visits were undertaken every weekday between 18th March and 12th April 2019 (with an additional visit on 6th April 2019). **Table 4.1** summarises the dates of all visits in 2019, with further detail regarding each survey provided below.

4.2.14 In order to capture any changes to the use of the site by badger clans, a resurvey was conducted from 9th to the 30th November 2020, informed by the updated field sign survey in September 2020. **Table 4.2** summarises the dates of all visits in 2020, with further detail regarding each survey provided below.

4.2.15 All surveys were undertaken by experienced ecologists in line with current best-practice guidance produced by The Mammal Society (Ref. 30) and Scottish Badgers (Ref. 33).

Table 4.1: Territory mapping dates (2019)

Visit number	Date	Survey
1	18/03/2019	Bait marking food deployment
2	19/03/2019	Bait marking food deployment
3	20/03/2019	Bait marking food deployment
4	21/03/2019	Bait marking food deployment, site walkover to check latrines
5	22/03/2019	Bait marking food deployment
6	25/03/2019	Bait marking food deployment
7	26/03/2019	Bait marking food deployment

Visit number	Date	Survey
8	27/03/2019	Bait marking food deployment, site walkover to check latrines
9	28/03/2019	Bait marking food deployment
10	29/03/2019	Bait marking food deployment
11	01/04/2019	Bait marking food deployment
12	02/04/2019	Bait marking food deployment
13	03/04/2019	Bait marking food deployment
14	04/04/2019	Bait marking food deployment, site walkover to check latrines
15	05/04/2019	Bait marking food deployment
16	06/04/2019	Bait marking food deployment, site walkover to check latrines
17	08/04/2019	Bait marking food deployment
18	09/04/2019	Bait marking food deployment
19	10/04/2019	Bait marking food deployment
20	11/04/2019	Site walkover to check latrines within the Main Application Site
21	12/04/2019	Site walkover to check latrines within the wider area

Table 4.2: Territory mapping dates (2020)

Visit number	Date	Survey
1	09/11/2020	Bait marking food deployment
2	10/11/2020	Bait marking food deployment
3	11/11/2020	Bait marking food deployment
4	12/11/2020	Bait marking food deployment, site walkover to check latrines

Visit number	Date	Survey
5	13/11/2020	Bait marking food deployment
6	14/11/2020	Bait marking food deployment
7	15/11/2020	Bait marking food deployment
8	16/11/2020	Bait marking food deployment
9	17/11/2020	Bait marking food deployment
10	18/11/2020	Bait marking food deployment
11	19/11/2020	Bait marking food deployment, site walkover to check latrines
12	20/11/2020	Bait marking food deployment
13	21/11/2020	Bait marking food deployment
14	22/11/2020	Bait marking food deployment
15	23/11/2020	Bait marking food deployment
16	24/11/2020	Bait marking food deployment
17	25/11/2020	Bait marking food deployment
18	26/11/2020	Bait marking food deployment
19	27/11/2020	Bait marking food deployment
20	30/11/2020	Site walkover to check latrines

Survey limitations

4.2.16 Surveyors were able to access the vast majority of suitable habitats within the study area, including areas of dense scrub, where clear mammal paths into such vegetation were followed. However, in some instances vegetation was impenetrable and surveyors were limited to survey of the outer edge of the vegetation. Given that surveyors were able to note any signs of activity around or entering these limited number of patches, this is not considered a significant limitation.

4.2.17 An additional main sett was discovered after the commencement of the first feeding visits during the 2020 territory mapping. This sett had previously been

recorded as a single hole outlier, indicating an alteration in the use of this area by the occupying clan, expanded upon in the results section. This sett was fed using green pellets for the remainder of the exercise, totalling seven days of feeding, ten prior to the final check. Given that the feed mixture was taken up on each day and green pellets recovered from the latrine associated with the sett, this is not considered a significant limitation.

4.2.18 The updated territory mapping exercise in 2020 was conducted during November. For establishing sett ownership, this is considered a secondary peak in territory marking compared to the optimal spring period, as male badgers may move between social groups during this period. Given that no latrines were found with pellets fed at multiple main setts, the timing is not considered a limitation in itself. However, dense leaf litter did impede survey effort in wooded areas, with several latrines marked during the September field sign resurvey not located during the territory marking, though additional latrines were found within these woodlands.

4.2.19 Two areas falling within the 500m buffer of the Main Application Site that were accessed during the 2019 territory mapping exercise were not granted access for the 2020 resurvey. The northern area consists of a small field and a collection of modern farm buildings, with surveyors able to search the full perimeter, identifying an outlier sett and several dung pits with no evidence (e.g. push throughs) of badger entering the area itself. The southern area consists of a large arable field and a conifer plantation at the southern extent; with this land being on the periphery of the extended study area. For the above reasons, omission of these areas from the 2020 resurvey is not considered a significant limitation. Inaccessible areas are highlighted on the Badger Territory Mapping Plan in **Appendix G** (redacted from this version of the report for confidentiality).

4.2.20 Badgers are a territorial species and their activity is known to be dynamic, with the use of setts and foraging areas subject to change over time. As such, the use of the site by badgers may change prior to the commencement of the Proposed Development. This may include the creation of new setts, abandonment of currently active setts or the re-occupation of previously inactive setts. As a result, the findings of the surveys are robust but additional survey work would be required prior to the commencement of any construction works.

4.3 Results

Desk study

4.3.1 Species records returned from BRMC and HBG identified a number of badger setts and records of badger activity within the local area. This included some badger activity and badger setts within the study area.

4.3.2 The exact locations of these records are confidential; however, all records are from within the 2km search area surrounding the Main Application Site. In summary, the desk study included;

a. fourteen records of badger setts;

b. seven records of badger observations;

c. thirty one records of dead badger (mostly associated with roads); and
d. two other records of badger field signs.

Field survey

Territory mapping

4.3.3 The results of the badger bait-marking surveys are shown on the Badger Territory Mapping Plan in **Appendix G** (redacted from this version of the report).

4.3.4 Five main setts were identified during the territory mapping and attributed a colour reference for identification (red, yellow, blue, green and purple) based on the colour of the pellets used to bait these setts.

4.3.5 Red pellets were recorded regularly from numerous locations providing a defined picture of the clans core territory. This incorporates the plantation and semi-natural woodland immediately north of the sett, dense scrub east of Winch Hill, arable land and hedgerows south of the sett, as well as the ancient woodland assumed to form the southern extent of this territory. Given the several latrines along the arable field margin, Winch Hill Lane is assumed to form the eastern territory boundary, distinct of clans to the east of the road.

4.3.6 Yellow pellets were only recovered from the latrine associated with the yellow main sett, though only within the first week of feeding despite continued uptake of bait. This indicates a reduced level of activity associated with this sett. Numerous latrines containing no pellets or bait were located throughout Wigmore Valley Park to the west, as well as along the field boundary along Darley road to the east.

4.3.7 The numerous large active latrines located throughout Wigmore Valley Park, particularly within the relatively undisturbed dense scrub and woodland belt, indicate activity of a clan separate to the red clan to the east. However, despite several intensive searches no setts considered to be the main one were located within the park, with the largest a two-hole subsidiary. Given the reduced activity at the yellow main sett itself, it is considered likely that this is the clan present throughout the park, though the lack of yellow pellets recovered makes this difficult to confirm.

4.3.8 The dung pits without pellets along the field margin south of Darley road were of varying activity levels. Clear mammal paths led from each location to each side of Darley road, indicating crossing of badger at several points across Darley road to incorporate the field immediately north.

4.3.9 Further north of here numerous active latrines without pellets were located along field margins and roads, along with several outlier setts. This indicates this as being the boundary of another clan, likely within arable land and woodland north of the extended study area and outside of the main application site.

4.3.10 Whilst numerous well used latrines were recovered for the blue sett, these present a less defined boundary. This is assumed to include the majority of

arable land, field margins and woodland blocks west and north of the sett to Darley road, as well as some way south and east as indicated by two active latrines. The eastern latrine is located 200m from the purple main sett and assumed to constitute the territory boundary between the two clans.

4.3.11 Green pellets were only recovered from the latrine associated with this sett. However, numerous clear paths made by badger lead directly from this sett to outliers along the northern length of Winch Hill House woodland immediately to the south. Therefore, core territory for the green clan is assumed to incorporate this woodland and further arable land to the south, with Winch Hill Lane forming the western boundary abutted by the red clan. The core territory of the green clan is also assumed to extend into the arable land to the north and east, abutted by the blue clan.

4.3.12 No purple pellets were recovered from latrines, indicating that the core territory of the clan associated with this sett is positioned east of the sett, or extending south into the inaccessible area. This is somewhat ratified by several outlier setts found along the vegetated boundary at the rear of properties along Lye Hill.

4.3.13 In summary; two badger clans (red and yellow) territories are thought to have core territories entirely encapsulated within the Main Application Site. The core territories of the blue and green clans encapsulate land both within and outside the Main Application Site, with the purple clan considered to have a core territory entirely outside of the Main Application Site. The territory of a further clan is assumed to occupy land to the north of Darley road outside of the Main Application Site, forming the northern extent of the yellow clan and western extent of the blue clan.

Badger field signs survey

4.3.14 Survey work identified evidence of badgers within the study area and immediately adjacent land, including a variety of setts and signs of badger activity. The most recent survey undertaken in 2022 found that the red sett identified when the bait marking was undertaken is now disused.

4.3.15 The findings of the most recement activity status of the badger setts are outlined on the Badger Survey Plan in **Appendix F** (redacted from this version of the report).

4.3.16 The exact location of these records are confidential; however in summary, the field survey identified;

a. four active main setts, one of which was outside of the Main Application Site within the territory mapping study area;
b. two active and one disused annexe setts;
c. two active and one disused subsidiary setts; and
d. thriteen active and ten disused outlier setts.

4.3.17 No evidence of badger activity was found within the off-site car park areas.

4.4 Conclusions and recommendations

4.4.1 Suitable habitats for badger exist within the Main Application Site and wider arable landscape. The badger surveys have identified active main, subsidiary and outlier setts across several locations within the study area and adjacent land. Habitats within the Main Application Site form part of the territories for at least two badger groups.

4.4.2 Badgers are protected from killing or injury and their setts are protected from damage, obstruction or disturbance under the Protection of Badgers Act 1992. Any works which intentionally or recklessly caused harm to badgers or caused the destruction of their setts would be illegal.

4.4.3 An update survey would be required prior to the commencement of any works, including vegetation clearance. Setts showing signs of use by badgers would require closure under licence from Natural England should they fall within the land required for construction of the Proposed Development. A ‘buffer zone’ of at least 30m radius should be established surrounding any active or partially used setts that would not be removed, and disused setts should be confirmed and closed under the direction of a suitably qualified ecologist.

4.4.4 Main setts requiring closure would require provision of an alternative artificial sett, as mitigation for those lost. These artificial setts must show signs of use by the badger group which will be displaced prior to any closure works commencing.

5 BATS

5.1 Introduction

5.1.1 This section sets out the methodology and results of specific bat survey work undertaken in relation to the Proposed Development between 2016 and 2020.

Study area

5.1.2 The study area of the Bat Survey is limited to the Main Application Site and the off-site mitigation planting areas as habitats within the highway intervention works and car park locations are not considered suitable for roosting bats and were scoped out of further survey.

5.1.3 The Main Application Site primarily consists of amenity grassland (Wigmore Park), with woodland blocks, arable land and several residential buildings. It is set within a largely agricultural landscape context, with arable land bordering to the north east, south and east; and residential areas of Luton to the north and west of the existing airport.

5.1.4 The off-site mitigation planting areas are located to the north east of the Main Application Site, comprising arable fields, grassland field margins and hedgerows.

5.1.5 A Bat Tree and Building Roost Potential Survey Plan is included in **Appendix H** and a Bat Activity Survey Plan in **Appendix I**; both of which should be referenced in the reading of this section.

Survey scope

5.1.6 The objectives of the surveys were to:

a. assess the potential of trees and buildings within the study area to support bat roosts and identify the locations of any roosts;
b. identify the assemblage of bat species present within the study area;
c. record the relative levels of bat activity within the study area; and
d. identify any key foraging areas and commuting routes for bats within the study area.
e. Provide sufficient information to inform an assessment of the potential impacts on the local bat assemblage as a result of the Proposed Development and allow the design of appropriate mitigation measures.

Legislation and biodiversity context

5.1.7 All native bat species and the sites that they use for breeding or resting are afforded protection through the provisions within Schedule 5 of the Wildlife and Countryside Act 1981 (as amended) (Ref. 5) and Schedule 2 of the Conservation of Species and Habitat Regulations 2017 (as amended) (Ref. 34). It is therefore an offence, without a licence from Natural England, to intentionally or recklessly kill or injure bats; to disturb, obstruct, damage or destroy their

roosts (including when those roosts are empty) or to take, possess or trade in bats and their parts (alive or dead).

5.1.8 Species of principal importance for the purpose of conserving biodiversity in England are listed in accordance with the provisions of Section 41 of the Natural Environment and Rural Communities (NERC) Act 2006 (Ref.7) These include species in England that were previously identified as requiring action in the UK Biodiversity Action Plan (UK BAP) and continue to be regarded as conservation priorities in the subsequent UK Post-2010 Biodiversity Framework. The following bat species are classified as 'UK Priority Species' requiring conservation action within the UK:

a. greater horseshoe bat (*Rhinolophus ferrumequinum*);
b. lesser horseshoe bat (*Rhinolophus hipposideros*);
c. Bechstein's bat (*Myotis bechsteinii*);
d. noctule (*Nyctalus noctula*);
e. soprano pipistrelle (*Pipistrellus pygmaeus*);
f. brown long-eared bat (*Plecotus auritus*); and
g. barbastelle (*Barbastella barbastellus*).

5.2 Methodology

Desk study

5.2.1 Information about statutory designated nature conservation sites within 2km of the Main Application Site, and international sites designated for bat species within 30km, was obtained from the Government's MAGIC website (Ref. 35). Ordnance Survey maps and aerial photographs were reviewed to provide an indication of the habitat types likely to occur on adjacent land. The ecological connectivity of habitats within the site to off-site areas of semi-natural habitats was considered. This information was used to provide context for the assessment of the importance of the site for bat species.

5.2.2 A desk study exercise was undertaken in May 2018 (and updated in June 2022) to obtain existing records of legally protected and notable species, including bats. Species records from within 2km of the Main Application Site were requested from the Bedfordshire and Luton Biological Recording and Monitoring Centre (BRMC) and Herts Environmental Records Centre (HERC). This exercise was repeated in November 2020 to capture any additional records.

Field study

Ground based assessment of potential roost features

5.2.3 Preliminary ground level roost assessments of buildings and trees were undertaken on 12 August 2016 by two experienced ecologists to identify their suitability to support roosting bats in accordance with the Bat Conservation Trust (BCT) Good Practice Guidelines (Ref. 36). All ground level assessments of trees were updated in June 2020 to reconfirm roosting potential and identify

andy additional trees. Potential roosting features in trees are shaped by mechanisms including disease, decay and damage, all of which are variable and can change features over time (Ref. 37).

5.2.4 Buildings that fall within the footprint of the Airport Access Road were subject to external inspection to identify their suitability to support roosting bats on 09 September 2020.

5.2.5 Roost assessments of buildings, structures and trees were carried out to identify and assess any features that bats could use for roosting and inspect them for any evidence of bats (e.g. live or dead bats, droppings, fur-oil or urine staining, feeding remains and odour). In accordance with BCT guidelines (Ref. 36), all surveyed buildings and trees were classified as having negligible, low, moderate or high bat roosting potential, or as a confirmed roost, based on the following characteristics:

a. **Negligible:** Structure or tree does not support any features likely to be used by bats;
b. **Low:** A **structure** with one or more potential roost features that would be used by individual bats opportunistically; or a tree of sufficient size and age to contain potential roost features but with none seen from the ground, or features seen with only very limited roosting potential;
c. **Moderate:** A structure or tree with one or more potential roost features that could be used by bats due to **their** size, shelter, protection, conditions and surrounding habitat, but unlikely to hold a roost of high conservation status;
d. **High:** A structure or tree with one or more potential roost features that are obviously suitable for the use by large numbers of bats on a more regular basis and potentially for longer periods of **time**, due to their size, shelter, protection, conditions and the surrounding habitat; or
e. **Confirmed roost:** A feature which has evidence of roosting bats, such as observation of a live or dead bat in situ, bat feeding remains or bat droppings.

5.2.6 An internal inspection of buildings was not possible due to access constraints. Therefore, the roost potential was determined based on external surveys only, taking a precautionary approach to account for this, as detailed within the survey limitations section below.

5.2.7 Two derelict buildings at Winch Hill Farm (refer to Winch Hill Farm North Farmhouse and Winch Hill Farm South Farmhouse on the Bat Tree and Building Roost Potential Survey Plan in **Appendix H**) were demolished in October/November 2019, preceding the commencement of the Proposed Development, and therefore they do not form part of the baseline for the DCO application.

Tree climbing inspections

5.2.8 Tree climbing surveys were carried out in 2018 to inspect the potential roosting features on all trees classified as having moderate or high potential for roosting

bats. As per BCT guidelines, trees considered to have negligible or low potential were not subject to further survey and were therefore not climbed for inspection.

5.2.9 Tree climbing inspections were carried out between 21 and 25 May 2018 by suitably qualified ecologists (both holding at least a Level 2 bat licence) trained and certified in tree climbing and aerial rescue. A rope and harness climbing technique was used, allowing further investigation of potential roosting features which may be obscured from ground-level view. Torches and endoscopes were used for close investigation of any roosting features, and to search for evidence of bats.

5.2.10 Tree climbing is an effective way to access and investigate features that cannot be inspected from ground level. However, these surveys may be constrained by health and safety issues, for example where trees are deemed unsafe to climb.

5.2.11 The results of the tree climbing surveys were used to refine the results of the initial ground-based assessment of tree potential, with trees re-categorised as low, moderate or high potential once inspected by the climber. Where trees had multiple features of mixed roosting potential (i.e. moderate and high), the tree was treated according to the feature(s) with the highest potential.

Emergence and re-entry surveys

5.2.12 Following the identification of buildings and trees within the Main Application site boundary with potential to support roosting bats, dusk emergence and dawn re-entry surveys were undertaken at buildings between 2016 and 2019 and at trees between 2016 and 2018, which were subsequently updated in 2020, to ascertain the presence or absence of any bat roosts. Only buildings considered to be impacted by Proposed Development were surveyed, this was due to the large number of buildings within the Main Application Site that would not be impacted by the Proposed Development. The number of surveys on those buildings considered to be impacted were planned in accordance with BCT guidelines, as follows:

a. Any buildings with low roosting potential were subjected to one emergence and/or re-entry survey;
b. Any buildings and trees with moderate roosting potential were subjected to two emergence and/or re-entry surveys;
c. Any buildings and trees with high roosting potential were subjected to three emergence and/or re-entry surveys; and,
d. Where a bat roost was confirmed within a building or tree, additional surveys were undertaken as required to allow characterisation of the type of roost present.

5.2.13 All emergence/re-entry surveys were carried out during the peak bat activity period between May and September. Weather conditions and survey dates are summarised within **Table 5.1** and locations of trees and buildings are shown in **Appendix H**.

Table 5.1: Weather conditions for emergence and re-entry surveys (2016 - 2020 surveys).

Date	Feature	Start temp.(°C)	End temp.(°C)	Other weather observations (cloud cover, precipitation, wind)*
Buildings				
12/09/2016 (Emergence)	Pillbox	21	21	7/8 cloud, dry, 2/12 wind
19/05/2017 (Re-entry)	Pillbox	8	8	8/8 cloud, light rain, 2/12 wind
27/06/2018 (Re-entry)	Pillbox	14	13	1/8 cloud, dry, 1/12 wind
25/07/2018 (Emergence)	Pillbox	27	27	6/8 cloud, dry, 1/12 wind
23/05/2019 (Emergence)	Winch Hill House and garage	20	20	2/8 cloud, dry, 3/12 wind
17/06/2019 (Emergence)	Winch Hill Cottage (1) and (2), Winch Hill House (garage only)	16	14	2/8 cloud, dry, 1/12 wind
18/06/2019 (Re-entry)	Winch Hill House	12	9	3/8 cloud, dry, 0/12 wind
15/07/2019 (Emergence)	Winch Hill Cottage (1) and (2)	18	14	1/8 cloud, dry, 1/12 wind
16/07/2019 (Re-entry)	Winch Hill House (garage only)	13	12	0/8 cloud, dry, 1/12 wind
21/08/2019 (Re-entry)	Winch Hill Cottage (1) and (2)	13	10	0/8 cloud, dry, 2/12 wind
Trees				
31/08/2016 (Re-entry)	T120, T122, T124	14	14	0/8 cloud, dry, 2/12 wind
13/09/2016 (Re-entry)	T124	17	18	2/8 cloud, dry, 2/12 wind
27/09/2016 (Re-entry)	T172	12	12	7/8 cloud, dry, 3/12 wind
18/05/2017 (Emergence)	T103, T105	12	12	8/8 cloud, light rain, 3/12 wind
19/05/2017 (Re-entry)	T120, T122	8	8	8/8 cloud, light rain, 2/12 wind

Date	Feature	Start temp.(°C)	End temp.(°C)	Other weather observations (cloud cover, precipitation, wind)*
24/05/2017 (Emergence)	T120, 122, T124 and T172	13	13	1/8 cloud, dry, 2/12 wind
25/05/2017 (Re-entry)	T103, T105, T172	11	11	0/8 cloud, dry, 0/12 wind
05/07/2018 (Emergence)	T130	25	25	1/8 cloud, dry, 0/12 wind
19/07/2018 (Emergence)	T172, T173	22	22	3/8 cloud, dry, 2/12 wind
08/08/2018 (Emergence)	T122	21	17	6/8 cloud, dry, 3/12 wind
09/08/2018 (Re-entry)	T124	14	14	6/8 cloud, brief light rain, 0/12 wind
15/08/2018 (Re-entry)	T172, T173	19	17	6/8 cloud, dry, 3/12 wind
22/08/2018 (Emergence)	T159	18	18	7/8 cloud, dry, 3/12 wind
05/09/2018 (Re-entry)	T130	12	12	7/8 cloud, dry, 3/12 wind
05/09/2018 (Emergence)	T122	19	19	7/8 cloud, dry, 3/12 wind
11/09/2018 (Re-entry)	T159	16	16	3/8 cloud, dry, 3/12 wind
10/08/2020 (Emergence)	T106, T122, T120, T105, T119	28	24	2/8 cloud, dry, 3/12 wind
11/08/2020 (Re-entry)	T167, T161, T163, T164	19	21	1/8 cloud, dry, 1/12 wind
17/08/2020 (Emergence)	T103, T104. T107, T124	20	18	7/8 cloud, light rain at start, 1/12 wind
18/08/2020 (Re-entry)	T111, T112	16	15	5/8 cloud, brief light drizzle, 2/12 wind
24/08/2020 (Emergence)	T113, T126, T168, T169, T170	18	16	2/8 cloud, dry, 2/12 wind
26/08/2020 (Emergence)	T171, T172, T174	19	17	3/8 cloud, dry, 1/12 wind
02/09/2020 (Emergence	T167, T161	16	15	8/8 cloud, light drizzle at start, 3/12 wind

Date	Feature	Start temp.(°C)	End temp.(°C)	Other weather observations (cloud cover, precipitation, wind)*
03/09/2020 (Re-entry)	T105, T106, T107	15	16	8/8 cloud, dry, 3/12 wind
08/09/2020 (Emergence)	T111, T112, T172	20	19	3/8 cloud, dry, 2/12 wind
09/09/2020 (Re-entry)	T119, T122, T124, T174	14	16	2/8 cloud, dry, 3/12 wind
15/09/2020 (Emergence)	T120, T126, T167	22	20	7/8 cloud, dry, 3/12 wind
16/09/2020 (Re-entry)	T113, T168, T169, T170	19	17	2/8 cloud, dry, 2/12 wind
22/09/2020 (Emergence)	T161, T163	18	17	8/8 cloud, dry, 2/12 wind
23/09/2020 (Re-entry)	T122, T172			8/8 cloud, heavy showers, 2/12 wind
29/09/2020 (Emergence)	T105, T106, T124, T164	15	13	1/8 cloud, dry, 1/12 wind
30/09/2020 (Re-entry)	T103, T104, T120, T126	11	10	0/8 cloud, dry, 1/12 wind

*Cloud cover was recorded in oktas and wind was estimated using the Beaufort scale. Please note that the numbering of all trees has been updated based on 2020 surveys, and results from previous reports are superseded.

5.2.14 Dusk emergence surveys of trees and buildings commenced 15 minutes before sunset and extended until 90 minutes after sunset. Dawn re-entry surveys of trees and buildings commenced 90 minutes before sunrise and extended until 15 minutes after sunrise.

5.2.15 Surveyors were positioned around buildings and trees to ensure all aspects with suitable features could be observed during the surveys and any bats emerging from or entering access points would be identified.

5.2.16 All surveyors were equipped with BatLogger M (Elekon) real-time full spectrum detectors which simultaneously play back, display the call frequency, and record bat calls. The detectors were set to record with an automatic trigger, and high sensitivity, enabling effective detection of any UK bat species.

5.2.17 All bats observed or heard on site were recorded, including (where possible) the number of bats, species, and information regarding behaviour (e.g. foraging or commuting) and direction of flight. Following the surveys, the recorded sound files were analysed using BatExplorer software to aid and confirm the identification of bats to species or genus level.

Bat activity transect surveys

5.2.18 In accordance with the BCT guidelines (Ref. 36) for sites of moderate suitability, bat activity transect surveys were undertaken once per month between April and September 2018. As described within BCT guidelines, five transect routes of similar lengths (approximately 3km) were utilised, the locations of which are shown on **Appendix I**, alongside their respective stopping locations. Bat activity transect surveys have not been updated, given the low level of bat activity recorded. However, bat static surveys have been updated in 2021 to reconfirm bat activity levels across the site remain at similar levels to those previously recorded in 2018-2020.

5.2.19 The transect routes were planned prior to the surveys, focusing on suitable foraging and commuting habitats identified from the site Phase 1 habitat survey. All five transect surveys took place simultaneously each month in order to cover the whole site in each survey incidence. Two experienced surveyors walked each of the transect routes, stopping periodically at specific points along the transect routes to observe bat activity for periods of five minutes. The locations of stopping points were chosen to ensure good coverage of the study area. Dusk transect activity surveys commenced at or before sunset and lasted for at least 90 minutes and dawn transect surveys started 90 minutes before sunrise and lasted until 15 minutes after sunrise, in accordance with the BCT guidelines. Transect start points and directions were alternated each month in order to vary the time at which stopping points were sampled during the survey period.

5.2.20 All surveyors were equipped with BatLogger M (Elekon) real-time full spectrum detectors. All bats observed or heard on site were recorded, including (where possible) the species, and information regarding behaviour (e.g. foraging or commuting) and direction of flight. Following the surveys, the recorded sound files were analysed using BatExplorer software for identification of bats to species or genus level.

5.2.21 A Bat Activity Index is then established for each night in each location. This provides an index of the amount of use bats make of an area, but it is important to note that this is used to quantify bat activity, not bat abundance, which cannot be inferred from these acoustic recordings.

5.2.22 Weather conditions for the transect surveys were suitable for bat activity, as summarised in **Table 5.2**.

Table 5.2: Weather conditions for transect surveys (2018).

Date	Dusk or Dawn	Start temp (°C)	End temp (°C)	Other weather observations (cloud cover, precipitation, wind)*
26/04/2018	Dusk	10	8	3/8 cloud cover, dry, 3/12 wind
22/05/2018	Dusk	12	11	1/8 cloud cover, dry, 3/12 wind

Date	Dusk or Dawn	Start temp (°C)	End temp (°C)	Other weather observations (cloud cover, precipitation, wind)*
26/06/2018	Dusk	21	19	0/8 cloud cover, dry. 1/12 wind
23/07/2018	Dusk	29	26	1/8 cloud cover, dry, 2/12 wind
20/08/2018	Dusk	24	20	3/8 cloud cover, dry, 1/12 wind
21/08/2018	Dawn	18	17	3/8 cloud cover, dry, 2/12 wind
25/09/2018	Dusk	10	10	2/8 cloud cover, dry, 2/12 wind

* Cloud cover was recorded in oktas and wind was estimated using the Beaufort scale

Bat activity static surveys

5.2.23 To gain longer-term data and increase the likelihood of detecting the species using the site, static detector surveys were also undertaken each month from April to September 2018. A total of ten BatLogger A+ (Elekon) automated static detectors were deployed for each of the six recording periods, at the ten locations shown on the Bat Activity Survey Plan in **Appendix I**. Updated static detector surveys were then undertaken from April to October 2021 to reconfirm bat activity levels across the site.

5.2.24 Sampling locations for the static detectors were selected using a subjective approach based on expert knowledge of the site gathered from habitat and bat surveys since 2016 and considering the main areas with potential to be impacted by the Proposed Development. Locations were selected based on likely bat commuting routes, taking into account the connectivity of the site habitats, and its large arable/pasture land areas.

5.2.25 For consistency across the sampling, the same model of static bat detector was used across the site, with the same settings and microphone type. Detectors were deployed by experienced ecologists, positioning the unidirectional microphones at appropriate heights and directions to maximise the recorded activity and to avoid obstruction of sound by dense foliage or other potential sound barriers.

5.2.26 Each detector was deployed for at least five consecutive nights during each recording period. The detectors were set to start recording from half an hour before sunset and throughout the night until half an hour after sunrise the following day, in line with BCT guidelines (Ref. 36).

5.2.27 All acoustic data was downloaded and analysed in BatExplorer software to identify species present and to quantify bat activity levels within the study area. The number of sound files recorded by the detectors each night was taken as a proxy value to the number of bat passes. After sound analysis and species classification in BatExplorer, a summary of the average bat passes per hour for

each species/genus group (also known as a Bat Activity Index, as per BCT guidelines) was calculated.

5.2.28 Weather data for temperature, wind speed and precipitation were checked from online records for the nearest weather station in Luton Airport to ensure that the weather was suitable during the sampling period. There was variation in weather conditions over each of the five-day periods. Where sub-optimal weather conditions were identified and found to impact levels of bat activity, the most suitable 5 nights of data was used.

Bat back-tracking surveys

5.2.29 Two nights of back-tracking surveys were undertaken on 18 and 27 August 2020. The first was carried out in the ridgeline woodland in the centre of the Proposed Development and the second in the ancient woodland (Winch Hill Wood) immediately east of the airport boundary (northern and southern hatched areas on the Bat Activity Survey Plan in **Appendix I**, respectively). The aim of these surveys was to gather visual observations of bats commuting back to their roosts at sunrise and attempt to track them back to their roosts. In accordance with BCT guidelines (Ref. 36), dawn back tracking surveys are carried out under the following principles:

a. The later a bat is seen before sunrise, the closer it is likely to be to its roost (exact timing dependant on species).
b. At sunrise, bats fly towards their roosts, so surveyors can follow bats at this time to locate their roosts.
c. At sunrise, some bat species will swarm around roost access points, providing a window of opportunity for surveyors to find and identify roosts.

5.2.30 Surveys were started two hours before sunrise, and continued until source roosts were found, or bats were no longer active. In each survey four surveyors were positioned along commuting routes on the edges of the woodland.

5.2.31 All surveyors were equipped with BatLogger M (Elekon) real-time full spectrum detectors to help detect and identify any observed bats. Any bats seen potentially flying towards roosts in the woodlands were followed and watched carefully for any dawn swarming or roost re-entry.

5.2.32 Weather conditions for the back-tracking surveys were suitable for bat activity, as summarised in **Table 5.3**.

Table 5.3: Weather conditions for back-tracking surveys.

Date	Start temp (°C)	End temp (°C)	Other weather observations (cloud cover, precipitation, wind)*
18/08/2020	16	16	8/8 cloud cover, light rain, 2/12 wind
27/08/2020	12	14	7/8 cloud cover, dry, 1/12 wind

*Cloud cover is recorded in oktas and wind is recorded using the Beaufort scale

Bat trapping surveys

5.2.33 In line with BCT guidelines (Ref. 36), advanced licenced bat survey techniques can be used to provide additional information needed to fully consider the potential level of impacts from the Proposed Development. The woodland areas on site provide suitable roosting and foraging habitats for elusive species that can be difficult to survey via other methods (i.e. tree-roosting or quiet-echolocating species, and sensitive bat populations such as Annex II bat species). Trapping surveys were undertaken in order to assess bat communities in the woodland areas and to gain further information about the presence of roosts and breeding bats on site.

5.2.34 Two nights of bat trapping were undertaken on 04 July and 29 August 2018 by suitably qualified ecologists (lead surveyor holds Natural England Level 3 and 4 Class Licences for bats). Surveys were focused on the ridgeline woodland in the centre of the Proposed Development and the ancient woodland (Winch Hill Wood) immediately east of the airport boundary (northern and southern hatched areas on the Bat Activity Survey Plan in **Appendix I**, respectively).

5.2.35 Each survey involved the deployment of four harp traps (in combination with AT100 lures) and a triple-high mist net. Surveys commenced at sunset and continued throughout the night until 3am. The species, sex, age class, weight and breeding status was recorded for all bats captured.

5.2.36 Weather conditions for the trapping surveys were suitable for bat activity, as summarised in **Table 5.4**.

Table 5.4: Weather conditions for trapping surveys.

Date	Start temp (°C)	End temp (°C)	Other weather observations (cloud cover, precipitation, wind)*
04/07/2018	18	15	5/8 cloud cover, dry, 2/12 wind
29/08/2018	15	9	2/8 cloud cover, dry, 1/12 wind

*Cloud cover is recorded in oktas and wind is recorded using the Beaufort scale

Survey limitations

5.2.37 Internal inspection of buildings with potential roost features was not possible due to access being denied and/or not considered essential to support assessment of occupied buildings for the presence of bats. However, the number of nocturnal surveys undertaken is considered suitably robust to establish presence or absence of bats, based on the roost potential assessments undertaken in line with BCT guidelines (Ref. 36).

5.2.38 Access for external inspection and emergence/re-entry surveys of Winch Hill Cottage (1) was restricted. Surveyors positioned around Winch Hill Cottage (2) were able to observe most aspects of Winch Hill Cottage (1) during emergence and return surveys because the buildings are located immediately adjacent to

one another. Whilst one aspect of Winch Hill Cottage (1) could not be fully observed, it is considered that the survey effort expended is sufficient to identify any bat roosts within this building. This survey limitation was also compensated for by undertaking a third survey of Winch Hill Cottage, above the minimum requirements for buildings with moderate roosting potential.

5.2.39 Where trees of medium and high roost potential from the ground-based assessments were not safe to climb, the roost potential ascertained during the ground-based assessments was used to decide the number of subsequent emergence or return surveys. This approach is in line with the BCT guidelines.

5.2.40 There are a few surveys where weather conditions were suboptimal, with temperatures slightly below 10°C and light rain or heavy rain showers during periods of the survey. In these situations, the professional judgement of surveyors justified the validity of the surveys based on the activity recorded (including bats re-entering a roost in one suboptimal survey) and the conditions on the ground.

5.2.41 Due to very low temperatures in October 2018, transect surveys and static monitoring were terminated in September. The temperatures ranged between 0-8° and were generally below 6°C.

5.2.42 Corruption of data has meant that the analysis of the static detector data from Location 8 in August 2021 was only partially completed. As a result, the majority of files were not able to be analysed, reducing the comparability of this data to other months.

5.2.43 Bats exhibit great variation in their calls depending on many factors, including the surrounding habitat, and there is a substantial degree of overlap for some call characteristics between species. Some calls may not be identifiable to species level due to interference from local noise or other bats, or because only a partial call was recorded. As a result, it was only possible to determine the genus of the bat in some recordings, and for some genus (e.g. Myotis) which is a main limitation of this methodology.

5.2.44 Different bat species have different levels of detectability (e.g. some species may echolocate more frequently than others, some species calls may be quieter than others – making them more difficult to detect), so the Bat Activity Index cannot be assumed to represent the difference in bat activity levels between species. Additionally, as individual bats may pass the detector multiple times, the Bat Activity Index cannot be assumed to represent the actual number of bats present.

5.2.45 Despite the above limitations, the results gathered are considered sufficiently robust to meet the survey objectives and draw the conclusions described within this report.

5.3 Results

Desk study

5.3.1 There are no statutory designated sites for bats within 30km of the Main Application Site.

5.3.2 There are records of bats in flight within 2km of the Main Application Site from the last 10 years for common pipistrelle only.

Field study

Ground-based assessment of potential roost features - buildings

5.3.3 Six of the 19 buildings on site were initially classified as having moderate potential for roosting bats. Two buildings (Pillbox (also known as WWII Headquarters) and Winch Hill Cottage (2)) were subsequently confirmed as roosts.

5.3.4 Two derelict buildings at Winch Hill Farm (refer to Winch Hill Farm North Farmhouse and Winch Hill Farm South Farmhouse on the Bat Tree and Building Roost Potential Survey Plan in **Appendix H**) were demolished in October/November 2019, preceding the commencement of the Proposed Development, and therefore they do not form part of the baseline for the application for development consent.

5.3.5 Survey results for bat surveys at these two buildings were provided separately in a report issued in August 2019 (Winch Hill Farmhouse Demolition Ecology Report) and are therefore not detailed further within this report.

5.3.6 Five of the 17 buildings assessed in 2020 within the footprint of the Proposed Development were assessed as having moderate potential for roosting bats. The remaining 12 buildings, which fall within the footprint of the Airport Access Road, were assessed in 2020 as providing either negligible (six buildings) or low (six buildings) roost potential.

5.3.7 A summary of each building surveyed and the assessment of their roosting potential based on the initial inspections is provided in **Table 5.5**. The locations and assessment results of all buildings are shown on the Bat Tree and Building Roost Potential Survey Plan in **Appendix H**.

Table 5.5: Buildings with potential roosting features for bats

Building name and code*	Description	Roost potential
Pillbox B001	Red brick WW2 pillbox. Single storey, red-brick structure with 6 small openings that provide potential entry/exit points.	Moderate initially, then confirmed as roost through emergence/re-entry surveys
Winch Hill House	1970s-built house. Brick construction partly cladded with pebble dash. Pitched tile roof	Moderate

Building name and code*	Description	Roost potential
B002	with multiple potential access points for bats, including gaps at gable apex, under soffits, between tiles and under flashing. No evidence of bats (e.g. droppings) noted.	
Winch Hill House garage B003	Associated (but unconnected) garage/ workshop, wood-boarded construction and pitched, corrugated metal roof with plastic lining. Approximately 20 – 30 years old, located within the edge of adjacent conifer plantation. Some holes within wooden boards, with small sections of wood cladding missing. There is a small hole near the gable apex at approximately 5m height. No evidence of bats noted externally.	Moderate
Winch Hill Cottage (1) B004	1850s semi-detached property. Red-brick construction. The pitched roof is of cross hipped design. Multiple slipped or slightly lifted tiles were observed. Lead flashing between roof and chimney appears to offer some void space for roosting bats. Single storey extension to rear of property with single pitched tile roof. Shared porch structure to the front of the property with wood post and brick construction and single sloped tile roof, lead flashing tie ins to main structure. Due to access restrictions it was not possible to search for evidence of bats.	Moderate
Winch Hill Cottage (2) B005	1850s semi-detached property. Red-brick construction. Pitched cross hipped tile roof with multiple slipped or slightly lifted tiles. Lead flashing between roof and chimney appears to offer some void space for roosting bats. Shared porch structure to the front of the property with wood post and brick construction and single sloped tile roof, lead flashing tie ins to main structure. At the time of the inspection a previous extension had been removed from the southern side of the building to make way for a new brick construction extension. Slot holes associated with the beams of the previous extension were exposed and offered potential access points for bats. No evidence of bats (such as droppings) were noted.	Moderate initially, then confirmed as roost through emergence/re-entry surveys
Winch Hill Farm North Farmhouse	Demolished in October/November 2019.	Moderate

Building name and code*	Description	Roost potential
B006		
Winch Hill Farm South Farmhouse B007	Demolished in October/November 2019.	Low
Building 95 (Halcyon House) B008	Two storey office building, within industrial/business estate forming the wider airport complex. Building of corrugated metal construction, with corrugated metal walls, PVC windows, flat roof (material not visible). Appears in good general condition, no obvious features that could be utilised by roosting bats. Negligible suitability for bats also as a result of artificial lighting on all aspects, and buildings location within an industrial estate with foraging opportunities limited to ornamental shrubs and individual trees.	Negligible
Building 194 (Rushton House) B009	Two storey office building, within industrial/business estate forming the wider airport complex. Building of corrugated metal construction, with corrugated metal walls, PVC windows, flat roof (material not visible). Generally in a good state of repair; however, metal lip connecting top of walls to flat roof is missing for a c.5m stretch at the western elevation. This could allow an access points for bats beneath roofing material. Some foraging opportunities offered by scrub mosaic to the north of the building, however given the predominance of artificial lighting, and generally denuded foraging opportunities within local landscape, roosting potential for bats is assessed as low.	Low
Building 123 B010	Two storey brick structure office building with attached warehouse with brick and corrugated metal construction. The brick office section of the building has a flat roof (material not visible), wooden framed windows and doors and large corrugated metal shutter doors on the southern side. The building sits within an industrial/business estate forming the wider airport complex. The building is in a good state of repair with no obvious features that could be utilised by roosting bats. The building has artificial lighting on each aspect and limited foraging opportunities in the immediate vicinity.	Negligible

Building name and code*	Description	Roost potential
Building 53 B011	Small warehouse style building constructed from corrugated concrete or asbestos panels, forming the walls and roof. The building sits within an industrial/business estate forming the wider airport complex. It is in a poor state of repair with many of the corrugated sheets broken or wholly missing to reveal wooded structure beneath with plastic lining. Gaps present where corrugated sheets overlap. Potential for these features to be utilised by roosting bats. However, given the lack of suitable foraging habitats within the immediate surrounds, and artificial lighting to all elevations, the suitability for roosting bats remains low.	Low
Building 74 (Alpha LSG) B012	Large, single storey brick building with wooden soffit boxes, PVC windows and a flat roof of roofing felt construction. The building sits within an industrial/business estate forming the wider airport complex. The structure is in a generally good state of repair, however a c.2-5cm gap near the south-east corner between the base of the soffit and the wall could allow access into the soffit box void for crevice dwelling bat species. However, given the lack of suitable foraging habitats within the immediate surrounds, and artificial lighting to all elevations, the suitability for roosting bats remains low.	Low
Building 108 (Monarch) B013	Two storey building, brick structure to the ground floor, corrugated metal cladding surrounding the second floor to the eastern half of the building, flat roof across the whole of the building although material not visible. The building sits within an industrial/business estate forming the wider airport complex. A small area of immature trees are present to the western end of the building and the scrub mosaic of Dairyborn Scarp DWS to the north. The building is in a good state of repair, with no obvious access/egress points for roosting bats. Moreover, the building is subject to artificial lighting from adjacent street lighting and security lights on adjacent buildings.	Negligible
Building 107 (TUI) B014	Two storey office building of brick construction with metal framed windows, flat roof with	Low

Building name and code*	Description	Roost potential
	elevated pitched corrugated metal section. The building sits within an industrial business estate forming the wider airport complex. A small area of immature trees form a landscaped bund along the south and western end of the building and the scrub mosaic of Dairyborn Scarp DWS is present to the north. Metal trade access doors at the western end of the building are damaged allowing potential access point for crevice dwelling bats behind the cladding or into the structure. These habitats provide some foraging opportunities for bats, although there is extensive light spill from security lights on the building and street lighting along the access roads.	
Building 140 (Prospect House Day Nursery) B015	Two storey office building cladded with metal panels, with a pitched corrugated metal roof and PVC windows. The building is in a good state of repair with no visible features that could be used by roosting bats. The building sits within an industrial/business estate forming the wider airport complex. A small area of immature trees form a landscaped bund along the south and eastern end of the building and the scrub mosaic of Dairyborn Scarp DWS is present to the north beyond a carpark. These habitats provide some foraging opportunities for bats, although there is extensive light spill from security lights on the building and street lighting along the access roads.	Negligible
Building 133 (Essex House) B016	Two storey office building of brick construction with pitched tiled roof, metal framed windows, and wooded soffit boxes. The building is in a generally good state of repair however the soffit is partially broken on the north eastern corner with a small strip of wood missing forming a c.5-10cm wide gap which could offer access/egress point for crevice dwelling bats. The building sits within an industrial/business estate forming the wider airport complex. The scrub mosaic habitats of Dairyborn Scarp DWS are located immediately to the west, and immature trees form a landscape bund to the east, these habitats may offer suitable foraging habitats for bats. However, given the	Low

Building name and code*	Description	Roost potential
	extensive light spill from street lighting and security lighting adjacent to the building it is considered to have low potential for roosting bats.	
Building 137 (Eaton House) B017	Two storey office building of brick construction with pitched tiled roof, metal framed windows, and wooded soffit boxes. The building is in a generally good state of repair however there is a small hole c.5cm in diameter in the soffit box at the south west corner which could offer access/egress point for crevice dwelling bats. The building sits within an industrial / business estate forming the wider airport complex. The scrub mosaic habitats of Dairyborn Scarp DWS are located immediately to the west, and immature trees form a landscape bund to the east, these habitats may offer suitable foraging habitats for bats. However, given the extensive light spill from street lighting and security lighting adjacent to the building it is considered to have low potential for roosting bats.	Low
Building 146 (Monarch Training Centre) B018	Two storey office building of prefabricated rendered wooden boarding construction, metal framed windows and flat roof likely comprising roofing felt. The building appears no longer in use but is in a good state of repair with no visible features that could be utilised by roosting bats. The building sits within an industrial/business estate forming the wider airport complex. The scrub mosaic habitats of Dairyborn Scarp DWS are located immediately to the west, which may offer suitable foraging habitats for bats. The building is subject to illumination from security lighting on the building and adjacent street lighting.	Negligible
Abandoned caravans within Dairyborn Scarp DWS. B019	Three temporary, caravan/portacabin type temporary building structures are located within Dairyborn Scarp DWS. These dilapidated structures are of largely plastic boarding structure, with metal framed windows which are devoid of glass, and with holes in the roof leave the interior fully exposed to the elements. No obvious crevices or ledges are present which could accommodate roosting	Negligible

Building name and code*	Description	Roost potential
	bats. The structures are completely surrounded by buddleia dominated scrub.	

*Building numbers have been assigned with the exception of those within the industrial estate at Dairyborn Scarp DWS, which have building numbers associated with the estate

Ground-based and tree climbing assessment of potential roost features - trees

5.3.8 All trees (with the exception of those in the ridgeline woodland and the ancient woodland (Winch Hill Wood) found to have low, moderate or high roosting potential during the ground-based assessments in 2018 and 2020, and the tree climbing assessment in 2018 within the Main Application Site are summarised in **Table 5.6**. Also included are trees that have been downgraded to negligible in 2020. The locations of these trees are provided on the Bat Tree and Building Roost Potential Survey Plan in **Appendix H**.

5.3.9 The numbering and roosting potential of all trees has been updated based on 2020 surveys, and results from previous surveys are superseded.

5.3.10 Of the sixteen trees found to have high or moderate potential roost features during the ground-based assessments in 2018, nine were subjected to tree climbing inspections. The remaining seven trees were deemed unsafe to climb but were re-inspected from ground level. No confirmed bat roosts were identified during the tree climbing surveys. The level of bat roosting potential of several of the trees was re-categorised as a result of the survey.

5.3.11 The Main Application Site included eight trees with high potential (of which two were later confirmed as roosts), fourteen with moderate (of which one was later confirmed as a roost) and fourteen with low potential in 2020.

5.3.12 The ridgeline woodland is largely coniferous; however it included one tree with moderate potential (later confirmed as a roost) and nine with low in 2020. These trees were not subject to emergence/return surveys; however, this woodland was included in the back-tracking and trapping surveys and will be retained.

5.3.13 The ancient woodland (Winch Hill Wood) included three trees with high potential, nineteen with moderate and four with low in 2020. These trees were not subject to emergence/return surveys; however, this woodland was included in the back-tracking and trapping surveys and will be retained.

5.3.14 The off-site mitigation areas included four trees with high potential, 18 with moderate and four with low in 2020; however they were not subject to further survey due to the planned retention of these trees in areas not subject to construction works.

5.3.15 The land within the footprint of the Airport Access Road included one tree with moderate potential and two with low.

Table 5.6: Ground-based and tree climbing roost potential assessments of trees.

Tree ID	Species	Description	Roost potential - GLTA 2018	Roost potential - tree climbing 2018	Roost potential - GLTA 2020*
T101	Quercus robur	Main Application Site Oak with dead limb on second stem, 1m out from the canopy. Loose bark at 3.5m height, facing north. DBH 0.8m.	-	-	**Low**
T102	Quercus robur	Main Application Site Dead oak tree with decay feature at 1m height, facing north-east. DBH 0.5m.	-	-	**Low**
T103	Quercus robur	Main Application Site Oak with woodpecker hole on branch, 9m high and north-west facing. Tree inspection noted that features could provide shelter for low numbers of bats. DBH 0.9m.	Moderate	Moderate	**Moderate**
T104	Quercus robur	Main Application Site Oak with two features, a hazard beam at 3m height, facing south east, and a branch cavity with small amount of dead wood around it. DBH 1.2m.	-	-	**Moderate initially, then confirmed as roost through emergence/ re-entry surveys**

Tree ID	Species	Description	Roost potential - GLTA 2018	Roost potential - tree climbing 2018	Roost potential - GLTA 2020*
T105	Quercus robur	Main Application Site Tall oak with dead branch. Features are a woodpecker hole at 5.5m, north-west facing and a knot hole at 5.8m height, north-west facing. DBH 1.2m. Tree inspection noted that features could provide shelter for low numbers of bats.	Moderate	Moderate	**High**
T106	Quercus robur	Main Application Site Oak with woodpecker hole at 6m height, facing north-east. Callus roll directly above that could extend into cavity. Flies coming in and out of entrance, and possible stain marks. Decay feature present with possible ramshorn between deadwood and heartwood. DBH 1.2m.	-	-	**High**
T107	Quercus robur	Main Application Site Oak with ramshorn feature extending from	-	-	**Moderate**

Tree ID	Species	Description	Roost potential - GLTA 2018	Roost potential - tree climbing 2018	Roost potential - GLTA 2020*
		base to top on west facing side. DBH 0.65m.			
T108	Quercus robur	Main Application Site No potential roosting features visible from ground, but limited view from thick foliage. DBH 1.2m.	-	-	**Low**
T109	Quercus robur	Main Application Site Oak with multiple decay features with fissures and an open wound at 4m height, facing north. DBH 1.2m.	-	-	**Low**
T110	Quercus robur	Main Application Site Oak with fallen branch now on ground. Small hole from tear out at 3m height, facing west. DBH 1.6m.	-	-	**Low**
T111	Quercus robur	Main Application Site Oak with difficult access due to dense bramble and blackthorn. Splits in exposed heartwood at 4m height, facing east. DBH 1m.	-	-	**Moderate**
T112	Quercus robur	Main Application Site	-	-	**Moderate**

Tree ID	Species	Description	Roost potential - GLTA 2018	Roost potential - tree climbing 2018	Roost potential - GLTA 2020*
		Oak with callus roll at 8m height, facing south east. DBH 1m.			
T113	Quercus robur	Main Application Site Oak with two features – a trunk cavity, and a callus roll at 6m height, facing north west. DBH 0.8m.	-	-	**Moderate**
T118	Quercus robur	Main Application Site Oak with dead branch, shallow split along length leading to shallow knot hole. 7m west facing. DBH 1m.	Low	N/A	**Low**
T119	Quercus robur	Main Application Site Oak with two knot holes on limbs at 10m height, facing south west. DBH 1.1m.	-	-	**Moderate**
T120	Quercus robur	Main Application Site Dead oak with a woodpecker hole in stem at 6m facing south and rot hole on limb. Shallow trunk splits at 3m on north and south aspects making it unsafe to climb. Small knot hole at	Moderate	High	**High initially, then confirmed as roost through emergence/ re-entry surveys**

Tree ID	Species	Description	Roost potential - GLTA 2018	Roost potential - tree climbing 2018	Roost potential - GLTA 2020*
		3m facing north. DBH 0.9m.			
T121	Quercus robur	Main Application Site Ivy clad young oak. No features recorded, but thick ivy coverage is a limitation. DBH 0.4m.	-	-	**Low**
T122	Fraxinus excelsior	Main Application Site Large ash with multiple features mostly on southern aspect, including trunk cavities and woodpecker holes. Unsafe to climb due to hollow trunk. DBH 1.2m.	Moderate	High	**High**
T123	Quercus robur	Main Application Site Mature oak adjacent to airport fence. Split at 7m facing north-east but no depth to feature. DBH 1m.	Low	N/A	**Low**
T124	Quercus robur	Main Application Site Very mature oak tree with several features of moderate bat potential. Knot hole at 7m high, facing west. Branch split at 6m, leading into	Moderate	High	**High initially, then confirmed as roost**

Tree ID	Species	Description	Roost potential - GLTA 2018	Roost potential - tree climbing 2018	Roost potential - GLTA 2020*
		branch cavity, facing east. DBH 1.5m.			
T125	Fraxinus excelsior	Main Application Site Ash tree with single knot hole at 5.5m, facing north-east. DBH 0.45m.	Low	N/A	**Low**
T126	Quercus robur	Main Application Site - within ridgeline woodland Very mature oak tree with multiple knot holes and ivy cover. Knot hole at 6m, south-west facing. Knot hole at 8m, south facing. DBH 1.1m. Tree inspection noted that features could provide shelter for low numbers of bats.	Moderate	Moderate	**Moderate initially, then confirmed as roost**
T127	Prunus avium	Main Application Site - within ridgeline woodland Wild cherry with shallow knot hole at 6m, south-west facing. DBH 0.3m.	Low	N/A	**Low**
T128	Prunus avium	Main Application Site - within ridgeline woodland Wild cherry with open trunk cavity	Low	N/A	**Negligible**

Tree ID	Species	Description	Roost potential - GLTA 2018	Roost potential - tree climbing 2018	Roost potential - GLTA 2020*
		at 6m, east facing in 2018. The feature was found to have recently fallen during 2020 survey and no longer suitable for roosting bats. DBH 0.6m.			
T129	Quercus robur	Main Application Site - within ridgeline woodland Oak with shallow callus roll at 1m east. DBH 1.1m.	Low	N/A	**Low**
T136	Quercus robur	Main Application Site - within ridgeline woodland Cherry with trunk cavity at 1m, north facing. No potential roosting features noted in 2020 survey. DBH 0.25m.	Low	N/A	**Negligible**
T140	Quercus robur	Main Application Site - within ridgeline woodland Single stem mature oak with multiple dead limbs facing south at around 8m height. DBH 1m.	-	-	**Low**
T141	Prunus avium	Main Application Site - within ridgeline woodland	-	-	**Low**

Tree ID	Species	Description	Roost potential - GLTA 2018	Roost potential - tree climbing 2018	Roost potential - GLTA 2020*
		Single stem cherry tree with fork at 2.5m height. Bark split with decay at 1m height, facing south. Light ivy cladding and heavily cobwebbed. DBH 0.5m.			
T144	Fraxinus excelsior	Main Application Site - within ridgeline woodland Ash with low rot cavity (0.5m, west-facing). Decay feature at base of stump on east side. DBH 0.4m.	Moderate	Moderate	**Low**
T146	Quercus robur	Main Application Site - within ridgeline woodland Single stem mature oak free with decay features on limbs at 8m height. DBH 1.3m.	-	-	**Low**
T148	Quercus robur	Main Application Site - within ridgeline woodland Oak with shallow knot hole at 7m, facing down towards ground on north-west side. DBH 1.1m.	Low	N/A	**Low**

Tree ID	Species	Description	Roost potential - GLTA 2018	Roost potential - tree climbing 2018	Roost potential - GLTA 2020*
T154	Prunus avium	Main Application Site - within ridgeline woodland Large cherry tree with hazard beam on fallen main stem at 0.7m height, facing north west. Cobwebs inside feature. DBH 0.4m.	-	-	**Low**
T159	Quercus robur	Main Application Site - within ridgeline woodland Oak with thick ivy cover. Shallow branch cavity at 12m height, north facing. DBH 1m.	Low	N/A	**Low**
T160	Fagus sylvatica	Main Application Site Single stem beech forking into two stems at 4.5m height. Upwards facing wound on branch at 11m height, on south facing side. DBH 0.3m.	-	-	**Low**
T161	Acer campestre	Main Application Site Field maple with woodpecker hole in dead stem where a tearout has occurred, at 6.5m height,	-	-	**High**

Tree ID	Species	Description	Roost potential - GLTA 2018	Roost potential - tree climbing 2018	Roost potential - GLTA 2020*
		facing east. DBH 0.5m.			
T162	Fagus sylvatica	Main Application Site Beech on woodland edge. Single stem forking at 1m, with decay features in stems at 2.5m height, leaving to cavity in steam on north side. DBH 0.3m.	-	-	**Low**
T163	Fagus sylvatica	Main Application Site Single stem beech with start of a woodpecker hole at 10m height, facing south west. DBH 0.25m.	-	-	**Moderate**
T164	Quercus robur	Main Application Site Single stem mature oak with ivy cladding. Branch cavity at 10m height on west side. DBH 1m.	-	-	**Moderate**
T165	Fagus sylvatica	Main Application Site Beech with small crevice on trunk at 2.2m height, facing east. Was once a fusion weald. DBH 0.6m.	-	-	**Low**
T166	Fagus sylvatica	Main Application Site	-	-	**Low**

Tree ID	Species	Description	Roost potential - GLTA 2018	Roost potential - tree climbing 2018	Roost potential - GLTA 2020*
		Single stem beech forking into two stems at 4m height. Knot hole at 6m height, facing west. DBH 0.3m.			
T167	Quercus robur	Main Application Site Mature oak with knot hole on limb at 10m height, facing west, and a woodpecker hole at 10m height on east side. DBH 1.5m.	-	-	**High**
T168	Quercus robur	Main Application Site Single stem oak on field margin with branch cavity at 3m height, facing north. DBH 1m.	-	-	**Moderate**
T169	Quercus robur	Main Application Site Single stem mature oak with ivy cladding. Split visible at 7m height on north side. Features may be obstructed by ivy cover. DBH 1.3m.	-	-	**Moderate**
T170	Quercus robur	Main Application Site Oak with knot hole on branch elbow at 6m	-	-	**Moderate**

Tree ID	Species	Description	Roost potential - GLTA 2018	Roost potential - tree climbing 2018	Roost potential - GLTA 2020*
		height, facing north. DBH 0.9m.			
T171	Quercus robur	Main Application Site Oak tree with shallow split at 6m, north-east facing. Multiple cavities with split limbs. DBH 1.3m.	Low	N/A	**Moderate**
T172	Quercus robur	Main Application Site Oak with callus roll and branch cavity at 6m height facing west. Unsafe to climb, re-assessed from ground only. DBH 1.2m.	Moderate	Moderate	**High**
T173	Quercus robur	Main Application Site Oak with knot hole and hazard beam. Unsafe to climb, re-assessed from ground only. Knot hole shallow. DBH 0.9m.	Moderate	Moderate	**Low**
T174	Tilia cordata	Main Application Site Dual stem oak with woodpecker hole at 4m height, facing northeast. DBH 0.2m.	-	-	**Moderate**
T175	Quercus robur	Within mitigation area Multiple features splits and split	-	-	**High**

Tree ID	Species	Description	Roost potential - GLTA 2018	Roost potential - tree climbing 2018	Roost potential - GLTA 2020*
		branches 4m northeast, 5m southwest, 10m south, knothole 15m south. Hibernation potential. DBH 1.5m.			
T176	Quercus robur	Within mitigation area Large trunk split 8m west, woodpecker holes 8m south and 6m east, branch cavity. DBH 1.5m.	-	-	**High**
T177	Quercus robur	Within mitigation area Loose bark 3m west, trunk cavity 9m north, broken main stem at crown. DBH 1.5m.	-	-	**Moderate**
T178	Quercus robur	Within mitigation area Callus roll 5m east, split limb 3m southwest, dead limb with multiple hollows. DBH 1m.	-	-	**Moderate**
T179	Quercus robur	Within mitigation area Split dead limb 5m southeast. DBH 1.75m.	-	-	**Moderate**
T180	Quercus robur	Within mitigation area Dead limb with loose bark 4m west, woodpecker hole 6m	-	-	**Moderate**

Tree ID	Species	Description	Roost potential - GLTA 2018	Roost potential - tree climbing 2018	Roost potential - GLTA 2020*
		southeast, split and twisted limb 8m southwest. DBH 1m.			
T181	Fraxinus excelsior	Within mitigation area Trunk cavity 4m south, woodpecker and rot holes 8m southeast. DBH 2m.	-	-	**High**
T182	Quercus robur	Within mitigation area Lost limb with splitting at base 8m southeast. DBH 1.5m.	-	-	**Moderate**
T183	Quercus robur	Within mitigation area Split limbs 8m southwest but very exposed. DBH 1.5m.	-	-	**Low**
T184	Quercus robur	Within mitigation area Woodpecker holes with rot 6m northwest. DBH 1m.	-	-	**Moderate**
T185	Quercus robur	Within mitigation area Woodpecker hole with significant staining 6m northeast. DBH 1.5m.	-	-	**Moderate**
T186	Quercus robur	Within mitigation area Significant ivy cover from 1m,	-	-	**Moderate**

Tree ID	Species	Description	Roost potential - GLTA 2018	Roost potential - tree climbing 2018	Roost potential - GLTA 2020*
		dead limbs with loose bark and rot holes 6m northeast. DBH 1.5m.			
T187	Quercus robur	Within mitigation area Dead wood but no obvious features. DBH 1m.	-	-	**Low**
T188	Fraxinus excelsior	Within mitigation area Significant ivy cover from 1m potentially obscuring features. DBH 1m.	-	-	**Moderate**
T189	Quercus robur	Within mitigation area Branch cavity/rot hole 4m southeast dead limbs with loose bark 4m southeast but fairly exposed. DBH 1.5m.	-	-	**Moderate**
T191	Quercus robur	Within mitigation area Knot hole with small rot holes 5m south. DBH 1m.	-	-	**Moderate**
T192	Quercus robur	Within mitigation area Split limb with dead wood at base of stem, loose bark 2m south. DBH 1.5m.	-	-	**Moderate**
T194	Quercus robur	Within mitigation area	-	-	**Moderate**

Tree ID	Species	Description	Roost potential - GLTA 2018	Roost potential - tree climbing 2018	Roost potential - GLTA 2020*
		Split limbs at crown break with hollows at base 5m northwest. DBH 1.5m.			
T195	Quercus robur	Within mitigation area Rot hollows, truck cavity 2m south, split in truck with callus roll 4m south. DBH 0.5m.	-	-	**High**
T196	Quercus robur	Within mitigation area Not possible to fully assess due to foliage. DBH 2m.	-	-	**Low**
T198	Quercus robur	Within mitigation area Brach cavity and lifted bark 8m east and branch cavity 7m west. DBH 1.5m.	-	-	**Moderate**
T199	Fraxinus excelsior	Within mitigation area Significant ivy cover. DBH 1.5m.	-	-	**Moderate**
T201	Fraxinus excelsior	Within mitigation area Unable to inspect due to dense scrub. DBH 1m.	-	-	**Low**
T202	Fraxinus excelsior	Within mitigation area Significant ivy cover. DBH 2m.	-	-	**Moderate**
T203	Quercus robur	Within mitigation area	-	-	**Moderate**

Tree ID	Species	Description	Roost potential - GLTA 2018	Roost potential - tree climbing 2018	Roost potential - GLTA 2020*
		Standing dead tree unable to inspect due to ivy cover and hedgerow. DBH 1m.			
T204	Acer campestre	Within mitigation area Significant ivy cover. DBH 1.5m.	-	-	**Moderate**
T206	Acer campestre	Main Application Site - within ancient woodland Multi-stemmed coppiced, vertical split/wound 3.5m southwest. DBH 1.5m.	-	-	**Moderate**
T207	Fagus sylvatica	Main Application Site - within ancient woodland Multi-stemmed coppiced, vertical crack/loose bark 7m southwest. DBH 1m.	-	-	**Moderate**
T208	Fagus sylvatica	Main Application Site - within ancient woodland Multi-stemmed coppiced, wound next to ramshorn 10m west. DBH 1.2m.	-	-	**Moderate**
T209	Betula pendula	Main Application Site - within ancient woodland Loose bark and cavity beneath, 2m west, decaying trunk. DBH 0.4m.	-	-	**Moderate**

Tree ID	Species	Description	Roost potential - GLTA 2018	Roost potential - tree climbing 2018	Roost potential - GLTA 2020*
T210	Betula pendula	Main Application Site - within ancient woodland Decaying tree, woodpecker hole 12m southwest. DBH 0.4m.	-	-	**Moderate**
T211	Acer campestre	Main Application Site - within ancient woodland Multi-stemmed coppiced, trunk cavity and knot hole 8m west. DBH 1.5m.	-	-	**Moderate**
T212	Fagus sylvatica	Main Application Site - within ancient woodland Two-stemmed, loose bark and decay/rot all around main stem from 4.5m. DBH 0.75m.	-	-	**High**
T213	Fagus sylvatica	Main Application Site - within ancient woodland Three vertical wounds from 4.5m, scrub prevented full inspection. DBH 0.3m.	-	-	**High**
T214	Acer campestre	Main Application Site - within ancient woodland Two-stemmed coppiced, wound on main stem 3m west. DBH 0.5m.	-	-	**Moderate**

Tree ID	Species	Description	Roost potential - GLTA 2018	Roost potential - tree climbing 2018	Roost potential - GLTA 2020*
T215	Fagus sylvatica	Main Application Site - within ancient woodland Two-stemmed, split 1m northeast. DBH 1.5m.	-	-	**Moderate**
T216	Fagus sylvatica	Main Application Site - within ancient woodland Multi-stemmed coppiced, split at 1m, loose bark all around, decay. DBH 1m.	-	-	**High**
T217	Betula pendula	Main Application Site - within ancient woodland Knot hole 3m southeast. DBH 0.5m.	-	-	**Moderate**
T218	Populus sp.	Main Application Site - within ancient woodland Two-stemmed with split at 0.5m south. DBH 1.2m.	-	-	**Moderate**
T219	Betula pendula	Main Application Site - within ancient woodland Wound 4.5m south. DBH 0.5m.	-	-	**Moderate**
T220	Aesculus hippocastanum	Within CPAR Ivy cover from 1m. DBH 1m.	-	-	**Low**
T223	Betula pendula	Within CPAR Ivy cover with some lifted bark too obscured to fully inspect. DBH 0.8m.	-	-	**Low**

Tree ID	Species	Description	Roost potential - GLTA 2018	Roost potential - tree climbing 2018	Roost potential - GLTA 2020*
T225	Acer pseudopla-tanus	Within CPAR Standing dead trunk with lengths of lifted bark. DBH 0.3m.	-	-	**Moderate**
T226	Prunus avium	Within ridgeline woodland Wild cherry with split limb at 4m west. Tree found fallen in 2020. DBH 0.3m.	Moderate	Moderate	**Negligible**
T227	Juglans regia	Main Application Site Walnut with multiple knot holes that don't extend inwards. DBH 1m.	Low	N/A	**Negligible**

* The most updated roost potential classification is in bold in the 2020 column.

Emergence and re-entry surveys - buildings

5.3.16 Two buildings were confirmed to support bat roosts: the Pillbox (B001) and Winch Hill Cottage (2) (B005). The Proposed Development does not directly impact these buildings, and both will be retained.

5.3.17 No roosts were observed during surveys of the other three buildings: Winch Hill House (B002), Winch Hill House garage (B003) and Winch Hill Cottage (1) (B004). No emergence/return surveys were possible at any of the remaining buildings within Dairyborn Scarp DWS. A summary of these results is provided in **Table 5.7**. Photographs of conformed roosts are provided in **Section 13**.

Table 5.7: Summary of building emergence and re-entry surveys and confirmed roosts.

Building	Roost (Yes/No)	Details of results and roost type
Pillbox B001	Yes	Confirmed as a bat roost, with one common pipistrelle emerging during dusk survey on 12 September 2016, and one common pipistrelle emerging during dusk survey on 19 May 2017. During further surveys on 27 June and 25 July 2018 no bats were observed emerging from the structure.

Building	Roost (Yes/No)	Details of results and roost type
Winch Hill House B002	No	N/A
Winch Hill House garage B003	No	N/A
Winch Hill Cottage (1) B004	No	N/A
Winch Hill Cottage (2) B005	Yes	Confirmed as a bat roost, with one common pipistrelle emerging during dusk survey on 15th July 2019. During further surveys on 17th June and 21st August 2019 no bats were observed emerging from the structure. Winch Hill Cottage (2) is considered a summer day roost used by low numbers of common pipistrelle bats. Hibernation potential cannot be ruled out, in the absence of an internal inspection; however due to access restrictions this was not possible.

Emergence and re-entry surveys - trees

5.3.18 Four trees were confirmed to support bat roosts in 2020: T104, T120, T124 and T126.

5.3.19 No bats were seen to emerge from or return to any other trees during the surveys. A summary of the confirmed tree roosts is provided in **Table 5.8**. Photographs of confirmed roosts in 2020 are provided in **Section 13**.

Table 5.8: Summary of the confirmed tree roosts.

Tree	Details of results and roost type
T104	Confirmed as a bat roost, with three common pipistrelles observed emerging during the survey on 17 August 2020. No bats were observed re-entering the tree on the dawn survey carried out on 20 September 2020. Tree T104 is considered a summer day roost used by low numbers of common pipistrelle bats.
T120	Confirmed as a bat roost, with one common pipistrelle observed emerging from the tree during the survey on 24 May 2017. No bats were observed emerging from or re-entering the tree on other surveys carried out on 31 August 2016, 19 May 2017, 10 August 2020, 9 September 2020, and 30 September 2020.

Tree	Details of results and roost type
	Tree T120 is considered to support an occasional summer day roost used by low numbers of common pipistrelle bats.
T124	Confirmed as a bat roost, with two common pipistrelles observed emerging from the tree during the survey on 24 May 2017. No bats were observed emerging from or re-entering the tree on other surveys carried out on 31 August 2016, 13 September 2016, 17 August 2020, 9 September 2020 and 29 September 2020. Tree T124 is considered to support an occasional summer day roost used by low numbers of common pipistrelle bats.
T126	Confirmed as a bat roost with one common pipistrelle observed emerging from the central area of tree during the survey on 24 August 2020. Exact feature was not located due to ivy growth. One common pipistrelle was observed re-entering the tree during the dawn back-tracking survey on 27 August 2020. No bats were observed re-entering the tree on the dawn re-entry surveys on the 15 and 30 September 2020. Tree T126 is considered to support an occasional summer day roost used by low numbers of common pipistrelle bats.

Bat activity transect surveys

5.3.20 Bat activity along each of the five transect routes in 2018, which are illustrated on the Bat Activity Survey Plan in **Appendix I**, is discussed in detail below.

Transect 1

5.3.21 Transect 1 covers the perimeter of Wigmore Park, Wigmore Park Local Wildlife Site (LWS) and the area immediately to the south. During the April survey of this area, no bats were recorded. During surveys in all other months, a limited number of passes from common pipistrelle were recorded, with a single soprano pipistrelle pass recorded in each of the June and July transects. In May, June and September a low number of common pipistrelle were observed foraging above hedges or treelines to the north and east of Wigmore Park.

Transect 2

5.3.22 Transect 2 covers the perimeter of the arable fields and woodland to the west of Winch Hill (including a broadleaved woodland block with ancient woodland indicator species present (but is not listed as ancient woodland) and areas adjacent to the dilapidated residential buildings). Common pipistrelle passes were recorded in low numbers across all months, with infrequent (one or two per survey) pipistrelle sp. and soprano pipistrelle passes. Some brief foraging behaviour was observed near the broadleaved woodland block in April, May and August (during both dusk and dawn transects).

Transect 3

5.3.23 Transect 3 covers the perimeter of the arable fields and pasture to the east of Winch Hill, to the north of (not including) Winch Hill House and associated coniferous plantation woodland. During the April survey of this area, no bats were recorded. During the subsequent surveys, a low level of commuting by common pipistrelle was recorded, with some more prolonged foraging behaviour observed during the May and June transects. Infrequent (one or two per survey) Pipistrelle sp. and soprano pipistrelle passes and a single Myotis sp. pass at 23:08 were noted during the June transect. Throughout all months, several of the 'listening stops', particularly in the north of the area, yielded no bat observations.

Transect 4

5.3.24 Transect 4 covers the perimeter of the arable fields to the south of Winch Hill, on both the east and west of the Winch Hill B-road, bordering the fragment of ancient woodland and sections of the airport. During the first two surveys in April and May, very low numbers of common pipistrelle passes were recorded (less than 10 per survey). In subsequent surveys, low levels of common pipistrelle commuting activity were recorded, and foraging was only recorded during the July and September transects. There were occasional passes by soprano pipistrelle and noctule during the July transect only. A single barbastelle pass was recorded during the September transect (at 19:51), near the treeline which runs immediately north of the runway, however the direction of flight was not observed.

Transect 5

5.3.25 Transect 5 is a linear transect which follows the southern perimeter fencing of the airport, from Luton Airport Parkway to the fragment of ancient woodland at the south of Winch Hill, passing by Someries Castle. Low levels of common pipistrelle and soprano pipistrelle foraging and commuting activity was recorded in all months, mostly concentrated near the woodlands and Someries castle to the south of the Proposed Development. Passes were not observed/bat calls were not recorded along the perimeter of the airport, likely due to high levels of noise and light disturbance.

Static monitoring of bat activity

5.3.26 The assemblage of bat species recorded during static detector surveys comprises at least nine different species. Species/genera recorded (in order of number of bat passes, from high to low in 2018) comprise:

a. common pipistrelle;
b. pipistrelle sp.;
c. soprano pipistrelle;
d. Myotis sp.;
e. noctule;
f. barbastelle;

g. Leisler's bat;
h. brown long-eared bat;
i. Nathusius' pipistrelle; and
j. Serotine.

5.3.27 A summary of the Bat Activity Index (average bat passes per hour) is provided in **Table 5.9**. The locations of static detectors from Location 1 (Loc1) to Location 10 (Loc10) are shown on the Bat Activity Survey Plan in **Appendix I**.

Table 5.9: Overall results of the static bat detector monitoring 2018 and 2021 (all species)

Month	Average Bat Passes/Hour 2018										
	Loc	Loc	Loc3	Loc	Loc5	Loc	Loc	Loc8	Loc9	Loc1	Total
April	0.13	1.16	0.04	0.05	4.95	0.00	0.00	0.67	0.45	0.02	7.47
May	1.69	2.69	78.73	7.62	24.60	0.38	2.09	10.38	25.71	10.53	164.42
June	2.20	3.35	13.69	4.75	16.50	2.70	0.00	17.48	36.23	7.65	104.54
July	18.88	9.52	27.60	0.03	26.16	0.00	6.61	35.60	0.29	16.00	140.69
Aug	4.00	6.15	0.80	0.03	24.53	0.78	1.40	67.93	0.03	1.00	106.73
Sept	52.68	11.14	-	5.00	-	6.70	0.76	-	-	-	76.38
Total	79.58	34.01	120.86*	17.48	96.73*	10.55	10.86	132.05*	62.71*	35.30*	600.13
Month	**Average Bat Passes/Hour 2021**										
	Loc 1	**Loc 2**	**Loc3**	**Loc 4**	**Loc5**	**Loc 6**	**Loc 7**	**Loc8**	**Loc9**	**Loc1 0**	**Total**
April	0.75	1.22	1.02	0.56	0.09	0.00	0.05	1.51	2.02	0.16	7.38
May	0.31	5.93	7.02	1.27	1.72	1.20	7.64	11.84	19.56	7.44	63.94
June	0.93	7.88	26.08	7.38	5.40	10.20	0.95	77.58	55.75	34.90	227.03
July	4.10	19.01	32.99	23.65	10.85	20.83	3.63	41.63	62.61	16.45	231.46
Aug	24.15	13.85	13.55	19.22	22.22	24.58	42.93	64.88**	15.58	31.78	272.71
Sept	39.08	3.46	1.06	13.68	0.00	4.96	0.44	42.30	3.28	7.00	115.26
Oct	0.94	20.69	2.57	0.25	7.42	2.23	0.06	29.04	1.51	1.51	66.21
Total	70.25	72.04	84.28	66.00	47.70	63.99	55.70	268.77**	160.30	99.24	983.98

* Indicates totals including September data, where data is missing due to theft or destruction of detectors
** Indicates totals where data is missing due to data corruption during analysis

5.3.28 May was the month of highest recorded bat passes per hour and April was the month of lowest recorded bat passes per hour in 2018. In 2021, July was the month of highest recorded bat passes per hour and April remained the lowest. In 2018, data from September is not readily comparable to other months however, due to the theft or destruction of bat detectors in three of the ten locations in this month. Locations 3 and 8 generally had the highest levels of bat activity and Locations 6 and 7 had the lowest in 2018. In 2021, Location 8 had the highest level of bat activity, and Locations 5 and 7 had the lowest.

5.3.29 A summary of the bat activity recorded from static detector surveys is described by species below.

Common pipistrelle

5.3.30 Common pipistrelle was recorded widely across the site, with the species present in all locations and all months from April to October (September in 2018). Activity was relatively low, with most recording periods registering around 80 or fewer common pipistrelle average passes per hour (see **Table 5.10** below). Some of these passes may be attributed to foraging bats repeatedly passing the detector, based on the calls recorded and time between recordings. This assumption is also based on the foraging behaviour observed in several locations during transect surveys. The lowest common pipistrelle activity at any location was zero and the highest was 65.75 average passes per hour, which was recorded in August at Location 8 (immediately north of the runway, adjacent to the ancient woodland block) in 2018 and 76.70 passes per hour recorded in June at Location 8. Other notable periods of activity in 2018 included 65.51 average passes per hour in August at Location 3 (north of the runway, between Wigmore Park and Winch Hill) and 51.96 average passes per hour in September at Location 1 (in Wigmore Park, near the Pillbox). In 2021, notable periods of activity included 62.23 average passes per hour in August at Location 8, 61.79 average passes per hour in July and 53.75 average passes per hour in June at Location 9 (in the southeast of the site).

Table 5.10: Average bat passes per hour for common pipistrelle in 2018 and 2021

Month	Average Passes/Hour 2018									
	Loc1	Loc2	Loc3	Loc4	Loc5	Loc6	Loc7	Loc8	Loc9	Loc10
April	0.13	1.16	0.04	0.05	4.89	0.00	0.00	0.65	0.45	0.02
May	1.40	2.53	65.51	5.89	19.11	0.38	0.11	9.27	23.20	9.42
June	1.48	3.08	10.73	41.5	11.58	2.43	0.00	14.93	28.83	5.08
July	1.64	8.32	24.13	0.03	22.99	0.00	6.16	33.73	0.16	9.71
Aug	2.85	3.68	0.50	0.03	23.18	0.38	1.05	65.75	0.00	0.73
Sept	51.96	9.66	-	4.70	-	6.12	0.00	-	-	0.08
Month	**Average Passes/Hour 2021**									
	Loc1	**Loc2**	**Loc3**	**Loc4**	**Loc5**	**Loc6**	**Loc7**	**Loc8**	**Loc9**	**Loc10**
April	0.74	1.18	1.02	0.55	0.09	0.00	0.02	1.34	1.78	0.09
May	0.24	5.69	6.96	1.27	1.61	1.16	6.27	10.71	18.83	7.22

June	0.90	7.18	22.78	7.05	5.15	10.15	0.95	76.70	53.75	33.00
July	3.63	18.61	30.48	23.57	10.77	20.24	3.25	39.33	61.79	11.84
Aug	22.68	12.98	13.08	17.00	21.41	23.13	42.55	62.23	13.58	14.53
Sept	26.5	3.24	1.04	12.78	0.00	4.70	0.40	41.76	2.88	3.02
Oct	0.91	20.58	2.15	0.23	7.23	1.89	0.06	24.60	0.05	0.05

Pipistrelle sp.

5.3.31 Pipistrelle sp. (bats which cannot be distinguished as either common pipistrelle or soprano pipistrelle due to peak frequency overlap) were recorded across the site, in all months, with very low levels of activity (see **Table 5.11** below). These results should be considered in combination with the common pipistrelle and soprano pipistrelle results, however the average number of Pipistrelle sp. passes per night does not have a significant impact on the classification of activity level for either species since the values are mostly near zero and the maximum is low at 10.60 passes per hour (May 2018, Location 3 – situated in the north of the site, between Wigmore and Winch Hill).

Table 5.11: Average bat passes per hour for Pipistrelle sp. in 2018 and 2021

Month	**Average Passes/Hour 2018**									
	Loc1	**Loc2**	**Loc3**	**Loc4**	**Loc5**	**Loc6**	**Loc7**	**Loc8**	**Loc9**	**Loc10**
April	0.00	0.00	0.00	0.00	0.05	0.00	0.00	0.00	0.00	0.00
May	0.29	0.07	10.60	1.1	4.42	0.00	1.91	0.98	2.33	1.04
June	0.68	0.13	2.66	0.48	3.78	0.05	0.00	1.50	6.08	0.65
July	1.87	0.93	2.77	0.00	2.03	0.00	0.13	1.52	0.13	1.15
Aug	0.80	0.78	0.23	0.00	0.53	0.05	0.00	1.05	0.00	0.10
Sept	0.60	1.06	-	0.28	-	0.00	0.04	-	-	0.02
Month	**Average Passes/Hour 2021**									
	Loc1	**Loc2**	**Loc3**	**Loc4**	**Loc5**	**Loc6**	**Loc7**	**Loc8**	**Loc9**	**Loc10**
April	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
May	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.09	0.00	0.00
June	0.00	0.55	2.98	0.00	0.03	0.00	0.00	0.13	0.03	0.00
July	0.07	0.00	0.00	0.00	0.00	0.03	0.00	0.13	0.40	1.33
Aug	0.03	0.00	0.00	0.06	0.00	0.00	0.00	0.00	0.00	0.00
Sept	0.04	0.06	0.00	0.06	0.00	0.06	0.00	0.08	0.01	1.08
Oct	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.06	0.06

Soprano pipistrelle

5.3.32 Soprano pipistrelle activity was recorded across the site from May to September with very low levels of activity (see **Table 5.12** below). Soprano pipistrelle were not recorded at any locations in April, with the exception of Location 9 (in the south east of the site) in 2021. Activity was very low, with average number of

passes per hour ranging from zero to 11.70, recorded in August 2021 at Location 10 (south west of the runway).

Table 5.12: Average bat passes per hour for soprano pipistrelle in 2018 and 2021

Month	Average Passes/Hour 2018									
	Loc1	Loc2	Loc3	Loc4	Loc5	Loc6	Loc7	Loc8	Loc9	Loc10
April	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
May	0.00	0.00	2.60	4.53	0.96	0.00	0.00	0.11	0.16	0.07
June	0.05	0.05	0.25	0.13	1.10	0.10	0.00	0.45	1.33	1.93
July	0.35	0.21	0.67	0.00	0.83	0.00	0.21	0.29	0.00	4.96
Aug	0.13	0.10	0.05	0.00	0.53	0.00	0.00	0.58	0.00	0.13
Sept	0.04	0.02	-	0.00	-	0.08	0.22	-	-	0.00
Month	**Average Passes/Hour 2021**									
	Loc1	**Loc2**	**Loc3**	**Loc4**	**Loc5**	**Loc6**	**Loc7**	**Loc8**	**Loc9**	**Loc10**
April	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.00
May	0.00	0.00	0.00	0.00	0.00	0.00	0.18	0.56	0.67	0.11
June	0.00	0.05	0.15	0.03	0.00	0.00	0.00	0.40	1.93	1.75
July	0.07	0.08	0.03	0.03	0.05	0.05	0.00	0.16	0.24	2.45
Aug	0.2	0.20	0.00	0.16	0.06	0.48	0.03	2.03	0.43	11.70
Sept	12.45	0.14	0.02	0.76	0.00	0.12	0.04	0.36	0.16	2.50
Oct	0.00	0.05	0.00	0.00	0.00	0.03	0.00	4.06	1.4	1.40

Myotis sp.

5.3.33 Myotis sp. bats were recorded across the site from May to September with very low levels of activity (see **Table 5.13** below). Myotis sp. were not recorded at any locations in April in 2018 and only at Location 8 and Location 9 (immediately north of the runway, adjacent to the ancient woodland block, and in the south east of the site respectively) in 2021. Activity was limited, with the average number of passes per hour ranging from zero to 0.32 (July 2018, Location 5 – Winch Hill).

Table 5.13: Average bat passes per hour for Myotis sp. in 2018 and 2021

Month	Average Passes/Hour 2018									
	Loc1	Loc2	Loc3	Loc4	Loc5	Loc6	Loc7	Loc8	Loc9	Loc10
April	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
May	0.00	0.00	0.02	0.00	0.07	0.00	0.07	0.02	0.02	0.00
June	0.00	0.00	0.03	0.00	0.05	0.00	0.00	0.03	0.00	0.00
July	0.00	0.00	0.03	0.00	0.32	0.00	0.05	0.00	0.00	0.05
Aug	0.10	0.20	0.03	0.00	0.30	0.15	0.10	0.18	0.03	0.05
Sept	0.02	0.06	-	0.02	-	0.18	0.20	-	-	0.00
Month	**Average Passes/Hour 2021**									

	Loc1	Loc2	Loc3	Loc4	Loc5	Loc6	Loc7	Loc8	Loc9	Loc10
April	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.11	0.04	0.00
May	0.02	0.00	0.02	0.00	0.00	0.04	0.53	0.02	0.00	0.02
June	0.00	0.00	0.08	0.03	0.00	0.00	0.00	0.00	0.00	0.00
July	0.00	0.00	0.00	0.00	0.03	0.05	0.00	0.00	0.00	0.13
Aug	0.00	0.00	0.08	0.19	0.22	0.13	0.00	0.03	0.15	0.23
Sept	0.04	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.14	0.22
Oct	0.03	0.00	0.05	0.02	0.03	0.02	0.00	0.00	0.00	0.00

Nyctalus sp.

5.3.34 Nyctalus sp. bats were recorded across the site, with the exception of Location 9 (2018 only, in the south east of the site) (see **Table 5.14** below). Nyctalus sp. were recorded in all months from April to October (September 2018) with very low levels of activity. The highest levels of activity were concentrated to the east of the runway at Location 8 in both 2018 and 2021, with the average number of passes per hour reaching 1.84 in 2021 (See **Table 5.14** below).

Table 5.14: Average bat passes per hour for Nyctalus sp. in 2018 and 2021

Month	Average Passes/Hour 2018									
	Loc1	Loc2	Loc3	Loc4	Loc5	Loc6	Loc7	Loc8	Loc9	Loc10
April	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00
May	0.00	0.00	0.00	0.07	0.02	0.00	0.00	0.00	0.00	0.00
June	0.00	0.03	0.03	0.00	0.00	0.10	0.00	0.58	0.00	0.00
July	0.03	0.05	0.00	0.00	0.00	0.00	0.05	0.05	0.00	0.13
Aug	0.13	0.75	0.00	0.00	0.00	0.18	0.20	0.38	0.00	0.00
Sept	0.06	0.22	-	0.00	-	0.04	0.16	-	-	0.00
Month	**Average Passes/Hour 2021**									
	Loc1	Loc2	Loc3	Loc4	Loc5	Loc6	Loc7	Loc8	Loc9	Loc10
April	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.07
May	0.04	0.07	0.04	0.00	0.00	0.00	0.00	0.31	0.00	0.07
June	0.03	0.10	0.05	0.23	0.20	0.05	0.00	0.35	0.05	0.08
July	0.20	0.21	0.53	0.03	0.00	0.40	0.29	1.84	0.19	0.56
Aug	1.00	0.60	0.38	1.50	0.31	0.25	0.33	0.40	0.38	4.80
Sept	0.04	0.00	0.00	0.04	0.00	0.02	0.00	0.04	0.00	0.10
Oct	0.00	0.02	0.37	0.00	0.02	0.00	0.00	0.19	0.00	0.00

Barbastelle

5.3.35 Barbastelle activity was recorded sporadically in May, June, August and September at locations 2, 6 and 7 in 2018 (see **Table 5.15** below). In 2021, barbastelle activity was recorded sporadically in all months at almost all locations (see **Table 5.15**). There was a very low level of activity, with average

number of passes per hour ranging from zero to 0.62 (August 2018, Location 2 – situated south of Wigmore Park and north of the runway). During the August recording period at Location 2, the number of actual barbastelle passes varied between zero and ten each night, indicating a low number of bats passing briefly through the area. The timing of barbastelle passes did not correspond to expected barbastelle emergence times, therefore it is not anticipated that barbastelle are likely to be emerging from nearby roosts.

Table 5.15: Average bat passes per hour for barbastelle in 2018 and 2021

Month	Average Passes/Hour 2018									
	Loc1	Loc2	Loc3	Loc4	Loc5	Loc6	Loc7	Loc8	Loc9	Loc10
April	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
May	0.00	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
June	0.00	0.05	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.00
July	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Aug	0.00	0.65	0.00	0.00	0.00	0.03	0.03	0.00	0.00	0.00
Sept	0.00	0.12	-	0.00	-	0.22	0.06	-	-	0.00
Month	**Average Passes/Hour 2021**									
	Loc1	**Loc2**	**Loc3**	**Loc4**	**Loc5**	**Loc6**	**Loc7**	**Loc8**	**Loc9**	**Loc10**
April	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.05	0.00	0.00
May	0.00	0.18	0.00	0.00	0.11	0.00	0.00	0.07	0.03	0.02
June	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.08
July	0.00	0.00	0.00	0.03	0.00	0.03	0.00	0.00	0.00	0.13
Aug	0.13	0.00	0.00	0.03	0.06	0.43	0.00	0.05	0.93	0.30
Sept	0.00	0.00	0.00	0.04	0.00	0.02	0.00	0.00	0.00	0.08
Oct	0.00	0.05	0.00	0.00	0.09	0.29	0.00	0.12	0.00	0.00

Brown long-eared bat

5.3.36 Brown long-eared bat was recorded sporadically in May, June and September in 2018 at locations 2 (south of Wigmore Park and north of the runway), 4, 6 and 7 (all within the east of the site) (see **Table 5.16** below). In 2021, brown long-eared bat was recorded sporadically in all months except April, and at all locations (see **Table 5.16** below). There was a very low level of activity in 2018, with average number of passes per hour ranging from zero to 0.06 in September (at Locations 6 and 7, east of the runway). Activity levels were marginally higher in 2021 with the average number of passes per hour ranging from 0 to 1.84 in July (at Location 3 situated in the north of the site, between Wigmore and Winch Hill). The highest number of passes on any given night was 26.

Table 5.16: Average bat passes per hour for brown long-eared bat in 2018 and 2021

Month	Average Passes/Hour 2018									
	Loc1	Loc2	Loc3	Loc4	Loc5	Loc6	Loc7	Loc8	Loc9	Loc10
April	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
May	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00
June	0.00	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
July	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Aug	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sept	0.00	0.00	-	0.00	-	0.06	0.06	-	-	0.00
Month	**Average Passes/Hour 2021**									
	Loc1	**Loc2**	**Loc3**	**Loc4**	**Loc5**	**Loc6**	**Loc7**	**Loc8**	**Loc9**	**Loc10**
April	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
May	0.00	0.00	0.00	0.00	0.00	0.00	0.67	0.09	0.03	0.00
June	0.00	0.00	0.05	0.05	0.00	0.00	0.00	0.00	0.00	0.00
July	0.00	0.03	1.84	0.00	0.00	0.03	0.05	0.05	0.00	0.00
Aug	0.05	0.08	0.03	0.28	0.16	0.18	0.00	0.00	0.13	0.18
Sept	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Oct	0.00	0.00	0.00	0.00	0.05	0.00	0.00	0.02	0.00	0.00

Nathusius' pipistrelle

5.3.37 In 2018, Nathusius' pipistrelle was recorded once in May and once in September, at locations 5 (Winch Hill) and 7 (east of the runway) respectively (see **Table 5.17** below). In 2021, Nathusius' pipistrelle was recorded four times in July at location 3 (situated in the north of the site, between Wigmore and Winch Hill), three times in July at Location 2 (south of Wigmore Park and north of the runway), twice in April at Location 7 (east of the runway), and once at location 6 (east of the runway) in September and once at Location 8 (immediately north of the runway, adjacent to the ancient woodland block) in September and October (See **Table 5.17**).

Table 5.17: Average bat passes per hour for Nathusius' pipistrelle in 2018 and 2021

Month	Average Passes/Hour 2018									
	Loc1	Loc2	Loc3	Loc4	Loc5	Loc6	Loc7	Loc8	Loc9	Loc10
April	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
May	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00
June	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
July	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Aug	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sept	0.00	0.00	-	0.00	-	0.00	0.02	-	-	0.00
Month	**Average Passes/Hour 2021**									

	Loc1	Loc2	Loc3	Loc4	Loc5	Loc6	Loc7	Loc8	Loc9	Loc10
April	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.00	0.00	0.00
May	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
June	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
July	0.00	0.08	0.11	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Aug	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sept	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.02	0.00	0.00
Oct	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00

Serotine

5.3.38 Serotine was recorded once in 2018, in August at location 7 (east of the runway) (see **Table 5.18** below). Serotine was recorded in July and August in 2021, at locations 1, 7,8 and 10.

Table 5.18: Average bat passes per hour for Serotine in 2018 and 2021

Month	Average Passes/Hour 2018									
	Loc1	Loc2	Loc3	Loc4	Loc5	Loc6	Loc7	Loc8	Loc9	Loc10
April	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
May	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
June	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
July	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Aug	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.00
Sept	0.00	0.00	-	0.00	-	0.00	0.00	-	-	0.00
Month	**Average Passes/Hour 2021**									
	Loc1	Loc2	Loc3	Loc4	Loc5	Loc6	Loc7	Loc8	Loc9	Loc10
April	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
May	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
June	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
July	0.12	0.00	0.00	0.00	0.00	0.00	0.03	0.11	0.00	0.00
Aug	0.08	0.00	0.00	0.00	0.00	0.00	0.03	0.15	0.00	0.05
Sept	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.00	0.00
Oct	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Bat back-tracking surveys

5.3.39 During the dawn back-tracking survey carried out at the conifer and broadleaf ridgeline woodland, one common pipistrelle was successfully tracked back to its roost in tree T126, on the western edge of the conifer woodland. Common pipistrelles were recorded by all surveyors positioned around the woodland, with observations of bats foraging along the woodland edges, and flying and foraging inside the woodland.

5.3.40 No bat roosts were found during the dawn back-tracking survey carried out in the ancient woodland (Winch Hill Wood). Common pipistrelles and noctule bats were recorded by three of the four surveyors during the survey, with few observational notes of foraging of common pipistrelles along the lane to the eastern side of the woodland.

Bat trapping surveys

5.3.41 Low numbers of bats were recorded during both trapping surveys, with a peak count of four bats on 29 August 2018. Species diversity was also low with only two common bat species encountered, common pipistrelle and brown long-eared, as detailed in **Tables 5.19** and **5.20** below.

Table 5.19: Bat trapping survey results for 04 July 2018

Time	Species	Sex	Age	Forearm (mm)	Weight (g)	Breeding Status	Notes
23:26	Common pipistrelle	Female	Juvenile	32.1	5	Non-breeding	Caught in harp trap within ridgeline woodland
00:47	Common pipistrelle	Male	Adult	32.3	5.5	Breeding	Caught in harp trap within ridgeline woodland

Table 5.20: Bat trapping survey results for 29 August 2018

Time	Species	Sex	Age	Forearm (mm)	Weight (g)	Breeding Status	Notes
21:13	Brown long-eared	Male	Adult	36.7	11.5	Non-breeding	Caught in harp trap within ancient woodland
21:25	Common pipistrelle	Female	Juvenile	31.7	5	Non-breeding	Caught in harp trap within ridgeline woodland
21:35	Common pipistrelle	Male	Juvenile	30	5.2	Non-breeding	Caught in harp trap within ancient woodland

Time	Species	Sex	Age	Forearm (mm)	Weight (g)	Breeding Status	Notes
00:29	Brown long-eared	Female	Adult	39	11	Breeding	Caught in harp trap within ancient woodland

Summary of results

A summary of the bat species recorded within the study area is provided in **Table 5.21** below.

Table 5.21: Bat species recorded within study area during surveys

Species	Desk study records	Recorded during active (emergence and transect) surveys?	Recorded during passive (static detector) surveys?	Confirmed roosts within the study area?
Common pipistrelle	Bats in flight; no known roosts	Yes	Yes	Yes
Soprano pipistrelle	None	Yes	Yes	No
Myotis sp.	None	Yes	Yes	No
Noctule	None	Yes	Yes	No
Barbastelle	None	Yes	Yes	No
Leisler's bat	None	No	Yes	No
Brown long-eared bat	None	Yes	Yes	No
Nathusius' pipistrelle	None	No	Yes	No
Serotine	None	No	Yes	No

5.3.42 **Table 5.22** provides an indication of the roost potential on and near to the site for each species recorded, based on existing records of roosts obtained through the desk study, the presence of suitable roost features, and the amount of time before or after sunset that bats were first recorded (then considered against published average emergence times in BCT guidelines (Ref. 36).

Table 5.22: Site/nearby roost potential and contributing factors or evidence

Species	Suitable roost features present on site	Earliest record (time from sunset in hr.min)	Nearby roost potential (not necessarily on-site)
Common pipistrelle	Trees of varying roost potential on site. Four known summer day roosts (T104, T120, T124 and T126). Few buildings on site but greater number of potentially suitable buildings in the wider landscape. Two known summer day roosts (B001 and B005).	-0.20	Moderate number of roosts likely, including six known roosts – T104, T120, T124, T126, B001 and B005.
Soprano pipistrelle	Trees of varying roost potential on site. Few buildings on site but greater number of potentially suitable buildings in the wider landscape.	+0.04	Potential for Small number of roosts.
Myotis sp.	Trees of varying roost potential on site. Few buildings on site but greater number of potentially suitable buildings in the wider landscape.	+0.58	Potential for Small number of roosts.
Noctule	Trees of varying roost potential on site.	+0.13	Potential for Small number of roosts.
Barbastelle	Trees of varying roost potential on site.	+0.24	Potential for Small number of roosts.
Leisler's bat	Trees of varying roost potential on site. Few buildings on site but greater number of potentially suitable buildings in the wider landscape.	+0.28	Potential for Small number of roosts.
Brown long-eared bat	Few buildings on site but greater number of potentially suitable buildings in the wider landscape.	+1.21	Potential for Small number of roosts.
Nathusius' pipistrelle	Trees of varying roost potential on site. Few buildings on site but greater number of potentially suitable buildings in the wider landscape.	+0.18	Potential for Small number of roosts.
Serotine	Few buildings on site but greater number of potentially suitable buildings in the wider landscape.	+7.25	None likely.

5.3.43 The Bat Activity Index from static surveys is used, together with data from activity transect surveys, to guide determination of activity scores modified from Wray et al. (2007) (Ref. 38) (see the Bat/Site Evaluation System in **Appendix J**) which are in turn used to assess the value of the site for each species recorded (see **Table 5.23**).

Table 5.23: Site/species valuations modified from Wray et al. (2007) (Ref. 38)

Species	National rarity	Activity	Site/Near by roost potential	Type/ complexity of linear features	Total score	Value
Common pipistrelle	2	10	4	3	19	District, Local or Parish
Soprano pipistrelle	2	10	3	3	18	District, Local or Parish
Myotis sp.*	5	5	3	3	16	District, Local or Parish
Noctule	5	5	3	3	16	District, Local or Parish
Barbastelle	5	5	3	3	16	District, Local or Parish
Leisler's bat	5	5	3	3	16	District, Local or Parish
Brown long-eared bat	2	5	3	3	13	District, Local or Parish
Nathusius' pipistrelle	5	5	3	3	16	District, Local or Parish
Serotine	5	5	1	3	14	District, Local or Parish

*Score based on the rarer Myotis species – it is unlikely that any of the Myotis records are Bechstein's based on the habitats present on site which are largely sub-optimal for the species.

5.4 Conclusions and recommendations

5.4.1 Two building roosts and four tree roosts were found to be present within the study area.

5.4.2 Both of the building roosts (The Pillbox and Winch Hill Cottage (2)) are considered to be summer roosts for small numbers of common pipistrelle. Hibernation potential at Winch Hill Cottage (2) cannot be ruled out due to it not being possible to carry out an internal inspection. However, this building will not be directly impacted by the Proposed Development.

5.4.3 All tree roosts found are considered to be summer day roosts and should be retained where possible. If loss of a roost is unavoidable, a licence from Natural England will be needed to permit its loss. This would fall within the scope of the Natural England Bat Low Impact Class Licence (BLICL) because all roosts observed were used by low numbers of common pipistrelle bats and therefore of low conservation significance.

5.4.4 Update surveys would be required prior to the commencement of any works, including vegetation clearance, which should include an update assessment of potential roost features where trees and buildings are likely to be impacted.

5.4.5 At least nine species of bat utilise habitats found within the study area, including four UK Priority species (noctule, soprano pipistrelle, brown long-eared bat and barbastelle). It is possible that Bechstein's bat was detected, within records of Myotis species, however this is unlikely due to this species' specific habitat needs.

5.4.6 Most activity was from common pipistrelle, which was the only species confirmed as roosting onsite, recorded commuting and foraging widely across the site. Higher levels of activity were concentrated near existing features with mature vegetation, such as the woodland blocks adjacent to Winch Hill and Wigmore Park. There was very low bat activity in the areas bordering the airport runway, particularly to the south and east. Whilst common pipistrelle was the most commonly recorded species, overall the activity level for this species was relatively low across all months surveyed, when compared to the authors' knowledge of sites of a similar size and habitat type.

5.4.7 Taking the results of the activity transect surveys, static detector surveys and incidental observations during the bat emergence/re-entry surveys, the levels of activity from other species is considered to be very low. There is no indication that the site offers an important foraging resource for bats or supports well used commuting routes.

5.4.8 Barbastelle is the most significant species recorded in terms of conservation interest, as an Annex II species, but it was only recorded once and is therefore unlikely to be present in large numbers. The results confirm that barbastelle occur locally, however neither the surveys nor the assessment of habitats present suggest that the site provides a valuable or key habitat resource for this species.

6 HAZEL DORMOUSE

6.1 Introduction

6.1.1 This section sets out the methodology and results of the hazel dormouse survey work undertaken in relation to the Proposed Development during 2018.

Study area

6.1.2 The study area of the Hazel Dormouse Survey is limited to the Main Application Site as habitats within the highway intervention works and car park locations are not considered suitable for hazel dormice and were therefore scoped out of further survey.

6.1.3 The study area covered all areas of suitable habitat, primarily woodland blocks and associated scrub, set within the largely arable context to the east of the Main Application Site.

6.1.4 A Dormouse Survey Plan is included within **Appendix K** and this should be referenced in the reading of this section.

Survey scope

6.1.5 A series of hazel dormouse surveys were undertaken between May to November 2018.

6.1.6 The objectives of the survey were to:

a. undertake a desk-based review of hazel dormouse records within 2km of the Main Application Site to identify those that may be relevant to the development proposals;

b. undertake a desk-based review of all suitable woodlands with connectivity to the study area to determine whether habitats within the site could potentially support hazel dormice that would be relevant to the development proposals;

c. determine the presence or absence of hazel dormouse in suitable habitats within the study area; and

d. provide sufficient information to inform an assessment of the potential impacts to hazel dormice as a result of the Proposed Development.

e. Provide sufficient information to inform an assessment of the potential impacts on hazel dormouse as a result of the Proposed Development and allow the design of appropriate mitigation measures (where appropriate).

Legislation and local biodiversity context

6.1.7 The hazel dormouse is fully protected under the Wildlife and Countryside Act 1981 (as amended) (Ref. 5) and The Conservation of Species and Habitats Regulations 2017 (as amended) (Ref.34), making it an offence to:

a. Deliberately capture, injure or kill a dormouse;

b. Damage, destroy or obstruct access to any breeding site or resting place of a dormouse;

c. Deliberately or recklessly disturb a hazel dormouse while it's in a structure or place of shelter or protection; and

d. Possess, sell, control or transport live or dead hazel dormice, or parts of hazel dormice.

6.1.8 Hazel dormouse is also a species of principal importance for the purpose of conserving biodiversity in England, listed in accordance with the provisions of Section 41 of the Natural Environment and Rural Communities (NERC) Act 2006 (Ref.7). Section 40 of the same Act requires that planning authorities have regard to the conservation of biodiversity in England, when carrying out their normal functions. The hazel dormouse is listed on the Bedfordshire and Luton and Hertfordshire Local Biodiversity Action Plans (LBAPs).

6.2 Methodology

Desk study

6.2.1 A desk study exercise was undertaken in February 2018 (and updated in June 2022), which incorporated a 'scoping' exercise and a records search.

6.2.2 The scoping exercise involved a review of Ordnance Survey maps and online aerial mapping resources to identify woodlands within the study area and those within the surrounding landscape that are connected to the study area by a network of hedgerows. Broadleaved woodlands in excess of 20ha are generally considered optimal for supporting a viable population of hazel dormice, however hedgerows and smaller woodlands are able to support viable populations of dormice if they are well connected to other habitats that offer a food source and shelter throughout the year (Ref. 39).

6.2.3 A records search was conducted to obtain existing records of legally protected and notable species, including hazel dormouse. Species records within 2km of the Main Application Site were requested from the Bedfordshire and Luton Biological Recording and Monitoring Centre (BRMC). Where portions of the study area fell within the Hertfordshire county boundary, these records were returned from the Herts Environmental Records Centre (HERC). This exercise was repeated in November 2020 to capture any additional records.

6.2.4 No limit was placed on the age of the records.

Field survey

Habitat Assessment

6.2.5 A site walkover was undertaken in April 2018 by an experienced ecologist to identify any habitats within the Proposed Development site that would be suitable to support hazel dormice.

Feeding Remains/Nut search

6.2.6 Hazel dormice have a varied diet but feed predominantly on nuts such as hazel nuts or acorns when they are available, dropping the shells onto the ground as they feed. Nuts, pits and fruit stones which have been eaten by hazel dormice are distinguishable from those eaten by other rodents due to the markings left on the discarded shell. By searching for feeding remains beneath fruiting trees and analysing the tooth marks on nut shells, the presence of hazel dormice can be confirmed, although the method cannot reliably confirm the absence of dormice (Ref. 40).

6.2.7 Nut search surveys were carried out within Winch Hill Wood and the linear 'ridgeline' woodland immediately to the west of Winch Hill, both within the Main Application Site. The locations of the woodlands where nut searches were undertaken is shown on the Dormouse Survey Plan within **Appendix K**.

6.2.8 The initial nut search survey in May 2018 was not undertaken at the optimal time of year. Nut search surveys can be undertaken at any time of year; however the optimal period to undertake a search for distinctively gnawed nuts is when hazelnuts are fresh from mid-August to end-December (Ref. 39). In this instance an additional nut search was undertaken alongside surveys in September 2018 (within the optimal period) to increase the chances of successfully finding gnawed nuts.

Nest Tube/Box Survey

6.2.9 Hazel dormice naturally nest within tree cavities or in hedgerows and scrub but will readily nest within artificial hollows provided by nest tubes or boxes deployed within their habitat.

6.2.10 Nest tubes and nest boxes were deployed within suitable hedgerow, woodland and scrub in two wooded habitat sections, one in the central woodland west of the cottages at Winch Hill, and the other was along the northern airport boundary connecting to Winch Hill wood, as shown on the Dormouse Survey Plan in **Appendix K**. Nest tubes were placed every 10m to 15m according to best practice methodology (Ref. 40) by experienced dormouse surveyors. Fifteen nest boxes were also deployed within areas of woodland to provide alternative nesting opportunities.

6.2.11 Best practice methodology (Ref. 39) describes an index of probability dictating sufficient survey effort which should be undertaken to confidently detect dormice/assume absence on a site where a minimum of 50 dormouse tubes have been installed, whereby set scores are awarded for each month of survey as shown in **Table 6.1**.

6.2.12 The indices awarded for a single survey in each month should be added up for a total index of probability of detecting dormice. Assumed absence should not be based on a search effort score of less than 20, so nest tube surveys should aim to equal or exceed this score.

Table 6.1: Index of probability from Dormouse Conservation Handbook (Ref. 39)

Month	Index of probability
April	1
May	4
June	2
July	2
August	5
September	7
October	2
November	2

6.2.13 In total, 95 nest tubes and 15 nest boxes were installed on 26 and 27 April and 3 and 4 May 2018 within the habitats of the Main Application Site which were assessed as likely to support dormice. Survey visits to check for evidence of dormice were undertaken once per month between May and November 2018 as detailed in **Table 6.2** below.

Table 6.2: Dates of dormouse survey visits (2018)

Visit number	Date	Survey type
1	22/05/2018	Nut search Nest tube/nest box survey
2	27/06/2018	Nest tube/nest box survey
3	25/07/2018	Nest tube/nest box survey
4	22/08/2018	Nest tube/nest box survey
5	25/09/2018	Nut search Nest tube/nest box survey
6	24/10/2018	Nest tube/nest box survey
7	20/11/2018	Nest tube/nest box survey

6.2.14 Excluding nest boxes and accounting for the loss and damage to a small number of nest tubes throughout the survey (as detailed under survey limitations below), it is considered that a search effort score of 24 was achieved.

Survey limitations

6.2.15 Individual nest tubes were found to be missing inserts, damaged or were lost entirely to dense summer vegetation growth from injurious plants such as bramble and nettle scrub. The highest number of lost and/or damaged nest tubes was recorded in May 2018, with seven tubes subject to vandalism. These were all replaced during the survey and relocated in more discreet locations. These tubes or inserts were replaced during the next survey visit. The loss and/or damage of these tubes was factored into calculation of the search effort score,

which exceeded the minimum score of 20 required to align with best practice guidance (Ref. 39).

6.3 Results

Desk study

6.3.1 Analysis of aerial imagery confirmed that the study area comprises of small parcels of woodland, interconnected by linear woodland and hedgerows. The Main Application Site supports small semi-natural broadleaved and plantation woodlands, areas of scrub and hedgerows that have some connectivity to the network of hedgerows and woodlands within the wider landscape. These habitats have the potential to support hazel dormice, however it is noted that the wider landscape comprises intensively managed arable land and many of the hedgerows within the network are gappy and heavily flailed. This may limit the ability of any hazel dormice present to disperse across the landscape and colonise new habitats.

6.3.2 The offsite car park areas do not support habitats that have suitable connectivity to the larger woodlands, or hedgerow networks, within the wider landscape and are therefore not considered suitable for supporting populations of hazel dormouse. These areas were not subject to further survey for hazel dormouse.

6.3.3 There were two records of hazel dormouse in the Hertfordshire area. The first was recorded from 1995 to the 1km square, located adjacent to the study area to the east and the other from 1996 for over 1km to the south east.

6.3.4 There were no records of hazel dormouse in the Bedfordshire and Luton area and no nearby re-introduction sites.

Field survey

Habitat Assessment

6.3.5 The main areas of potential hazel dormouse habitat within the study area were the central woodland blocks and the linear woodland boundary of the farmland and Luton Airport leading to Winch Hill Wood CWS.

6.3.6 These areas of semi-natural broadleaved woodland comprised of predominately pedunculate oak (*Quercus robur*), occasional sycamore (*Acer pseudoplatanus*) and self-seeded ash (*Fraxinus excelsior*). The scrub interspersed or at the edge of the woodland comprised of blackthorn (*Prunus spinosa*), hawthorn (*Crataegous monogyna*) and bramble (*Rubus agg*). These areas are illustrated by Photograph 5 within **Section 13**.

6.3.7 The scrub to the north west of Wigmore Park is comprised of mainly ornamental shrubs which were assessed as unsuitable for hazel dormouse.

6.3.8 Potentially suitable habitats within the farmland across the rest of the study area comprised of islands of scrub habitat and defunct hedgerows which offer limited suitability for dormice due to their poor connectivity. While dormice will cross gaps including active highways (Ref. 41) and open fields, this is likely to be where optimal dormouse habitat is limited and exists either side of the gap.

Dormice have been shown to be unlikely to descend to ground level to cross gaps of a few metres, preferring instead to take substantial detours to avoid doing so (Ref. 42,43).

Feeding Remains/Nut Search

6.3.9 Hazel nuts were found throughout the woodland blocks. Feeding remains from wood mouse and grey squirrel were identified. No hazel dormouse feeding remains were found during the survey.

Nest Tube Survey

6.3.10 No evidence of hazel dormouse was found during the survey period.

6.3.11 A wood mouse (*Apodemus sylvaticus*) nest was found in a nest box during October 2018, located within Winch Hill Wood CWS.

6.4 Conclusions and recommendations

6.4.1 No evidence of hazel dormouse presence was detected during the survey period and for the purpose of the environmental impact assessment this species is considered likely absent from the Main Application Site.

6.4.2 Wood mouse were recorded using Winch Hill Wood in October 2018, demonstrating the existing value of these wooded habitats on site to semi-arboreal mammals.

6.4.3 An update presence/absence survey would be required prior to the commencement of any works, including vegetation clearance, to reconfirm the likely absence of this species from the Main Application Site.

7 RIPARIAN MAMMALS

7.1 Introduction

7.1.1 This section sets out the methodology and results of specific riparian mammal survey work undertaken in relation to the Proposed Development during 2019 and 2022.

Study area

7.1.2 The study area of the Riparian Mammal Survey covers waterbodies and watercourses within 250m of the Proposed Development boundary. Within the Main Application Site, there are no waterbodies or watercourses of suitable size or connectivity for supporting riparian mammals. However, highway interventions in the Luton and Hitchin areas are located within close proximity to watercourses. These watercourses have the potential to be impacted by the Proposed Development and therefore form the study area for the riparian mammal surveys.

7.1.3 A Riparian Mammal Survey Area Plan is included within **Appendix L**, a Riparian Mammal Habitat Assessment Plan is provided at **Appendix M** and an Otter Survey Plan is provided at **Appendix N**. These should be referenced in the reading of this section.

Survey scope

7.1.4 A series of otter and water vole surveys were undertaken in June and July 2019, with a repeat visit in September 2019. A ground truthing exercise was undertaken in July 2022 to determine if the habitat suitability assessments remained valid, further presence and absence surveys were then undertaken In July and September 2022 on those watercourses with moderate to high potential support otter or water vole.

7.1.5 The objectives of the surveys were to:

a. undertake a desk-based review of riparian mammal records within 2km of the Main Application Site to identify those that may be relevant to the development proposals;

b. assess the suitability of the watercourses within the study area to support populations of riparian mammals;

c. determine the presence or absence of riparian mammals on watercourses within the study area; and

d. provide sufficient information to inform an assessment of the potential impacts to riparian mammals as a result of the Proposed Development and allow the design of appropriate mitigation measures (where appropriate).

Legislation and local biodiversity context

7.1.6 Otter and sites that they use for breeding or shelter are afforded protection through the provisions of the Wildlife and Countryside Act 1981 (as amended)

(Ref. 5), and The Conservation of Habitats and Species Regulations 2017 (as amended) (Ref.34). It is an offence, without a licence from Natural England to:

a. kill, injure or capture an otter; or

b. damage, destroy or obstruct access to any otter breeding or resting site.

7.1.7 Water vole is afforded legal protection through provisions in the Wildlife and Countryside Act 1981 (as amended) (Ref. 5) and the CRoW Act 2000 (Ref. 6). It is an offence to kill or injure water voles, and to damage, destroy or obstruct access to any place that water vole use for shelter or protection, or to disturb water voles while using these places.

7.1.8 Otter and water vole are also species of principal importance for the purpose of conserving biodiversity in England, listed in accordance with the provisions of Section 41 of the Natural Environment and Rural Communities (NERC) Act 2006 (Ref. 7). Section 40 of the same Act requires that planning authorities have regard to the conservation of biodiversity in England, when carrying out their normal functions.

7.1.9 In addition, both otter and water vole are listed as priority species within Hertfordshire (Ref. 44) and Bedfordshire and Luton (Ref. 45), and consequently have specific Species Action Plans, last updated March 2006 and September 2009 respectively.

7.2 Methodology

Desk study

7.2.1 A desk study exercise was undertaken in June 2019 (and updated in June 2022, which incorporated a ‘scoping’ exercise to identify watercourses within proximity to the Proposed Development and a records search. This exercise was repeated in June 2022 to capture any additional records.

7.2.2 The records search was conducted to obtain existing records of legally protected and notable species, including otter and water vole. Species records within 2km of the Main Application Site were requested from the Bedfordshire and Luton Biological Recording and Monitoring Centre (BRMC), Herts Environmental Records Centre (HERC).

Field survey

7.2.3 Survey work for riparian mammals was undertaken in accordance and with regard to current guidance and best practice outlined in:

a. Ecology of the European Otter (2003) (Ref. 46);

b. Fourth Otter Survey of England 2000-2002(Ref. 47);

c. The Water Vole Mitigation Handbook (2016) (Ref. 48).

7.2.4 A ground truthing exercise was conducted on all watercourses identified by the desk-based study, on 17, 18 and 24 June 2019, with an additional section of the River Lea assessed on 04 July 2019. This ground truthing exercise was updated in July 2022, the habitat suitability assessment below therefore

represents an accurate current baseline. The purpose of this exercise was to identify and scope out waterbodies unsuitable for survey for riparian mammals due to being either dry or inaccessible. For the purposes of this report, the sections of River Lea upstream and downstream of the A1081 are treated separately as their channel characteristics and neighbouring land uses are highly divergent.

7.2.5 Ground truthed watercourses were subsequently assessed for suitability to support otter and water vole. Habitat suitability assessments were conducted by experienced surveyors immediately following successful ground truthing. Where access permitted, habitat suitability was assessed to 50 meters each side of the road transect point, aside from the River Lea, where surveyors were able to access several kilometres of bank adjacent to and downstream of the airport. Habitat suitability was assessed using the criteria summarised below.

Habitat suitability assessment criteria - otter

7.2.6 Otter can utilise a wide variety of habitat types, especially those in close proximity to watercourses and waterbodies. They are likely to use different habitats at different times, including terrestrial habitats for shelter and movement between various waterbodies for foraging. Key habitat features that are likely to contribute towards otter preferentially utilising an area include low disturbance, abundant prey (primarily fish and crayfish) and cover for resting opportunities in close proximity to the watercourse, including couches and holts. As holts and couches can be set back from the watercourse, surveys also took into account any areas of suitable vegetation or other habitat suitable for resting directly adjacent to the watercourse, up to 10m from the bank.

Habitat suitability assessment criteria - water vole

7.2.7 Optimal habitat conditions for water vole include slow flowing or still water, with a width over 3m and depth of over 1m, while steep banks in close proximity to the watercourse offer burrowing opportunities for shelter and breeding. Water vole also require emergent bankside vegetation for food and shelter, which is generally a consequence of minimal channel shading. Whilst water vole will utilise sub-optimal habitats outside of these parameters, total absence of any one of these habitat features will impair the ability of water vole to utilise an area.

Presence/likely absence surveys

7.2.8 Following habitat suitability assessment, presence/likely absence surveys were conducted on waterbodies with any suitability for either otter or water vole. The first of the two presence/likely absence surveys was conducted on the same date as the original ground truthing and habitat suitability assessment (i.e. 17, 18 and 24 June 2019 and 04 July 2019), with a further presence/likely absence survey undertaken in autumn on 25 September 2019. These surveys where then updated on the 28 July 2022 and the 28th September 2022. The second visit increases the robustness of the assessment, especially where watercourses are likely to change throughout the year, and consequently be utilised by water vole during different parts of the breeding season (Ref. 48).

7.2.9 Activity surveys involve a bankside systematic search for field signs of both otter and water vole, both on banks immediately adjacent to the watercourse, and within any suitable terrestrial habitat in close proximity. Otter field signs include feeding remains, spraints, footprints, holts, slides and anal jelly. Water vole field signs include latrines, burrows, footprints, and 'lawns' created by grazing.

Evaluation of results

7.2.10 When assessing the relative importance of watercourses for otter and water vole, consideration has been given to both the suitability of habitats present and the abundance of field signs as indicators of use and population density. Given their often transient nature and large home ranges, otter population density is extremely difficult to reliably determine (Ref. 46), therefore conclusions have been drawn using the number and type of field signs located at each site.

Survey limitations

7.2.11 The desk-based study identified all watercourses with the potential to be impacted upon by works. Due to health and safety concerns a drainage ditch, that runs along the M1 motorway to the south of junction 10, was not accessed. Given that this ditch is directly adjacent to the M1 on one side and intensively managed agricultural land on the other it is considered unlikely to offer suitable habitat for water vole or otter, therefore its lack of survey is not considered a significant limitation.

7.2.12 Riparian mammals, especially otter, are highly mobile animals, frequently occupying large home ranges and travelling large distances to make use of various habitats. Consequently, they may occur only transiently in parts of their ranges. However, given that both species are usually associated with water as the core habitat type within their territory, it is reasonable to assume that identifying and surveying all potentially impacted watercourses will minimise this issue. Additionally, conducting a second survey in a later season is likely to increase the chance of identifying riparian mammals given the possibility of habitats features changing throughout the year. Therefore, this is not considered a significant limitation.

7.2.13 Small sections of the potentially impacted watercourses were inaccessible, on health and safety grounds, for detailed survey during the presence/absence survey, for example due to dense scrub or thick muddy banks. However, it was generally possible to conduct habitat suitability assessments on the full length of the study section at each watercourse, using binoculars to assess areas surveyors could not directly access. Additionally, the repeat survey in autumn allowed surveyors to assess several areas that were inaccessible earlier in the year as dense vegetation had died back.

7.2.14 Of the section of River Lea upstream of the A1081, a large portion of the watercourse was inaccessible for detailed survey, shown in the Riparian Mammal Habitat Assessment Plan within **Appendix M**. However, surveyors were able to use overbridges at several points in this inaccessible section to determine the suitability of this section to support otter and water vole. The habitat suitability was considered negligible for both species, given the heavy

channelization and channel shading, high disturbance, extremely shallow depth and clear signs of pollution. As the section of River Lea directly upstream of this inaccessible area at Manor Road Park was considered to be of low suitability for water vole, the whole section of River Lea upstream of the A1081 is, on a precautionary basis, considered of low suitability for water vole.

7.2.15 Although undertaken within the ideal survey season, heavy rain prior to the autumn activity survey may have washed away field signs from more exposed locations. However, field signs are likely to persist in more sheltered locations, under bridges or amongst vegetation for example, as river levels did not rise above normal levels.

7.2.16 The July 2022 surveys were undertaken during a period of prolonged dried weather, where river levels were abnormally low.

7.2.17 On the basis that the survey encompassed the majority of the sections of watercourse identified at desk study, it is considered that the results of the survey work undertaken are robust and that these are not significant limitations.

7.3 Results

Desk study

7.3.1 The data search results from BRMC and HERC returned no records of otter or water vole from the 2km area surrounding the Main Application Site within the past 10 years.

7.3.2 The citation for the River Lea CWS references populations of water vole utilising the River, although no specific location is given. A section of the River Lea within Luton, upstream of survey area, is listed as a key area for water vole within the LBAP from 2009.

Field survey

7.3.3 Habitat Suitability Assessment of all potentially impacted watercourses identified only the River Lea downstream of the A1081 as being of at least moderate suitability to support a population of otter and water vole. Reassessment of all watercourses during the autumn surveys determined that the habitat features present represent similar suitability to the initial summer survey.

7.3.4 Results of the Habitat Suitability Assessment are displayed in **Table 7.1** and are mapped on the Riparian Mammal Habitat Assessment Plan in **Appendix M**.

Table 7.1: Riparian mammal survey dates, results of ground truthing and Habitat Suitability Assessment.

Watercourse	Survey Date	Ground Truthed	Otter Suitability	Water Vole Suitability
A602 ditch	17/06/2019 and 28/07/2022	True	Low	Low
Ippollitts Brook	17/06/2019 and 28/07/2022	True	Negligible	Low
River Lea (downstream A1081)	18/06/2019 and 28/07/2022	True	High	Moderate
London road ditch	24/06/2019 and 28/07/2022	False	-	-
River Lea (upstream A1081)	04/07/2019 and 28/07/2022	True	Negligible	Low

7.3.5 Field signs for riparian mammals were detected during the presence/absence surveys during the summer visit. Field signs were located only on the section of the River Lea downstream of the A1081, and were limited to otter, despite the watercourse also being of moderate suitability for water vole.

7.3.6 During the 2019 autumn presence/absence surveys, reductions in vegetation allowed surveyors to assess areas of the River Lea downstream of the A1081 that had been inaccessible on the previous visit. This area was highly suitable for otter sheltering opportunities with suitable holt and couching areas identified, though no definitive field signs were found. On the same section of River Lea, a single potential water vole burrow was located, though in the absence of other field signs, is considered too ambiguous to derive presence.

7.3.7 As the riparian and surrounding terrestrial habitat is of high quality, with multiple otter sprainting sites located in addition to extensive areas of suitable holting sites (although no confirmed holts were identified), it is considered that the section of River Lea directly downstream of the A1081 is an important site for otter. Despite the same location representing moderate habitat suitability for supporting water vole, no definitive field signs were located during the summer surveys, and therefore water vole are considered unlikely to be present.

7.3.8 On the A602 ditch, potential otter feeding remains were identified to contain a signal crayfish claw. Despite identifying potential otter feeding remains at the A602 ditch, the absence of other field signs, as well as low quality riparian and surrounding terrestrial habitat, mean that this area is not considered an important site for otter.

7.3.9 All field signs detected are recorded in **Table 7.2** and mapped on the Riparian Mammal Habitat Assessment Plan in **Appendix M**. Photographs (6-8) showing the otter spraints, potential water vole burrow and potential feeding remains are included within **Section 13** of this report.

Table 7.2: Results of the presence/absence surveys

Location	Season	Species	Field sign	Grid reference
River Lea	Summer 2019, summer and autumn 2022	Otter	Spraint	TL 10971 19678
River Lea	Summer 2019	Otter	Spraint	TL 10424 20184
River Lea	Autumn 2019	Water vole	Potential Burrow	TL 10935 19740
A602 ditch	Autumn 2019	Otter	Potential feeding remains	TL 18222 28634

7.4 Conclusions and recommendations

7.4.1 A section of the River Lea directly downstream of the A1081 has been identified as supporting habitat of high suitability for otter and moderate suitability for water vole.

7.4.2 Further surveys have determined that the section of the River Lea directly downstream of the A1081 represents a potentially important site for supporting otter. This was confirmed through the presence of otter spraint and highly suitable terrestrial habitat offering extensive sheltering opportunities. Otter may utilise any of the other watercourses within the study area but given the lack of prey and sheltering opportunities, it is considered likely that this is only transiently to commute between areas of more suitable habitat.

7.4.3 Despite the habitat present on the River Lea downstream of the A1081 also being of moderate potential to support water vole, no definitive field signs were detected during either visit; the single potential burrow identified is considered too ambiguous to derive presence in the absence of additional field signs.

7.4.4 Habitat features are likely to change temporally throughout the year, and consequently the suitability of watercourses for supporting either otter or water vole may also change. The second survey during autumn ensures the results of the initial assessment are robust, allowing surveyors to search for field signs over multiple seasons, thus accounting for changes in habitat, and riparian mammal activity, throughout the year.

7.4.5 As there are no watercourses capable of supporting riparian mammals within the Main Application Site, recommendations made in subsequent mitigation strategies will be limited only to works that may impact upon watercourses

indirectly from the Proposed Development or direct effects as a result of the highways interventions proposed to existing carriageways within proximity to watercourses, most notably the River Lea.

7.4.6 An update presence/absence survey would be required prior to the commencement of any works, including vegetation clearance, to reconfirm the likely absence of this species from the Proposed Development and its immediate surroundings. If evidence of otter and/or water vole is recorded in close proximity to highway intervention works, a licence from Natural England may be required to disturb and/or displace these species.

8 BREEDING BIRDS

8.1 Introduction

8.1.1 This section sets out the methodology and results of the breeding bird survey work undertaken in relation to the Proposed Development during 2018, 2019 and 2021.

Study area

8.1.2 The Study Area used to gather existing records for the Site as part of the desk study last updated in June 2022 extended to 2km from the Main Application Site.

8.1.3 The 2018 study area for breeding bird surveys included two transects; one to the east and one to the south of the existing airport. The southern transect was incorporated due to an ongoing sift process at that time, which included an option to expand the airport to the south of the existing runway. Expansion to the south was not progressed after an option appraisal and selection process was undertaken. As a result, the study area for surveys undertaken in 2021 included one transect to the east of the existing airport, covering habitats suitable for breeding birds within the Main Application Site, as well as suitable connective habitat up to 500m beyond. However, with the exception of junction 10 of the M1, the majority of the highways intervention locations and car parking locations do not include suitable habitats for breeding birds and were therefore scoped out by the project team for further breeding bird surveys.

8.1.4 The study area for the 2019 additional Schedule 1 Breeding Bird Surveys was extended to incorporate the surrounding farmland within 1.5km of the Main Application Site.

8.1.5 The Phase 1 Habitat Survey of junction 10 of the M1 identified scrub and grassland habitats which a low number of common bird species may utilise. A full breeding bird survey of these habitats has not been carried out.

8.1.6 The study area site is set within a largely agricultural landscape context, with arable land bordering to the north, south and east; and residential areas of Luton to the north and west of the existing airport.

8.1.7 A Bird Survey Area Plan is included in **Appendix O** and a Breeding Bird Survey Plan is provided in **Appendix P**, and these should be referenced in the reading of this section.

Survey scope

8.1.8 The survey aim was to sample breeding bird territories for all species within the study area (within and up to 500m from the Main Application Site, other than those areas scoped out due to low suitability) along a defined transect route, particularly those species which are:

a. subject to special protection through the provisions of legislation; and/or

b. otherwise notable bird species including;

i. Red[1] and Amber[2] List species of the Birds of Conservation Concern (Ref. 49); and/or
ii. species of principal importance listed by Natural England in accordance with Section 41 of the Natural Environment and Rural Communities (NERC) Act 2006 (Ref.7).

8.1.9 The 2018 Breeding Bird Survey was repeated (scope remained unchanged) in 2021. However, the current development option being taken forward is an expansion to the east of the existing airport (and not the south), requiring re-surveying of the eastern transect only.

8.1.10 During 2019, an additional survey was undertaken for the presence of nesting red kite and barn owl (both Schedule 1 species). The survey area for this extended to 1.5km from the Main Application Site. This survey was not repeated in 2021 as results from 2019 were still considered valid at this time.

8.1.11 The overall objective of the survey was to provide sufficient information to inform an assessment of the potential impacts to the breeding bird assemblage as a result of the Proposed Development and allow the design of appropriate mitigation measures.

Legislation and local biodiversity context

8.1.12 All wild birds, their nests and their eggs are afforded legal protection through provisions in the Wildlife and Countryside Act 1981 (as amended) (Ref. 5) and the Countryside and Rights of Way (CRoW) Act 2000 (Ref. 6).

8.1.13 It is an offence, with certain exceptions, to:

a. kill, injure or take any wild bird;
b. take, damage or destroy the nest of any wild bird while it is in use or being built;
c. take or destroy the egg of any wild bird; and
d. have in one's possession or control any wild bird (dead or alive), part of a wild bird or egg of a wild bird which has been taken in contravention of the Act or, the Protection of Birds Act 1954 (Ref. 50).

8.1.14 In addition to the above listed offences, it is also illegal to intentionally or recklessly disturb any wild bird listed on Schedule 1 of the Wildlife and Countryside Act 1981 (as amended), while it is nest building or is in, on or near a nest with eggs or young; or to disturb the dependent young of such a species. Consent from Natural England would be required to cause disturbance while nesting or to disturb its dependent young.

8.1.15 Species of Principal Importance in England are listed by Natural England in accordance with Section 41 of the Natural Environment and Rural Communities (NERC) Act 2006 (Ref. 7). These include species in England that were

[1] Red List criteria for breeding birds are those species which have experienced a severe decline of more than 50% of population and/or range over the last 25 years.
[2] Amber List criteria for breeding birds are those species which have experienced a moderate decline of between 25% and 49% of population and/or range over the last 25 years.

identified as requiring action in the UK Biodiversity Action Plan (UK BAP) and continue to be regarded as conservation priorities in the subsequent UK Post-2010 Biodiversity Framework.

8.1.16 The Bedfordshire and Luton (Ref. 51) and Hertfordshire (Ref. 52) Local Biodiversity Action Plans (LBAPs) detail actions to help maintain and enhance the nature conservation status of certain bird species of local conservation concern. This includes:

a. Tree sparrow (*Passer montanus*);
b. Bittern (*Botaurus stellaris*);
c. Stone-curlew (*Burhinus oedicnemus*); and
d. Song thrush (*Turdus philomelos*).

8.2 Methodology

Desk study

8.2.1 The bird records obtained from Bedfordshire and Luton and Hertfordshire Biological Records Centres in June 2022 within 2km of the Main Application Site were reviewed.

Field survey

General breeding bird territories

8.2.2 The methodology was adapted from the Common Bird Census (Ref. 53), aiming to estimate the number of breeding bird territories within and up to 500m from the Main Application Site, utilising two fixed transect routes.

8.2.3 Four survey visits were carried out between April and July 2018 and April and June 2021. This was considered to be a sufficient survey effort to make an estimation of the number of breeding territories present for each species, given the types of habitats present. Two transect routes were devised to include the main habitat types present that are likely to be important for breeding birds within the survey area. The transect routes are shown on the Bird Survey Area Plan in **Appendix O**. The north-eastern transect is mainly located along/adjacent to amenity grassland, scrub, semi-natural broadleaved woodland and arable land. The southern transect is mainly located along/adjacent to airfield, pastures, arable land, hedgerows and semi-natural broadleaved woodland.

8.2.4 As detailed within the study area section above, the 2018 breeding bird survey included a transect to the east and south of the existing airport as alternative options under consideration at that time included works to the south. The 2021 breeding bird surveys focussed solely on the transect to the east of the existing airport, covering habitats suitable for breeding birds within the Main Application Site.

8.2.5 In 2018, the first three survey visits took place within 4 hours from sunrise and the final visit 3 hours and 15 minutes before and 45 minutes after sunset. The

sunset visit was included in order to increase the likelihood of identifying crepuscular species with greater activity peaks at dusk. During 2021, all survey visits took place within 4 hours from sunrise.

8.2.6 The survey visits were completed, in line with standard guidance53, during suitable weather conditions for recording birds by avoiding strong winds, fog and rain. Details of the prevailing weather conditions during the survey visits are summarised in **Table 8.1**.

Table 8.1: Weather conditions during all breeding bird survey visits

Survey date	Weather conditions
06/04/2018	F2 southerly, 13°C, 75% cloud and dry
09/05/2018	F1 westerly, 14°C, cloudless and dry
06/06/2018	F1 north-easterly, 9°C, overcast and dry
02/07/2018	F1 north-easterly, 15°C, 25% cloud and dry
22/04/2021	F1 easterly, 1°C, 0% cloud, sunny and dry
12/05/2021	F2 south-westerly, 9°C, 100% cloud and dry
28/05/2021	F2 southerly, 9°C, 100% cloud and dry
08/06/2021	F2 northerly, 9°C, 100% cloud and dry

8.2.7 On each visit, the fixed transect route(s) were slowly walked by a surveyor competent and experienced in breeding bird surveys using the above methodology. All birds within the survey area were identified and recorded on 1:6,000 scale site maps, or recorded digitally on a tablet, using standard British Trust for Ornithology (BTO) species codes (Ref. 54). A pair of 10x42 binoculars was used to assist with detecting signs of breeding activity. The methodology is based on the premise that many species are territorial during the breeding season. This is found particularly amongst passerines, where territories are often marked by conspicuous song, display, and periodic disputes with neighbouring individuals. The following signs of bird breeding activity were recorded:

a. singing male in suitable nesting habitat;
b. pair in suitable nesting habitat;
c. courtship and display;
d. visiting a probable nest site;
e. agitated behaviour;
f. adults building a nest;
g. used nest or eggshells;

h. recently fledged young;
i. adults entering or leaving an occupied nest;
j. adults carrying faecal sac of food for young;
k. nest containing eggs; and
l. nest with young.

8.2.8 Upon completion of the survey visits, all data was transferred to a master map, to highlight the location of an occupied nest site or presumed centre of a breeding territory. When the same species was recorded in the same vicinity on three or more visits, this was taken to constitute a breeding territory. Separate territory maps were produced for the 2019 and 2021 breeding bird surveys.

Schedule 1 species breeding territories

8.2.9 During 2019, specific surveys were undertaken to determine the presence of red kite and barn owl nest sites from an extended study area including land within 1.5km of the Main Application Site. This data was used to supplement records taken for these species during the 2018 Breeding Bird Survey.

8.2.10 Two daytime surveys to search for active red kite nests were undertaken on 12 and 29 April, outside of the key sensitivity nesting period (Ref. 55) to reduce the likelihood of nest desertion through surveyor disturbance. These surveys were carried out in suitable weather conditions, avoiding strong winds and precipitation. Binoculars were used to observe any areas considered likely nesting areas for red kite, including woodland blocks, and locations where indicative kite activity, such as active pairs of birds or birds mating, had previously been noted. Given a lack of canopy cover, in smaller woodland blocks it was possible for surveyors to use binoculars to observe nests directly. In larger woodlands, characteristic nesting behaviours, such as returning with nest material, aggression to other avian species, agitated behaviour while flying around the nest or both parents simultaneously entering the woodland, were noted and used to determine breeding territories.

8.2.11 Stage 2 (Ref. 56) daytime surveys to search for barn owl potential nest sites were carried out on 20 May and 24 June, constituting a ground level assessment of suitable trees and structures within the Main Application Site noted during prior Stage 1 surveys, as well as an initial assessment of trees and structures within the expanded study area. Stage 1 surveys aim to broadly establish and record those features, such as built structures, mature trees and habitats, which might offer potential nest sites, roost sites or foraging habitats for barn owls. Stage 3 nest site verification surveys were undertaken at potential nest sites within the optimal survey period (Ref. 57) during suitable weather conditions on 24 June, 4 and 8 July, in-line with best practice guidance (Ref. 58). The prevailing weather conditions during the dusk emergence survey visits are summarised in **Table 8.2**. Due to project health and safety restrictions, nest site verifications were restricted to dusk emergence surveys, observing site entrances from distance and noting signs of breeding behaviours, including chick screeching, adult birds returning with prey items, or both parents observed

concurrently at the nest site. All surveys were undertaken by a licensed surveyor.

Table 8.2: Weather conditions during the barn owl dusk emergence survey visits

Survey Date	Weather conditions
24/06/2019	F1 westerly, 18°C, 100% cloud, intermittent drizzle
04/07/2019	F2 north westerly, 20°C, cloudless and dry
08/07/2019	F3 south easterly, 16°C, 75% cloud and dry

Survey limitations

8.2.12 Factors that influence bird presence and dispersal to and/or from the survey area include prevailing food availability, roost site suitability, disturbance and weather conditions. However, the fieldwork was undertaken by experienced bird surveyors during suitable weather and times of day to help ensure that regularly occurring species within the survey area were recorded with sufficient certainty to not significantly limit the validity of the findings presented in this report.

8.2.13 Surveys of Schedule 1 nesting birds were primarily conducted on private land away from the Main Application Site. As such, access was restricted to Public Rights of Way (PRoW), and private land encapsulating suitable nesting features where surveyors were able to agree access.

8.2.14 In several areas, particularly to the east of the Main Application site, this restricted red kite scoping surveys to being taken from vantage points on PRoW. This technique was unable to reliably determine red kite nest site locations. However, given frequent activity over areas of suitable habitat, as well as similar occupied territories to the south of the Main Application Site, it is considered likely that at least another pair of red kite may nest in woodland to the east of the Main Application Site within 1.5km. Given the distance from the Main Application Site, it is not considered necessary to pinpoint the exact nest location as potential disturbance is considered unlikely.

8.2.15 Surveyors were able to access the majority of areas identified for barn owl nest site scoping and subsequent emergence surveys. However, access was not available to several private properties to the north of the Main Application Site which, from a distance, may provide potential nest sites for barn owls. Given frequent anecdotal reports of barn owl sightings to the north of the Main Application Site, it is considered likely that there may be an additional breeding pair of barn owls to the north of the Main Application Site within 1.5km. Given the distance from the Main Application Site, it is not considered necessary to pinpoint the exact nest location as potential disturbance is considered unlikely.

8.3 Results

Desk study

8.3.1 Information from the Bedfordshire and Luton and Hertfordshire Biological Records Centres confirmed that the following breeding species relevant to this report have been recorded within the desk study area (including and extending to 2km from the Main Application Site) since 2006.

Fourteen Red List species:

a. grey partridge (*Perdix perdix*);
b. lapwing (*Vanellus vanellus*);
c. cuckoo (*Cuculus canorus*);
d. turtle dove (Streptopelia turtur);
e. marsh tit (*Poecile palustris*);
f. skylark (*Alauda arvensis*);
g. starling (*Sturnus vulgaris*);
h. spotted flycatcher (*Muscicapa striata*);
i. house sparrow (*Passer domesticus*);
j. yellow wagtail (*Motacilla flava*);
k. swift (*Apus apus*)
l. house martin (*Delichon urbicum*)
m. linnet (*Linaria cannabina*); and
n. yellowhammer (*Emberiza citrinella*).

Eight Amber List species:

a. stock dove (*Columba oenas*);
b. tawny owl (*Strix aluco*)
c. kestrel (*Falco tinnunculus*);
d. willow warbler (*Phylloscopus trochilus*);
e. song thrush;
f. Woodpigeon (*Columba palumbus*)
g. dunnock (*Prunella modularis*); and
h. bullfinch (*Pyrrhula pyrrhula*).

Schedule 1 species:

a. red kite (*Milvus milvus*); and
b. barn owl (*Tyto alba*).

Field survey

8.3.2 The distribution of territories is indicated on the Breeding bird Survey Plan in **Appendix P**.

8.3.3 A summary of breeding bird territories identified during the 2018, and 2021 surveys is provided in **Table 8.3**. The taxonomic sequence of species listed is in accordance with the British List (Ref. 59).

Table 8.3: Breeding bird territories recorded within the Main Application Site and within 500m from survey visits in 2018 and 2021

Common name	Scientific name	BTO symbol	Status	Estimated number of breeding territories 2018	Estimated number of breeding territories 2021
Woodpigeon	*Columba palumbus*	WP	Amber List	15	8
Collared Dove	*Streptopelia decaocto*	CD	Green List	1	0
Great Spotted Woodpecker	*Dendrocopos major*	GS	Green List	1	1
Magpie	*Pica pica*	MG	Green List	1	1
Coal Tit	*Periparus ater*	CT	Green List	2	1
Blue Tit	*Cyanistes caeruleus*	BT	Green List	1	5
Great Tit	*Parus major*	GT	Green List	1	2
Skylark	*Alauda arvensis*	S.	Red List, Species of Principal Importance	12	11
Willow Warbler	*Phylloscopus trochilus*	WW	Amber List, Species of Principal Importance	1	0
Chiffchaff	*Phylloscopus collybita*	CC	Green List	3	4
Blackcap	*Sylvia atricapilla*	BC	Green List	4	7
Lesser Whitethroat	*Sylvia curruca*	LW	Green List	1	0
Whitethroat	*Sylvia communis*	WH	Amber List	3	5
Goldcrest	*Regulus regulus*	GC	Green List	0	1

Common name	Scientific name	BTO symbol	Status	Estimated number of breeding territories 2018	Estimated number of breeding territories 2021
Wren	*Troglodytes troglodytes*	WR	Amber List	9	12
Song Thrush	*Turdus philomelos*	ST	Amber List, Species of Principal Importance, LBAP	1	2
Blackbird	*Turdus merula*	B.	Green List	3	8
Robin	*Erithacus rubecula*	R.	Green List	8	5
Dunnock	*Prunella modularis*	D.	Amber List, Species of Principal Importance,	2	3
Meadow Pipit	*Anthus pratensis*	MP	Amber List	1	0
Chaffinch	*Fringilla coelebs*	CH	Green List	5	5
Linnet	*Linaria cannabina*	LI	Red List, Species of Principal Importance,	3	1
Goldfinch	*Carduelis carduelis*	GO	Green List	4	2
Yellowhammer	*Emberiza citrinella*	Y.	Red List, Species of Principal Importance,	4	2

* 2018 and 2021 data only included in this table. For results of the focussed 2019 Schedule 1 Species Surveys (red kite and barn owl) within the Main Application Site and up to 1.5 km please refer to Section 8.3.9 below.

8.3.4 During 2018, a total of 23 breeding species and 86 breeding territories were recorded across both transects. During the 2021 surveys, a total of 20 breeding species and 86 breeding territories were recorded.

8.3.5 During 2018, three Red List species were recorded: skylark (12 territories), yellowhammer (4 territories) and linnet (3 territories). During 2021, three Red List species were recorded: skylark (11 territories), yellowhammer (2 territories) and linnet (1 territory). During 2018, four Amber List species were recorded within the survey area: dunnock (2 territories), willow warbler (1 territory), song thrush (1 territory) and meadow pipit (1 territory). During 2021, two Amber List species was recorded within the survey area: dunnock (3 territories) and song

thrush (2 territories). In addition to being Red or Amber List, skylark, willow warbler, song thrush, dunnock, linnet and yellowhammer are species of principal importance.

8.3.6 During 2018, it is likely that the following 12 species, for which individuals were recorded in suitable habitat on either one or two survey visits, may also have bred successfully within the survey area: stock dove (Amber List), tawny owl (Amber List), green woodpecker (Green List), jackdaw (Green List), carrion crow (Green List), goldcrest (Green List), long-tailed tit (Green List), garden warbler (Green List), mistle thrush (Red List), greenfinch (Red List), goldfinch (Green List) and bullfinch (Amber List, species of principal importance).

8.3.7 During 2021, it is likely that the following 17 species, for which individuals were recorded in suitable habitat on either one or two survey visits, may also have bred successfully within the survey area: green woodpecker (Green List), jackdaw (Green List), carrion crow (Green List), long-tailed tit (Green List), buzzard (Green List), collared dove (Green List), grey partridge (Red List), house sparrow (Red List, species of principal importance), jay (Green List) lesser whitethroat (Green List), pheasant (non-listed), red kite (Schedule 1, Green List), red-legged partridge (non-listed), reed bunting (Amber List), starling (Red List, species of principal importance), swallow (Green List) and bullfinch (Amber List, species of principal importance). Song thrush is also an LBAP species.

8.3.8 During the 2019 survey work, breeding territories of two Schedule 1 species were also recorded:

a. Red kite - two occupied nests and another territory were recorded in woodland within the expanded study area; and

b. Barn owl - an occupied nest and another breeding territory were recorded within the expanded study area (also an LBAP species).

8.4 Conclusions and recommendations

8.4.1 During 2018, a total of 23 common bird species were recorded breeding within the study area. Of these, Red and Amber List species were represented by less than ten breeding territories with the exception of skylark with 12 territories.

8.4.2 During 2021, a total of 20 common bird species were recorded breeding within the study area. Of these, Red and Amber species were represented by less than ten breeding territories with the exception of skylark with 11 territories.

8.4.3 Breeding territories of the Red and Amber List species are associated with the following habitats within the survey area: arable land (skylark), species-poor semi-improved grassland (skylark and meadow pipit), scrub (willow warbler and linnet) hedgerows (dunnock, linnet and yellowhammer) and woodland (song thrush). Survey findings in 2018 and 2021 were largely similar in terms of numbers and diversity of species recorded. Habitats with a higher number of territories associated with them included woodland, scrub and hedgerows and semi-improved rough grassland. This was consistent in 2018 and 2021 surveys.

8.4.4 A total of five breeding territories were recorded during 2019 in the extended survey area for species listed under Schedule 1. These were three red kite and two barn owl breeding territories within the expanded study area. No breeding territories of Schedule 1 species were recorded during 2018 or 2021 (within the Main Application Site). However, targeted surveys were not carried out as they were for 2019.

9 WINTERING BIRDS

9.1 Introduction

9.1.1 This section sets out the methodology and results of the wintering bird survey work undertaken in relation to the Proposed Development between 2017 and 2022.

Study area

9.1.2 The study area of the Wintering Birds Survey covers suitable habitats within the Main Application Site and further suitable habitats up to 500m beyond, as shown on the Wintering Bird Survey Plan in **Appendix Q**. However, given the low suitability of the habitats present, and high levels of disturbance at the highways intervention locations and carparking locations these areas were scoped out for further wintering bird surveys. The study area also incorporates the surrounding farmland within 500m of the Main Application Site.

9.1.3 The study area is set within a largely agricultural landscape context, with arable land bordering to the north, south and east; and residential areas of Luton to the north and west of the existing airport.

Survey scope

9.1.4 The survey aim was to determine the wintering bird assemblage and peak monthly counts of individual species within and up to 500m from the Main Application Site, particularly of those species which are:

a. Subject to special protection through the provisions of legislation, such as Schedule 1 of the Wildlife and Countryside Act 1981 (as amended) (Ref. 5) and Annex 1 of the Birds Directive 2009/147/EC on the Conservation of Wild Birds (Ref. 60);

b. Otherwise notable bird species: Red (those species which have experienced a severe decline of more than 50% of population and/or range over the last 25 years) and Amber (those species which have experienced a moderate decline of between 25% and 49% of population and/or range over the last 25 years) List species of the Birds of Conservation Concern (BoCC) 5 (Ref.49); and/or, Species of principal importance listed on Section 41 of the Natural Environment and Rural Communities (NERC) Act 2006.

9.1.5 Provide sufficient information to inform an assessment of the potential impacts to the wintering bird assemblage as a result of the Proposed Development and allow the design of appropriate mitigation measures.

Legislation and local biodiversity context

9.1.6 All wild birds, their nests and their eggs are afforded legal protection through provisions in the Wildlife and Countryside Act 1981 (as amended) (Ref. 5) and the Countryside and Rights of Way (CRoW) Act 2000 (Ref. 6).

9.1.7 It is an offence, with certain exceptions, to:

a. kill, injure or take any wild bird;
b. take, damage or destroy the nest of any wild bird while it is in use or being built;
c. take or destroy the egg of any wild bird; and
d. have in one's possession or control any wild bird (dead or alive), part of a wild bird or egg of a wild bird which has been taken in contravention of the Act, the Protection of Birds Act 1954 or the law of any EU Member State (which implements the Birds Directive 2009/147/EC).

9.1.8 In addition to the above listed offences, it is also illegal to intentionally or recklessly disturb any wild bird listed on Schedule 1 of the Wildlife and Countryside Act 1981 (as amended), while it is nest building or is in, on or near a nest with eggs or young; or to disturb the dependent young of such a species. Consent from Natural England would be required to cause disturbance while nesting or to disturb its dependent young.

9.1.9 Rare or vulnerable bird species of European importance are listed in Annex 1 of Birds Directive 2009/147/EC on the Conservation of Wild Birds. Sites that regularly support threshold populations of Annex 1 species qualify for designation and to become part of the national site network.

9.1.10 Various bird species are also species of principal importance for the purpose of conserving biodiversity in England, listed in accordance with the provisions of Section 41 of the Natural Environment and Rural Communities (NERC) Act 2006 (Ref. 7), which places a duty on public organisations to 'have regard' to the conservation of these bird species.

9.1.11 The Bedfordshire and Luton (Ref. 61) and Hertfordshire (Ref. 62) Local Biodiversity Action Plans (LBAPs) details actions to help maintain or enhance the nature conservation status of certain bird species of local conservation concern. This includes:

a. Tree sparrow (*Passer montanus*);
b. Bittern (*Botaurus stellaris*);
c. Stone-curlew (*Burhinus oedicnemus*); and
d. Song thrush (*Turdus philomelos*).

9.2 Methodology

Desk study

9.2.1 Species records within 2km of the Main Application Site were requested from the Bedfordshire and Luton Biological Recording and Monitoring Centre (BRMC). Where records within the 2km search fell within the Hertfordshire county boundary, these were returned from the Herts Environmental Records Centre (HERC). This exercise was most recently updated in June 2022 to capture any additional records.

Field survey

9.2.2 The transect survey method used in undertaking assessments of wintering birds was derived from current best practice as described by (Bibby et al, 2000 (Ref. 63)) and (Gilbert et al 1998 (Ref. 64)) and conforms to the recommendations of the British Trust for Ornithology (BTO) and the Joint Nature Conservation Committee (JNCC).

9.2.3 Monthly transect survey visits were carried out over three winters between December 2017 and February 2018, with further more detailed surveys between October 2018 and March 2019, and a single transect survey over the winter from November 2021 to February 2022. Two transect routes were selected between 2017 and 2019 to include habitats that are likely to be attractive to birds. Areas with no access within 500m of the Main Application Site could be seen from the transect routes. The 2021/2022 wintering bird surveys only repeated the north eastern transect as the design option to expand to the south of the airport has not been progressed.

9.2.4 The transect routes are shown on the Wintering Bird Survey Plan in **Appendix Q**. The north eastern transect is mainly located along/adjacent to amenity grassland, scrub, semi-natural broadleaved woodland and arable land. The southern transect is mainly located along/adjacent to airfield, pastures, arable land, hedgerows and semi-natural broadleaved woodland.

9.2.5 The survey visits were completed during the day in suitable weather conditions for recording birds by avoiding strong winds, fog, torrential rain and falling snow. Details of the prevailing weather conditions during the survey visits are summarised in **Table 9.1**.

Table 9.1: Weather conditions during all wintering bird survey visits

Survey date	Weather conditions
20/12/2017	F2 westerly, 9°C, overcast and dry
17/01/2018	F4 south-westerly, 6°C, 25% cloud cover and dry
22/02/2018	F1 easterly, 4°C, 50% cloud cover and dry
26/10/2018	F2 north-westerly, 8°C, 75% cloud cover and dry
6/12/2018	F2 south-westerly, 12°C, overcast and dry
19/12/2018	F1 southerly, 8°C, 25% cloud cover and dry
24/01/2019	F1 north-westerly, 1°C, overcast and dry
15/02/2019	F1 southerly, 12°C, cloudless and dry

Survey date	Weather conditions
22/02/2019	F1 south-westerly, 10°C, 90% cloud cover and dry
16/11/2021	F0, 5°C, 0% cloud cover and dry
14/12/2021	F2 south-westerly, 9°C, 80% cloud cover and dry
19/01/2022	F3 westerly, 4°C, 80% cloud cover and dry
16/02/2022	F4 westerly, 11°C, 25% cloud cover and dry

9.2.6 On each visit, the fixed transect route was slowly walked by a surveyor competent and experienced in wintering bird surveys using the above methods. All birds visible along the transect within the survey area were identified and recorded on 1:6,000 scale site maps using standard British Trust for Ornithology (BTO) species codes. A pair of 10x42 binoculars was used to assist with species identification.

Survey limitations

9.2.7 Factors that influence bird presence and dispersal to and/or from the study area include prevailing food availability, roost site suitability, disturbance and weather conditions. However, the fieldwork was undertaken by experienced bird surveyors during suitable weather and times of day to help ensure that regularly occurring species within the survey area were recorded with sufficient certainty to not significantly limit the validity of the findings presented in this report.

9.3 Results

Desk study

9.3.1 Information obtained from the Bedfordshire and Luton and Hertfordshire Biological Records Centres confirmed that the following wintering species relevant to this report have been recorded within the study area since 2006.

Nineteen Red List species:

a. Eurasian white-fronted goose (*Anser albifrons*);
b. goldeneye (*Bucephala clangula*);
c. pochard (*Aythya ferina*);
d. grey partridge (*Perdix perdix*);
e. lapwing (*Vanellus vanellus*)
f. woodcock (*Scolopax rusticola*);
g. hen harrier (*Circus cyaneus*);
h. merlin (*Falco columbarius*);
i. herring gull (*Larus argentatus*)

j. skylark (*Alauda arvensis*);
k. starling (*Sturnus vulgaris*);
l. mistle thrush (*Turdus piscivorus*);
m. fieldfare (*Turdus pilaris*);
n. house sparrow (*Passer domesticus*);
o. marsh tit (*Poecile palustris*);
p. lesser redpoll (*Acanthis cabaret*);
q. linnet (*Linaria cannabina*);
r. greenfinch (*Chloris chloris*);
s. yellowhammer (*Emberiza citrinella*).

Twenty three Amber List species:

a. gadwall (*Mareca strepera*);
b. mallard (*Anas platyrhynchos*);
c. teal (*Anas crecca*);
d. moorhen (*Gallinula chloropus*);
e. green sandpiper (*Tringa ochropus*);
f. snipe (*Gallinago gallinago*);
g. black-headed gull (*Chroicocephalus ridibundus*);
h. common gull (*Larus canus*);
i. yellow-legged gull (*Larus michahellis*);
j. lesser black-backed gull (*Larus fuscus*);
k. kestrel (*Falco tinnunculus*);
l. short-eared owl (*Asio flammeus*);
m. stock dove (*Columba oenas*);
n. song thrush;
o. sparrowhawk (*Accipiter nisus*);
p. tawny owl (*Strix aluco*);
q. redwing (*Turdus iliacus*);
r. dunnock (*Prunella modularis*);
s. grey wagtail (*Motacilla cinerea*);
t. meadow pipit (*Anthus pratensis*);
u. wren (*Troglodytes troglodytes*);
v. woodpigeon; and
w. bullfinch (*Pyrrhula pyrrhula*).

Schedule 1 species:

a. hen harrier (*Circus cyaneus*);
b. merlin (*Falco columbarius*);
c. fieldfare (*Turdus pilaris*);
d. redwing (*Turdus iliacus*);
e. green sandpiper (*Tringa ochropus*);
f. brambling (*Fringilla montifringilla)*
g. red kite (*Milvus milvus*); and
h. barn owl (*Tyto alba*).

Annex 1 species:

a. golden plover (Pluvialis apricaria).

Field survey

9.3.2 Areas that were regularly frequented by wintering birds are shown on the Wintering Bird Survey in **Appendix Q**.

9.3.3 Monthly counts of all species recorded between October 2018 and March 2019 are provided in the Wintering Bird Survey Data 2018/2019 in **Appendix R** and between December 2017 and February 2018 are provided on the Wintering Bird Survey Data 2017/2018 in **Appendix S**. The monthly counts of all species recorded between November 2021 and February 2022 are provided in **Appendix T.**

9.3.4 Peak monthly counts recorded from all wintering bird survey visits are provided in **Table 9.2**. The taxonomic sequence of species listed in is in accordance with the British List (Ref. 65).

Table 9.2: Peak monthly counts from all wintering bird survey visits

Common name	Scientific name	BTO symbol	Status	Peak monthly count
Red-legged Partridge	*Alectoris rufa*	RL	No listed status	106
Grey Partridge	*Perdix perdix*	P.	Red List, Species of Principal Importance	2
Pheasant	*Phasianus colchicus*	PH	No listed status	24
Sparrowhawk	*Accipter nisus*	SH	Amber List	2
Red Kite	*Milvus milvus*	KT	Schedule 1, Green List	13

Common name	Scientific name	BTO symbol	Status	Peak monthly count
Buzzard	*Buteo buteo*	BZ	Green List	6
Golden Plover	*Pluvialis apricaria*	GP	Annex 1 and Green List	2
Black-headed Gull	*Chroicocephalus ridibundus*	BH	Amber List	c.330
Common Gull	*Larus canus*	CM	Amber List	5
Herring Gull	*Larus argentatus*	HG	Red List, Species of Principal Importance	2
Yellow-legged Gull	*Larus michahellis*	YG	Amber List	1
Lesser black-backed gull	*Larus fuscus*	LB	Amber List	1
Feral Pigeon	*Columba livia ssp. domestica*	FP	Green List	c.60
Stock Dove	*Columba oenas*	SD	Amber List	2
Woodpigeon	*Columba palumbus*	WP	Amber List	534
Collared Dove	*Streptopelia decaocto*	CD	Green List	4
Barn Owl	*Tyto alba*	BO	Schedule 1, Green List	1
Great Spotted Woodpecker	*Dendrocopus major*	GS	Green List	3
Green Woodpecker	*Picus viridis*	G.	Green List	1
Kestrel	*Falco tinnunculus*	K.	Amber list	1
Jay	*Garrulus glandarius*	J.	Green List	5
Magpie	*Pica pica*	MG	Green List	19
Jackdaw	*Corvus monedula*	JD	Green List	42
Rook	*Corvus frugilegus*	RK	Amber List	11
Carrion Crow	*Corvus corone*	C.	Green List	21
Coal Tit	*Periparus ater*	CT	Green List	3

Common name	Scientific name	BTO symbol	Status	Peak monthly count
Blue Tit	*Cyanistes caeruleus*	BT	Green List	26
Great Tit	*Parus major*	GT	Green List	11
Skylark	*Alauda arvensis*	S.	Red List, Species of Principal Importance	31
Long-tailed Tit	*Aegithalos caudatus*	LT	Green List	32
Goldcrest	*Regulus regulus*	GC	Green List	6
Wren	*Troglodytes troglodytes*	WR	Amber List	14
Nuthatch	*Sitta europaea*	NH	Green List	1
Starling	*Sturnus vulgaris*	SG	Red List, Species of Principal Importance	68
Blackbird	*Turdus merula*	B.	Green List	20
Fieldfare	*Turdus pilaris*	FF	Red List, Schedule 1	108
Redwing	*Turdus iliacus*	RE	Amber List, Schedule 1	69
Song Thrush	*Turdus philomelos*	ST	Amber List, Species of Principal Importance	84
Mistle Thrush	*Turdus viscivorus*	M.	Red List	1
Robin	*Erithacus rubecula*	R.	Green List	18
Stonechat	*Saxicola rubicola*	SC	Green List	1
House Sparrow	*Passer domesticus*	HS	Red List, Species of Principal Importance	5
Dunnock	*Prunella modularis*	D.	Amber List and Species of Principal Importance, LBAP	10

Common name	Scientific name	BTO symbol	Status	Peak monthly count
Pied Wagtail	*Motacilla alba*	PW	Green List	21
Meadow Pipit	*Anthus pratensis*	MP	Amber List	7
Chaffinch	*Fringilla coelebs*	CH	Green List	16
Brambling	*Fringilla montifringilla*	BL	Green List, Schedule 1	1
Bullfinch	*Pyrrhula pyrrhula*	BF	Amber List, Species of Principal Importance	2
Greenfinch	*Chloris chloris*	GR	Red List	4
Linnet	*Linaria cannabina*	LI	Red List, Species of Principal Importance	c.220
Lesser redpoll	*Acanthis cabaret*	LR	Red List, Species of Principal Importance	1
Goldfinch	*Carduelis carduelis*	GO	Green List	73
Siskin	*Spinus spinus*	SK	Green List	10
Yellowhammer	*Emberiza citrinella*	Y.	Red List, Species of Principal Importance	51
Reed bunting	*Emberiza schoeniclus*	RB	Amber List, Species of Principal Importance	1

9.3.5 A total of 55 species were recorded wintering within the survey area. The peak monthly counts of abundant species (represented by more than 20 individuals) are as follows:

a. red-legged partridge (106) and pheasant (22) recorded on the farmland mainly east of the Proposed Development;

b. black-headed gull (c.330) recorded on the amenity grassland playing fields and goldfinch (73) on tall ruderal vegetation at Wigmore Park;

c. long-tailed tit (32) in the scrub and hedgerows south of Wigmore Park;

d. feral pigeon (c.60) skylark (31) and linnet (c.220) on the set-aside to the east of Wigmore Park;
e. yellowhammer (51) in association with game bird cover and adjacent hedgerows south east of Winch Hill;
f. woodpigeon (534) recorded in the woods mainly east of the Proposed Development;
g. jackdaw (42) and carrion crow (21) recorded on arable land mainly south of the Proposed Development;
h. blue tit (26) located across the north-eastern transect associated with scrub, woodland and hedgerows;
i. starling (68), blackbird (20), fieldfare (108), redwing (69) and pied wagtail (21) on the grazing pasture south of the Proposed Development.

9.3.6 In total, eleven Red List species (grey partridge, herring gull, skylark, starling, fieldfare, mistle thrush, house sparrow, green finch, linnet, lesser redpoll and yellowhammer) and 16 Amber List species (sparrowhawk, black-headed gull, common gull, yellow-legged gull, lesser black-backed gull, stock dove, woodpigeon, kestrel, rook, wren, redwing, song thrush, dunnock, meadow pipit, bullfinch and reed bunting) were recorded within the survey area.

9.3.7 In addition to being Red or Amber List, grey partridge, herring gull, skylark, starling, song thrush, house sparrow, dunnock, linnet, bullfinch, lesser redpoll, reed bunting, and yellowhammer are also species of principal importance.

9.3.8 Red kite which is a Schedule 1 species was most frequently recorded over farmland within 500m of the south east, south and north east sides of the Main Application Site.

9.3.9 Barn owl is another Schedule 1 species for which signs of their presence was recorded. Barn owl pellets were found directly beneath a potential nest site in a building at Someries Farm approximately 150m south of the Proposed Development. Barn owl pellets were also found at the base of a tree roost site on the eastern most edge of the Main Application Site.

9.3.10 Redwing, fieldfare and brambling are all Schedule 1 species recorded within the survey area. All three species are migrants which winter in the UK, very rarely breeding in the UK.

9.3.11 Two golden plovers, which is an Annex 1 and Red List species, were recorded flying south over the eastern side of the survey area on one occasion. It is likely that these birds are associated with the flock that frequented the bean fields at Tankards Farm, Tea Green approximately 500m north east of the Main Application Site. Song thrush is also LBAP species.

9.4 Conclusions and recommendations

9.4.1 A total of 55 wintering bird species, including Red and Amber List species, were recorded within the study area.

9.4.2 The Red and Amber List species associated with the following habitats within the study area were:

a. amenity grassland (herring gull, lesser black-back gull, black-headed gull, common gull and lesser redpoll (flyover));
b. arable set-aside land (kestrel, skylark, linnet and yellowhammer);
c. species-poor semi-improved grassland (grey partridge, kestrel, skylark, starling, fieldfare, redwing and meadow pipit);
d. scrub and hedgerows (sparrowhawk, song thrush, dunnock, wren, bullfinch, linnet, goldfinch, reed bunting, house sparrow and yellowhammer); and
e. woodland (woodpigeon, stock dove, song thrush and greenfinch).

9.4.3 The flock of c.220 linnets that regularly frequented the arable set-aside to the east of Wigmore Park is noteworthy.

9.4.4 Red kite was most frequently recorded over farmland within 500m to the south east, south and north east of the Main Application Site.

9.4.5 A barn owl potential nest site was recorded in a building within 500m and south west of the Main Application Site. A barn owl roost site was also recorded in a tree on the eastern most edge of the Main Application Site.

9.4.6 A golden plover flock frequented the bean fields at Tankards Farm, Tea Green approximately 500m north east of the Main Application Site.

10 REPTILES

10.1 Introduction

10.1.1 This section sets out the methodology and results of the reptile survey work undertaken in relation to the Proposed Development during 2018 and 2019.

Study area

10.1.2 The study area of the Reptile Survey covers suitable habitats within the Main Application Site as shown on the Reptile Survey Area Plan in **Appendix V**. However, with the exception of junction 10 of the M1, the majority of the highway intervention locations and carparking locations do not include suitable habitats for reptiles and were therefore scoped out of further reptile surveys. The Phase 1 Habitat Survey of junction 10 of the M1 identified grassland and scrub habitats which could be utilised by a small number of common species though is generally unsuitable for reptiles. Consequently, this area did not form part of the study area for the Reptile Survey.

10.1.3 The study area is set within a largely agricultural landscape context, with arable land bordering to the north, south and east; and residential areas of Luton to the north and west of the existing airport.

Survey scope

10.1.4 A series of reptile surveys were undertaken between April 2018 and July 2019.

10.1.5 The objectives of the survey were to:

a. undertake a desk-based review of reptile records within 2km of the Main Application Site to identify those that may be relevant to the development proposals;

b. assess the suitability of the habitats within the study area to support populations of reptiles;

c. determine the presence or absence of reptiles in suitable habitats within the study area;

d. determine the size of any reptile populations present within the study area; and

e. provide sufficient information to inform an assessment of the potential impacts to common reptile species as a result of the Proposed Development and design appropriate mitigation measures.

Legislation and local biodiversity context

10.1.6 All native British reptile species are protected against killing and injury under Section 9 of the Wildlife and Countryside Act 1981 (as amended) (Ref. 5) and the Countryside and Rights of Way (CRoW) Act 2000 (Ref. 6).

10.1.7 The following reptile species are also species of principal importance for the purpose of conserving biodiversity in England, listed in accordance with the provisions of Section 41 of the Natural Environment and Rural Communities

(NERC) Act 2006 (Ref. 7), which places a duty on public organisations to 'have regard' to the conservation of these reptiles:

a. Adder (*Vipera berus*);
b. Common lizard (*Zootoca vivipara*);
c. Grass snake (*Natrix helvetica*);
d. Sand lizard (*Lacerta agilis*);
e. Slow-worm (*Anguis fragilis*); and
f. Smooth snake (*Coronella austriaca*).

10.1.8 Adder is listed as a priority species within Bedfordshire and Luton on the Local Biodiversity Action Plan (LBAP) and has a specific Species Action Plan (Ref. 66), last updated July 2010. The Hertfordshire LBAP does not include any reptile species.

10.2 Methodology

Desk study

10.2.1 A records search was conducted in February 2018 to obtain existing records of legally protected and notable species, including reptiles. Species records within 2km of the Main Application Site were requested from the Bedfordshire and Luton Biological Recording and Monitoring Centre (BRMC). Where records within the 2km search fell within the Hertfordshire county boundary, these were returned from the Herts Environmental Records Centre (HERC). This exercise was repeated in June 2022 to capture any additional records.

Field survey

10.2.2 Survey work for reptiles was undertaken in accordance with guidelines produced by Froglife (Ref. 67,68) and the Herpetofauna Groups of Britain and Ireland (HGBI) (Ref. 69).

10.2.3 A systematic walkover of the study area was undertaken on 25 April and 09 May 2018 by experienced ecologists, in order to assess habitats for their suitability to support reptiles. Good reptile habitats are generally open aspect, well-drained and south facing, mostly sunny, sheltered and relatively undisturbed. If present, any signs of reptiles (such as moulted skins, feeding remains, dead animals or live animals basking) were noted. This initial habitat assessment was undertaken to inform the areas to be targeted for further surveys. The offsite car park areas were scoped out for further survey as habitats present do not offer suitability for reptiles.

10.2.4 Artificial refugia comprising squares (minimum size 0.5m x 0.5m) of bitumen roofing felt, corrugated tin and onduline were distributed across key habitat areas within the study area immediately following identification of suitable reptile habitat during the systematic walkover. The artificial refugia heat up during the day at a faster rate than the surrounding environment, thus making them attractive to cold-blooded reptiles for basking and shelter. Refuges were left to 'bed in' for one week before surveys commenced. The bedding-in period for

these artificial refugia allows for species to become accustomed to their presence and begin making use of them. The position of each artificial refuge was recorded using a data-enabled iPad with ArcGIS software installed, giving location points accurate to 5 metres.

10.2.5 A total of 115 refugia were placed within all areas of suitable reptile habitat, with locations and distribution illustrated on the Reptile Survey Area Plan in **Appendix V**. The total refugia density of all areas of suitable reptile habitat within the study area is approximately 10 artificial refugia per hectare, which is at the higher end of the guideline 5-10 refugia per hectare.

10.2.6 **Table 10.1** summarises information relating to each of the areas of suitable reptile habitat identified during the systematic walkover for consequent artificial refugia survey.

Table 10.1: Areas identified as suitable reptile habitat

Suitable habitat area Grid reference	Number of artificial refugia distributed	Approximate area of compartment (ha)	Refugia density (refugia/ha)
TL 12756 22212	10	0.7	14.3/ha
TL 12614 21693	10	0.6	16.7/ha
TL 13073 22187	15	1.5	10/ha
TL 13143 21356	10	0.35	28.6/ha
TL 13493 21652	20	2.35	8.5/ha
TL 13402 22014	10	1.25	8/ha
TL 13670 21783	10	0.8	12.5/ha
TL 13777 21807	5	0.3	16.7/ha
TL 13804 21741	10	1.3	7.7/ha
TL 13979 21548	10	2	5/ha
TL 14021 21318	5	0.4	12.5/ha

10.2.7 Due to a prolonged period of sub-optimal survey conditions associated with a heatwave during summer 2018, further surveys were undertaken in 2019 in more suitable conditions. Artificial refugia were re-deployed, within the same locations as the 2018 surveys, between 28 March and 2 April 2019. Checks

were conducted as per the 2018 survey methodology between 26 April and 15 July.

10.2.8 Refugia were checked on 18 occasions in 2018 and a further 7 occasions in 2019, to account for surveys not completed in 2018 and those undertaken in sub-optimal conditions. A minimum of 48 hours was left between visits and ordinarily more than three days between visits, however exceptions were made when there was a window of suitable weather conditions due to extended periods of unsuitable weather.

10.2.9 During each visit, both the artificial refugia and existing debris/natural refugia were carefully approached to avoid disturbance of basking reptiles, then lifted and subsequently replaced. Visual searches of the general habitat and potential basking spots for reptiles were also conducted alongside refugia checks. The location, number and species of any reptiles observed was recorded, with sex and age group identified where possible.

10.2.10 All surveys were completed by two suitably experienced ecologists, typically during optimal weather conditions (dry and calm with an ambient temperature between 9 and 18°C) during the months when reptiles are active (March to October). Full details of the conditions are provided within **Table 10.2**.

Table 10.2: Reptile survey dates and weather conditions

Visit no.	Date	Weather (cloud cover, wind, precipitation)	Temperature (°C)
1	15/05/2018	60%, light, dry	14
2	23/05/2018	50%, light, dry	10
3	07/06/2018	30 %, light, dry	12
4	14/06/2018	50%, light, dry	13
5	21/06/2018	60%, light, dry	13
6	26/06/2018	20%, light, dry	18
7	05/07/2018	20%, light, dry	19
8	24/08/2018	50%, moderate, dry	16
9	28/08/2018	50%, light, dry	16
10	30/08/2018	50%, light, dry	15
11	04/09/2018	60%, moderate, dry	18

Visit no.	Date	Weather (cloud cover, wind, precipitation)	Temperature (°C)
12	06/09/2018	30%, light, dry	10
13	11/09/2018	20%, light, dry	15
14	13/09/2018	10%, light, dry	15
15	25/09/2018	20%, light, dry	15
16	28/09/2018	50%, moderate, dry	15
17	02/10/2018	90%, moderate, dry	17
18	04/10/2018	30%, light, dry	17
19	26/04/2019	25%, light, dry	10
20	30/04/2019	10%, none, dry	13
21	13/05/2019	10%, light, dry	13
22	24/05/2019	10%, none, dry	16
23	30/05/2019	25%, moderate, dry	15
24	03/06/2019	40%, light, dry	14
25	15/07/2019	70%, none, dry	19

10.2.11 Given the prevalence of dense scrub within certain parts of the study area (and therefore the potential for live animals hidden within the undergrowth), further checks and searches were undertaken as part of the Ecological Clerk of Works (ECoW) when vegetation was cleared from Wigmore Park to facilitate ground investigation surveys (June to July 2018). These works were supervised by a suitably qualified ecologist and no reptiles were encountered.

Evaluation of results

10.2.12 Guidance on population size estimates from Froglife (Ref. 70) shown in **Table 10.3** and provides an indication of reptile population size class i.e. low, good or exceptional. The peak adult count from a single visit is utilised for the assessment.

Table 10.3: Population size for survey assessment of key reptile sites

Species	Low	Good	Exceptional
Slow-worm	<5	5-20	>20
Common lizard	<5	5-20	>20
Grass snake	<5,	5-10,	>10
Adder	<5	5-10	>10

10.2.13 Population density can be estimated by dividing the adult peak count by the area of suitable reptile habitat present (ha) using the calculation from the HGBI guidance (Ref. 71) on population density estimates is shown in **Table 10.4**.

Table 10.4: Population density estimates

Species	Population size (adult density)
Slow-worm	High population >100/ha
	Medium population >50/ha
	Low population <50/ha
Common lizard	High population >80/ha
	Medium population >40/ha
	Low population <20/ha
Adder	High population >4/ha
	Medium population 2-4/ha
	Low population <2/ha
Grass snake	High population >4/ha
	Medium population 2-4/ha
	Low population <2/ha

Survey limitations

10.2.14 Reptiles are mobile animals, with some, such as grass snake, occupying large home ranges and therefore may occur as transient individuals on sites connected to wider areas that support these species. However, the level of survey effort undertaken is anticipated to have detected the reptile species present within the survey area.

10.2.15 The most effective times to undertake a reptile survey are April, May and September. Due to extended periods of high temperature, primarily during June and July 2018, fewer checks were undertaken in 2018 than initially planned. During such conditions, reptiles can enter aestivation, a period of enforced dormancy, which would be likely to influence survey results in this period (Ref. 72).

10.2.16 Consequently, and as described within the methodology section above, a further seven checks were conducted in suitable weather conditions between April and July 2019, with refugia redeployed in the same locations as the 2018 survey. These additional checks are considered to minimise the impact of adverse surveying weather conditions upon survey results, and therefore increase the robustness of results obtained during the 2018 surveys.

10.2.17 Although the surveys extended into early October 2018, which can be considered sub-optimal, the weather conditions during this period were well within the temperature range where reptiles would be active. As such, the survey dates are not considered to pose a constraint to the survey and are unlikely to materially affect the results of this report and the assessment that it informs.

10.2.18 A low number of the visits were undertaken during sub-optimal weather (e.g. moderate wind or high cloud cover); the overall results are considered robust due to the number of surveys completed within optimal conditions, with a suitable temperature range and dry conditions for all surveys, this is not considered to have affected the results of the survey.

10.2.19 Some areas where reptile refugia were initially located became inaccessible during the survey period. For example, four refugia were moved due to the commencement of the ground investigation works in Wigmore Park during June 2018 and approximately 12 refugia became shaded and overgrown by tall ruderal vegetation, including extensive stinging nettle cover to around head-height at the southern end of Wigmore Park.

10.2.20 These areas were likely reduced in suitability for reptiles and were discounted from further checks after July 2018. Given this, the 2019 artificial refugia surveys avoided these areas and placed refugia in adjacent areas of suitable habitat.

10.2.21 Additionally, approximately 15 (10%) refugia were removed by third parties, particularly in areas with a higher level of human disturbance such as Wigmore Park, or in areas of agricultural activity/machinery. Surveyors endeavoured to replace these refugia on subsequent visits to reduce the impact of this disruption to survey effort. Given the density of refugia utilised and the

distribution of refugia throughout all habitat types, this is not considered to be a significant limitation that could have affected the robustness of the survey.

10.2.22 Some parts of the Main Application Site were not accessible for survey, for example due to dense scrub or steep slopes. However, on the basis that the survey encompassed the majority of suitable habitats within the study area, it is considered that the results of the survey work undertaken are robust and that this is also not a significant limitation.

10.2.23 The results of these reptile surveys are representative only of the period in which the surveys were undertaken. Variations in conditions may occur over time due to seasonal factors, population dispersal or changes in habitat management and therefore the status of reptiles may be subject to change over time.

10.3 Results

Desk study

10.3.1 The Bedfordshire and Luton Species Action Plan for adder states: *"In 2009, an injured female adder was found among rubbish collected from the Luton area, so it appears there may also be a population remaining in the south of the county."* No records of adder were returned from HERC.

10.3.2 The data search results from BRMC and HERC returned one record of slow-worm from the 2km area surrounding the Main Application site within the past 10 years. Some additional historic records (between 1973 and 2007) of common lizard, grass snake and slow-worm were also returned.

Field survey

10.3.3 Slow-worm accounted for all reptiles identified during the survey, with the vast majority of individuals observed in the grassland area adjacent to Wigmore Park Allotments. Additionally, two slow-worm were found in the area of calcareous grassland to the south of Eaton green road. The first was found during the systematic walkover basking beneath a piece of an abandoned vehicle which has been in this location for some time and may have formed a permanent 'artificial' refuge, with the second found under an artificial refuge in 2019.

10.3.4 The location of the two areas supporting slow worm are shown on the Reptile Survey Results Plan within **Appendix W** and Photographs 9 and 10 within **Section 13**.

10.3.5 The results of all surveys and the incidental record are summarised in **Table 10.5** below.

Table 10.5: Results of the artificial refugia checks

Visit no.	Date	Result	Location
Incidental	06/05/2019	1 adult slow-worm	Grassland east of Wigmore Park

Visit no.	Date	Result	Location
1	15/05/2018	1 adult slow-worm	Adjacent to Wigmore Allotments
2	23/05/2018	1 adult slow-worm	Adjacent to Wigmore Allotments
3	07/06/2018	1 adult slow-worm	Adjacent to Wigmore Allotments
4	14/06/2018	Nil	-
5	21/06/2018	1 adult slow-worm	Adjacent to Wigmore Allotments
6	26/06/2018	Nil	-
7	05/07/2018	2 adult slow-worms	Adjacent to Wigmore Allotments
8	24/08/2018	4 adult slow-worms	Adjacent to Wigmore Allotments
9	28/08/2018	2 adult slow-worms, 6 juvenile slow-worms	Adjacent to Wigmore Allotments
10	30/08/2018	1 adult slow-worm, 1 juvenile slow-worm	Adjacent to Wigmore Allotments
11	04/09/2018	4 adult slow-worms	Adjacent to Wigmore Allotments
12	06/09/2018	1 juvenile slow-worm	Adjacent to Wigmore Allotments
13	11/09/2018	2 adult slow-worms, 2 juvenile slow-worms	Adjacent to Wigmore Allotments
14	13/09/2018	1 adult slow-worm	Adjacent to Wigmore Allotments
15	25/09/2018	1 adult slow-worm	Adjacent to Wigmore Allotments
16	28/09/2018	Nil	-
17	02/10/2018	1 adult slow-worm, 1 juvenile slow-worm	Adjacent to Wigmore Allotments
18	04/10/2018	3 adult slow-worms	Adjacent to Wigmore Allotments
19	26/04/2019	Nil	-
20	30/04/2019	5 juvenile slow- worm	Adjacent to Wigmore Allotments
21	13/05/2019	Nil	-
22	24/05/2019	1 juvenile slow-worm, 1 sub-adult slow worm	Adjacent to Wigmore Allotments

Visit no.	Date	Result	Location
23	30/05/2019	2 adult slow- worm, 2 juvenile slow-worm	3 Adjacent to Wigmore Allotments, 1 grassland east of Wigmore Park
24	03/06/2019	1 sub-adult slow-worm	Adjacent to Wigmore Allotments
25	15/07/2019	2 adult slow-worm, 5 juvenile slow-worm	Adjacent to Wigmore Allotments

Population Size Class and Population Density Estimate

10.3.6 The survey results indicate two small populations of slow-worm present within the Main Application Site, as highlighted on the Reptile Survey Results Plan in **Appendix W**. This is based upon peak adult counts of four and one for each of Wigmore Allotments and the area of unmanaged calcareous grassland east of Wigmore Park respectively. These two areas are separated by an area of arable land, mown semi-improved grassland and wooded belt; however, given the proximity of these two populations (approximately 200m) there is likely to be some movement of individuals between the two populations.

10.3.7 Based on an area of approximately 0.7 hectares of suitable habitat, the population density at Wigmore Park Allotments is 2.85/ha, while based on an area of approximately 1.5 hectares, the population density at the area of unmanaged grassland south of Eaton Green road is 0.67/ha. As such, based on guidance, both areas appear to support 'low' populations of slow-worm.

10.4 Conclusions and recommendations

10.4.1 Suitable habitats for reptiles exist within the study area. Reptile surveys have identified two 'low' populations of slow-worm within limited areas of the Main Application Site.

10.4.2 An additional nine surveyed areas within the survey extent boundary contain habitats suitable for slow-worm and other common species of reptile; however, none were identified in these areas during the artificial refugia surveys undertaken in 2018 and 2019. Given the presence of suitable habitats within the Main Application Site and immediate surrounds, and the large ranges covered by grass snake, it is possible that this species is also present at low densities.

11 AMPHIBIANS

11.1 Introduction

11.1.1 This section sets out the methodology and results of the amphibian survey work undertaken in relation to the Proposed Development between 2018 and 2020.

Study area

11.1.2 The study area of the Amphibian Survey covers waterbodies within 500m of the anticipated area of impacts within the Main Application Site boundary as detailed on the Pond Location Plan in **Appendix X**. The majority of the works associated with the highways interventions would occur in existing habitats within the highway boundary that largely comprise areas of hard standing, which do not include suitable habitats for amphibians and therefore were not included in the study area. The exception to this is the proposed highways intervention works at junction 10 of the M1, where vegetation clearance would be required. With reference to aerial imagery, there are three ponds and a drainage ditch system within 500m of Junction 10 and some terrestrial habitat also exists at this location.

11.1.3 The study area is set within a largely agricultural landscape context, with arable land bordering to the north, south and east; and residential areas of Luton to the north and west of the existing airport. Individual waterbodies took a variety of forms, ranging from natural and semi-natural field ponds, to man-made lined ponds.

Survey scope

11.1.4 Amphibian surveys were undertaken between April 2018 and May 2020.

11.1.5 The objectives of these surveys were to:

a. undertake a desk-based review of all waterbodies within 500m of the Main Application Site to determine whether they could potentially support any amphibian species, with a particular focus given to great crested newt populations;

b. undertake a review of amphibian species records within 2km of the Main Application Site;

c. assess the suitability of the habitats within the Main Application Site to support amphibian populations;

d. determine the presence or absence of any amphibian populations in any waterbodies within 500m of the Main Application Site;

e. determine the population size class of any great crested newt populations found to be present within 500m of the Main Application Site; and

f. provide sufficient information to inform an assessment of the potential impacts to amphibians as a result of the Proposed Development and design appropriate mitigation measures (where required).

Legislation and local biodiversity context

11.1.6 Great crested newt (*Triturus cristatus*) is fully protected under the Wildlife and Countryside Act 1981 (as amended) (Ref. 5), Countryside and Rights of Way (CRoW) Act 2000 (Ref. 6) and The Conservation of Habitats and Species Regulations 2017 (as amended) (Ref. 34) As such, without a licence from Natural England (NE), it is an offence to:

a. Kill, injure or capture a great crested newt;
b. Damage, destroy or obstruct access to any breeding site or resting place of a great crested newt; and
c. Disturb a great crested newt while it is occupying a structure or place that it uses for protection.

11.1.7 The legislation applies to all stages of the life cycle including eggs, larvae and juveniles.

11.1.8 The following amphibian species are also species of principal importance for the purpose of conserving biodiversity in England, listed in accordance with the provisions of Section 41 of the Natural Environment and Rural Communities (NERC) Act 2006 (Ref. 7), which places a duty on public organisations to 'have regard' to the conservation of these amphibians:

a. Common toad (*Bufo bufo*);
b. Natterjack toad (*Epidalea calamita*);
c. Pool frog (*Pelophylax lessonae*); and
d. Great crested newt.

11.1.9 Of the species listed on the NERC Act 2006, only two could feasibly be present within the Proposed Development boundary, great crested newt and common toad. These species were previously identified as requiring action in the UK Biodiversity Action Plan (UK BAP) and continue to be regarded as conservation priorities.

11.1.10 Natterjack toad is unlikely to be present as this species is almost exclusively confined to coastal sand dune systems, coastal grazing marsh and sandy heath habitats, which are not present within the Main Application Site. In addition, pool frog was presumed extinct in the wild in 1995 but has since been re-introduce at two sites in Norfolk; however they are still very restricted in distribution and considered absent from the Main Application Site.

11.1.11 Great crested newts are listed as priority species on both the Bedfordshire and Hertfordshire Local Biodiversity Action Plan (LBAP). Furthermore, the following species are referenced in the Hertfordshire LBAP;

a. Smooth newt (*Lissotriton vulgaris*);
b. Palmate newt (*Lissotriton helveticus*);
c. Common frog (*Rana temporaria*); and
d. Common toad.

11.2 Methodology

Desk study

11.2.1 A desk study exercise was undertaken in February 2018, which incorporated a 'pond scoping' exercise and a biological records search.

11.2.2 Ordnance Survey maps and aerial photographs were reviewed to identify ponds and other relevant waterbodies within 500m of the study area and to review habitat connectivity between these and the Main Application Site. This information was used to determine which required field survey, on the basis that they could potentially support great crested newt populations and other amphibians that could be affected by the Proposed Development.

11.2.3 A biological records search was conducted to obtain existing records of legally protected and notable species, including amphibians such as great crested newts. Species records within 2km of the Main Application Site were requested from the Bedfordshire and Luton Biological Recording and Monitoring Centre (BRMC). Where records within the 2km search fell within the Hertfordshire county boundary, these were returned from the Herts Environmental Records Centre (HERC). This exercise was repeated in June 2022 to capture any additional records.

11.2.4 Records of over 10 years were omitted as they may not accurately represent the current status of any amphibian populations in the area.

Field survey

Habitat suitability survey

11.2.5 A ground truthing and Habitat Suitability Index (HSI) assessment for great crested newts was completed at all accessible ponds within the study area, using the simplified HSI methodology (Ref. 73). The HSI surveys were carried out on 16 April 2018 by suitably qualified ecologists. An additional set of ground truthing and HSI assessments were conducted on 11 November 2019 in order to capture ponds where access had previously been restricted. During 2020 update HSI assessments were conducted on all ponds, where access was granted, between 23 April 2020 to 27 May 2020. On all occasions, the lead surveyor or both surveyors held survey licences for great crested newt.

11.2.6 The assessments are based on provision of suitable habitat for great crested newt breeding, foraging, shelter, and hibernation within the vicinity of the pond, and give an overall indication of suitability between 0 and 1:

a. 0 to 0.5 = poor suitability for great crested newts;
b. 0.51 to 0.59 = below average suitability for great crested newts;
c. 0.6 to 0.69 = average suitability for great crested newts;
d. 0.7 to 0.79 = good suitability for great crested newts; and
e. 0.8 to 1 = excellent suitability for great crested newts.

11.2.7 Habitats and features known to benefit amphibian populations include (Ref. 74):

a. Unshaded water bodies with emergent and submerged vegetation, which rarely dries out;
b. Unimproved and semi-improved grassland, swamps, hedgerow and scrub;
c. Connecting semi-natural habitat between ponds such as rough grassland, stone walls, hedgerows, scrub and trees;
d. Log piles and stone walls to provide refuge; and
e. Absence of predators, such as fish or wildfowl.

Presence/absence surveys

11.2.8 To determine great crested newt presence or absence, survey visits were undertaken at the ponds which held water, and where access was granted by the landowner. The initial survey visits were completed between 26 April 2018 and 22 May 2018. Updated surveys visits were completed between 23 April 2020 and 19 May 2020. All surveys were undertaken within the core period of mid-April to mid-May in line with best practice guidance (Ref. 75).

11.2.9 Four surveys are required to confirm great crested newt presence or absence, the surveys should be undertaken on the same evenings across all scoped in ponds. Where this was not possible, an explanation is provided under Survey Limitations in this section.

11.2.10 Each survey was carried out in accordance with the Great Crested Newt Mitigation Guidelines (Ref. 75) where possible; however, due to health and safety considerations in the 2018 surveys it was not possible to undertake bottle trapping, egg search or netting surveys at any waterbody, see explanation in Section 11.2.14. Therefore, during each visit in 2018, two survey methods were deployed, as described below:

a. **Torch survey:** The perimeter of the pond was surveyed for great crested newts after dark using a high-powered torch (1 million CP). Animals observed were identified to species, sex and life stage where possible; and
b. **Refugia search:** suitable natural and artificial refugia within proximity to ponds were searched by hand **for** the presence of great crested newts. Such refugia took the form of log piles, rubble, wooden planks and other such detritus within the terrestrial habitats. Any amphibians found were identified to species and gender.

11.2.11 During the updated surveys in 2020, where possible, three survey methods were deployed. Where this wasn't possible an explanation is provided in Section 11.2.14 below. The methods deployed for each pond were chosen based upon health and safety constraints, and therefore different combinations of the methods described below were used:

a. **Bottle trapping:** Traps were set up around the perimeter of the pond. Where access did not allow the use of standard bottle traps, floating bottle traps were used. Ponds were visited in the evening to set up the

traps, and an early morning visit to check the traps. Animals observed were identified to species, sex and life stage where possible.

b. **Egg search:** The perimeter of the pond was surveyed for Great Crested Newt (GCN) eggs by searching for folded leaves, and gently opening them to check for eggs. Only the minimum number of leaves were unwrapped to confirm GCN presence.

c. **Netting:** A dip net with a 2-4mm mesh was used to sweep around the pond margins, particularly through vegetation. Catch was inspected then released. Animals observed were identified to species, sex and life stage where possible.

d. **Torch survey:** The perimeter of the pond was surveyed for great crested newts after dark using a high-powered torch (1 million CP). Animals observed were identified to species, sex and life stage where possible.

e. **Refugia search:** suitable natural and artificial refugia within proximity to ponds were searched by hand for the presence of great crested newts. Such refugia took the form of log piles, rubble, wooden planks and other such detritus within the terrestrial habitats. Any amphibians found were identified to species and sex.

Weather Conditions

11.2.12 The dates, times and weather conditions of each survey are detailed below in **Tables 11.1** and **11.2** below.

Table 11.1: Weather conditions during amphibian surveys in 2018

Visit	Date	Overnight Temperature (°C)	Weather Conditions
1	26/04/2018	6	Clear, light wind, no rain
2	03/05/2018	6	Clear, light wind, no rain
3	08/05/2018	8	Clear, light wind, no rain
4	15/05/2018	10	Clear, light wind, no rain

Table 11.2: Weather conditions during amphibian surveys in 2020

Visit	Date	Overnight Temperature (°C)	Weather Conditions
1	23/04/2020	15	10% cloud cover, light wind, no rain
2	30/04/2020	10	15% cloud cover, no wind, no rain
3	06/05/2020	12	Clear, no wind, no rain
4	14/05/2020	12	Clear, light wind, no rain
5	19/05/2020	18	Clear, light wind, no rain

Environmental DNA survey

11.2.13 Environmental DNA analysis, known as eDNA, is a technique developed to detect DNA of a target species in the environment, in this case great crested newts in water. In order to assess the presence of great crested newt eDNA, 20 water samples are taken, following the field protocol outlined in the Defra Technical Advice Note (Ref. 76), at regular intervals from around each pond. The samples are analysed in laboratories using DNA amplification techniques, to identify whether great crested newt DNA is present.

11.2.14 Water samples for great crested newt eDNA were collected from all ponds that were holding water on 17 April 2018 except for Ponds 1 and 2 where samples were collected on 26 April 2018 due to delayed access permission. An attempt was made to eDNA survey Pond 7 again on 20 May 2019, due to an inconclusive result in 2018, however the pond was found to be dry on the return visit.

Survey limitations

11.2.15 Survey limitations were experienced at most ponds during the presence/ absence surveys relating to access and/or health and safety issues and are identified in **Table 11.3** below. Ponds that were dry at the time of HSI and subsequent survey visits are not included but are reported in the results section below. Due to the delayed timing of the additional ground truthing and HSI surveys conducted in November 2019, no presence/absence or eDNA surveys were conducted at ponds 16, 17, 18 and 19 in 2018. Water levels at pond 17 were insufficient to conduct presence/absence surveys in 2020, therefore this pond was scoped out on that basis. In 2020 the HSI of pond 20 was delayed until 27 May 2020 due to issues gaining access. Pond 20 therefore did not undergo further presence/absence or eDNA surveys. However, as Pond 20 is on the boundary of 500m from the Main Application site it is considered unlikely that any great crested newts that may use Pond 20 would be affected by the Proposed Development.

11.2.16 Despite the limitations identified, it is considered that an appropriate level of survey effort was deployed at each pond to allow a conclusion of presence or likely absence to be reached.

Table 11.3: Limitations experienced during the 2018 and 2020 amphibian surveys

Pond Number	Description	Limitations 2018	Methods Deployed 2018	Limitations 2020	Methods Deployed 2020
1	Steep-sided, deep Thames Water surface water retention ponds, next to Wigmore Park	90% margin inaccessible No BT due to lining No N due to H&S	T R ES	90% margin inaccessible No BT due to H&S* No N due to H&S Limited accessible	FBT R ES

Pond Number	Description	Limitations 2018	Methods Deployed 2018	Limitations 2020	Methods Deployed 2020
		Limited accessible vegetation for ES		vegetation for ES	
2	Steep-sided, deep Thames Water surface water retention ponds, next to Wigmore Park	90% margin inaccessible No BT due to lining No N due to H&S Leaf litter only for ES	T R ES	90% margin inaccessible No initial BT due to H&S* No N due to H&S Leaf litter only for ES	FBT R ES
4	Garden pond	Access granted for eDNA only	N/A	N/A	N/A
5	Steep, lined fire-training ponds covered by netting, located within the airfield	Turbidity limiting T No BT or ES due to netting	T R	No BT, ES or N due to new fencing	T R
6	Steep, lined fire-training ponds covered by netting, located within the airfield	Turbidity limiting T No BT or ES due to netting	T R	No BT, ES or N due to new fencing	T R
7	Field pond south of the airfield	Macrophytes Turbidity	R	N/A	N/A
8	Deep concrete walled pond, located within the airfield	No BT due to lining No N due to macrophyte Macrophyte cover limiting T	T R ES	No initial BT due to H&S* No N due to macrophyte Macrophyte cover limiting T	FBT R T
12	Ephemeral depression, located in Wigmore Park	Dry on third visit No BT or N due to depth Limited vegetation for ES	T ES R	Dry on second visit No BT or N due to depth Limited vegetation for ES	T ES R

Pond Number	Description	Limitations 2018	Methods Deployed 2018	Limitations 2020	Methods Deployed 2020
13	Part of drainage infrastructure for airport	No access	N/A	No initial BT due to H&S* Fluctuating water levels	FBT R T
14	Part of drainage infrastructure for airport	No access	N/A	No initial BT due to H&S* Limited vegetation for ES Fluctuating water levels	FBT R T
15	Part of drainage infrastructure for airport	No access	N/A	No initial BT due to H&S* Fluctuating water levels	FBT R T
16	N/A	N/A	N/A	Too shallow to BT or N Dry by third visit Turbidity limited T Leaf litter only for ES	T R ES
19	N/A	N/A	N/A	Too shallow to BT or N Leaf litter only for ES	T R ES

T: Torch, R: Refuge Search, ES: Egg Search, BT: Bottle Trap, FBT: Floating Bottle Trap, N: Netting.

* Bottle trapping was not initially possible due to Covid-19 restrictions on overnight stays however was instigated on subsequent surveys (using separate survey teams for the AM and PM), and using Floating bottle traps where necessary

Note: Where possible, three methods were deployed, however this was not always possible and not all methods identified below were deployed on each occasion due to changing limitations.

11.3 Results

Desk study

11.3.1 The desk-based pond scoping exercise identified ponds within 500m of the study area as shown on the Pond Location Plan in **Appendix X**.

11.3.2 BRMC provided 24 records of three amphibian species within the 2km distance from the Main Application Site:

a. 23 records of common frog, the closest record returned was located approximately 1 km north of the Main Application Site.

b. 1 record of smooth newt located approximately 1.9 km north of the Main Application Site.

11.3.3 HERC provided one record of an amphibian species within a 2km distance from the Main Application Site:

a. 1 record of common toad approximately 900m north of the Main Application Site.

Field survey

Habitat suitability Index Assessment

11.3.4 The results of the HSI assessment of the ponds of relevance to the Proposed Development are provided in **Table 11.4**; where ponds were not able to be surveyed due to access restriction this is stated.

Table 11.4: Pond locations and HSI assessment scores

Pond Number	Approximate distance and direction from the Proposed Development site	Grid reference of pond	HSI score 2018	Pond suitability 2018	HSI score 2020	Pond suitability 2020
1	Within the Proposed Development site	TL120221	0.43	Poor	0.60	Average
2	Within the Proposed Development site	TL122221	0.43	Poor	0.61	Average
3	60m north	TL130222	Dry	N/A	0.25	Poor
4	50m north	TL136224	0.65	Average	No Access	
5	Within the Proposed Development site	TL127215	0.46	Poor	0.60	Average
6	Within the Proposed Development site	TL128215	0.43	Poor	0.44	Poor
7	60m south	TL129206	0.49	Poor	Dry	N/A
8	Within the Proposed Development site	TL132212	0.51	Below Average	0.59	Below Average
9	Within the Proposed Development site	TL136212	0.45	Poor	Dry	N/A
10	370m east	TL148220	Dry	N/A	Dry	N/A
11	450m east	TL149215	No access		Dry	N/A

Pond Number	Approximate distance and direction from the Proposed Development site	Grid reference of pond	HSI score 2018	Pond suitability 2018	HSI score 2020	Pond suitability 2020
12	Within the Proposed Development site	TL125216	0.55	Below Average	0.40	Poor
13	Within the Proposed Development site	TL128212	Dry	N/A	0.57	Below Average
14	Within the Proposed Development site	TL127212	Dry	N/A	0.54	Below Average
15	Within the Proposed Development site	TL126212	0.29	Poor	0.40	Poor
16	290m north east	TL146223	0.46	Poor	0.36	Poor
17	330m north east	TL147223	Dry	N/A	N/A	N/A
18	310m south	TL120202	0.57	Below Average	Dry	N/A
19	20m west	TL105203	0.51	Below Average	0.53	Below Average
20	50m north	TL117225	N/A	N/A	0.44	Poor

Presence/Absence Survey

11.3.5 A habitat description and summary of the survey results for each pond included in the presence/absence surveys is provided below. Photographs of all ponds are provided in **Section 13** at the end of this report and detailed survey results are provided on the Amphibian Survey Results Plan in **Appendix Y**.

Pond 1

11.3.6 This pond is at the northern edge of the Main Application Site, just south of Eaton Green Road. It is a Thames Water surface water retention pond, steep sided, with near vertical banks. It is surrounded by mixed broadleaved woodland and scrub.

11.3.7 No great crested newts were recorded during the surveys in 2018 or 2020.

11.3.8 A peak count of 2 smooth newts were recorded during the 2018 surveys. A peak count of 31 smooth newts and 1 common frog was recorded during the 2020 surveys.

Pond 2

11.3.9 This pond is at the northern edge of the Main Application Site, just south of Eaton Green Road. It is a Thames Water small surface water retention pond,

steep sided, again with near vertical banks. It is also surrounded by mixed broadleaved woodland and some scrub.

11.3.10 No great crested newts were recorded during the surveys in 2018 or 2020.

11.3.11 No other amphibians were recorded during the surveys.

Pond 5

11.3.12 This pond is within the Main Application Site to the east of Wigmore Park CWS. It is a fire training pool, with a strong odour of hydrocarbons. It is steep, plastic lined with negligible vegetation. It is surrounded by rabbit grazed semi-improved grassland with some rubble piles nearby.

11.3.13 No great crested newts were recorded during the surveys in 2018 or 2020.

11.3.14 No other amphibians were recorded during the 2018 surveys. A peak count of 8 smooth newts, 3 common toads, 6 common toad tadpoles and 1 common frog was recorded in 2020.

Pond 6

11.3.15 This pond is within the Main Application Site to the east of Wigmore Park CWS. Like pond 5, it is a fire training pool, with a very strong odour of hydrocarbons. It is also steep, plastic lined with negligible vegetation. It is surrounded by rabbit grazed semi-improved grassland with some rubble piles nearby.

11.3.16 No great crested newts were recorded during the surveys in 2018 or 2020.

11.3.17 No other amphibians were recorded during the 2018 surveys. A peak count of 3 smooth newts and 3 common toads and 6 common toad tadpoles was recorded in 2020.

Pond 8

11.3.18 This pond is within the Main Application Site to the west of Winch Hill wood. It is a concrete walled, airfield drainage pond with high levels of macrophytes. It is surrounded by grassland and tarmac access roads.

11.3.19 No great crested newts were recorded during the surveys in 2018 or 2020.

11.3.20 A peak count of 1 smooth newt was recorded at Pond 8 in 2018. A peak count of 8 smooth newts, 1 common toad and 4 common frog3 was recorded in 2020.

Pond 12

11.3.21 This pond is 70m from the western boundary of Wigmore Park. It is a grassed depression with patches of bare ground surrounded by willow trees and scrub. It sporadically holds water following high rainfall events. It held water during only one visit on 15 May 2018 and again only one visit.

11.3.22 No great crested newts were recorded during the surveys in 2018 or 2020.

11.3.23 Common toad tadpoles were recorded during the 2018 surveys. A peak count of 2 smooth newts was recorded in 2020.

Pond 13

11.3.24 This pond is within the Main Application Site. It forms part of the drainage infrastructure for the airport runway. It intermittently holds water and is subject to high levels of pollution through runoff from the airport infrastructure.

11.3.25 No great crested newts were recorded during the surveys in 2020.

11.3.26 A peak count of 1 smooth newt and 1 common toad was recorded during the 2020 surveys.

Pond 14

11.3.27 This pond is within the Main Application Site. It forms part of the drainage infrastructure for the airport runway. It intermittently holds water and is subject to high levels of pollution through runoff from the airport infrastructure.

11.3.28 No great crested newts were recorded during the surveys in 2020.

11.3.29 A peak count of 4 smooth newts and 3 common toads was recorded during the 2020 surveys.

Pond 15

11.3.30 This pond is within the Main Application Site. It forms part of the drainage infrastructure for the airport runway. It intermittently holds water and is subject to high levels of pollution through runoff from the airport infrastructure.

11.3.31 No great crested newts were recorded during the surveys in 2020.

11.3.32 No other amphibians were recorded during the surveys.

Pond 16

11.3.33 This pond is 290m north west of the Main Application Site. It is a small pond of reasonable depth with surrounding terrestrial habitat suitable for supporting great crested newts.

11.3.34 No great crested newts were recorded during the surveys in 2020.

11.3.35 A peak count of 3 smooth newts was recorded during the surveys in 2020.

Pond 19

11.3.36 This pond is 20m west of the Main Application site. It is a small pond that had dried considerably at the time of HSI.

11.3.37 No other amphibians were recorded during the surveys in 2020.

11.3.38 A peak count of 3 smooth newts was recorded during the surveys in 2020.

Environmental DNA

11.3.39 Of the twelve ponds subject to HSI assessment in April 2018, only six ponds were sampled for environmental DNA. The six remaining ponds were not sampled due to low water levels which made them unsuitable for sampling at

the time of survey or due to a lack of access. See **Table 11.5** for a summary of the eDNA results

Table 11.5: Environmental DNA (eDNA) results noting survey limitations

Pond Number	eDNA result	Limitations
1	Negative	None
2	Negative	None
4	Negative	None
5	Negative	None
6	Negative	None
7	Indeterminate (2018) Dry (2019)	Algae and particulate matter present in sample in 2018.

11.3.40 All ponds apart from pond 7 returned a negative result for great crested newt eDNA.

11.3.41 Pond 7 was subject to an eDNA test and returned an indeterminate result, likely due to very low water levels causing the concentration of chemical/organic materials within the water sample. An attempt was made to resurvey Pond 7 in 2019 during the great crested newt breeding season however the pond was found to be dry.

Incidental sightings

11.3.42 During reptile surveys of the Main Application Site in 2018 utilising artificial refugia, in the form of corrugated metal/onduline and roofing felts, common toad were occasionally encountered within and to the periphery of Wigmore Park, within proximity to ponds 2 and 3. A single common toad was also encountered during a reptile survey to the west of the runway, between ponds 9 and 11.

11.4 Conclusions and recommendations

11.4.1 These conclusions and recommendations are based upon the most recent findings from the 2020 surveys with due regard for previous survey results.

11.4.2 No evidence of great crested newts was recorded during the survey period; it is considered this species is likely to be absent from the study area, and therefore no further consideration is required.

11.4.3 Ponds 1, 5, 6, 8, 13, 14, 16 and 19 were found to support low numbers of smooth newts. Therefore, it is assumed that these water bodies support a small-scale population of this species.

11.4.4 Additional amphibian species recorded during the surveys were common frog and common toad. Low numbers of common toad were incidentally found

during the reptile survey utilising terrestrial habitats, most notably the areas of long grassland to the periphery of Wigmore Park and allotments.

11.4.5 An update presence/absence survey would be required prior to the commencement of any works, including vegetation clearance, to reconfirm the likely absence of this species from the Main Application Site.

12 ROMAN SNAILS

12.1 Introduction

12.1.1 This section sets out the methodology and results of the Roman snail survey work undertaken in relation to the Proposed Development between 2018 and 2020.

Study area

12.1.2 The study area of the Roman Snail Survey incorporated land within the Main Application Site, as shown on the Roman Snail Survey Plan in **Appendix Z**. However, highway intervention locations and car parking locations do not include suitable habitats for Roman snail and were therefore scoped out for further surveys.

12.1.3 Field surveys undertaken [redacted] the Proposed Development boundary in this area was also included in the study area.

12.1.4 The study area is set within a largely agricultural landscape context, with arable land bordering to the north, south and east; and residential areas of Luton to the north and west of the existing airport.

Survey scope

12.1.5 A series of Roman snail surveys were undertaken between June 2018 and September 2020.

12.1.6 The objectives of the survey were to:

a. undertake a desk-based review of all Roman snail records within 2km of the Main Application Site to identify those that may be relevant to the development proposals;

b. assess the suitability of the habitats within the study area to support populations of Roman snail;

c. determine the presence or absence of Roman snail in suitable habitats within the study area; and

d. provide sufficient information to inform an assessment of the potential impacts to Roman snail as a result of the Proposed Development and allow the design of appropriate mitigation measures where required.

12.2 Legislation

12.2.1 The Roman snail is included within Schedule 5 of the Wildlife and Countryside Act 1981 (as amended) (Ref. 5). It is protected in relation to Section 9(1), (2) and (5), making it an offence to:

a. Intentionally kill, injure or take (including taking by hand) a Roman snail;

b. Possess or control a live or dead Roman snail, or any part of one; or

c. Sell, offer for sale or advertise for, live or dead Roman snails.

12.2.2 Any intentional movement or handling, however temporary, of a Roman snail is only permissible if covered by a relevant defence in the Act or carried out under a Natural England licence.

12.3 Methodology

Desk study

12.3.1 A desk study exercise was undertaken in February 2018 which included a biological records search for relevant species. The records search was conducted to obtain existing records of legally protected and notable species, including Roman snail. Species records within 2km of the Main Application Site were requested from the Bedfordshire and Luton Biological Recording and Monitoring Centre (BRMC). Where portions of the study area fell within the Hertfordshire county boundary, these records were returned from the Herts Environmental Records Centre (HERC). This exercise was repeated in November 2020 to capture any additional records.

Field survey

12.3.2 There is currently no standardised or published survey methodology for Roman snail. However, from discussions with species experts at Natural England, it is considered that a combination of a daytime hand search and nocturnal torchlight surveys in suitable weather conditions is sufficient to enable an assessment of presence or likely absence of Roman snail at a site. It is considered good practice that nocturnal surveys are undertaken in wet weather or within 24 hours following rainfall.

12.3.3 A walkover survey of all accessible potentially suitable habitat within the study area was carried out on 14 and 15 June 2018. No significant areas were inaccessible, however very dense areas could not always be fully accessed. These habitats typically included grassland margins along field boundaries and woodland areas. At the same time a daytime hand search was carried out where suitable habitat was identified. Areas of habitat with limited suitability for Roman snails within the Proposed Development were also identified at this time and discounted from further survey.

12.3.4 Where live snails and/or shells were not encountered during the daytime survey, but habitat was considered suitable, a subsequent torchlight survey was undertaken to determine presence or likely absence. The torchlight survey was carried out on 11 June 2019.

12.3.5 Field surveys undertaken [redacted] n additional daytime survey of the identified habitats [redacted] was completed on 18 June 2019. A daytime survey of [redacted] was also undertaken on 16 September 2020.

12.3.6 The daytime surveys consisted of systematically hand searching through ground vegetation and beneath logs and stones. The torchlight surveys focussed upon hand searching through ground vegetation, parting dense areas by hand. Any live snails and shells which were encountered were recorded. The tendency for Roman snail to aggregate (Ref. 77) makes hand searching a viable survey technique.

12.3.7 The surveys were undertaken by suitably qualified ecologists. Any survey techniques that involved temporarily taking snails (i.e. picking up for examination) were undertaken by an experienced surveyor who is a Natural England Roman snail licence holder.

12.3.8 The nocturnal survey was undertaken during optimal weather conditions, during rain and within 24 hours of a heavy downpour. The daytime survey of off-site habitats was undertaken during heavy rain. Full details of the conditions are provided within **Table 12.1**.

Table 12.1: Roman snail survey dates and weather conditions

Visit no.	Date	Survey Type	Weather	Temperature (°C)
1	14/06/2018 and 15/06/2018	Daytime hand search	Wind: 1/12 Dry	21
2	11/06/2019	Torchlight survey	Wind: 5/12 Light rainfall	10
3	18/06/2019	Daytime hand search	Wind: 4/12* Heavy rainfall	15
4	16/09/2020	Daytime hand search	Wind: 1/12 Dry	20

*Wind is provided using the Beaufort scale

Survey limitations

12.3.9 Whilst access was granted to the enclosed Dairyborn Scarp DWS, the majority of this site was inaccessible for survey given the extremely steep gradient of the escarpment, as well as impenetrable vegetation covering many other areas. Where possible, inaccessible habitats were viewed from multiple angles, using binoculars and through site fencing at suitable viewpoints. This is considered a notable limitation to the survey and as a result a reasonable worst-case scenario has been assumed within the baseline.

12.3.10 Some other areas of vegetation within the study area could not be fully searched due to inaccessibility. However (with the exception of Dairyborn Scarp DWS) it is considered that sufficient survey effort was employed to ascertain presence or likely absence of Roman snail across the study area.

12.4 Results

Desk study

12.4.1 The data search results from BRMC and HERC returned two records of Roman snail inside the 2km search radius of the Main Application Site within the past 10 years. The location of both records [redacted]. The results are summarised in **Table 12.2** below.

12.4.2 Some additional historic records (between 1948 and 1981) of Roman snail were also returned within [redacted]

Table 12.2: Records of Roman snail within the last 10 years.

Species	Date	Comments	Grid Reference
Roman snail Helix pomatia	28/06/2017	>20 Roman snails	[redacted]
Roman snail Helix pomatia	21/08/2017	1 Roman snail	[redacted]

12.4.3 Field surveys undertaken in [redacted]

Field Survey

12.4.4 The surveys did not identify the presence of live Roman snail within the Main Application Site, [redacted] In addition, [redacted]

12.5 Conclusions and recommendations

12.5.1 Suitable habitats for Roman snails exist within the Main Application Site, however, no Roman snail have been identified. [redacted]

12.5.2 [redacted] No live roman snails were found during the survey, but given the historic record from this site and the fragment identified, low numbers of Roman snail are assumed to be present on a precautionary basis in the absence of a full survey.

12.5.3 An updated survey would be required prior to the commencement of any works, including vegetation clearance, to confirm the presence or likely absence of this species [redacted].

12.5.4 While Roman snail [redacted] it is considered that continuation of current habitat management practices, which comprises regular mowing to maintain a short grassland sward, will prevent dispersal into the Main Application Site. This existing management involves standard controls such as maintenance of minimal vegetation between the interior and exterior fence-lines present in this location, avoiding overgrowth of vegetation within the Main Application Site in these locations.

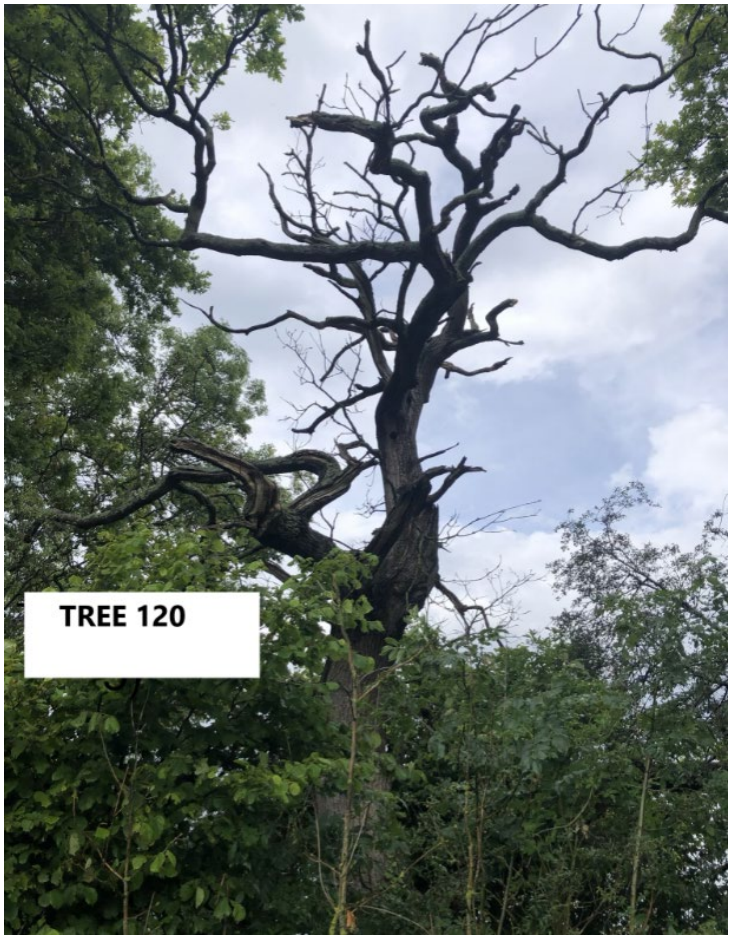
13 Photographs

Photograph 1: Pillbox supporting common pipistrelle roost

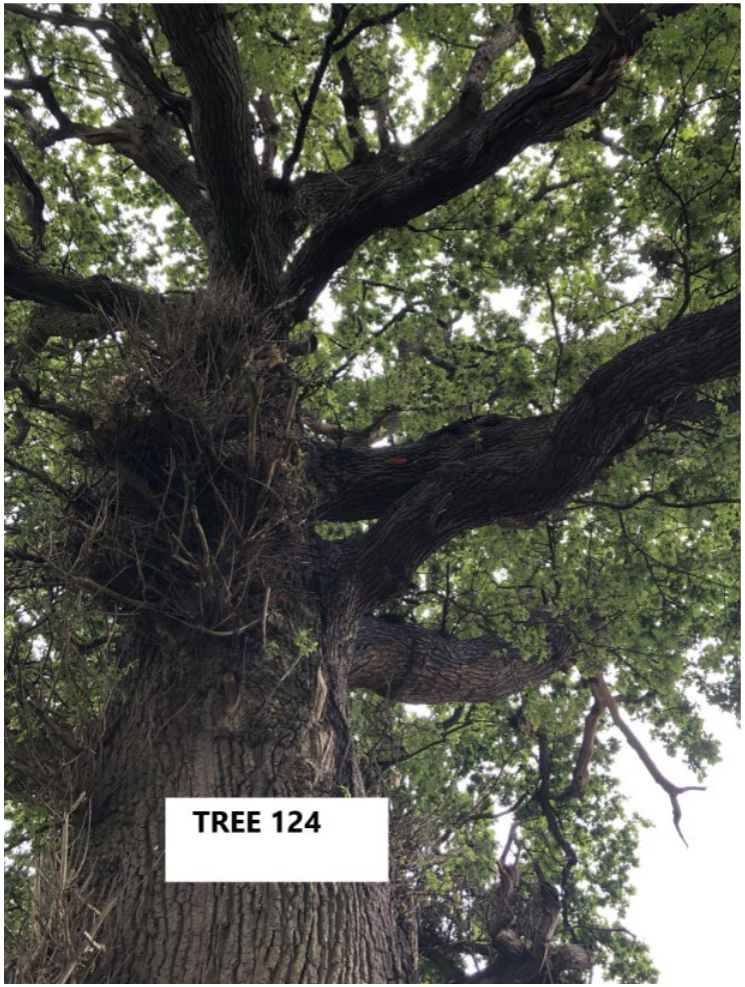
Photograph 2: Winch Hill Cottage (2) supporting common pipistrelle roost.

Photograph 3: Confirmed common pipistrelle roost

Photograph 4: Confirmed common pipistrelle roost



Photograph 5: Confirmed common pipistrelle roost



Photograph 6: Confirmed common pipistrelle roost

Photograph 7: Otter spraint

Photograph 8: Potential water vole burrow

Photograph 9: Potential otter feeding remains

Photograph 10: Reptile habitat supporting slow-worm adjacent to Wigmore Park Allotments

Photograph 11: Reptile habitat supporting slow-worm adjacent to the east of Wigmore Park

Photograph 12: Pond 1 - Thames Water attenuation pond, west of Darley Road (2018)

Photograph 13: Pond 2 - Thames Water attenuation pond (2018)

Photograph 14: Pond 3 - Thames Water attenuation pond north of Eaton Green Road (2020)

Photograph 15: Pond 4 – Pond north of Darley Road (2018)

Photograph 16: Pond 5 – fire training area pool, north of the airfield, the western pool (2020)

Photograph 17: Pond 6 – fire training area pool, north of the airfield (2020)

Photograph 18: Pond 7 (2018) – Farm pond to the south of the study area, temporarily wet

Photograph 19: Pond 7 (2019) – Farm pond to the south of the study area, dry when revisited

Photograph 20: Pond 8 – airfield drainage pond, north of airfield (2020)

Photograph 21: Pond 9 – dry drainage pond, north east of airfield (2020)

Photograph 22: Pond 12 – temporarily wet pond within Wigmore Park (2018)

Photograph 23: Pond 13 – Drainage basin part of SUDs associated with runway infrastructure (2018)

Photograph 24: Pond 14 – Drainage infrastructure forms part of SUDs associated with runway infrastructure (2018).

Photograph 25: Pond 15 – Drainage infrastructure forms part of SUDs associated with runway infrastructure (2018).

Photograph 26: Pond 16 – Small ephemeral depression on the boundary between the arable field and farm buildings

Photograph 27: Pond 18 – Drainage pond at the edge of a farm track (2018)

Photograph 28: Pond 18 – Drainage pond at the edge of a farm access track (2020)

Photograph 29: Pond 19 – Balancing pond adjacent to the roadside between Gipsy Lane and Parkway road (2020)

Photograph 30: Roman snail [redacted]

Appendix A

A1 Development Areas Plan

All structure positions are indicative. The proposed works will be subject to detailed design development. The changes will be within limits of deviation specified in the Development Consent Order.

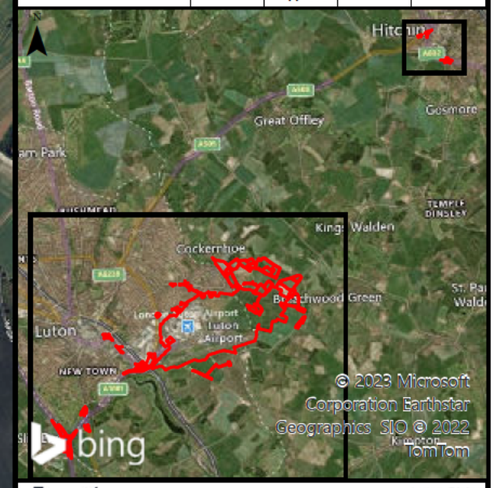
Legend

- Order Limits
- Local Authority Boundaries
- Someries Castle
- Luton Hoo Registered Park and Garden
- Winch Hill Farmhouse
- Luton Airport Business Park
- Open Space

Development Areas

- Main Application Site
- Off-site Highway Interventions
- Off-site Planting
- Off-site Car Parks

First Issue	AB	SM CS	20/02/23	P01
Revision History	Drawn	Checked Approved	Date	Rev.



Luton Rising
Our airport. Our community. Our planet.

Luton Rising
Hart House Business Centre
Kimpton Road, Luton, LU2 0LA
www.lutonrising.org.uk

London Luton Airport Expansion Development Consent Order

Drawing Title

Appendix A
Development Areas Plan

Purpose of issue				Suitability	
SUITABLE FOR INFORMATION				S2	
Drawn	Checked	Approved	Date	Scale	Size
AB	SM	CS	20/02/23	1:25,000	A3

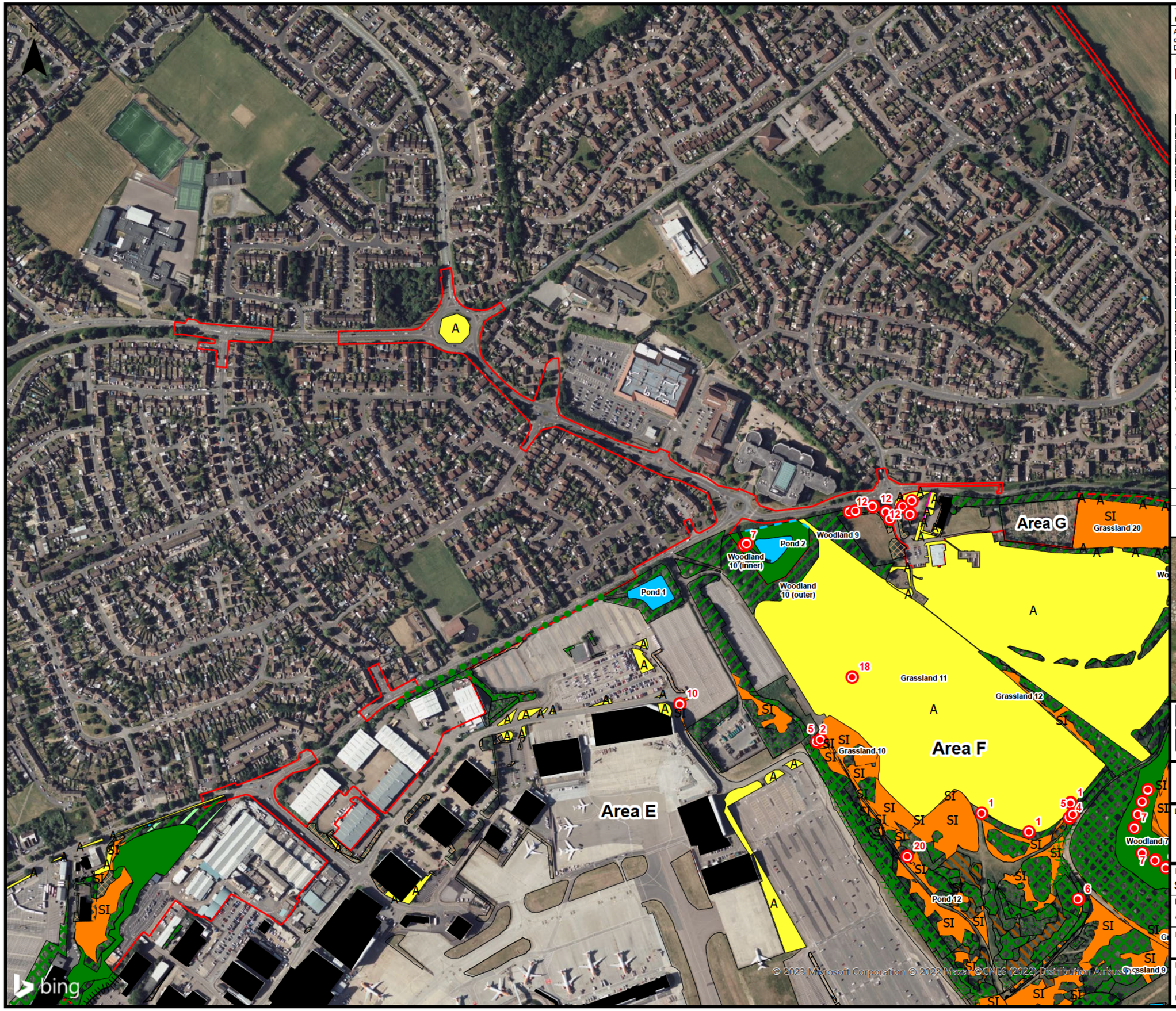
DCO Application Ref.	APFP Regulation	DCO Document Ref.
TR020001	APFP 5(2)(a)	TR020001/APP/5.02

Drawing Number	Revision
LLADCO-3C-ARP-00-00-DR-YE-0205	P01

Project - Phase - Originator - Asset/Zone - Sub Asset - Type- Disp. - Number

Appendix B

B1 Phase 1 Habitat Survey Plan



All structure positions are indicative. The proposed works will be subject to detailed design development. The changes will be within limits of deviation specified in the Development Consent Order.

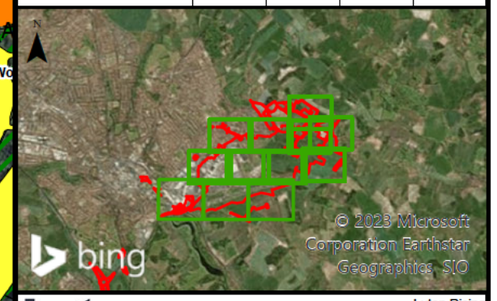
Legend

- Order Limits
- Target Notes

Habitat Description

- A1.1.1 - Broadleaved woodland - semi-natural
- A1.1.2 - Broadleaved woodland - plantation
- A1.3.2 - Mixed woodland - plantation
- A2.1 - Scrub - dense/continuous
- A2.2 - Scrub - scattered
- A3.1 - Broadleaved parkland/scattered trees
- A4.1 - Broadleaved woodland - recently felled
- B2.2 - Neutral grassland - semi-improved
- B3.1 - Calcareous grassland - unimproved
- B3.2 - Calcareous grassland - semi-improved
- B5 - Marsh/marshy grassland
- B6 - Poor semi-improved grassland
- C3.1 - Other tall herb and fern - ruderal
- G1 - Standing water
- G1.1 - Standing water - eutrophic
- J1.2 - Cultivated/disturbed land - amenity grassland
- J1.3 - Cultivated/disturbed land - ephemeral/short perennial
- J1.4 - Introduced shrub
- J3.6 - Buildings
- J4 - Bare ground
- J5 - Other habitat
- A2.2 - Scrub - scattered
- A3.1 - Broadleaved parkland/scattered trees
- J2.4 - Fence
- J2.5 - Wall
- J2.6 - Dry ditch

First Issue	AB	SM CS	20/02/23	P01
Revision History	Drawn	Checked Approved	Date	Rev.



Luton Rising
Hart House Business Centre
Kimpton Road, Luton, LU2 0LA
www.lutonrising.org.uk

Luton Rising — Our airport. Our community. Our planet.

London Luton Airport Expansion Development Consent Order

Drawing Title

Phase 1 Habitats Plan
Page 1 of 12

Purpose of issue	Suitability
SUITABLE FOR INFORMATION	S2

Drawn	Checked	Approved	Date	Scale	Size
AB	SM	CS	20/02/23	1:5,000	A3

DCO Application Ref.	APFP Regulation	DCO Document Ref.
TR020001	APFP 5(2)(a)	TR020001/APP/5.02

Drawing Number	Revision
LLADCO-3C-ARP-00-00-DR-YE-0206	P01

Project - Phase - Originator - Asset/Zone - Sub Asset - Type- Discp. - Number

All structure positions are indicative. The proposed works will be subject to detailed design development. The changes will be within limits of deviation specified in the Development Consent Order.

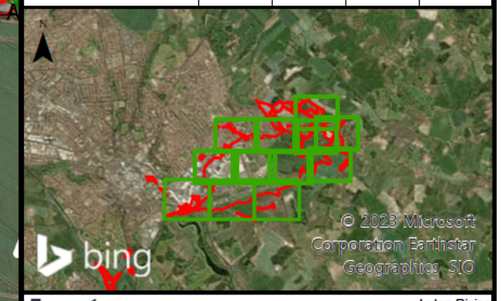
Legend

- Order Limits
- Target Notes

Habitat Description

- A1.1.1 - Broadleaved woodland - semi-natural
- A1.1.2 - Broadleaved woodland - plantation
- A1.2.2 - Coniferous woodland - plantation
- A1.3.2 - Mixed woodland - plantation
- A2.1 - Scrub - dense/continuous
- A2.2 - Scrub - scattered
- A3.1 - Broadleaved parkland/scattered trees
- B2.2 - Neutral grassland - semi-improved
- B3.1 - Calcareous grassland - unimproved
- B3.2 - Calcareous grassland - semi-improved
- B5 - Marsh/marshy grassland
- B6 - Poor semi-improved grassland
- C1.1 - Bracken - continuous
- C1.2 - Bracken - scattered
- C3.1 - Other tall herb and fern - ruderal
- G1 - Standing water
- G1.1 - Standing water - eutrophic
- I2.4 - Refuse-tip
- J1.1 - Cultivated/disturbed land - arable
- J1.2 - Cultivated/disturbed land - amenity grassland
- J1.3 - Cultivated/disturbed land - ephemeral/short perennial
- J1.4 - Introduced shrub
- J3.6 - Buildings
- J4 - Bare ground
- J5 - Other habitat
- A2.2 - Scrub - scattered
- A3.1 - Broadleaved parkland/scattered trees
- A3.2 - Coniferous parkland/scattered trees
- J2.1.1 - Intact hedge - native species-rich
- J2.1.2 - Intact hedge - species-poor
- J2.2.1 - Defunct hedge - native species-rich
- J2.2.2 - Defunct hedge - species-poor
- J2.3.1 - Hedge with trees - native species-rich
- J2.3.2 - Hedge with trees - species-poor
- J2.4 - Fence
- J2.5 - Wall
- J2.6 - Dry ditch

First Issue	AB	SM CS	20/02/23	P01
Revision History	Drawn	Checked Approved	Date	Rev.



Luton Rising
Our airport. Our community. Our planet.
Luton Rising
Hart House Business Centre
Kimpton Road, Luton, LU2 0LA
www.lutonrising.org.uk

London Luton Airport Expansion Development Consent Order

Drawing Title

Phase 1 Habitats Plan
Page 2 of 12

Purpose of issue				Suitability	
SUITABLE FOR INFORMATION				S2	
Drawn	Checked	Approved	Date	Scale	Size
AB	SM	CS	20/02/23	1:5,000	A3

DCO Application Ref.	APFP Regulation	DCO Document Ref.
TR020001	APFP 5(2)(a)	TR020001/APP/5.02

Drawing Number	Revision
LLADCO-3C-ARP-00-00-DR-YE-0206	P01

Project - Phase - Originator - Asset/Zone - Sub Asset - Type- Discp. - Number

All structure positions are indicative. The proposed works will be subject to detailed design development. The changes will be within limits of deviation specified in the Development Consent Order.

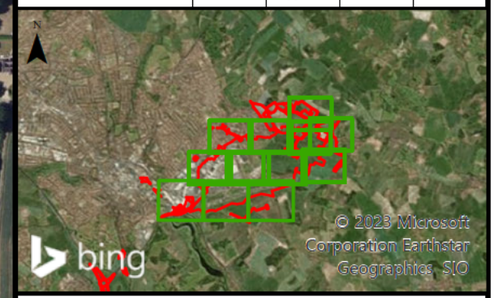
Legend

- Order Limits
- Target Notes

Habitat Description

- A1.1.1 - Broadleaved woodland - semi-natural
- A1.2.2 - Coniferous woodland - plantation
- A1.3.2 - Mixed woodland - plantation
- A2.1 - Scrub - dense/continuous
- A2.2 - Scrub - scattered
- A3.1 - Broadleaved parkland/scattered trees
- B2.2 - Neutral grassland - semi-improved
- B6 - Poor semi-improved grassland
- C1.1 - Bracken - continuous
- C3.1 - Other tall herb and fern - ruderal
- I2.4 - Refuse-tip
- J1.1 - Cultivated/disturbed land - arable
- J1.2 - Cultivated/disturbed land - amenity grassland
- J1.3 - Cultivated/disturbed land - ephemeral/short perennial
- J1.4 - Introduced shrub
- J3.6 - Buildings
- J5 - Other habitat
- A2.2 - Scrub - scattered
- A3.1 - Broadleaved parkland/scattered trees
- A3.2 - Coniferous parkland/scattered trees
- J2.1.1 - Intact hedge - native species-rich
- J2.1.2 - Intact hedge - species-poor
- J2.2.1 - Defunct hedge - native species-rich
- J2.2.2 - Defunct hedge - species-poor
- J2.3.1 - Hedge with trees - native species-rich
- J2.3.2 - Hedge with trees - species-poor
- J2.4 - Fence
- J2.5 - Wall
- J2.6 - Dry ditch

Revision History	Drawn	Checked / Approved	Date	Rev.
First Issue	AB	SM / CS	20/02/23	P01



Luton Rising
Hart House Business Centre
Kimpton Road, Luton, LU2 0LA
www.lutonrising.org.uk

Luton Rising — Our airport. Our community. Our planet.

London Luton Airport Expansion Development Consent Order

Drawing Title

Phase 1 Habitats Plan
Page 3 of 12

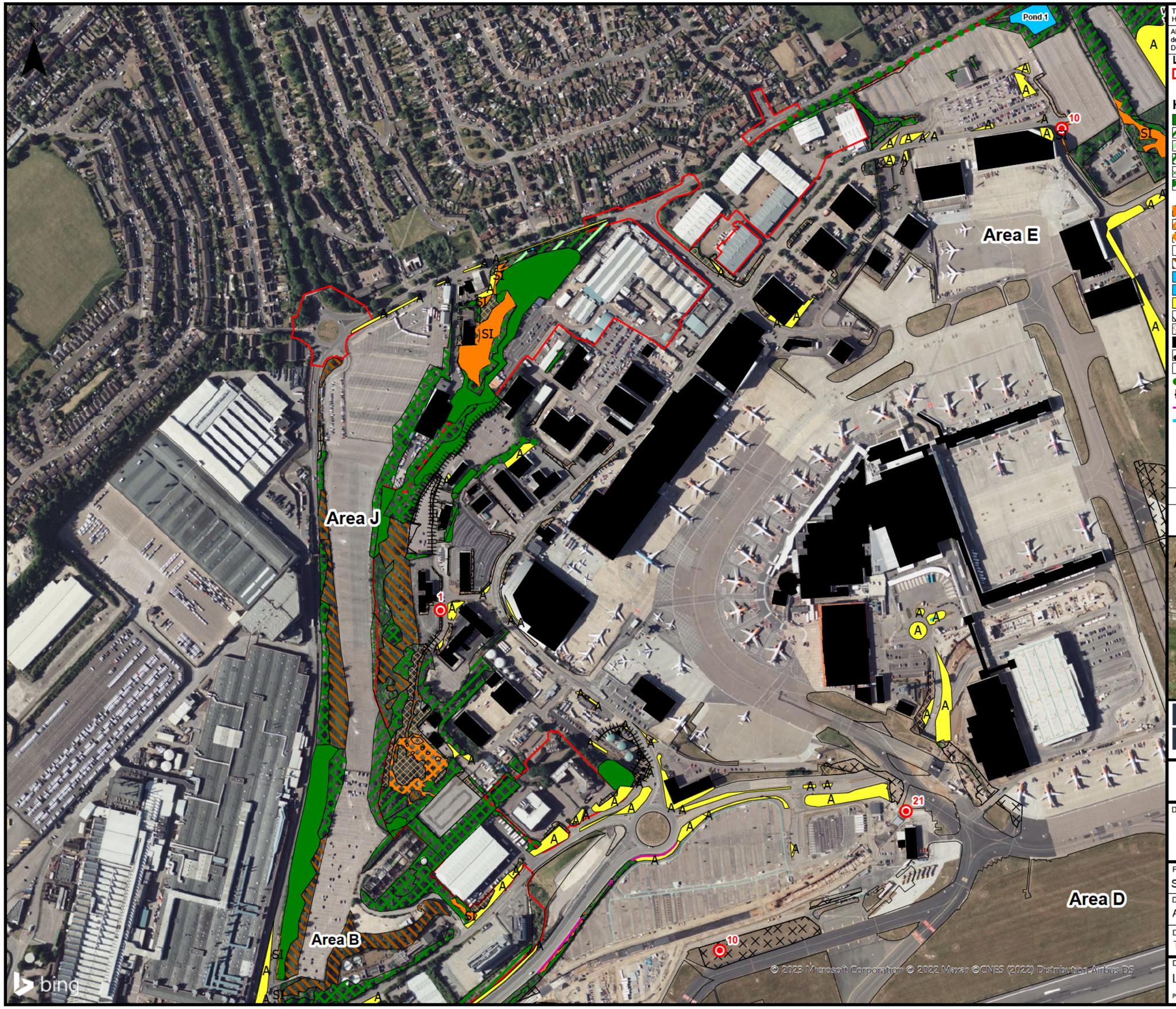
Purpose of issue	Suitability
SUITABLE FOR INFORMATION	S2

Drawn	Checked	Approved	Date	Scale	Size
AB	SM	CS	20/02/23	1:5,000	A3

DCO Application Ref.	APFP Regulation	DCO Document Ref.
TR020001	APFP 5(2)(a)	TR020001/APP/5.02

Drawing Number	Revision
LLADCO-3C-ARP-00-00-DR-YE-0206	P01

Project - Phase - Originator - Asset/Zone - Sub Asset - Type- Discp. - Number



All structure positions are indicative. The proposed works will be subject to detailed design development. The changes will be within limits of deviation specified in the Development Consent Order.

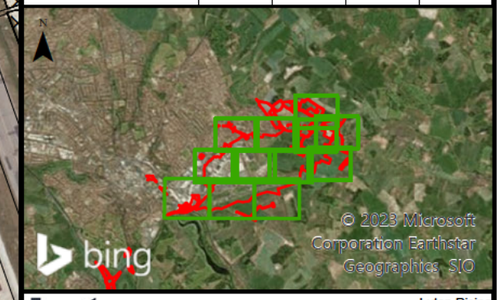
Legend

- Order Limits
- Target Notes

Habitat Description

- A1.1.1 - Broadleaved woodland - semi-natural
- A1.1.2 - Broadleaved woodland - plantation
- A1.3.2 - Mixed woodland - plantation
- A2.1 - Scrub - dense/continuous
- A2.2 - Scrub - scattered
- A3.1 - Broadleaved parkland/scattered trees
- A4.1 - Broadleaved woodland - recently felled
- B2.2 - Neutral grassland - semi-improved
- B3.1 - Calcareous grassland - unimproved
- B3.2 - Calcareous grassland - semi-improved
- B6 - Poor semi-improved grassland
- C3.1 - Other tall herb and fern - ruderal
- G1 - Standing water
- G1.1 - Standing water - eutrophic
- J1.2 - Cultivated/disturbed land - amenity grassland
- J1.3 - Cultivated/disturbed land - ephemeral/short perennial
- J1.4 - Introduced shrub
- J3.6 - Buildings
- J4 - Bare ground
- J5 - Other habitat
- A3.1 - Broadleaved parkland/scattered trees
- J2.4 - Fence
- J2.5 - Wall
- J2.6 - Dry ditch

Revision History	Drawn	Checked / Approved	Date	Rev.
First Issue	AB	SM / CS	20/02/23	P01



Luton Rising
Our airport. Our community. Our planet.

Luton Rising
Hart House Business Centre
Kimpton Road, Luton, LU2 0LA
www.lutonrising.org.uk

London Luton Airport Expansion Development Consent Order

Drawing Title

Phase 1 Habitats Plan
Page 4 of 12

Purpose of issue	Suitability
SUITABLE FOR INFORMATION	S2

Drawn	Checked	Approved	Date	Scale	Size
AB	SM	CS	20/02/23	1:5,000	A3

DCO Application Ref.	APFP Regulation	DCO Document Ref.
TR020001	APFP 5(2)(a)	TR020001/APP/5.02

Drawing Number	Revision
LLADCO-3C-ARP-00-00-DR-YE-0206	P01

Project - Phase - Originator - Asset/Zone - Sub Asset - Type- Disp. - Number

All structure positions are indicative. The proposed works will be subject to detailed design development. The changes will be within limits of deviation specified in the Development Consent Order.

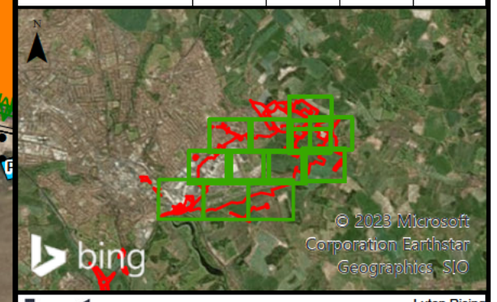
Legend

- Order Limits
- Target Notes

Habitat Description

- A1.1.1 - Broadleaved woodland - semi-natural
- A1.1.2 - Broadleaved woodland - plantation
- A2.1 - Scrub - dense/continuous
- A2.2 - Scrub - scattered
- A4.1 - Broadleaved woodland - recently felled
- B2.2 - Neutral grassland - semi-improved
- B3.1 - Calcareous grassland - unimproved
- B3.2 - Calcareous grassland - semi-improved
- B5 - Marsh/marshy grassland
- B6 - Poor semi-improved grassland
- C1.1 - Bracken - continuous
- C3.1 - Other tall herb and fern - ruderal
- G1 - Standing water
- G1.1 - Standing water - eutrophic
- J1.1 - Cultivated/disturbed land - arable
- J1.2 - Cultivated/disturbed land - amenity grassland
- J1.3 - Cultivated/disturbed land - ephemeral/short perennial
- J1.4 - Introduced shrub
- J3.6 - Buildings
- J4 - Bare ground
- A2.2 - Scrub - scattered
- A3.1 - Broadleaved parkland/scattered trees
- J2.2.2 - Defunct hedge - species-poor
- J2.3.1 - Hedge with trees - native species-rich
- J2.6 - Dry ditch

First Issue	AB	SM CS	20/02/23	P01
Revision History	Drawn	Checked Approved	Date	Rev.



Luton Rising
Hart House Business Centre
Kimpton Road, Luton, LU2 0LA
www.lutonrising.org.uk

Luton Rising — Our airport. Our community. Our planet.

London Luton Airport Expansion Development Consent Order

Drawing Title

Phase 1 Habitats Plan
Page 5 of 12

Purpose of issue			Suitability		
SUITABLE FOR INFORMATION			S2		
Drawn	Checked	Approved	Date	Scale	Size
AB	SM	CS	20/02/23	1:5,000	A3

DCO Application Ref.	APFP Regulation	DCO Document Ref.
TR020001	APFP 5(2)(a)	TR020001/APP/5.02

Drawing Number	Revision
LLADCO-3C-ARP-00-00-DR-YE-0206	P01

Project - Phase - Originator - Asset/Zone - Sub Asset - Type- Discp. - Number

All structure positions are indicative. The proposed works will be subject to detailed design development. The changes will be within limits of deviation specified in the Development Consent Order.

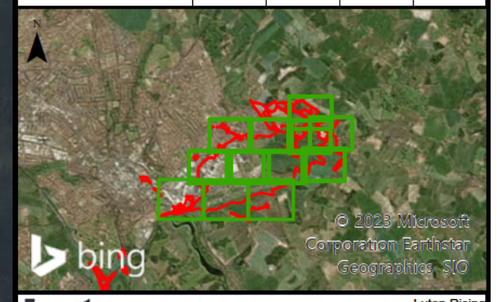
Legend

- Order Limits
- Target Notes

Habitat Description

- A1.1.1 - Broadleaved woodland - semi-natural
- A1.1.2 - Broadleaved woodland - plantation
- A1.2.2 - Coniferous woodland - plantation
- A1.3.2 - Mixed woodland - plantation
- A2.1 - Scrub - dense/continuous
- A2.2 - Scrub - scattered
- A3.1 - Broadleaved parkland/scattered trees
- B2.2 - Neutral grassland - semi-improved
- B3.1 - Calcareous grassland - unimproved
- B3.2 - Calcareous grassland - semi-improved
- B6 - Poor semi-improved grassland
- C1.1 - Bracken - continuous
- C3.1 - Other tall herb and fern - ruderal
- G1.1 - Standing water - eutrophic
- I2.4 - Refuse-tip
- J1.1 - Cultivated/disturbed land - arable
- J1.2 - Cultivated/disturbed land - amenity grassland
- J1.3 - Cultivated/disturbed land - ephemeral/short perennial
- J1.4 - Introduced shrub
- J3.6 - Buildings
- J4 - Bare ground
- J5 - Other habitat
- A2.2 - Scrub - scattered
- A3.2 - Coniferous parkland/scattered trees
- J2.1.1 - Intact hedge - native species-rich
- J2.1.2 - Intact hedge - species-poor
- J2.2.1 - Defunct hedge - native species-rich
- J2.2.2 - Defunct hedge - species-poor
- J2.3.1 - Hedge with trees - native species-rich
- J2.3.2 - Hedge with trees - species-poor
- J2.4 - Fence
- J2.5 - Wall

Revision History	Drawn	Checked / Approved	Date	Rev.
First Issue	AB	SM / CS	20/02/23	P01



Luton Rising
Hart House Business Centre
Kimpton Road, Luton, LU2 0LA
www.lutonrising.org.uk

Luton Rising — Our airport. Our community. Our planet.

London Luton Airport Expansion Development Consent Order

Drawing Title

Phase 1 Habitats Plan
Page 6 of 12

Purpose of issue	Suitability
SUITABLE FOR INFORMATION	S2

Drawn	Checked	Approved	Date	Scale	Size
AB	SM	CS	20/02/23	1:5,000	A3

DCO Application Ref.	APFP Regulation	DCO Document Ref.
TR020001	APFP 5(2)(a)	TR020001/APP/5.02

Drawing Number	Revision
LLADCO-3C-ARP-00-00-DR-YE-0206	P01

Project - Phase - Originator - Asset/Zone - Sub Asset - Type- Discp. - Number

All structure positions are indicative. The proposed works will be subject to detailed design development. The changes will be within limits of deviation specified in the Development Consent Order.

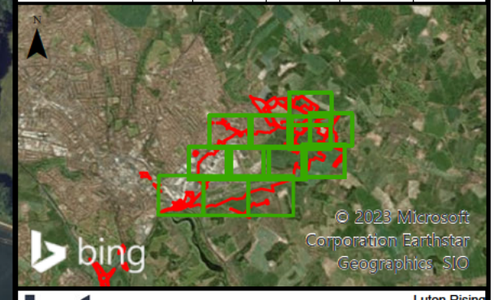
Legend

- Order Limits
- Target Notes

Habitat Description

- A1.1.1 - Broadleaved woodland - semi-natural
- A1.1.2 - Broadleaved woodland - plantation
- A1.2.2 - Coniferous woodland - plantation
- A1.3.2 - Mixed woodland - plantation
- A2.1 - Scrub - dense/continuous
- A2.2 - Scrub - scattered
- A3.1 - Broadleaved parkland/scattered trees
- B2.2 - Neutral grassland - semi-improved
- B3.2 - Calcareous grassland - semi-improved
- B6 - Poor semi-improved grassland
- C1.1 - Bracken - continuous
- C3.1 - Other tall herb and fern - ruderal
- I2.4 - Refuse-tip
- J1.1 - Cultivated/disturbed land - arable
- J1.2 - Cultivated/disturbed land - amenity grassland
- J1.3 - Cultivated/disturbed land - ephemeral/short perennial
- J1.4 - Introduced shrub
- J3.6 - Buildings
- J5 - Other habitat
- A3.1 - Broadleaved parkland/scattered trees
- A3.2 - Coniferous parkland/scattered trees
- J2.1.1 - Intact hedge - native species-rich
- J2.1.2 - Intact hedge - species-poor
- J2.2.1 - Defunct hedge - native species-rich
- J2.2.2 - Defunct hedge - species-poor
- J2.3.1 - Hedge with trees - native species-rich
- J2.3.2 - Hedge with trees - species-poor
- J2.4 - Fence
- J2.5 - Wall

Revision History	Drawn	Checked / Approved	Date	Rev.
First Issue	AB	SM / CS	20/02/23	P01



Luton Rising
Hart House Business Centre
Kimpton Road, Luton, LU2 0LA
www.lutonrising.org.uk

Our airport. Our community. Our planet.

London Luton Airport Expansion Development Consent Order

Drawing Title

Phase 1 Habitats Plan
Page 7 of 12

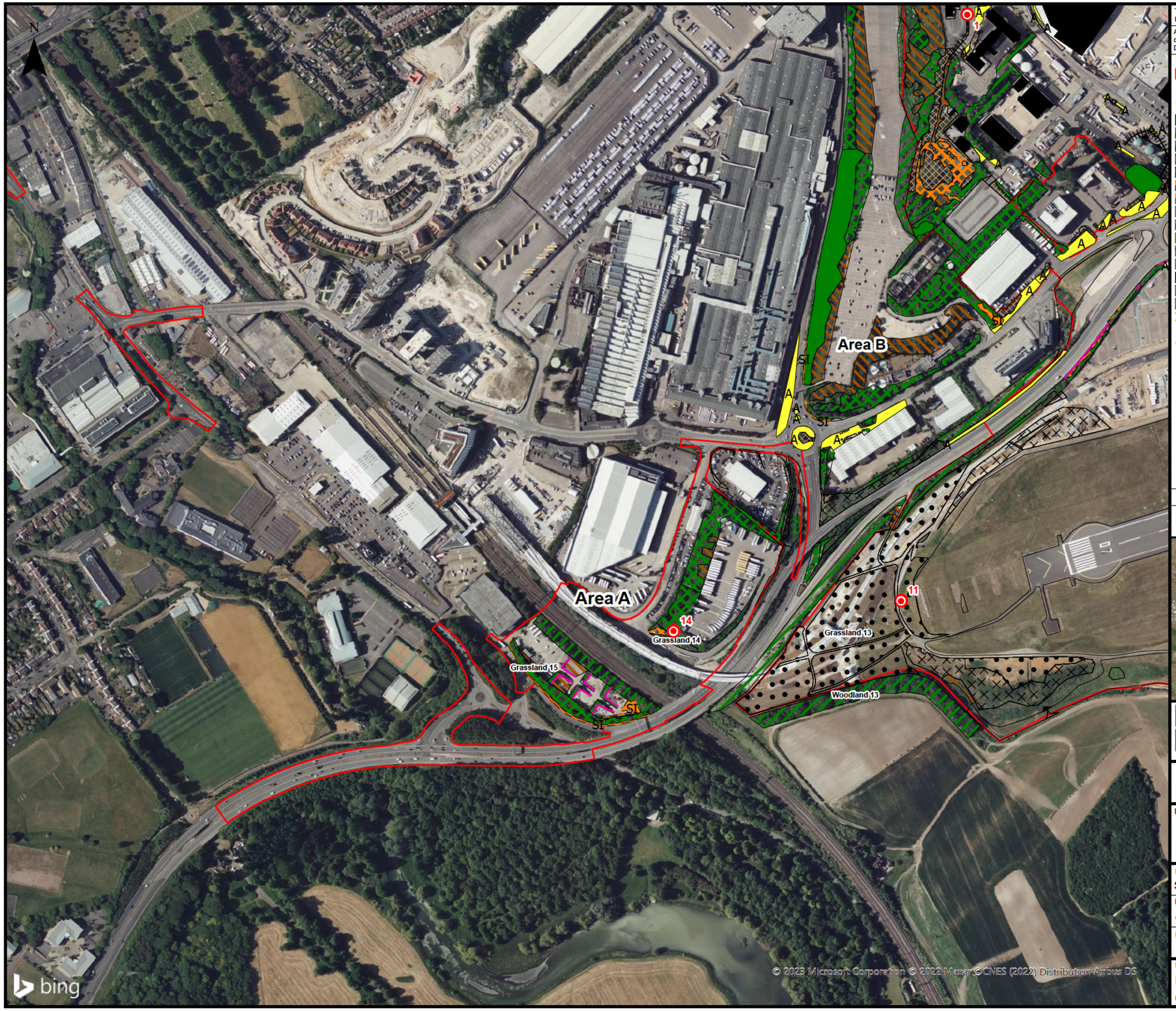
Purpose of issue	Suitability
SUITABLE FOR INFORMATION	S2

Drawn	Checked	Approved	Date	Scale	Size
AB	SM	CS	20/02/23	1:5,000	A3

DCO Application Ref.	APFP Regulation	DCO Document Ref.
TR020001	APFP 5(2)(a)	TR020001/APP/5.02

Drawing Number	Revision
LLADCO-3C-ARP-00-00-DR-YE-0206	P01

Project - Phase - Originator - Asset/Zone - Sub Asset - Type- Discp. - Number



All structure positions are indicative. The proposed works will be subject to detailed design development. The changes will be within limits of deviation specified in the Development Consent Order.

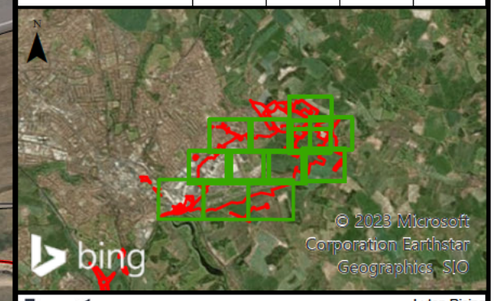
Legend

- Order Limits
- Target Notes

Habitat Description

- A1.1.1 - Broadleaved woodland - semi-natural
- A1.1.2 - Broadleaved woodland - plantation
- A2.1 - Scrub - dense/continuous
- A2.2 - Scrub - scattered
- A3.1 - Broadleaved parkland/scattered trees
- B2.2 - Neutral grassland - semi-improved
- B3.2 - Calcareous grassland - semi-improved
- B6 - Poor semi-improved grassland
- C3.1 - Other tall herb and fern - ruderal
- J1.2 - Cultivated/disturbed land - amenity grassland
- J1.3 - Cultivated/disturbed land - ephemeral/short perennial
- J1.4 - Introduced shrub
- J3.6 - Buildings
- J4 - Bare ground
- J5 - Other habitat
- A2.2 - Scrub - scattered
- J2.4 - Fence
- J2.5 - Wall

Revision History	Drawn	Checked / Approved	Date	Rev.
First Issue	AB	SM / CS	20/02/23	P01



Luton Rising
Hart House Business Centre
Kimpton Road, Luton, LU2 0LA
www.lutonrising.org.uk

Luton Rising — Our airport. Our community. Our planet.

London Luton Airport Expansion Development Consent Order

Drawing Title

Phase 1 Habitats Plan
Page 8 of 12

Purpose of issue	Suitability
SUITABLE FOR INFORMATION	S2

Drawn	Checked	Approved	Date	Scale	Size
AB	SM	CS	20/02/23	1:5,000	A3

DCO Application Ref.	APFP Regulation	DCO Document Ref.
TR020001	APFP 5(2)(a)	TR020001/APP/5.02

Drawing Number	Revision
LLADCO-3C-ARP-00-00-DR-YE-0206	P01

Project - Phase - Originator - Asset/Zone - Sub Asset - Type- Discp. - Number

All structure positions are indicative. The proposed works will be subject to detailed design development. The changes will be within limits of deviation specified in the Development Consent Order.

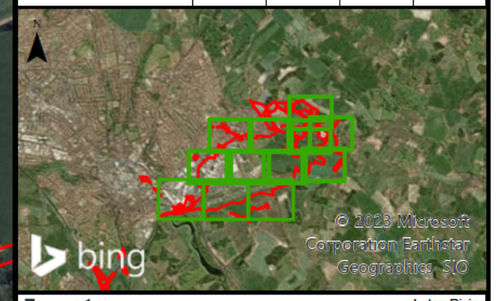
Legend

- Order Limits
- Target Notes

Habitat Description

- A1.1.1 - Broadleaved woodland - semi-natural
- A1.1.2 - Broadleaved woodland - plantation
- A2.1 - Scrub - dense/continuous
- A2.2 - Scrub - scattered
- A3.1 - Broadleaved parkland/scattered trees
- B2.2 - Neutral grassland - semi-improved
- B3.2 - Calcareous grassland - semi-improved
- B6 - Poor semi-improved grassland
- C3.1 - Other tall herb and fern - ruderal
- J1.1 - Cultivated/disturbed land - arable
- J1.2 - Cultivated/disturbed land - amenity grassland
- J1.3 - Cultivated/disturbed land - ephemeral/short perennial
- J1.4 - Introduced shrub
- J3.6 - Buildings
- J4 - Bare ground
- J5 - Other habitat
- J2.4 - Fence
- J2.5 - Wall
- J2.6 - Dry ditch

First Issue	AB	SM CS	20/02/23	P01
Revision History	Drawn	Checked Approved	Date	Rev.



Luton Rising
Hart House Business Centre
Kimpton Road, Luton, LU2 0LA
www.lutonrising.org.uk

Luton Rising — Our airport. Our community. Our planet.

London Luton Airport Expansion
Development Consent Order

Drawing Title

Phase 1 Habitats Plan
Page 9 of 12

Purpose of issue	Suitability
SUITABLE FOR INFORMATION	S2

Drawn	Checked	Approved	Date	Scale	Size
AB	SM	CS	20/02/23	1:5,000	A3

DCO Application Ref.	APFP Regulation	DCO Document Ref.
TR020001	APFP 5(2)(a)	TR020001/APP/5.02

Drawing Number	Revision
LLADCO-3C-ARP-00-00-DR-YE-0206	P01

Project - Phase - Originator - Asset/Zone - Sub Asset - Type- Discp. - Number

All structure positions are indicative. The proposed works will be subject to detailed design development. The changes will be within limits of deviation specified in the Development Consent Order.

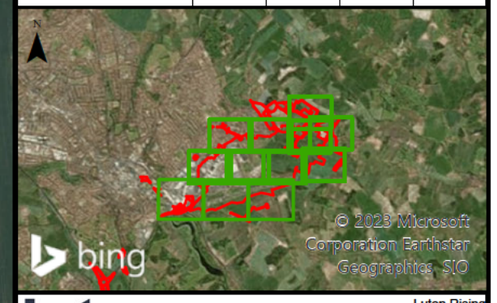
Legend

- Order Limits
- Target Notes

Habitat Description

- A1.1.1 - Broadleaved woodland - semi-natural
- A1.1.2 - Broadleaved woodland - plantation
- A2.1 - Scrub - dense/continuous
- A2.2 - Scrub - scattered
- B2.2 - Neutral grassland - semi-improved
- B6 - Poor semi-improved grassland
- C3.1 - Other tall herb and fern - ruderal
- G1.1 - Standing water - eutrophic
- J1.1 - Cultivated/disturbed land - arable
- J1.3 - Cultivated/disturbed land - ephemeral/short perennial
- J3.6 - Buildings
- J4 - Bare ground
- J2.1.1 - Intact hedge - native species-rich
- J2.1.2 - Intact hedge - species-poor
- J2.2.1 - Defunct hedge - native species-rich
- J2.2.2 - Defunct hedge - species-poor
- J2.3.1 - Hedge with trees - native species-rich

First Issue	AB	SM CS	20/02/23	P01
Revision History	Drawn	Checked Approved	Date	Rev.



Luton Rising
Hart House Business Centre
Kimpton Road, Luton, LU2 0LA
www.lutonrising.org.uk

Our airport. Our community. Our planet.

London Luton Airport Expansion Development Consent Order

Drawing Title

Phase 1 Habitats Plan
Page 10 of 12

Purpose of issue	Suitability
SUITABLE FOR INFORMATION	S2

Drawn	Checked	Approved	Date	Scale	Size
AB	SM	CS	20/02/23	1:5,000	A3

DCO Application Ref.	APFP Regulation	DCO Document Ref.
TR020001	APFP 5(2)(a)	TR020001/APP/5.02

Drawing Number	Revision
LLADCO-3C-ARP-00-00-DR-YE-0206	P01

Project - Phase - Originator - Asset/Zone - Sub Asset - Type- Discp. - Number

All structure positions are indicative. The proposed works will be subject to detailed design development. The changes will be within limits of deviation specified in the Development Consent Order.

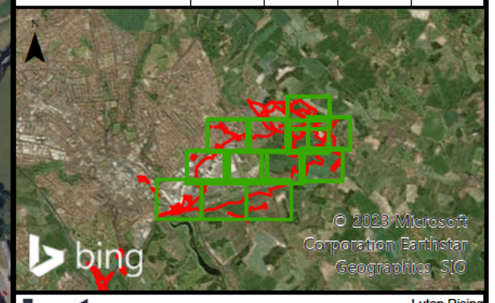
Legend

- Order Limits
- Target Notes

Habitat Description

- A1.1.1 - Broadleaved woodland - semi-natural
- A2.1 - Scrub - dense/continuous
- A2.2 - Scrub - scattered
- B2.2 - Neutral grassland - semi-improved
- B6 - Poor semi-improved grassland
- C1.1 - Bracken - continuous
- C3.1 - Other tall herb and fern - ruderal
- J1.1 - Cultivated/disturbed land - arable
- J1.3 - Cultivated/disturbed land - ephemeral/short perennial
- A2.2 - Scrub - scattered
- J2.1.1 - Intact hedge - native species-rich
- J2.1.2 - Intact hedge - species-poor
- J2.2.1 - Defunct hedge - native species-rich
- J2.2.2 - Defunct hedge - species-poor
- J2.3.1 - Hedge with trees - native species-rich
- J2.6 - Dry ditch

Revision History	Drawn	Checked / Approved	Date	Rev.
First Issue	AB	SM / CS	20/02/23	P01



Luton Rising
Hart House Business Centre
Kimpton Road, Luton, LU2 0LA
www.lutonrising.org.uk

Luton Rising — Our airport. Our community. Our planet.

London Luton Airport Expansion
Development Consent Order

Drawing Title

Phase 1 Habitats Plan
Page 11 of 12

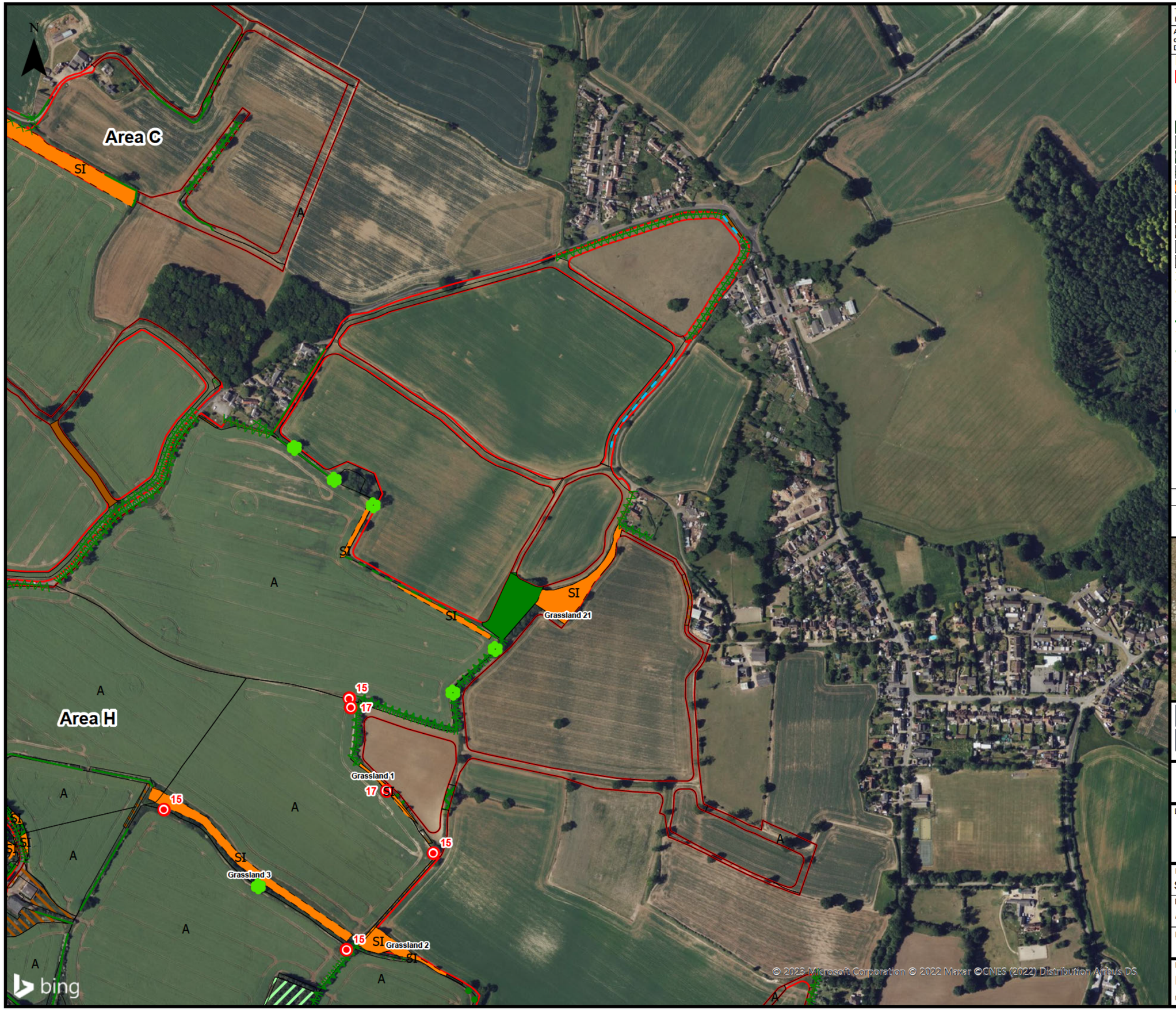
Purpose of issue	Suitability
SUITABLE FOR INFORMATION	S2

Drawn	Checked	Approved	Date	Scale	Size
AB	SM	CS	20/02/23	1:5,000	A3

DCO Application Ref.	APFP Regulation	DCO Document Ref.
TR020001	APFP 5(2)(a)	TR020001/APP/5.02

Drawing Number	Revision
LLADCO-3C-ARP-00-00-DR-YE-0206	P01

Project - Phase - Originator - Asset/Zone - Sub Asset - Type- Discp. - Number



All structure positions are indicative. The proposed works will be subject to detailed design development. The changes will be within limits of deviation specified in the Development Consent Order.

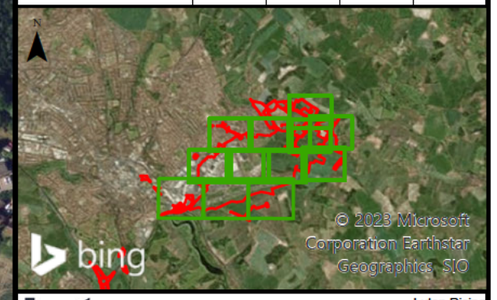
Legend

- Order Limits
- Target Notes

Habitat Description

- A1.1.1 - Broadleaved woodland - semi-natural
- A1.2.2 - Coniferous woodland - plantation
- A2.1 - Scrub - dense/continuous
- A2.2 - Scrub - scattered
- B2.2 - Neutral grassland - semi-improved
- B6 - Poor semi-improved grassland
- C1.1 - Bracken - continuous
- C3.1 - Other tall herb and fern - ruderal
- J1.1 - Cultivated/disturbed land - arable
- J1.4 - Introduced shrub
- A2.2 - Scrub - scattered
- A3.1 - Broadleaved parkland/scattered trees
- J2.1.1 - Intact hedge - native species-rich
- J2.1.2 - Intact hedge - species-poor
- J2.2.1 - Defunct hedge - native species-rich
- J2.2.2 - Defunct hedge - species-poor
- J2.3.1 - Hedge with trees - native species-rich
- J2.3.2 - Hedge with trees - species-poor
- J2.4 - Fence
- J2.6 - Dry ditch

First Issue	AB	SM CS	20/02/23	P01
Revision History	Drawn	Checked Approved	Date	Rev.



Luton Rising
Hart House Business Centre
Kimpton Road, Luton, LU2 0LA
www.lutonrising.org.uk

Our airport. Our community. Our planet.

London Luton Airport Expansion Development Consent Order

Drawing Title

Phase 1 Habitats Plan
Page 12 of 12

Purpose of issue	Suitability
SUITABLE FOR INFORMATION	S2

Drawn	Checked	Approved	Date	Scale	Size
AB	SM	CS	20/02/23	1:5,000	A3

DCO Application Ref.	APFP Regulation	DCO Document Ref.
TR020001	APFP 5(2)(a)	TR020001/APP/5.02

Drawing Number	Revision
LLADCO-3C-ARP-00-00-DR-YE-0206	P01

Project - Phase - Originator - Asset/Zone - Sub Asset - Type- Discp. - Number

Appendix C

C1 Phase 1 Habitat Survey Target Notes

Target Note	Species	Easting	Northing	Summary
1	Japanese rose	512549.5	221808.2	Schedule 9 invasive plant
1	Jaanese rose	512675.5	221822.8	Schedule 9 invasive plant
1	Japanese rose	511239.4	221279.2	Schedule 9 invasive plant species
1	Japanese rose	512616.5	221782.1	Schedule 9 invasive plant
2	Grass vetchling	512315.7	221909.8	Plant species of interest
4	Wild basil	512673.9	221802.3	Plant species of interest
4	Wild basil	514090	221531.2	Plant species of interest
5	Basil thyme	512678.9	221806.9	Notable plant species
5	Basil thyme	512321	221912.7	Notable plant species
5	Basil thyme	514000	221487.8	Notable plant species
6	Common twayblade	512686.1	221686.5	Plant species (17 no.) of interest
7	Japanese knotweed	512216.5	222190.3	Schedule 9 invasive plant
7	Japanese knotweed	512212.9	222188.2	Schedule 9 invasive plant
7	Japanese knotweed	512785.1	221841.6	Schedule 9 invasive plant
7	Japanese knotweed	512777.2	221824.9	Schedule 9 invasive plant
7	Japanese knotweed	512770.9	221806.6	Schedule 9 invasive plant
7	Japanese knotweed	512766.1	221787.6	Schedule 9 invasive plant
7	Japanese knotweed	512777.2	221751.9	Schedule 9 invasive plant
7	Japanese knotweed	512795.5	221741.5	Schedule 9 invasive plant
7	Japanese knotweed	512810.5	221731.2	Schedule 9 invasive plant

Target Note	Species	Easting	Northing	Summary
7	Japanese knotweed	512829.6	221719.3	Schedule 9 invasive plant
10	Small toadflax	511636.3	220796.1	plant species of interest and arable weed
10	Small toadflax	512121.9	221962.9	plant species of interest and arable weed
11	Round-leaved fluellen	511145.7	220448.3	plant species of interest and arable weed
12	Cotoneaster (C.simonsii/integrifolius)	512362.3	222235.1	Likely Schedule 9 invasive plant
12	Cotoneaster	512370.9	222236.7	Likely Schedule 9 invasive plant
12	Cotoneaster	512414.1	222235.4	Likely Schedule 9 invasive plan
12	Cotoneaster	512419.5	222225.4	Likely Schedule 9 invasive plant
12	Cotoneaster	512395	222243	Likely Schedule 9 invasive plant
12	Cotoneaster	512438	222243	Likely Schedule 9 invasive plant
12	Cotoneaster	512448.3	222232.1	Likely Schedule 9 invasive plant
12	Cotoneaster	512450.8	222251.3	Likely Schedule 9 invasive plant
13	Cornflower	513057.3	222116.9	Notable plant species and arable weed
14	Hairy violet	513449.1	221813	Notable plant species
14	Hairy violet	510823.1	220405.4	Plant species of interest
15	Field madder	514271	222035.1	Notable plant species and arable weed
15	Field madder	514267.3	221679	Notable plant species and arable weed
15	Field madder	514229.7	221576.7	Notable plant species and arable weed
15	Field madder	514390.3	221816	Notable plant species and arable weed
15	Field madder	514008.3	221878	Plant species of interest
16	Wild strawberry	513751.4	222209.9	Notable plant species

Target Note	Species	Easting	Northing	Summary
17	Field scabious	514273.5	222022.3	Notable plant species
17	Field scabious	514323.8	221904.2	Notable plant species
17	Field scabious	513977.2	221490.8	Notable plant species
17	Field scabious	513078.5	222178	Notable plant species
18	Bee orchids (12 no)	512366.2	222001.2	Plant species of interest
19	Hoary plantain	513088	222130.3	Notable plant species
20	Galingale	512444.2	221747.1	Notable plant species
21	Rat's-tail fescue	511900.8	220993.9	Plant species of interest
22	Large-leaved Lime	513832	221538.5	Notable plant species
16	Wild strawberry	513751.4	222209.9	Notable plant species
17	Field scabious	514273.5	222022.3	Notable plant species
17	Field scabious	514323.8	221904.2	Notable plant species
17	Field scabious	513977.2	221490.8	Notable plant species
17	Field scabious	513078.5	222178	Notable plant species
18	Bee orchids (12 no)	512366.2	222001.2	Plant species of interest
19	Hoary plantain	513088	222130.3	Notable plant species
20	Galingale	512444.2	221747.1	Notable plant species
21	Rat's-tail fescue	511900.8	220993.9	Plant species of interest
22	Large-leaved lime	513832	221538.5	Notable plant species
23	Large oak possible veteran	513813	221587	Tree of interest

Appendix D

D1 Botanical Species List

Scientific Name	English Name
Acer campestre	Field Maple
Acer platanoides	Norway maple
Achillea millefolium	Yarrow
Aesculus hippocastanum	Horse chestnut
Agrimonia eupatoria	Agrimon
Agrimonia procera	Fragrant agrimony
Agrostis capillaris	Common bent
Agrostis stolonifera	Creeping bent
Allaria petiolata	Hedge garlic
Allium paradoxum	Few-flowered garlic
Alnus glutinosa	Italian alder
Alnus sp	Alder sp.
Alopecurus pratensis	Meadow foxtail
Anisantha sterillis	Barren brome
Anthoxanthum odoratum	Sweet vernal grass
Anthriscus sylvestris	Cow parsley
Aphanes arvensis	Parsley piert
Aquilegia vulgaris	Columbine
Arrhenatherum elatius	False oat grass
Artemesia vulgaris	Mugwort
Arum maculatum	Wild arum
Atriplex patula	Common orache
Avena fatua	Wild oat
Ballota nigra	Black horehound
Barbarea sp.	Winter cress sp.
Bellis perennis	Daisy
Berberis sp.	Barberry sp.
Betula pendula	Silver birch
Blackstonia perfoliata	Yellow-wort
Brachypodium sylvaticum	False wood brome
Brachypodium sylvaticum	False brome
Bromus erecta	Upright brome

Scientific Name	English Name
Bromus hordaceus	Soft brome
Bryonia alba	White bryony
Buddleia davidii	Buddleia
Buddleia globosa	Orange ball-tree
Buxus sempervirens	Box
Capsella bursa-pastoris	Shepherd's purse
Carduus crispus	Welted thistle
Carex disticha	Brown sedge
Carex remota	Remote sedge
Carex spicata	Spiked sedge
Carpinus betulus	Hornbeam
Cedrus sp.	Cedar sp.
Centaurea cyanus	Cornflower
Centaurea nigra	Common knapweed
Centaurium erythraea	Common centaury
Cerastium fontanum	Common mouse-ear
Chamaenerion angustifolium	Rosebay willowherb
Chenopodium album	Fat hen
Chenorhinum minus	Small toadflax
Cirsium arvense	Creeping thistle
Cirsium vulgare	Spear thistle
Clematis vitalba	Traveller's joy
Clinopodium acinos	Basil thyme
Clinopodium vulgare	Wild basil
Conium maculatum	Hemlock
Conopodium majus	Pignut
Convolvulus arvensis	Field bindweed
Cornus sanguinea	Dogwood
Coronopus squamatus	Swine-cress
Corylus avellana	Hazel
Cota austriaca	Austrian chamomile
Cotoneaster horizontalis	Wall cotoneaster
Cotoneaster microphyllus	Small leaved cotoneaster
Cotoneaster simonsii	Himalayan cotoneaster
Cotoneaster sp.	Cotoneaster sp.

Scientific Name	English Name
Cotoneaster waterii	Waterer's cotoneaster
Crataegus monogyna	Hawthorn
Crepis capillaris	Hawk's-beard
Cupressocyparis sp.	Cypress sp.
Cyanus cyaneus	Rare cornflower
Cynosurus cristatus	Crested dog's tail
Cyperus longus	Galingale
Dactylis glomerata	Cock's-foot
Dactylorhiza fuschsii	Common spotted orchid
Daucus carota	Wild carrot
Dipsacus fullonum	Common teasel
Dryopteris filix-mas	Male fern
Elymus repens	Couch grass
Epilobium ciliatum	American willowherb
Epilobium hirsutum	Hoary willowherb
Epilobium hirsutum	Great willowherb
Epilobium montanum	Broad-leaved willowherb
Epilobium sp	Willowherb sp.
Ervum tetraspermum	Smooth tare
Euonymus europaeus	Spindle
Euonymus japonicus	Evergreen spindle
Euphorbia helioscopia	Sun spurge
Festuca gigantaea	Giant fescue
Festuca rubra	Red fescue
Fragaria vesca	Wild strawberry
Fraxinus excelsior	Ash
Fumaria officinalis	Common fumitory
Galega officinalis	Goat's rue
Galeopsis tetrahit	Common hemp nettle
Galium verum	Ladies' bedstraw
Gallium aparine	Cleavers
Geranium dissectum	Cut leaved crane's bill
Geranium robertianum	Herb robert
Glechoma hederacea	Ground ivy
Hedera helix	Ivy

Scientific Name	English Name
Helminthotheca echioides	Bristly ox-tongue
Heracleum mantegazzianum	Giant hogweed
Heracleum sphondylium	Hogweed
Holcus lanatus	Yorkshire fog
Hyacinthoides non-scripta	Bluebell
Hypericum perforatum	St John's-wort
Ilex aquifolium	Holly
Impatiens glandulifera	Indian balsam
Iris pseudacorus	Flag iris
Jacobaea erucifolia	Hoary ragwort
Juglans regia	Walnut
Juncus inflexus	Hard rush
Kickxia spuria	Round-leaved fluellen
Knautia arvensis	Field scabious
Lamiastrum galeobdolon subsp. montanum	Yellow archangel
Lamium album	White dead nettle
Lamium galeobdolon subsp. argentatum	Variegated yellow archangel
Lamium purpureum	Red dead nettle
Larix decidua	Larch
Lathyrus nissolia	Grass vetchling
Lathyrus pratensis	Meadow vetchling
Lavandula angustifolia	Garden lavender
Leontodon hispidus	Rough hawkbit
Leucanthemum vulgare	Ox-eye daisy
Linaria vulgaris	Yellow toadflax
Linum catharticum	Fairy flax
Lolium multiflorum	Italian rye-grass
Lolium perenne	Perrenial rye grass
Lonicera nitida	Wilson's honeysuckle
Lonicera periclymenum	Honey suckle
Lotus corniculatus	Bird's foot trefoil
Lycium barbarum	Duke of Argyll's teaplant
Lysimachia arvensis	Scarlet pimpernel
Mahonia aquifolium	Oregon-grape

Scientific Name	English Name
Malus domestica	Domestic apple
Malus sylvestris	Crab apple
Malva moschata	Muskmallow
Malva sylvestris	Common mallow
Matricaria discoidea	Pineapple weed
Medicago lupulina	Black medick
Medicago sativa ssp. sativa	Lucerne
Melica uniflora	Wood medlick
Mentha aquatica	Water mint
Mentha sp.	Mint sp.
Mercurialis perennis	Dog's mercury
Moehringia trinerva	Three-nerved sandwort
Myosotis arvensis	Forget-me-not
Myrrhis odorata	Sweet cicely
Neottia ovata	Common twayblade
Nothofagus obliqua	Role beech
Nothofagus oblqua	Roble beech
Odontities vernus	Red bartsia
Oenothera glazioviana	Evening primrose
Ophrys apifera	Bee orchid
Orchis pyramidalis	Pyramidial orchid
Papaver rhoeas	Common poppy
Pastinaca sativa	Wild parsnip
Persicaria lapathifolia	Pale persicaria
Persicaria maculosa	Redshank
Phleum bertolonii	Cat's-tail
Phleum pratense	Timothy
Picea abies	Norway spruce
Picea sp.	Spruce sp.
Pinus sylvestris	Scots pine
Plantago lanceolata	Ribwort plantain
Plantago major	Greater plantain
Plantago media	Hoary plantain
Platanus x hispanica	London plane
Poa annua	Annual meadow grass

Scientific Name	English Name
Poa pratensis	Smooth meadow grass
Poa trivialis	Rough meadow grass
Populus canescen	Grey poplar
Populus nigra	Black poplar
Populus sp	Poplar sp.
Potentilla reptans	Creeping cinquefoil
Prunus avium	Wild cherry
Prunus laurocerasus	Cherry Laurel
Prunus spinosa	Blackthorn
Pteridium aquilinum	Bracken
Pyracantha sp.	Firethorn sp.
Quercus robur	Pedunculate oak
Quercus rubra	Red oak
Ranunculus acris	Meadow buttercup
Ranunculus repens	Creeping buttercup
Raphanus raphanistrum	Wild radish
Reynoutria japonica	Japanese Knotweed
Rhinanthus minor	Yellow-rattle
Rosa arvensis	Field rose
Rosa canina	Dog rose
Rosa rugosa	Japanese rose
Rosa sp.	Rose
Rubus cockburnianus	White stemmed bramble
Rubus fruticosus agg	Bramble aggregate
Rubus ideus	Raspberry
Rumex acetosa	Common sorrel
Rumex conglomeratus	Clustered dock
Rumex crispus	Curled dock
Rumex obtusifolius	Broad-leaved dock
Rumex sanguineus	Wood dock
Salix caprea	Goat willow
Salix fragilis	Crack willow
Salix sp.	Willow sp.
Salix viminalis	Osier
Sambucus nigra	Elder

Scientific Name	English Name
Scrophularia nodosa	Common figwort
Sedum acre	Biting stonecrop
Sherardia arvensis	Field madder
Silene dioica	Red campion
Silene vulgaris	Bladder campion
Sinapis arvensis	Charlock
Solanum dulcamara	Woody nightshade
Sonchus asper	Prickly sow thistle
Sorbus aria agg	Whitebeam aggregate
Sorbus aucuparia	Rowan
Sorbus torminals	Wild service tree
Stachys sylvatica	Hedge woundwort
Stellaria holostea	Greater stitchwort
Stellaria media	Chickweed
Symphoricarpos	Snowberry
Symphytum officinale	Common comfrey
Taraxacum officinale agg.	Dandelion aggregate
Teucrium	Germander
Tilia cordata	Small leaved lime
Tilia platyphyllos	Large leaved lime
Torilis japonica	Upright hedge parsley
Tragopogon pratensis	Goat's beard
Trifolium campestre	Hop trefoil
Trifolium dubium	Lesser hop trefoil
Trifolium pratense	Red clover
Trifolium repens	White clover
Tripleurospermum inodorum	Scentless mayweed
Trisetum flavescens	Yellow oat-grass
Tsuga heterophylla	Western hemlock
Tussilago farfara	Colt's foot
Typha latifolia	Bulrush
Ulex sp.	Gorse sp.
Ulmus procera	English elm
Ulmus x hollandica	Dutch elm
Urtica dioica	Common nettle

Scientific Name	English Name
Verbascum nigrum	Dark mullein
Verbascum thapsus	Great mullein
Veronica chamaedrys	Speedwell
Veronica persica	Common field speedwell
Veronica polita	Grey field speedwell
Veronica serpyllifolia	Thyme-leaved speedwell
Veronica sp.	Hebe sp.
Viburnum lantana	Wayfairing tree
Viburnum opulus	Guelder rose
Vicia cracca	Tufted vetch
Viola arvensis	Wild pansy
Viola hirta	Hairy violet
Viola riviniana	Common dog violet
Vulpia myuros	Rat's tail fescue
Wiegela florida	Wiegela