M5 Junction 10 Improvements Scheme

Preliminary Environmental Information Report (PEIR)

Biodiversity chapter

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Document accessibility

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Glossary

Abbreviation	Definition
AADT	Annual Average Daily Traffic
AAWT	Annual Average Weekday Traffic
AEP	Annual Exceedance Probability
ALC	Agricultural Land Classification
AMP	Archaeological Management Plan
AONB	Area of Outstanding Natural Building
ARN	Affected Road Network
ASPT	Average Score Per Taxon
AQAL	Air Quality Assessment Level
AQMA	Air Quality Management Area
AQS	Air Quality Strategy
BAP	Biodiversity Action Plan
BCT	Bat Conservation Trust
BEIS	Department of Business, Energy and Industrial Strategy
BGS	British Geological Survey
BMV	Best and Most Versatile
BoQ	Bill of Quantities
BS	British Standards
BTO	British Trust for Ornithology
CAMS	Catchment Abstraction Management Strategy
CBC	Cheltenham Borough Council
CBC	Common Birds Census
CCC	Committee on Climate Change
CD&E	construction, Demolition and Excavation
CEMP	Construction Environmental Management Plan
CEA	Cumulative Effects Assessment
CIEEM	Chartered Institute of Ecology and Environmental Management
CIRIA	Construction Industry Research and Information Association
CL:AIRE	Contaminated Land: Applications in Real Environments
CLP	Classification, Labelling and Packaging
CMS	Continuous Monitoring Station
CO_2	Carbon Dioxide
CO_2e	Carbon Dioxide Equivalent
COP	Conference of the Parties
COSHH	Control of Substances Hazardous to Health
CPS	Connecting Places Strategies
CRoW	Countryside and Rights of Way
CRTN	Calculation of Road Traffic Noise
CSZs	Core Sustenance Zones
DCO	Development Consent Order
DfT	Department for Transport
DM	Do Minimum
DMOY	Do Minimum Scenario in the Opening Year
DMFY	Do Minimum Scenario in the Future Assessment Year
DMRB	Design Manual for Roads and Bridges
DoE	Department of the Environment
DoWCoP	Definition of Waste: Development Industry Code of Practice
DS	Do Something
DSFY	Do Something in the Future Assessment Year
DSOY	Do Something Scenario in the Opening Year
EC	European Commission
ECoW	Ecological Clerk of Works
eDNA	environmental DNA

Abbreviation	Definition
EEA	European Economic Area
EFT	Emissions Factors Toolkit
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
END	Environmental Noise Directive
EPA	Environmental Protection Act
EPS	European Protected Species
EPUK	Environmental Protection UK
EQS	Environmental Quality Standards
EU	European Union
ES	Environmental Statement
FRA	Flood Risk Assessment
ES	Environmental Statement
GCC	Gloucester City Council
GCER	Gloucestershire Centre for Environmental Records
GCN	Great Crested Newt
GFirst LEP	Gloucestershire Local Enterprise Partnership
GHER	Gloucestershire Historic Environment Record
GHGs	Greenhouse Gases
GLNP	Gloucestershire Local Nature Partnership
GLVIA3	Guidelines for Landscape and Visual Impact Assessment
GLTA	Ground Level Tree Assessment
GPLC	Guiding Principles for Land Contamination
GWDTE	Groundwater Dependant Terrestrial Ecosystems
GWT	Gloucestershire Wildlife Trust
HDV	Heavy Duty Vehicles
HER	Historic Environment Record
HEWRAT	Highways England Water Risk Assessment Tool
HGVs	High Good Vehicles
HIF	Housing Infrastructure Fund
HLC	Historic Landscape Characterisation
HMC	Habitat Modification Class
HMS	Habitat Modification Score
HRA	Habitat Regulations Assessments
HSI	Habitat Suitability Index
IAQM	Institute of Air Quality Management
IDB	International Drainage Board
IPCC	International Panel on Climate Change
JCS	Joint Core Strategy
JNCC	Joint Nature Conservation Committee
LAQM	Local Air Quality Management
LCAs	Landscape Character Assessments
LCRM	Land Contamination: Risk Management
LCT	Landscape Character Type
LDV	Light Duty Vehicles
LLFA	Lead Local Flood Authority
LNR	Local Nature Reserves
LOAEL	Lowest observed adverse effect level
LTP	Local Transport Plans
LVIA	Landscape and Visual Impact Assessment
MAFF	Ministry of Agriculture, Fisheries and Food
MCHW	Manual of Contract Documents for Highway Works
MHCLG	Ministry of Housing, Communities and Local Government
MMP	Materials Management Plan
MSA	Mineral Safeguarding Areas
MW	Minor Watercourse

Abbreviation	Definition
NCA	National Character Area
NERC	Natural Environment and Rural Communities
NHLE	National Heritage List for England
NIAs	Noise Important Areas
NMP	National Mapping Programme
NMU	Non- Motorised User
NNR	National Nature Reserves
NPS NN	National Policy Statement for National Networks
NOEL	No Observed Effect Level
NPPF	National Planning Policy Framework
NPPG	National Planning Practice Guidance
NPSE	Noise Policy Statement for England
NSIP	Nationally Significant Infrastructure Projects
NSR	Noise Sensitive Receptors
NVC	National Vegetation Classification
OS	Ordnance Survey
PAH	Polyaromatic Hydrocarbons
PAS	Portable Antiquities Scheme
PCBs	Polychlorinated Biphenyls
PCF	Project Control Framework
PCL	Potential Contaminant Linkage
PCM	Pollution Climate Mapping
PCSM	Preliminary Conceptual Site Model
PEAOR	Preliminary Environmental Assessment of Options Report
PEIR	Preliminary Environmental Information Report
PINS	Planning Inspectorate
PPE	Personal Protective Equipment
PPGs	Pollution Prevention Guidelines
PPG	Planning Practice Guidance
PPS10	Planning Policy Statement 10
PPGN	Planning Practice Guidance: Noise
PRA	Preliminary Roost Assessment
PRoW	Public Right of Way
Q_{95}	The 5 percentile flow
RAMS	Risk Assessments, Method Statements
RBD	River Basin Districts
RBMP	River Basin Management Plans
RCP	Relative Concentration Pathway
RCS	River Corridor Survey
RFFPs	Reasonably Foreseeable Future Projects
RHS	River Habitat Survey
RNAG	Reason for not Achieving Good
RoWIP	Rights of Way Improvement Plan
SAC	Special Area of Conservation
SHMP	Soil Handling Management Plan
SM	Scheduled Monument
SOAEL	Significant Observed Adverse Effect Level
SoCC	Statement of Community Consultation
SPD	Supplementary Planning Document
SPA	Special Protection Area
SPZ	Source Protection Zones
SSSI	Site of Special Scientific Interest
SuDS	Sustainable Drainage Systems
SWMP	Site Waste Management Plan
TAMP	Transport Asset Management Plan
TBC	Tewkesbury Borough Council

Abbreviation	Definition
TAR	Technical Appraisal Report
TSCS	Thin Surface Course System
UKCP18	United Kingdom Climate Projections 2018
UNFCCC	United Nations Framework Convention on Climate Change
UXO	Unexploded Ordnance
VfM	Value for Money
WCH	Walkers, Cyclists and Horse Riders
WEEE	Waste Electrical and Electronic Equipment
WER	Water Environment Regulations
WFD	Water Framework Directive
WHTP	Whalley, Hawkes, Paisley & Trigg
WSI	Written Scheme of Investigation
ZTV	Zone of Theoretical Visibility

Chapters 1-4 of this PEIR have been produced as a separate document.

1. Introduction

2. The Scheme

3. Assessment of Alternatives

4. Environmental Assessment Methodology

Table 4-1 - Significance Matrix

Sensitivity of receptor	Magnitude of impact				
	Major	Moderate	Minor	Negligible	No change
Very high	Very large	Large or very large	Moderate or large	Slight	Neutral
High	Large or very large	Moderate or large	Slight or moderate	Slight	Neutral
Medium	Moderate or large	Moderate	Slight	Neutral or slight	Neutral
Low	Slight or moderate	Slight	Neutral or slight	Neutral or slight	Neutral
Negligible	Slight	Neutral or slight	Neutral or slight	Neutral	Neutral

Table Source: DMRB LA 104 Environmental assessment and monitoring Table 3.8.1

Table 4-2 - Significance categories and typical descriptions

Value	Typical descriptors
Very Large	Effects at this level are material in the decision-making process.
Large	Effects at this level are likely to be material in the decision-making process.
Moderate	Effects at this level can be considered to be material decision-making factors.
Slight	Effects at this level are not material in the decision-making process.
Negligible	No effects or those that are beneath levels of perception, within normal bounds of variation or within the margin of forecasting error.

Table Source: DMRB LA 104 Environmental assessment and monitoring Table 3.7

The discipline specific chapters of this PEIR have been produced as separate documents.

5. Air Quality

6. Noise and Vibration

7. Biodiversity

7.1. Introduction

7.1.1. This chapter presents the preliminary environmental assessment of the M5 Junction 10 Improvements Scheme (the Scheme) for Biodiversity based on the Scheme as it is described in Chapter 2 (and detailed in the Design Fix 2 drawings in Appendix 2.1).

7.1.2. The chapter summarises the regulatory and policy framework related to biodiversity, details the methodology followed for the assessment and describes the baseline terrestrial and aquatic biodiversity resources within and surrounding the Scheme, as they are understood at present (September 2021). Following this, the design, mitigation and residual effects of the proposed scheme are discussed, along with the limitations of the assessment.

7.1.3. The assessment at this stage is based on the findings from desk study, terrestrial and aquatic ecological walkover surveys and a suite of Phase 2 ecology surveys. Further surveys are underway, or are proposed, to ensure a robust baseline is established, to enable refinement of the assessment, to ensure that mitigation proposals are robust and that any biodiversity net gain targets are met.

7.2. Planning policy and topic legislative context

Legislative context

7.2.1. The following relevant legislation exists to protect habitats and species of nature conservation importance. These pieces of legislation include a number of offences relating to protected species and requirements for licences to allow construction works to proceed.

7.2.2. The legislation and policy relating to specific species are further detailed within the Technical Appendix reports (Appendices 7.1 to 7.13).

The Conservation of Habitats and Species Regulations 2017 (As amended)[1] (the Habitats Regulations 2017)

7.2.3. The regulations transpose the land and marine aspects of the Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora (the Habitats Directive) and certain elements of the Wild Birds Directive (Council Directive 2009/147/EC) into UK law.

7.2.4. The regulations cover the designation and protection of European Sites[2] and the protection of European protected species.

The Ramsar Convention on Wetlands 1971

7.2.5. Ramsar sites are wetlands of international importance that have been designated under the criteria of the Ramsar Convention on Wetlands for containing representative, rare or unique wetland types or for their importance in conserving biological diversity.

7.2.6. The Convention on Wetlands is an intergovernmental treaty that provides the framework for national action and international cooperation for the conservation and wise use of wetlands and their resources.

[1]As amended by The Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019.
[2] These should be taken as including: Sites of Community Importance (SCIs), Special Protection Areas (SPAs), potential SPAs (pSPAs), Special Areas of Conservation (SACs), candidate SACs (cSACs), possible SACs (pSACs) and Ramsar sites. Following the changes made to the Conservation of Habitats and Species Regulations 2017 (as amended) by the Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019, SACs and SPAs in the UK no longer form part of the EU's Natura 2000 ecological network and now form part of a UK national site network. In this document they are still referred to as European Sites.

Wildlife and Countryside Act 1981 (as amended)

7.2.7. This is the primary legislation which protects animals, plants and habitats in the UK.

7.2.8. It covers: the protection of birds, animals and plants; measures to prevent the establishment of non-native species which may be detrimental to native wildlife; and the designation of protected areas.

Natural Environment and Rural Communities (NERC) Act 2006

7.2.9. The NERC Act 2006 places a duty on public authorities to have regard to conservation of biodiversity while exercising their functions, as well as placing a duty on the Secretary of State to produce a list of organisms of principle importance for conservation of biodiversity in England (referred to as priority habitats and species and collectively as the 'England Biodiversity List').

The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017

7.2.10. The Water Environment Regulations (WER) (2017) is the leading legislation on the duties of regulators (Environment Agency in England) in relation to environmental permitting, abstraction, and impoundment of water. Its principal aims are to protect and improve the water environment and promote the sustainable use of water, as follows:

- To prevent deterioration of the status of water bodies;
- To protect, enhance and restore all water bodies with the aim of achieving 'good status' by 2027 at the latest;
- To progressively reduce or phase out the release of individual pollutants or groups of pollutants and cease or phase out emissions, discharges and losses of priority hazardous substances;
- To prevent or limit the entry of pollutants to groundwater; and,
- To comply with the requirements of all Water Framework Directive (WFD) Protected Areas.

Environment Bill

7.2.11. The Environment Bill is currently working its way through parliament. The Bill was introduced to Parliament in January 2020, and Royal Assent is anticipated in Autumn 2021.

7.2.12. The legislation builds on the 25 Year Environment Plan (see below), aiming to clean up the country's air, restore natural habitats and increase biodiversity. Existing provisions in the Environment Bill require developments to deliver 10% biodiversity net gain in most new schemes, applying to all development permitted under the Town and Country Planning Act 1990. An amendment to the Bill in June 2021, in response to the Dasgupta Review[3], will extend this requirement to nationally significant infrastructure projects.

Salmon and Freshwater Fisheries Act 1975

7.2.13. The Act makes it illegal to poison or injure fish, their spawn, spawning grounds and the food of such fish.

The Eels (England and Wales) Regulations 2009

7.2.14. The Regulations give powers to the regulators (the Environment Agency and Natural Resources Wales) to implement recovery measures of European eel stocks in all freshwater and estuarine waters in England and Wales.

[3] The Economics of Biodiversity: The Dasgupta Review (February 2021) available from Final Report - The Economics of Biodiversity: The Dasgupta Review - GOV.UK (www.gov.uk)

The Protection of Badgers Act 1992

7.2.15. It is an offence to wilfully kill, injure or take a badger; or intentionally or recklessly damage, destroy or obstruct access to a badger sett or disturb a badger in its sett. It is not illegal to carry out disturbance activities in the vicinity of setts that are not occupied.

7.2.16. Where required, licences for development activities involving disturbance or sett interference or closure are issued by Natural England. Licences are normally not granted from December to June inclusive because cubs may be present within setts.

The Hedgerow Regulations 1997

7.2.17. Under the regulations, it is against the law to remove or destroy certain hedgerows without permission from the local planning authority. In general, permission will be required before removing hedges that are at least 20 metres in length, over 30 years old and contain certain species of plant. The local planning authority will assess the importance of the hedgerow using criteria set out in the regulations. In addition, the local planning authority must be notified of all hedgerow removals.

National policy

National Policy Statement for National Networks (NPS NN, 2014)[45]

7.2.18. The NPS NN sets out the need for, and Government's policies to deliver, development of NSIPs on the national road and rail networks in England. It provides planning guidance and is the basis for the examination by the Examining Authority and decisions by the Secretary of State.

7.2.19. Paragraphs 5.20 – 5.38 of NPS NN, 2014 specifically relate to ecology and biodiversity conservation. Of particular relevance to the Scheme are paragraphs 5.22 and 5.23, which outline the requirement to *'ensure that the environmental statement clearly sets out any likely significant effects on internationally, nationally and locally designated sites of ecological or geological conservation importance'*. Furthermore, the applicant should show the extent to which the project has '*taken advantage of opportunities to conserve and enhance biodiversity and geological conservation interests'*.

7.2.20. Paragraph 5.26 outlines that appropriate weight should be attached to designated sites of international, national and local importance, protected species, habitats and other species of principal importance for the conservation of biodiversity, and to biodiversity and geological interests within the wider environment.

7.2.21. Paragraph 5.27 discusses international sites, stating that these are the most important sites for biodiversity, and are provided statutory protection under the Habitats Regulations.

7.2.22. Paragraph 5.28 discusses Sites of Special Scientific Interest (SSSIs) as requiring a high degree of protection. Paragraph 5.29 goes on to state that '*where a proposed development is likely to have an adverse effect on a SSSI, development consent should not normally be granted. Where an adverse effect on the site's notified special interest features is likely, an exception should be made only where the benefits of the development at this site clearly outweigh both the impacts that it is likely to have on the features of the site that make it of special scientific interest, and any broader impacts on the national network of SSSIs'*

7.2.23. Paragraph 5.31 outlines that whilst due consideration should be given to regional or local biodiversity designations, they would not constitute a reason to refuse development consent.

7.2.24. Paragraph 5.32 discusses irreplaceable habitats including ancient woodland and veteran trees, stating 'The Secretary of State should not grant development consent for any development that would result in the loss or deterioration of irreplaceable habitats

[4] Department for Transport (December 2014) National Policy Statement for National Networks
[5] A ministerial statement on 22 July 2021 by Grant Shapps (Secretary of State for Transport) indicates that the NPS NN will be reviewed, with a proposed completion date of no later than Spring 2023.

including ancient woodland and the loss of aged or veteran trees found outside ancient woodland, unless the national need for the benefits of the development, in that location, clearly outweigh the loss.'

7.2.25. Paragraph 4.23 sets out that any application should be accompanied by sufficient information to enable the examining authority to undertake an appropriate assessment under the Habitats Regulations.

National Planning Policy Framework (NPPF, 2021)[6]

7.2.26. The NPPF does not form the basis for decision making on NSIPs, and in the event of conflict with the NPS NN, the NPS NN takes precedence.

7.2.27. Paragraph 174 states that 'planning policies and decisions should contribute to and enhance the natural and local environment by:

- 'Protecting sites of biodiversity value; and
- Minimising impacts on and providing net gains for biodiversity, including by establishing coherent ecological networks that are more resilient to current and future pressures.'

7.2.28. Paragraph 179 builds on this by stating that plans should protect and enhance biodiversity through the identification, mapping and safeguarding of '*components of local wildlife-rich habitats and wider ecological networks, including the hierarchy of international, national and locally designated sites of importance for biodiversity; wildlife corridors that connect them; and areas identified by national and local partnerships for habitat management, enhancement restoration and creation'. Furthermore, plans should 'promote the conservation, restoration and enhancement of priority habitats, ecological networks and the protection and recovery of priority species; and identify and pursue opportunities for securing measurable net gains for biodiversity*.'

7.2.29. Paragraph 180 states that, 'if significant harm to biodiversity resulting from a development cannot be avoided (through locating on an alternative site with less harmful impacts), adequately mitigated, or, as a last resort, compensated for, then planning permission should be refused.'

7.2.30. Building on the previous version of the NPPF, planning practice guidance (published January 2016) explains the key issues in implementing policy to protect biodiversity, including local requirements.

The UK Biodiversity Action Plan (BAP) and Post-2010 Biodiversity Framework 2012[7]

7.2.31. The BAP is the UK's initiative to maintain and enhance biodiversity in response to the Convention on Biological Diversity signed in 1992. The UK BAP was used to draw up the 'England Biodiversity List' and has been succeeded by the UK Post-2010 Biodiversity Framework in 2012, due to a change in government strategy by all UK countries, focussing on managing the environment as a whole rather than dealing with different aspects of biodiversity and environment separately. However, the UK BAP list of priority habitats and species continue to be regarded as conservation priorities in the UK Post-2010 Biodiversity Framework (JNCC & DEFRA 2012).

Biodiversity 2020: A strategy for England's wildlife and ecosystem services (DEFRA, 2011)[8]

7.2.32. Biodiversity 2020 is a national strategy for England's wildlife and ecosystem services. It sets out the Government's ambition to halt overall loss of England's biodiversity by 2020,

[6] Ministry of Housing, Communities and Local Government (July 2021) National Planning Policy Framework
[7] JNCC and DEFRA (on behalf of the Four Countries' Biodiversity Group). 2012. UK Post-2010 Biodiversity Framework. July 2012. Available from: http://jncc.defra.gov.uk/page-6189
[8] Department for Environment, Food & Rural Affairs (DEFRA) (2011) Biodiversity 2020: A strategy for England's wildlife and ecosystem services

support healthy well-functioning ecosystems and establish coherent ecological networks, with more and better places for nature for the benefit of wildlife and people.

A Green Future: Our 25 Year Plan to Improve the Environment (DEFRA, 2018)[9]

7.2.33. The Plan sets out government action for improving the environment, within a generation. It aims to deliver cleaner air and water in our cities and rural landscapes, protect threatened species and provide richer wildlife habitats. It calls for an approach to agriculture, forestry, land use and fishing that puts the environment first.

Our plan to protect and increase biodiversity (Highways England, 2015)[10]

7.2.34. National Highways (formerly Highways England) must minimise environmental impacts and protect and enhance the quality of the surrounding environment (as per the terms of National Highway's licence from the Department for Transport). National Highways also has a key performance indicator, which states that improved biodiversity must be delivered, as set out in the company's Biodiversity Action Plan. The Operational Metrics Manual[11] sets out the parameters for measuring and monitoring performance against the key performance indicators.

7.2.35. Specifically, National Highways are expected to maximise biodiversity delivery through: landscape scale biodiversity projects that reduce habitat fragmentation; new projects which enhance biodiversity value of land and therefore reduce their impacts; an increased number of SSSI which are in favourable or recovering condition; managed woodland areas that are meeting their intended purpose; grassland areas that are managed appropriately; 3500 hectares of grassland rich in wildflower species.

7.2.36. The plan sets out the approach to meet the above expectations and address biodiversity challenges, and contains five specific outcomes, with a series of related actions. The five outcomes are as follows:

- Outcome 1: Highways England and our suppliers are equipped to produce good biodiversity performance.
- Outcome 2: The Strategic Road Network is managed to support biodiversity.
- Outcome 3: We have delivered biodiversity enhancements whilst implementing a capital programme of network improvement.
- Outcome 4: We have addressed the legacy of biodiversity problems on our network via a targeted programme of investment.
- Outcome 5: We are fully transparent about our biodiversity performance.

Regional/local policy and guidance

Gloucestershire's Local Transport Plan 2020–2041[12]

7.2.37. LTP PD0.2 – Local Environmental Protection states that 'GCC will work with District Councils and other partners; to minimise the impact of transport on landscapes, townscapes, heritage assets and the wider historic environment; to protect and enhance the water environment, air quality, soils and agricultural resources; to reduce the risk of flooding and the levels of noise pollution; to achieve biodiversity net gain and conserve

[9] HM Government (2018) A Green Future: Our 25 Year Plan to Improve the Environment
[10] Highways England (June 2015) Our plan to protect and increase biodiversity. Available from: biodiversity-plan.pdf (highwaysengland.co.uk)
[11] Highways England (January 2019) Operational Metrics Manual.
[12] Gloucestershire County Council (2020) Gloucestershire's Local Transport Plan2020 - 2041

geodiversity and the historic environment, from traffic or improvements on the highway network.' GCC will do this by implementing the following policy proposals:

- Protect and avoid harm to geodiversity and biodiversity associated with transport infrastructure in addition to taking opportunities to enhance the natural environment wherever practicable;
- Comply with Gloucestershire Highways Biodiversity Guidance or subsequent guidance and the Green Infrastructure Pledge;
- Maximise the opportunities for transport interventions to contribute towards major new initiatives, including Nature Recovery Networks and large scale woodland creation and other similar measures that would help achieve biodiversity net gain targets; and
- Support Natural England's work on the Green Transport Corridors and Green Infrastructure Agreements, as well as their recommendations of the Linear Infrastructure Network, ensuring that within or adjacent to the rail network and Major Road Network, green infrastructure can deliver biodiversity gains, ecological connectivity and ecosystem services.

7.2.38. Policy LTP PD 4.1 – Gloucestershire's Highway Network states that 'GCC will maintain a functioning highway network that supports Gloucestershire's transport network by ensuring the safe, accessible and expeditious movement of highway users.' GCC will do this by implementing the following policy proposals:

- Follow green infrastructure principles in the design, maintenance and operation of highway asset as set out in the green infrastructure pledge as well as meeting Building with Nature standards.

7.2.39. Policy LTP PD 4.2 – Highway Network Resilience states that 'GCC will provide a resilient highway network that can withstand unforeseen events, including extreme weather events and long term changes to the climate' by regularly reviewing winter maintenance and vegetation clearance procedures and policies, in line with the Gloucestershire Highways Biodiversity Guidance (or subsequent guidance).

7.2.40. Policy LTP PD 4.3 – Highway Maintenance states that 'GCC will manage the local highway asset management in line with the Highways Asset Management Framework and other guidance or policies such as the Code of Practice for Well Managed Highway Infrastructure' by complying with the Gloucestershire Highways Biodiversity Guidance or subsequent guidance. Enhance and restore the wildlife function of highway verges by continuing to work in partnership with Gloucestershire Wildlife Trust (GWT) through GCC's Conservation Road Verges Site Register to ensure that all road verges receive appropriate conservation management as part of highways maintenance and related schemes.

Joint Core Strategy (JCS) 2011-2031[13]

7.2.41. Strategic Objective 4 – Conserving and enhancing the environment states that planning policy and decisions should 'Conserve, manage and enhance the area's unique natural environment and great biodiversity, including its waterways, Sites of Special Scientific Interest (SSSI), the Cotswold's AONB, and areas of landscape and biodiversity importance.'

7.2.42. Policy SD9: Biodiversity and Geodiversity outlines the stance that the biodiversity resource of the JCS area will be protected and enhanced through conserving and enhancing biodiversity and geodiversity on internationally, nationally and locally designated sites, as well as encouraging new development to contribute positively to biodiversity and geodiversity whilst linking with wider networks of green infrastructure.

7.2.43. SD9 also states that 'harm to the biodiversity or geodiversity of an undesignated site or asset should be avoided where possible.' Where risk of harm cannot be avoided,

[13] Gloucester City, Cheltenham Borough and Tewkesbury Borough (Adopted December 2017) Joint Core Strategy 2011 - 2031

appropriate mitigation should be provided through 'integrating enhancements into the Scheme that are appropriate to the location.'

7.2.44. The Strategy states that it provides an opportunity to deliver some of the objectives and complement the work programme of the Gloucestershire Local Nature Partnership (GLNP). It refers to the Gloucestershire Nature Map, which sets out spatial priorities for ecological conservation and enhancement across the county. A key part of this is the identification of a number of Strategic Nature Areas (SNAs), which are the key landscape-scale blocks of land where characteristic habitats that typify the county can be expanded and linked to support wildlife. SD9 encourages habitat creation and restoration within these SNAs and associated Nature Improvement Areas (NIAs).

Cheltenham Borough Local Plan – Saved Policies (2006)[14]

7.2.45. Policy CP 3: Sustainable Environment states that development will be permitted only where it would '*safeguard and promote biodiversity'*.

7.2.46. Policy NE 1: Habitats of Legally Protected Species states 'development which would materially harm, either directly or indirectly, a site supporting any legally protected species will not be permitted unless safeguarding measures can be provided through conditions or planning obligations to secure its protection.'

7.2.47. Policy NE 2: Designated Nature Conservation Sites states 'development which would harm, either directly or indirectly, a designated nature conservation site will not be permitted unless safeguarding measures can be provided through conditions or planning obligations to secure its protection; or other material factors exist to override nature conservation considerations.'

7.2.48. Policy NE 3: Biodiversity and Geodiversity of Local Importance states 'development which would harm, either directly or indirectly, a habitat, species or geological site of local importance will only be permitted where the feature of interest can be maintained within the development; or suitable measures of mitigation or compensation can be provided.'

Cotswolds Area of Outstanding Natural Beauty (AONB) Management Plan 2018 – 2023 (Cotswold Conservation Board, 2018)[15]

7.2.49. The Scheme lies approximately 4.5 km west of the Cotswold AONB. Policy CE7: Biodiversity states that biodiversity in the Cotswolds AONB should be conserved and enhanced by establishing a coherent and resilient ecological network across the Cotswolds AONB and in its setting, focussing on the priority species and habitats listed in Appendix 8. This should be achieved by protecting existing wildlife sites, increasing the size of existing wildlife sites, creating more wildlife sites and improving connectivity between wildlife sites.

Gloucestershire Highways Biodiversity Guidance (2019)[16]

7.2.50. The guidance recommends early consideration of biodiversity impacts, as this reduces the risk of future delays, and also allows opportunities for wildlife to be developed. It identifies the value of highway habitats, which can provide refuges for some species, links to wider ecological networks within the landscape, and provide buffers if situated adjacent to designated sites of nature conservation value.

7.2.51. It identifies the main biodiversity impacts of highways including: habitat loss and fragmentation, the presence of a physical barrier, pollution, hydrological and soil changes, changes in the numbers of predators and/or prey, disturbance, and introduction of non-native invasive species.

7.2.52. The guidance identifies that good design, landscaping, green bridges and wildlife underpasses can mitigate some of these impacts and, as a last resort, offsite compensatory measures. Practical management advice for a variety of newly created and

[14] Cheltenham Borough Council (Adopted July 2006) Cheltenham Borough Local Plan Second Review
[15] Cotswolds Conservation Board Cotswolds Area of Outstanding Natural Beauty Management Plan 2018 - 2023
[16] Gloucestershire County Council (December 2019) Gloucestershire Highways Biodiversity Guidance

existing habitats is given, as well as suggested mitigation and enhancement measures for biodiversity. These recommendations in particular have been taken into consideration during the development of mitigation for this Scheme.

Gloucestershire's Nature Recovery Network[17]

7.2.53. In line with the launch of the Government's 25 Year Environment Plan, the GLNP, led by the Gloucestershire Wildlife Trust, are in the process of developing a Nature Recovery Network. This will take the form of a spatial GIS-based master plan for nature restoration covering the entire county, which will complement the natural capital mapping being undertaken by GLNP and build upon the Gloucestershire Nature Map (which identifies SNAs).

Gloucestershire Tree Strategy (Gloucestershire Local Nature Partnership, 2020)[18]

7.2.54. The vision of the strategy is a thriving network of sustainably managed trees and woodlands covering at least 20% of the county by 2030, delivering resilience and connectivity for people, wildlife and the economy.

Gloucestershire Biodiversity Action Plan (BAP)[19]

7.2.55. At the county level a BAP for Gloucestershire has been produced and was launched on 5 April 2000. The aim of the Plan is to achieve a county richer in wildlife. The Biodiversity Action Plan for Gloucestershire covers both local and national concerns and contributes to an international process.

7.2.56. The BAP for Gloucestershire contains a series of Habitat Action Plans and Species Action Plans. These take into account national priorities using the knowledge of local experts to devise what action we need to take 'on the ground' to conserve and enhance biodiversity.

7.2.57. From 2007 there was a review of the Gloucestershire BAP, which moved Gloucestershire towards a more spatially-based biodiversity delivery framework and resulted in the compilation of the Gloucestershire Nature Map in 2008, which was updated in late 2011. By 2012, Local Nature Partnerships were announced and this biodiversity framework was subsumed into what is now the GLNP. GLNP adopted Nature Map with a focus on priority habitats and species, which have now been incorporated into DEFRA's Nature Improvement Areas and create joined up and resilient ecological networks at a landscape scale. The Gloucestershire Nature Map is currently being transformed into the Gloucestershire Nature Recovery Network.

7.3. Methodology

Assessment methodology

7.3.1. The assessment has followed guidance from the Chartered Institute of Ecology and Environmental Management (CIEEM)[20], LA 108[21] and LD 118[22]. The significance of effects on biodiversity resources identified has been categorised, where appropriate, according to LA 108 and considers both on-site impacts and those that may occur to adjacent and more distant biodiversity resources.

[17] Further information at www.gloucestershirenature.org.uk
[18] Gloucestershire Local Nature Partnership (September 2020) Gloucestershire Tree Strategy
[19] Gloucestershire Biodiversity Partnership (2000) Gloucestershire Biodiversity Action Plan
[20] CIEEM (2018). Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine. Chartered Institute of Ecology and Environmental Management, Winchester.
[21] LA 108 Biodiversity (Highways England, March 2020). [Online]. [Accessed October 2020]. Available from: https://www.standardsforhighways.co.uk/dmrb/search?discipline=SUSTAINABILITY_AND_ENVIRONMENT.
[22] LD 118 Biodiversity Design (Highways England, March 2020). [Online]. [Accessed October 2021]. Available from: https://www.standardsforhighways.co.uk/dmrb/search?discipline=SUSTAINABILITY_AND_ENVIRONMENT.

Valuation of resources

7.3.2. Biodiversity resources have been valued following the geographical framework provided in LA 108, as detailed in Table 7-1. The evaluation is based on the information gathered from the desk study and field surveys, using a combination of professional judgement and accepted criteria[23] (e.g. diversity, rarity and naturalness).

Table 7-1 - Biodiversity resource importance (Taken from LA 108)

Biodiversity resource importance	
International or European importance	
Sites	Sites including: European sites: Sites of Community Importance (SCIs); Special Protection Areas (SPAs); Potential SPAs (pSPAs); Special Areas of Conservation (SACs); Candidate or possible SACs (cSACs or pSACs); Wetlands of International Importance (Ramsar sites). Biogenetic Reserves, World Heritage Sites (where recognised specifically for their biodiversity value) and Biosphere Reserves. Areas which meet the published selection criteria for those sites listed above but which are not themselves designated as such.
Habitats	N/A
Species	Resident, or regularly occurring, populations of species which can be considered at an international or European level where: The loss of these populations would adversely affect the conservation status or distribution of the species at an international or European scale; or The population forms a critical part of a wider population at this scale; or The species is at a critical phase of its life cycle at an international or European scale.
UK or national importance	
Sites	Sites including: Sites of Special Scientific Interest (SSSIs) or Areas of Special Scientific Interest (ASSIs); National Nature Reserves (NNRs); National Parks; Marine Protected Areas (MPAs) including Marine Conservation Zones (MCZs); or Areas which meet the published selection criteria for those sites listed above but which are not themselves designated as such.
Habitats	Habitats including:

[23] Set out in Ratcliffe, D.A (1977). A Nature Conservation Review. Cambridge University Press.

Biodiversity resource importance	
	Areas of UK BAP priority habitats; Habitats included in the relevant statutory list of priority species and habitats; and Areas of irreplaceable habitats including: Ancient woodland; Ancient or veteran trees; Blanket bog; Limestone pavement; Sand dunes; Salt marsh; Lowland fen; Areas of habitat which meet the definition for habitats above, but which are not themselves designated or listed as such.
Species	Resident, or regularly occurring, populations of species which can be considered at an international, European, UK or national level where: The loss of these populations would adversely affect the conservation status or distribution of the species at a UK or national scale; or The population forms a critical part of a wider population at this scale; or The species is at a critical phase of its life cycle at a UK or national scale.
Regional importance	
Sites	Designated sites (non-statutory) including heritage coasts.
Habitats	Areas of habitats identified (including for restoration) in regional plans or strategies (where applicable).
Species	Species including: Resident, or regularly occurring, populations of species which can be considered at international, European, UK or national level where: The loss of these populations would adversely affect the conservation status or distribution of the species at a regional scale; or The population forms a critical part of a wider regional population; or The species is at a critical phase of its life cycle. Species identified in regional plans or strategies.
County or equivalent authority importance	
Sites	Wildlife/nature conservation sites designated at a county (or equivalent) level including: Local Wildlife Sites (LWS); Local Nature Conservation Sites (LNCS); Local Nature Reserves (LNRs); Sites of Importance for Nature Conservation (SINCs); Sites of Nature Conservation Importance (SNCIs);

Biodiversity resource importance	
	County Wildlife Sites (CWSs).
Habitats	Areas of habitats identified in county or equivalent authority plans or strategies (where applicable).
Species	Species including: Resident, or regularly occurring, populations of species which can be considered at an international, European, UK or national level where: The loss of these populations would adversely affect the conservation status or distribution of the species at a county or unitary authority scale; or The population forms a critical part of a wider county or equivalent authority area population, e.g. metapopulations; or The species is at a critical phase of its life cycle. Species identified in a county or equivalent authority area plans or strategies.
Local importance	
Sites	Wildlife/nature conservation sites designated at a local level including: Local Wildlife Sites (LWS); Local Nature Conservation Sites (LNCS); Local Nature Reserves (LNRs); Sites of Importance for Nature Conservation (SINCs); Sites of Nature Conservation Importance (SNCIs); Sites of Local Nature Conservation Importance (SLNCIs).
Habitats	Areas of habitat considered to appreciably enrich the habitat resource within the local context including features of importance for migration, dispersal, or genetic exchange.
Species	Populations/communities or species considered to appreciably enrich the habitat resource within the local context including features of importance for migration, dispersal or genetic exchange.

7.3.3. Where survey information is incomplete, a precautionary approach has been taken and the highest likely value has been ascribed, based on interpretation of the information that is available. In these cases, it is clearly stated that the value is precautionary and preliminary. Details of any relevant assumptions are also clearly stated, along with details of any further survey work required/underway to enable a more robust evaluation. It is the intention that any additional data will be gathered prior to submission of the ES, such that the precautionary approach will not be necessary in the ES.

7.3.4. Biodiversity resources that have been identified to be of less than local importance are not considered to be important and, as such, it is proposed to scope these resources out of the EIA. Where mitigation is required for these resources for legal reasons, this is detailed in 7.7.

Characterisation of impacts

7.3.5. The level of impact has been determined by the assessment of the following characteristics:

- Positive or negative (e.g. adverse/beneficial);

- Duration (e.g. permanent/temporary);
- Reversibility (e.g. irreversible/reversible);
- Extent/magnitude;
- Frequency and timing.

7.3.6. The level of impacts on biodiversity resources shall be reported in accordance with the criteria provided in LA 108 (as detailed in Table 7-2 below), and in accordance with CIEEM guidelines, taking into consideration any embedded mitigation measures[24].

Table 7-2 - Level of impact and typical descriptions (Taken from LA 108)

Level of impact (change)		Typical description
Major	Adverse	• Permanent/irreversible damage to a biodiversity resource; and • The extent, magnitude, frequency, and/or timing of an impact negatively affects the integrity or key characteristics of the resource.
	Beneficial	• Permanent addition of, improvement to, or restoration of a biodiversity resource; and • The extent, magnitude, frequency, and/or timing of an impact positively affects the integrity or key characteristics of the resource.
Moderate	Adverse	• Temporary/reversible damage to a biodiversity resource; and • The extent, magnitude, frequency, and/or timing of an impact negatively affects the integrity or key characteristics of the resource.
	Beneficial	• Temporary addition of, improvement to, or restoration of a biodiversity resource; and • The extent, magnitude, frequency, and/or timing of an impact positively affects the integrity or key characteristics of the resource.
Minor	Adverse	• Permanent/irreversible damage to a biodiversity resource; and • The extent, magnitude, frequency, and/or timing of an impact does not affect the integrity or key characteristics of the resource.
	Beneficial	• Permanent addition of, improvement to, or restoration of a biodiversity resource; and • The extent, magnitude, frequency, and/or timing of an impact does not affect the integrity or key characteristics of the resource.
Negligible	Adverse	• Temporary/reversible damage to a biodiversity resource; and • The extent, magnitude, frequency, and/or timing of an impact does not affect the integrity or key characteristics of the resource.

[24] Considered to be mitigation measures incorporated into the Scheme design.

Level of impact (change)		Typical description
	Beneficial	• Temporary addition of, improvement to, or restoration of a biodiversity resource; and • The extent, magnitude, frequency, and/or timing of an impact does not affect the integrity or key characteristics of the resource.
No change		• No observable impact, either positive of negative

Assessment of significance of effects

7.3.7. The importance of the resource and level of impact has been used to determine the significance of effect using the matrix in LA 108, shown in Table 7-3 below.

Table 7-3 - Significance matrix (Taken from LA 108)

	Level of impact					
		No change	Negligible	Minor	Moderate	Major
Resource importance	International or European importance	Neutral	Slight	Moderate or large	Large or very large	Very large
	UK or national importance	Neutral	Slight	Slight or moderate	Moderate or large	Large or very large
	Regional importance	Neutral	Neutral or slight	Slight	Moderate	Moderate or large
	County or equivalent authority importance	Neutral	Neutral or slight	Neutral or slight	Slight	Slight or moderate
	Local importance	Neutral	Neutral	Neutral or slight	Neutral or slight	Slight

7.3.8. Significant effects typically comprise effects that remain within the moderate, large or very large categories once mitigation has been taken into account.

Establishing the study area

7.3.9. The study area extends beyond the Scheme footprint in accordance with the DMRB[25] and to accommodate minor changes in the footprint.

7.3.10. Unless otherwise stated, the Scheme refers to the redline boundary, excluding those sections of the redline boundary that extend approximately 2 km north and 2 km south of the highway alignment along the M5 corridor. I In these areas, the only works proposed are the installation of signage in discrete locations, which will require vegetation clearance of up to approximately 20 m^2 In addition, vegetation in front of the sign up to a distance of a 180 m would need to be trimmed back to ensure visibility. It is the intention to survey these discrete locations prior to the ES. The highway alignment and the redline boundary are shown on the Design Figures in Appendix 2.1.

7.3.11. The distance that the study area extends beyond the Scheme was determined by the likely spatial scale of potential significant effects for each type of biodiversity resource, i.e. the

[25] Design Manual for Roads and Bridges. 2019. LA 104 Environmental assessment and monitoring. Online https://www.standardsforhighways.co.uk/dmrb/search/78a69059-3177-43dc-94bd-465992cfda82. [Accessed July 2020]

Zones of Influence. These are based on good practice guidance, where available (references provided), but in most cases are determined by professional judgement. The various study areas are shown on Figure 7A in Appendix A.

- 30 km from the Scheme for identification of European Sites where bats are one of the qualifying features[26].
- 2 km from the Scheme (extended to any distance where there is a direct hydrological connection) for identification of all other statutory designated nature conservation sites, including European Sites, SSSIs, National Nature Reserves (NNRs) and Local Nature Reserves (LNRs).
- 2 km from the Scheme for identification of any bat species records.
- 1 km from the Scheme for identification of non-statutory designated nature conservation sites (e.g., Local Wildlife Sites) and records of priority habitats[27] and ancient woodland.
- 1 km from the Scheme for identification of any protected or priority[28] species records.
- 500 m from the Scheme for identification and survey of waterbodies that could potentially support breeding populations of great crested newt[29] and watercourses and waterbodies that could potentially support otter and water vole.
- 250 m from the Scheme for habitat surveys and assessment of potential to support protected or priority species.
- 250 m from the Scheme for identification of ancient and veteran trees.
- 200 m from the ARN for identification of European Sites, Statutory and non-statutory designated nature conservation sites, nature improvement areas, areas of ancient woodland and veteran trees for the assessment of air quality impacts as a result of nitrogen deposition from road traffic emissions[30]. Further detail is included in the Air Quality chapter (Chapter 5). .
- 150 m from the Scheme for identification of aquatic features (watercourses and standing waterbodies), hereafter the aquatic feature screening area. For watercourses identified within the aquatic feature screening area, the study area is extended up to 2 km upstream and downstream from the Scheme for hydrologically connected aquatic features, designated sites, and background records.
- 100 m from the Scheme for assessment of building and trees for bat roost potential. This is extended where buildings and trees beyond 100 m would be isolated by the Scheme. This was reduced to 50 m along the southern side of the A4019, given the more urbanised nature of this area, and the more limited potential for impacts.

[26] Design Manual for Roads and Bridges. LA 115 Habitats Regulations Assessment (formerly HD 44/09). Online: http://www.standardsforhighways.co.uk/ha/standards/dmrb/vol11/section4/LA%20115%20Habitats%20Regulations%20assessment%20-web.pdf [Accessed 21/10/19].
[27] Priority habitats are those habitats listed in accordance with Section 41 of the Natural Environment and Rural Communities Act 2006 (the NERC Act) as being of principal importance for the conservation of biodiversity in England.
[28] Priority species in this context comprise species listed in accordance with Section 41 of the NERC Act; IUCN Red List species; Red and Amber Birds of Conservation Concern; and species that are Nationally Scarce or Rare.
[29] This species typically uses suitable terrestrial habitat up to 500 m from a breeding pond (Natural England (2001). Great Crested Newt Mitigation Guidelines. English Nature, Peterborough.
[30] Design Manual for Roads and Bridges. LA 105 Air Quality (formerly HA 207/07, IAN 170/12, IAN 174/13, IAN 175/13, part of IAN 185/15). Online: 10191621-07df-44a3-892e-c1d5c7a28d90 (standardsforhighways.co.uk).

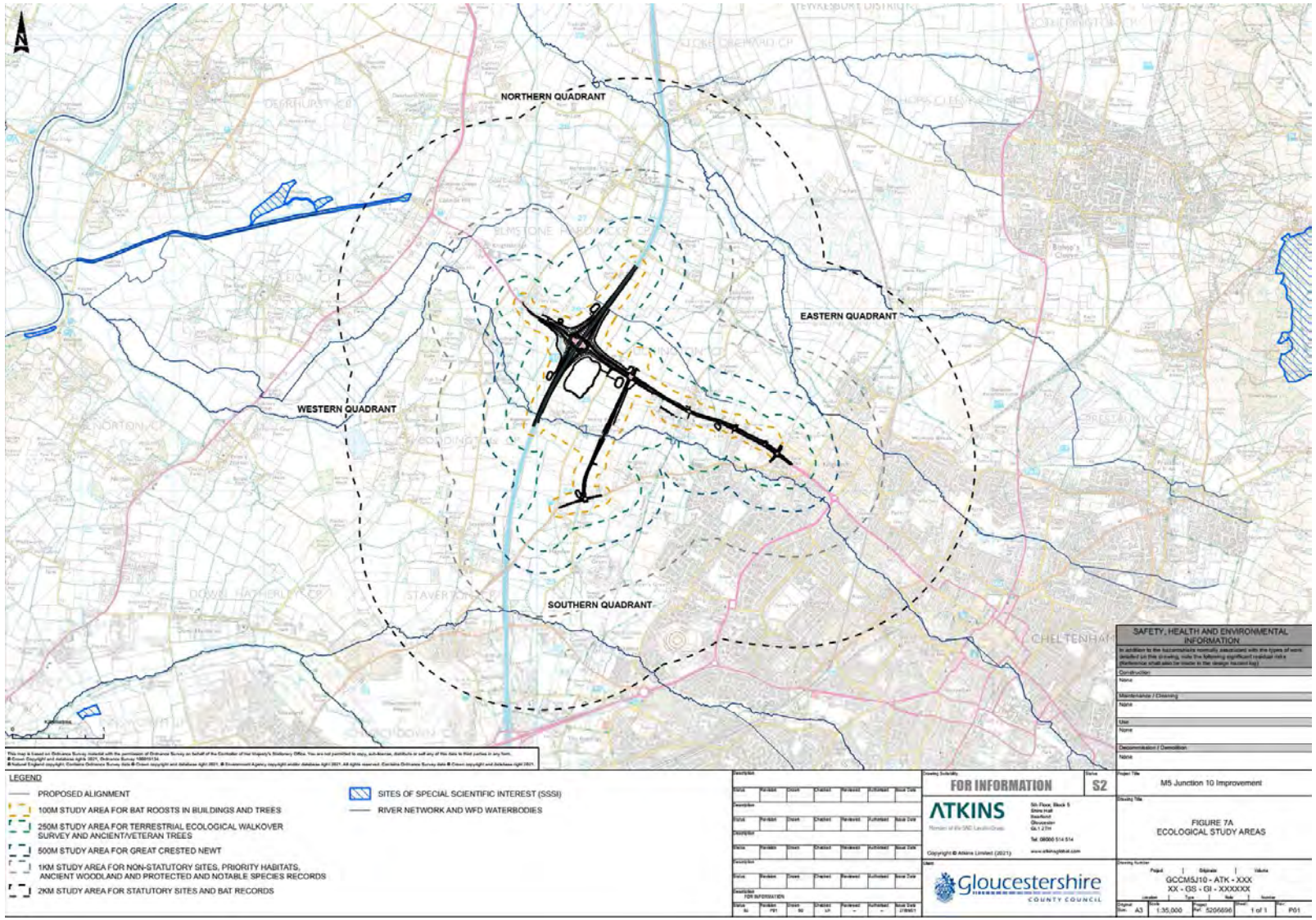


Figure 7-1 – Ecological study areas

Baseline data collection

7.3.12. Further information on species and habitat specific surveys are detailed within the Technical Appendix reports (Appendices 7.1 to 7.13); a summary is provided here.

Desk study

7.3.13. A desk-based data gathering exercise was undertaken in September 2019 and April 2021 to collect existing information on biodiversity resources within the study areas described above. Details of the searches and data sources are provided below.

7.3.14. In 2018, Ecus undertook a Preliminary Ecological Appraisal (PEA) for the M5 Junction 10 Improvement Scheme[31]. This was reviewed to obtain relevant information, although the Scheme has changed in scope since the original survey.

7.3.15. The MAGIC website[32] was reviewed to identify:

- European Sites within 30 km of the Scheme where bats are one of the qualifying features.
- Statutory designated nature conservation sites within 2 km of the Scheme or those with a direct hydrological connection to the Scheme.
- Priority habitats and ancient woodland within 1 km of the Scheme.
- Granted EPS licences[33] within 1 km of the Scheme (2 km for bats);
- European Sites, Statutory designated nature conservation sites and areas of ancient woodland within 200 m of the ARN.

7.3.16. The Woodland Trust's Ancient Tree Inventory website[34] was reviewed to locate records of ancient and veteran trees within 250 m of the Scheme and within 200 m of the ARN.

7.3.17. Historic and recent aerial imagery was reviewed using Google Earth Pro (version 7.3.3) to supplement and refine the boundaries between habitats that were noted in the field.

7.3.18. Gloucestershire Centre for Environmental Records (GCER) was contacted on 11 September 2019, and again on 12 April 2021 and 12 October 2021 to obtain recent records[35] of the following:

- Non-statutory designated nature conservation sites within 1 km of the Scheme and within 200 m of the ARN.
- Bat species records within 2 km of the Scheme.
- Other protected and priority species within 1 km of the Scheme.

7.3.19. Ordnance Survey (OS) maps and satellite imagery were reviewed to identify the following:

- Waterbodies that could be suitable for great crested newt within 500 m of the Scheme.
- Buildings that could support bat roosts within 100 m of the Scheme, or that would be isolated by the Scheme (i.e., where existing connections to surrounding habitat would be severed by new roads).

7.3.20. Documents associated with the Elms Park development planning application (reference 16/02000/OUT) were obtained from the Tewkesbury Borough Council website[36].

[31] Ecus (2019). M5 J10 Preliminary Ecological Appraisal. Report prepared for Amey OW PLC, December 2018.
[32] DEFRA. c2019. Magic Map Application. [Online]. [Accessed 20th May 2021]. Available from: https://magic.defra.gov.uk/MagicMap.aspx
[33] Licences granted by Natural England to permit activities that might otherwise cause a breach of the Conservation of Habitats and Species Regulations 2017, with respect to species protected by that legislation.
[34] Woodland Trust. 2019. Ancient Tree Inventory - Woodland Trust. [Online]. [Accessed 20th May 2021]. Available from: https://ati.woodlandtrust.org.uk/
[35] Records of observations within the last 10 years.
[36] https://publicaccess.tewkesbury.gov.uk/online-applications

7.3.21. A desk study was undertaken to identify watercourses and standing waterbodies (ponds[37] and lakes[38]) potentially affected by the Scheme. The aquatic feature screening area was set at 150 m from the redline boundary (including the sections of the redline boundary that extend approximately 2 km north and 2 km south of the highway alignment along the M5 corridor)[39]. The following data sources used in aquatic feature identification:

- OS Mapping and aerial imagery[40].
- OS Open Rivers[41].
- Esri World Topographic Map[42].
- Environment Agency Main Rivers Map[43].

7.3.22. Background habitat and species records from within the last five years have been reviewed by desk study. For aquatic features identified within the screening area, the search for background records has been undertaken within 2 km upstream and downstream of the Scheme boundary to identify the presence of hydrologically connected aquatic features, designated sites and ecological background records. 2 km defines the ecological zone of influence (measured in linear watercourse extent) from the redline boundary.

7.3.23. The following data sources have been used to obtain species (aquatic macroinvertebrates, aquatic macrophytes and fish) and habitat records:

- MAGIC website[44].
- Environment Agency Severn River Basin Management Plan[45].
- Environment Agency Fish and Ecology data explorer for aquatic macrophytes, aquatic invertebrates and fish[46].
- Environment Agency Data Catchment Explorer[47].
- Environment Agency River Habitat Survey monitoring data from the Government data website[48].
- Other project data that includes HSI[49] surveys.

Field surveys

7.3.24. The following section outlines the ecological survey work that has been undertaken to date. Surveys for terrestrial ecology were led by suitably experienced ecologists considered competent to undertake specific surveys in accordance with CIEEM[50]. Aquatic habitats and species surveys (excluding protected species) are not directly covered by the CIEEM competencies for species surveys. Aquatic surveys were led by suitably experienced specialist aquatic ecologists following standard Environment Agency sampling methods for aquatic macroinvertebrates, aquatic macrophytes and fish. River Habitat Surveys (RHS) were led by Environment Agency accredited surveyors. The

[37] Man-made or natural standing water bodies less than 2 ha (20,000 m^2) in area
[38] Man-made or natural standing water bodies greater than 2 ha (20,000 m^2) in area
[39] Note: compensatory proposed floodplain is not included within the redline boundary at this stage, but the stretches of the M5 corridor extending approximately 2 km north and 2 km south of the highway alignment are included with respect to the aquatic feature screening area.
[40] Available from: Free OS OpenData Map Downloads | Free Vector & Raster Map Data | OS Data Hub and https://www.bing.com/maps
[41] https://www.ordnancesurvey.co.uk/business-government/products/open-map-rivers
[42] https://www.arcgis.com/home/item.html?id=7dc6cea0b1764a1f9af2e679f642f0f5
[43] https://www.arcgis.com/apps/webappviewer/index.html?id=17cd53dfc524433980cc333726a56386
[44] DEFRA. c2019. Magic Map Application. [Online]. Available from: https://magic.defra.gov.uk/MagicMap.aspx
[45] https://www.gov.uk/government/publications/severn-river-basin-district-river-basin-management-plan
[46] https://environment.data.gov.uk/ecology/explorer/
[47] https://environment.data.gov.uk/catchment-planning/
[48] https://data.gov.uk/data/search [Accessed August 2021]
[49] Oldham R.S., Keeble J., Swan M.J.S. and Jeffcote, M., 2000. Evaluating the suitability of habitat for the Great Crested Newt (*Triturus cristatus*). Herpetological Journal,10(4), pp. 143-155.
[50] https://cieem.net/resource/competencies-for-species-survey-css/

methodologies for the surveys are further detailed within the corresponding Technical Appendix reports.

7.3.25. The majority of the ecological survey data collected to date is from 2019 and 2020. Assuming planning submission in summer 2022, the survey data from 2019 will be three years old. To account for this, it is proposed to undertake update extended Phase 1 habitat surveys in targeted areas to determine whether any of the baseline conditions have changed significantly. The scope of any future surveys will be agreed in due course with statutory consultees. In addition, a Phase 1 habitat survey is scheduled for the motorway verge habitats in September 2021, which are expected to be directly impacted by the Scheme works and could not be surveyed during the initial walkover surveys.

Extended Phase 1 habitat

7.3.26. A walkover survey of accessible land within 250 m of the Scheme was undertaken in May and September 2019 to validate habitat mapping undertaken previously by Ecus and identify habitats and features that could potentially support protected and priority species within the study area. This area totals approximately 400 hectares (ha). Habitat classification was undertaken in accordance with the Joint Nature Conservation Committee (JNCC) Phase 1 Habitat Survey methodology[51]. Habitats were recorded on base maps of the study area. Target notes were used to describe the characteristic plant species and any habitats/features suitable for protected and priority species or signs of their presence. Further detail on the Phase 1 surveys is included in Technical Appendix 7.1.

Hedgerow

7.3.27. Hedgerows located partially or entirely within 250 m of the Scheme were subject to a full hedgerow survey in June and August 2019 and June 2021. These surveys recorded information on the following: height and width, presence of gaps, presence of banks, walls and ditches, presence of trees, adjacent land use and proximity of other ecological features, species present, management, and evidence of use by animal species. The survey methodology followed the guidelines in the Hedgerow Survey Handbook[52]. Following the survey, the results were assessed against the wildlife and landscape criteria for determining 'important' hedgerows set out in Schedule 1, Part 2 of the Hedgerow Regulations 1997[53]. Further detail on the hedgerow surveys is included in Technical Appendix 7.2.

Bats

7.3.28. Bat surveys are being undertaken in accordance with BCT good practice survey guidelines[54]. Further details of the surveys are provided in Technical Appendix 7.3. Surveys undertaken to the end of the 2020 survey season include:

- Preliminary Roost Assessment (PRA) of buildings within the study area.
- DNA surveys of any bat droppings found within trees or structures in the study area.
- Emergence/re-entry surveys of buildings assessed as having greater than negligible bat roost potential during the PRA.
- Hibernation surveys of structures: full spectrum static recorders were left within structures with internal cavities which could not be fully inspected.

[51] JNCC (2010). Handbook for Phase 1 Habitat Survey – A Technique for Environmental Audit [Online]. Available at: http://data.jncc.gov.uk/data/9578d07b-e018-4c66-9c1b-47110f14df2a/Handbook-Phase1-HabitatSurvey-Revised-2016.pdf
[52] DEFRA (2007) Hedgerow Survey Handbook. A standard procedure for local surveys in the UK. DEFRA, London
[53] Available at https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/438652/hedgerow__guide_part_1.pdf. Accessed 16 September 2021.
[54] Collins, J. (ed.) (2016) Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd edn). The Bat Conservation Trust, London.

- Ground Level Tree Assessment (GLTA) of trees within the study area.
- Tree climbing of trees within the study area that were assessed as having moderate or higher bat roosting potential as a replacement for emergence/re-entry surveys. Trees with moderate potential were climbed two times in the survey season (May – September) to search for evidence of roosting bats, and trees with high potential were climbed three times in the survey season (May – September).
- Emergence/re-entry surveys of trees with moderate or higher bat roosting potential which could not be climbed safely, or where features could not be assessed during tree climbing. The tree emergence surveys were weighted preferentially towards the use of infra-red cameras over surveyors[55].
- All trees assessed to have hibernation potential were subject to a hibernation tree climb in February 2020.
- Bat activity surveys, comprising transect surveys and static detector surveys were undertaken to identify levels of activity, key foraging and commuting areas, and the bat species present. Ten transect routes were undertaken, with two static detectors located along each transect. Another 15 static detectors were deployed across the Scheme to provide additional information on the surrounding habitat.
- Bat crossing point surveys were undertaken at five locations where the Scheme would sever hedgerows, and therefore potentially impact the foraging and commuting habitats of bats. The crossing point surveys were conducted using the methodology produced by DEFRA[56].

7.3.29. Based on the results from 2019 and 2020 surveys and in order to collect a full suite of survey data to inform the impact assessment, the following surveys for bats are proposed/continuing (where access can be arranged):

- Surveys are ongoing for transects, static detector, and crossing points surveys along the A4019, which were added to the suite of surveys in 2021 as a result of changes to the Scheme design. These surveys will be completed by the end of the 2021 survey season.
- Repeat of crossing point surveys undertaken in previous years in accordance with DEFRA guidance[57].
- Internal inspections and hibernation surveys of buildings to be demolished, those within 100 m of the Scheme and those at risk from fragmentation within the study area will be undertaken once asbestos information is received and analysed, assuming access can be arranged, and COVID-19 restrictions allow.
- Further building and tree surveys will be required to fill any gaps in the survey data, for example where it has not been possible to undertake the requisite number of survey visits of a particular feature due to access restrictions, adverse weather conditions or time constraints.

[55] It is accepted that this goes against the BCT good practice survey guidelines, which states that 'while such equipment is very useful as a complementary technique, it should not be used to replace surveyors to any significant degree; the majority of any site should be observed by surveyors.' The more recent Thermal Imaging: Bat Survey Guidelines (Fawcett Williams (2019) Thermal Imaging: Bat Survey Guidelines - produced in association with the BCT) endorses the use of thermal imaging cameras as a replacement for one or more surveyors. It is considered that there is a trend towards using cameras in place of surveyors, and that this is at least as reliable, if not more so, than surveyors. It is anticipated that the guidance regarding the use of infra-red cameras will be brought into line with the thermal imaging guidance in the near future.
[56] Berthinussen, J & Altringham, J (2015) WC1060 Development of a cost-effective method for monitoring the effectiveness of mitigation for bats crossing linear transport infrastructure. Appendix G: Local effects of transport infrastructure & mitigation: best practice survey protocol and data analysis.
[57] Berthinussen, J & Altringham, J (2015) WC1060 Development of a cost-effective method for monitoring the effectiveness of mitigation for bats crossing linear transport infrastructure. Appendix G: Local effects of transport infrastructure & mitigation: best practice survey protocol and data analysis.

7.3.30. Advanced survey techniques for bats, focusing on Bechstein's bat with the aim of establishing their use of the landscape affected by the Scheme, are planned in 2021[58].

7.3.31. Further detail on the completed and proposed bat surveys can be found within Technical Appendix 7.3.

Dormouse

7.3.32. Hazel dormouse surveys have been undertaken in accordance with good practice guidance[59]. An initial hazel dormouse habitat suitability assessment was undertaken in May and September 2019 during the walkover surveys. The initial walkover survey included an assessment of habitat type, structure, species composition and connectivity with other areas of suitable habitat outside the survey area. Hazel dormouse nest tube surveys were carried out between May and November 2019. A total of 666 artificial nest tubes were placed in seven distinct areas in suitable habitat (woodland, hedgerows and scrub) and checked by a licensed surveyor every two months up to November 2019. Hazel dormouse nest tube surveys are currently underway along the A4019 within an additional two areas. A total of 220 nest tubes have been deployed within hedgerows and scrub along the A4019, which will be checked every two months up to November 2021. Further detail on dormouse surveys is included in Technical Appendix 7.4.

Badger

7.3.33. A badger survey was carried out between November 2020 and January 2021 in accordance with good practice guidance[60]. The extent of the badger survey was based on the zone of influence for this species and included all land within the Scheme area and a 50 m buffer extending out in all directions from the Scheme boundary where access allowed. The area was inspected for evidence of badger activity including setts, latrines, dung pits, prints, foraging scrapes, pathways, hairs, and scratching posts. Any setts identified during the surveys were classified as either a main, annexe, subsidiary or outlier sett. Further detail on badger surveys is included in Technical Appendix 7.5.

Otter

7.3.34. Otter habitat suitability assessments were carried out in September and November 2019, and in March and July 2021. These surveys assessed the suitability of habitats within the study area to provide habitat for otters, considering the water level, food supply, visible pollution levels, levels of disturbance, connectivity, and places for resting and sheltering. Otter presence / likely absence surveys were carried out between September and November 2019, and in June and July 2020. The surveys were undertaken following good practice methodologies and were based on otter survey protocols set out in Chanin and Smith (2003)[61]. Identified potential otter resting sites (five locations) were monitored to assess activity levels. This comprised the deployment of trail cameras to monitor the features for two four-week periods in July 2020 and September/October 2020. Further detail on otter surveys is included in Technical Appendix 7.6.

[58] Following advanced survey techniques for bats in May 2021, the July 2021 advanced surveys were not undertaken. No bats of the target species were caught in May 2021, and it was considered that there was a high chance of this happening again in July. In addition, land access was problematic in May, and was deteriorating such that the situation was predicted to be worse in July 2021. Furthermore, there were technical issues with the automated radiotracking system that was proposed, reducing the number and range of species of bats that can be caught and tagged. As a result of these factors, the July 2021 surveys were not undertaken. It is proposed to analyse the results of all of the bat survey work at the end of the 2021 survey season and review the need for advanced surveys in 2022.
[59] Natural England Standing Advice: Hazel or common dormice: surveys and mitigation for development projects, accessed May2019 from: https://www.gov.uk/guidance/hazel-or-common-dormice-surveys-and-mitigation-for-development-projects
[60] Harris, S., Cresswell, P. & Jefferies, D. (1989) Surveying Badgers. Occasional Publication No.9. The Mammal Society.
[61] Chanin and Smith (2003). *Monitoring the otter Lutra lutra*. Conserving Natura 2000 Rivers Monitoring Series No 10. Peterborough, English Nature.

Water vole

7.3.35. Water vole habitat suitability assessment surveys were carried out in September and November 2019 and in March and July 2021 according to good practice guidance[62,63]. Habitat features which were assessed as suitable during the habitat suitability assessments undertaken in September 2019 were then immediately subject to a presence / likely absence survey for water vole. A second water vole presence / likely absence survey was undertaken for suitable habitat features in June 2020, covering sections of the River Chelt and one minor watercourse. The habitat features which were surveyed in November 2019 were scoped out from further assessment (due to unsuitable habitat) and therefore presence / likely absence surveys for water vole were not undertaken here in 2020. Further detail on water vole surveys is included in Technical Appendix 7.7.

Breeding and wintering birds

7.3.36. Breeding bird surveys were undertaken on four occasions in June and July 2019, May 2020 and April 2021. The principles of the Common Birds Census (CBC) mapping methodology developed by the British Trust for Ornithology (BTO) were broadly followed[64]. This level of survey effort was considered suitable to generate enough encounters with birds to produce clusters of registrations to minimise the risk of overlooking scarce species and species of conservation concern. Six representative transects of varying lengths were surveyed, which gave suitable coverage of the study area. The data captured over the survey visits was analysed to provide an estimate of the number of recorded priority species territories[65,66,67].

7.3.37. Surveys for barn owl have been incorporated into the bat building and tree surveys. This has included identification of features potentially suitable for nesting, roosting or foraging barn owls. Incidental records of barn owl were also collected during other surveys. Further detail on breeding bird surveys is included in Technical Appendix 7.8.

7.3.38. Wintering bird surveys were undertaken each month from September 2019 to March 2020 inclusive. The wintering bird survey method used involves recording all birds on a map as with a CBC survey but during the non-breeding season. This method allows presence, abundance and spatial distribution to be recorded. A total of six wintering bird survey visits was considered suitable to generate enough encounters with birds to characterise usage of the study area by wintering and migrating birds and minimise the risk of overlooking scarce species and species of conservation concern. Six representative transects of varying lengths were surveyed, which gave suitable coverage of the study area. Further detail on the wintering bird surveys is included in Technical Appendix 7.9.

[62] Strachan, R. and Moorhouse, T. (2011). Water Vole Conservation Handbook (3rd edition). Wildlife Conservation Research Unit, University of Oxford.
[63] Dean, M. et al The Water Vole Mitigation Handbook (2016). Mammal Society.
[64] Gilbert, G., Gibbons, D.W. and Evans, J. (1998) Bird monitoring methods: A manual of techniques for key UK species. RSPB: Sandy.
[65] For this assessment, priority birds have been taken as those listed on: Schedule 1 of the Wildlife and Countryside Act (1981); Annex 1 (under Article 4,1) and regularly occurring migratory bird species (under Article 4.2) of Directive 2009/147/EC (the Birds Directive) and interest features of relevant Ramsar sites (Severn Estuary SPA and Ramsar and Walmore Common SPA); Red or amber lists of Birds of Conservation Concern, the England Biodiversity List and the Gloucestershire Biodiversity Action Plan.
[66] The UK's leading bird conservation organisations have worked together on a quantitative review of the status of the birds that occur regularly in the UK (currently on the third review). Bird species have been assessed against a set of objective criteria to place each on one of three lists – green, amber and red – indicating an increasing level of conservation concern. The criteria used in assessments are intended to ensure that Birds of Conservation Concern (BoCC) listings reflect each species' global and European status as well as that within the UK, and additionally measure the importance of the UK population in international terms.
The findings of the third review are in: Eaton, M.A., Brown A.F., Noble D.G., Musgrove, A.J., Hearn R.D., Aebischer N.J., Gibbons D.W., Evans A., and Gregory R.D. (2009). Birds of Conservation Concern 3: The population status of birds in the United Kingdom, Channel Islands and the Isle of Man. British Birds 102: 296-341.
[67] Section 40 of the Natural Environment and Rural Communities (NERC) Act 2006 sets out the duty for public authorities to conserve biodiversity in England. Habitats and species of principal importance for the conservation of biodiversity as identified by the Secretary of State for England, in consultation with Natural England, are referred to in Section 41 of the NERC Act 2006 for England. The list of habitats and species was updated in 2008 and is known as the England Biodiversity List.

Reptiles

7.3.39. An initial reptile habitat suitability assessment was undertaken in May and September 2019 during the initial walkover surveys. Presence / likely absence surveys for common species of reptile[68] were carried out between August and October 2019 and August and October 2020 in accordance with standard survey guidance[69,70,71]. Artificial refuges, consisting of roofing felt and corrugated metal sheets ('tins') measuring approximately 0.5 m^2, were laid out in 39 survey transects within suitable habitat. Seven checks of the artificial refuges were undertaken in suitable weather conditions. Reptile surveys are currently underway within an additional area to the north west of the Scheme where access had previously been refused. Further detail on reptile surveys is included in Technical Appendix 7.10.

Great crested newts

7.3.40. In June 2019 and June 2020, May and June 2021, great crested newt habitat suitability surveys and environmental DNA (eDNA) surveys were undertaken of all accessible waterbodies within 500 m of the Scheme. The habitat suitability survey followed the HSI methodology developed by Oldham et al. (2000)[72]. eDNA survey followed the Natural England approved methodology described by Biggs, et al. (2014)73. Water samples were collected from each pond and sent to ADAS or SureScreen Scientifics[74] for laboratory analysis. Further detail on great crested newt surveys is included in Technical Appendix 7.11.

Aquatic habitats and species

7.3.41. Separate site walkover surveys have been undertaken to inform the assessment of aquatic habitats and species. The requirement for including specific aquatic habitats in the walkover was determined based on the potential Scheme interactions and associated impacts. Only those features for which impacts are considered likely to occur based on the current Scheme understanding were screened in for walkover survey.

7.3.42. The aquatic walkover survey, undertaken on the 23 and 24 July 2019, focused around the point of interaction with the Scheme (i.e. proposed crossing point of a watercourse) and, where feasible, 250 m up and downstream of these interactions.

7.3.43. During the walkover survey, habitat characteristics were recorded broadly following habitat descriptors outlined in the RHS methodology[75], which includes substrates, vegetation types, flow types, approximate channel dimensions and presence of artificial features (channel/bank re-sectioning and/or existing crossing structures, weirs or outfalls). Further detail on the aquatic ecology surveys is included in Technical Appendix 7.12.

7.3.44. Following review of background records, other scheme data, and observations from the walkover survey, further detailed aquatic species and habitat surveys were undertaken on

[68] Due to the restricted ranges of smooth snake and sand lizard, these species are not considered within this report.
[69] Froglife (1999) Reptile Survey: an introduction to planning, conducting and interpreting surveys for snake and lizard conservation. Froglife advice sheet 10.
[70] Design Manual for Roads and Bridges. 2019. Sustainability and Environment Design. LD 118 Biodiversity Design (formerly LA 118). Online: https://www.standardsforhighways.co.uk/dmrb/search/9317652b-4cb8-4aaf-be57-b96d324c8965
[71] Sewell D., Griffiths R., Beebee T., Foster J., & Wilkinson J. (2013). Survey protocols for the British herpetofauna. Version 1.0.
[72] Oldham R.S., Keeble J., Swan M.J.S. & Jeffcote M. (2000). Evaluating the suitability of habitat for the Great Crested Newt (*Triturus cristatus*). Herpetological Journal 10 (4), 143-155.
[73] Biggs J., Ewald N., Valentini A., Gaboriaud C., Griffiths R.A., Foster J., Wilkinson J., Arnett A., Williams P. & Dunn F. (2014). Analytical and methodological development for improved surveillance of the Great Crested Newt. DEFRA Project WC1067. Freshwater Habitats Trust: Oxford.
[74] SureScreen Scientifics is a participant in Natural England's eDNA proficiency testing scheme and achieved 80% in blind tests undertaken in 2020. ADAS is a participant in Natural England's eDNA proficiency testing scheme and has achieved perfect scores in blind tests undertaken in 2017, 2018, 2019 and 2020.
[75] Environment Agency (2003) River Habitat Survey in Britain and Ireland - Field Survey Guidance Manual and National Rivers Authority (1992). River Corridor Surveys: Methods and Procedures.

watercourses which exhibited suitable habitat considered likely to support valuable assemblages of aquatic species. These surveys included the following:

- RHS[76] undertaken in July 2020.
- River Corridor Survey (RCS)[77] undertaken in July 2020.
- Aquatic macroinvertebrates[78] undertaken in October 2020.
- Aquatic macrophytes (LEAFPACS)[79] undertaken in July 2020.
- Fish (electric fishing)[80] undertaken in July 2020.

7.3.45. White clawed crayfish surveys were undertaken on 27, 28 and 29 July 2020 of the River Chelt and Leigh Brook, comprising visual assessment of available habitat features. At sites that were suitable (along the River Chelt), a manual search of refuge habitats within five patches along the reaches surveyed for RHS and RCS was undertaken following standard survey methodology[81]. All white-clawed crayfish surveys were led by surveyors holding a Natural England Class Survey Licence (CL11). During the surveys, information was recorded on the site length, channel width, flow, water clarity, water temperature, water quality, and shading, as well as information on the types of refuges present for searching and the presence of any crayfish burrows.

7.4. Consultation

7.4.1. Natural England have been consulted and have provided feedback on the survey work undertaken to-date, the survey work proposed, and the HRA Screening report. Consultation with Natural England is ongoing.

7.4.2. Early consultation with the Environment Agency was undertaken on 16 January 2020 and 15 July 2021 to discuss assessment and survey approach for WFD assessment and aquatic ecology. Further to these meetings, the Environment Agency provided written consultation responses outlining key considerations for the Scheme, details of which are provided in Technical Appendix 7.12. Consultation with the Environment Agency is ongoing.

7.4.3. The Gloucestershire County Council ecologist has provided useful information on Gloucestershire's policies with regard to biodiversity. Consultation with Gloucestershire County Council is ongoing.

7.4.4. The following organisations will also be consulted in relation to biodiversity:

- Gloucestershire Wildlife Trust; and
- GLNP.

7.4.5. The consultees' views will be taken into account in the subsequent stages of the project, including the final design of the Scheme and its associated mitigation and compensation measures.

[76] Environment Agency, 2003. River Habitat Survey in Britain and Ireland. Field Survey Guidance Manual.
[77] National Rivers Authority, 1992. River Corridor Surveys: Methods and Procedures. Conservation Technical Handbook.
[78] Aquatic macroinvertebrate samples were collected using a standard three-minute kick-sampling technique in accordance with River Invertebrate Prediction & Classification Systems (RIVPACS) standard sampling protocols. RIVPACS is the model implemented within the RICT (River Invertebrate Classification Tool) used by the Environment Agency to determine WFD invertebrate classifications. Reference: EU Star UK (2006) RIVPACS Macroinvertebrate Sampling Protocol. Available at: http://www.eu-star.at/pdf/RivpacsMacroinvertebrateSamplingProtocol.pdf (accessed April 2021)
[79] UKTAG, 2014. Guide to Macrophytes in Rivers River LEAFPACS2. [pdf] Available at: http://www.wfduk.org/sites/default/files/Media/Characterisation%20of%20the%20water%20environment/Biological%20Method%20Statements/River%20Macrophytes%20UKTAG%20Method%20Statement.pdf [Accessed: August 2021].
[80] UKTAG (2008). River Assessment Methods: Fish Fauna (Fisheries Classification Scheme 2) by Water Framework Directive - United Kingdom Technical Advisory Group (WFD-UKTAG): https://www.wfduk.org/sites/default/files/Media/Characterisation%20of%20the%20water%20environment/Biological%20Method%20Statements/river%20fish.pdf
[81] Peay S (2003). Monitoring the White-clawed Crayfish Austropotamobius pallipes. Conserving Natura 2000 Rivers Monitoring Series No. 1, English Nature, Peterborough.

7.5. Baseline conditions

7.5.1. The paragraphs below provide a summary of the results of the baseline surveys undertaken to-date (up to the end of 2020 for bats), and an initial assessment of the relative importance of the biodiversity resources in accordance with LA 108.

Designated sites

Wye Valley and Forest of Dean Bat Sites SAC

7.5.2. The Wye Valley and Forest of Dean Bat Sites SAC is located within 30 km of the Scheme and supports bats as qualifying features. The SAC represents a complex of 13 component SSSIs which support the greatest concentration of lesser horseshoe bat in the UK (26% of the national population) and represents the northern part of the range for greater horseshoe bat (supporting 6% of the UK population). The nearest of the SAC sites (Blaisdon Hall SSSI) is located approximately 21 km west of the Scheme.

7.5.3. This SAC has been ascribed a valuation of International importance.

Severn Estuary SAC/SPA/Ramsar

7.5.4. The Severn Estuary is designated as an SAC, SPA and a Ramsar Site. All of the watercourses which are crossed by the Scheme (River Chelt, Leigh Brook, and their tributaries) eventually flow into the River Severn, which is approximately 7.5 km downstream from their closest Scheme interaction. From the nearest confluence point, where the River Chelt joins the River Severn, just upstream of Wainlode Cliff, the Severn Estuary designations are a further 40 km downstream.

7.5.5. The Severn Estuary SAC/SPA/Ramsar/SSSI supports the following features of nature conservation importance:

- 1130 Estuaries – one of the best areas in the UK.
- 1140 Mudflats and sandflats not covered by seawater at low tide – one of the best areas in the UK.
- 1330 Atlantic salt meadows– one of the best areas in the UK.
- 1110 Sandbanks which are slightly covered by seawater all the time – the site is thought to support a significant presence of this habitat.
- 1170 Reefs – the site is thought to support a significant presence of this habitat.
- 1095 Sea lamprey– one of the best areas in the UK.
- 1099 River lamprey– one of the best areas in the UK.
- 1103 Twaite shad (– one of the best areas in the UK.
- Wintering Bewick's swan – 280 individuals representing at least 4.0% of the wintering population in Great Britain (5 year peak mean 1991/2 - 1995/6).
- The site also qualifies under Article 4.2 of the Directive (79/409/EEC) by supporting populations of European importance of the following migratory species:
- Passage population of ringed plover – 655 individuals representing at least 1.3% of the Europe/Northern Africa wintering population (5 year peak mean 1991/2 - 1995/6).
- Wintering population of curlew – 3903 individuals representing at least 1.1% of the wintering Europe population -breeding population (5 year peak mean 1991/2 - 1995/6).

- Wintering population of dunlin – 44,624 representing at least 3.2% of the wintering Northern Siberia/Europe/Western Africa population (5 year peak mean 1991/2 - 1995/6).
- Wintering population of pintail – 599 individuals representing at least 1.0% of the wintering Northwestern Europe population (5 year peak mean 1991/2 - 1995/6).
- Wintering population of redshank – 2330 individuals representing at least 1.6% of the wintering Eastern Atlantic - wintering population (5 year peak mean 1991/2 - 1995/6).
- Wintering population of shelduck – 3330 individuals representing at least 1.1% of the wintering Northwestern Europe population (5 year peak mean 1991/2 - 1995/6).
- Regular assemblages of over 20,000 wildfowl[82], which qualify the site as a wetland of international importance.
- Estuarine habitats (Ramsar Criterions 1 and 3).
- Migratory fish (Ramsar Criterions 4 and 8) including: Atlantic salmon, sea trout, sea lamprey, river lamprey, allis shad, twaite shad, and European eel.
- The fish of the whole estuarine and river system is one of the most diverse in Britain, with over 110 species recorded. Salmon, sea trout, sea lamprey, river lamprey, allis shad, twaite shad and European eel use the Severn Estuary as a key migration route to their spawning grounds in the many tributaries that flow into the estuary[83]. The site is important as a feeding and nursery ground for many fish species particularly allis shad and twaite shad. In addition, the Severn Estuary has the largest European eel run in Great Britain.
- Internationally important populations of wintering birds (Ramsar Criterion 6) including: Tundra swan, Bewick's swan, white-fronted goose, shelduck, gadwall, dunlin, and common redshank
- Wintering waterfowl assemblage of international importance (Ramsar Criterion 5)
- Breeding lesser black-backed gull (identified subsequent to designation for possible future consideration under Ramsar Criterion 6 - 4167 apparently occupied nests representing an average of 2.8% of the western Europe/Mediterranean/west African breeding population (Seabird 2000 Census)).

7.5.6. The Severn Estuary SAC/SPA/Ramsar has been ascribed a valuation of International importance.

Walmore Common SPA/Ramsar

7.5.7. Walmore Common SPA/Ramsar has been included as there is the potential for functionally linked land associated with this European Site to be affected by the Scheme. Walmore Common SPA/Ramsar comprises 53 ha of damp grassland and ditches, which flood regularly during the winter and support Bewick's swan as a qualifying feature. The site is located approximately 17.5 km south west of the Scheme.

7.5.8. Walmore Common SPA/Ramsar has been ascribed a value of International importance.

Coombe Hill Canal SSSI

7.5.9. Coombe Hill Canal SSSI, is located within the study area. Coombe Hill Canal SSSI consists of a 3.7 km stretch of disused canal flanked by ditches, neutral grassland, scattered scrub and trees, an area of inundation fen and a withy bed. The site is of special

[82] Over winter, the area regularly supports 93,986 individual waterfowl (5-year peak mean 1991/2 - 1995/6), including: gadwall, shelduck, pintail, dunlin, curlew, redshank, Bewick's swan, wigeon, lapwing, teal, mallard, shoveler, pochard, tufted duck, grey plover, white-fronted goose, and whimbrel.
[83] Natural England and the Countryside Council for Wales (2009). The Severn Estuary/Mor Hafren European Marine Site

interest for its assemblages of nationally rare and scarce invertebrates and nationally scarce plants. This site is located approx. 1.9 km north west of the Scheme.

7.5.10. Coombe Hill Canal SSSI has been ascribed a valuation of National importance.

Non-statutory sites

7.5.11. No non-statutory designated nature conservation sites have been identified within 1 km of the Scheme. There are six non-statutory designated nature conservation sites within 200 m of the ARN:

- Norton (A38) Conservation Road Verge – a wide band of dwarf elder, with rough grassland, tall herb and hedgerow.
- Pegmore Farm, The Leigh 'Meadow 2' potential LWS – a diverse wet meadow grassland.
- Cotswold Farm, The Leigh Conservation Road Verge – a stand of dwarf elder within tall herb and rank grassland, with encroaching scrub and tree saplings.
- Tewkesbury Nature Reserve potential LWS – a nature reserve important to the local community.
- Tewkesbury Railway Line (Disused) LWS – an area with invertebrate interest, specifically glow worm.
- Walton Cardiff Ponds LWS – an area with amphibian interest, specifically great crested newt.

7.5.12. The above mentioned non-statutory designated nature conservation sites have each been ascribed a valuation of County importance.

Terrestrial habitats

7.5.13. There are no recorded ancient woodlands within 1 km of the Scheme, nor within 200 m of the ARN.

7.5.14. There are no recorded ancient or veteran trees within 250 m of the Scheme. One veteran tree has been recorded within 200 m of the ARN.

7.5.15. Priority habitat records identified during the desk study within 1 km of the Scheme include:

- Deciduous woodland and traditional orchards within the Scheme;
- Good Quality Semi-improved Grassland (Lowland Meadows and Pastures) 640 m west; and
- Coastal and Floodplain Grazing Marsh approximately 680 m west of the Scheme.

7.5.16. The Scheme is located within a low-lying, mainly agricultural landscape to the north west of Cheltenham. The 250 m study area is dominated by large arable fields, improved grasslands and poor semi improved grasslands. The dominant arable and grassland habitats are interspersed with pockets of other terrestrial habitats of greater nature conservation value, including broadleaved and mixed woodland, traditional orchard and semi-improved neutral grassland. The traditional orchards and broadleaved semi-natural woodland meet the criteria for the priority habitat type: traditional orchard[84] and lowland mixed deciduous woodland[85], respectively.

[84] Maddock, A. (ed) (2008). *UK Biodiversity Action Plan Priority Habitat Descriptions – Traditional Orchards*. Online: https://data.jncc.gov.uk/data/2829ce47-1ca5-41e7-bc1a-871c1cc0b3ae/UKBAP-BAPHabitats-56-TraditionalOrchards.pdf [Accessed: 21/09/21]
[85] Maddock, A. (ed) (2008). *UK Biodiversity Action Plan Priority Habitat Descriptions – Lowland Mixed Deciduous Woodland*. Online: https://data.jncc.gov.uk/data/2829ce47-1ca5-41e7-bc1a-871c1cc0b3ae/UKBAP-BAPHabitats-30-LowlandMixedDecWood.pdf [Accessed: 21/09/21]

7.5.17. These habitats exist either side of the M5 motorway, which runs south west to north east, and the A4019, which runs north west to south east. The study area is also bisected by the River Chelt, which flows through the area from east to west.

7.5.18. The fields across the study area are typically bordered by species-poor hedgerows. Results from the hedgerow surveys indicate that a total of 137 intact and 59 defunct hedgerows meet the criteria for a priority habitat[86]. A total of 75 hedgerows were species-rich (i.e. at least five woody species were present within the length of the hedgerow). Two hedgerows within the survey area are 'Important', as defined by the wildlife and landscape criteria set out in Schedule 1 of The Hedgerows Regulations 1997. LA 108 advises that UK BAP priority habitats and habitats of principal importance should be considered to be of national nature conservation value. However, the majority of the hedgerows within the survey area are species poor, and only relatively short stretches of hedgerow are present within the Scheme. Furthermore, although there has been loss of hedgerows and field boundaries in recent decades due to agricultural intensification, hedgerows and hedgerows with trees are frequent throughout Gloucestershire. Nevertheless, the hedgerow network provides ecological connectivity, combining with the strips of plantation woodland, motorway verge habitats and riverside habitats to form a network of habitat corridors through an otherwise ecologically impoverished landscape.

7.5.19. While aquatic habitats are evaluated separately, the proximity of the terrestrial habitats to aquatic habitats and the connectivity provided by the aquatic habitats is considered to enhance the overall value of the terrestrial habitats.

7.5.20. Taking all of the above into consideration, the broadleaved semi-natural woodland and traditional orchards have each been ascribed a value of County importance. The remaining terrestrial habitats, including hedgerows, are considered to be a resource of Local importance for biodiversity.

7.5.21. The veteran tree is considered to be a resource of National importance for biodiversity.

Bats

7.5.22. There are two EPS licences granted for bats within 2 km of the Scheme:

- 2015-8404-EPS-MIT is a licence granted approximately 170 m east of the M5. The licence is in effect until 2025 and allows for the destruction of a resting place of brown long-eared and lesser horseshoe bats.
- 2017-28135-EPS-MIT is a licence granted approximately 500 m west of the M5. The licence is in effect until March 2022 and allows for the destruction of a resting place for common pipistrelle, lesser horseshoe, and soprano pipistrelle.

7.5.23. GCER provided 59 recent records[87] of bat species that have been recorded within the study area. These comprise records of:

- Bechstein's bat
- Brown long-eared bat
- Common pipistrelle
- Daubenton's bat
- Lesser horseshoe
- Soprano pipistrelle
- Unidentified bat species

7.5.24. The habitats recorded within the study area are suitable for foraging and commuting bats, including the Annex II species (lesser horseshoe, greater horseshoe, barbastelle and

[86] Maddock, A. (ed) (2008). *UK Biodiversity Action Plan Priority Habitat Descriptions – Hedgerows*. Online: https://data.jncc.gov.uk/data/ca179c55-3e9d-4e95-abd9-4edb2347c3b6/UKBAP-BAPHabitats-17-Hedgerows.pdf [Accessed: 21/09/21].
[87] Recent records refers to those recorded within the last 10 years.

Bechstein's bat). Key areas are likely to include the River Chelt habitat corridor; the woodland plantations along the M5 corridor and the traditional orchards.

7.5.25. The following is a summary of building bat roost survey results to the end of the 2020 bat survey season:

- Confirmed roosts in 43 buildings. Species confirmed so far comprise brown long-eared, common pipistrelle, soprano pipistrelle, lesser horseshoe, Natterer's bat maternity roost, noctule, Myotis species, and whiskered.
- High potential for roosts in 10 buildings.
- Moderate potential for roosts in 35 buildings.
- Low potential for roosts in 59 buildings.
- Negligible potential for roosts in 72 buildings.

7.5.26. A further 148 structures have unknown roosting potential as surveys are not complete or no access had been permitted.

7.5.27. There are 335 trees across the study area, many of which could potentially support bat roosts. The following is a summary of tree bat roost survey results up to the end of the 2020 bat survey season:

- Confirmed roosts in 5 trees. Species confirmed so far comprise noctule, barbastelle and Bechstein's.
- High potential for roosts in 18 trees.
- Moderate potential for roosts in 42 trees.
- Low potential for roosts in 120 trees and 30 tree groups.
- Negligible potential in 150 trees.

7.5.28. Hibernation surveys were carried out on trees and structures within the study area. These are summarised below:

- One structure was subject to a hibernation potential survey and evidence was found.
- Hibernation surveys were completed at 13 structures where no evidence of hibernating bats was found.
- 133 structures were found to have no hibernation suitability.
- 19 structures were assessed to have hibernation suitability, but further surveys were not possible due to issues with access.
- 201 structures have not been surveyed to date due to access limitations.
- 85 trees were assessed to have hibernation suitability and were subject to survey, however no hibernation roosts were identified in these trees.
- 13 trees were assessed to have hibernation suitability, however, were not subject to survey to due access limitations.

7.5.29. DNA surveys were carried out where droppings were found in trees and structures. These surveys identified roosts of common pipistrelle, soprano pipistrelle, lesser horseshoe, Natterer's, whiskered and brown long-eared bats.

7.5.30. Transect surveys at seven locations were completed in 2019 and 2020. The results are detailed fully in Technical Appendix 7.3, and are summarised below:

- Transect 2. Passes from common pipistrelle, soprano pipistrelle, pipistrelle species, Myotis species, nyctaloid bats and unidentified bat species.

- Transect 4. Passes from common pipistrelle, soprano pipistrelle, Myotis species, noctule, Leisler's, nyctaloid bats, brown-long eared, lesser horseshoe, serotine, and barbastelle bats.
- Transect 5. Passes from common pipistrelle, soprano pipistrelle, Myotis species, noctule, brown long-eared, lesser horseshoe, and unidentified bat species.
- Transect 7. Passes from common pipistrelle, soprano pipistrelle, pipistrelle species, Myotis species, noctule, brown long-eared, lesser horseshoe, and serotine bats.
- Transect 8: Passes from common pipistrelle, soprano pipistrelle, Myotis species, noctule, nyctaloid, brown long-eared, lesser horseshoe, serotine, barbastelle, and unidentified bat species.
- Transect 9. Passes from common pipistrelle, soprano pipistrelle, pipistrelle species, Myotis species, noctule, nyctaloid species, and barbastelle bats
- Transect 10. Passes from common pipistrelle, soprano pipistrelle, pipistrelle species, Myotis species, noctule, Leisler's, nyctaloid bats, lesser horseshoe, and serotine bats.

7.5.31. Twenty static detectors were deployed in 2019 and 2020. Detailed information on these surveys is provided in Technical Appendix 7.3. The detectors recorded passes of the following species:

- Common pipistrelle
- Soprano pipistrelle
- Nathusius pipistrelle
- Pipistrelle species
- Myotis species
- Noctule
- Leisler's
- Nyctaloid species
- Brown long-eared
- Lesser horseshoe
- Greater horseshoe
- Serotine
- Barbastelle
- Unidentified bat species

7.5.32. Crossing point surveys were carried out at five locations in 2020. The results of these surveys are detailed further in Technical Appendix 7.3. Crossing point location 3 was not considered to be a bat crossing point as only six common pipistrelle bats were identified during the initial two survey visits. The other four survey locations were considered to be bat crossing points.

7.5.33. Table 7-4 summarises the importance level of the various bat features that have been recorded up to the end of 2020 (further detail is included in Technical Appendix 7.3). This information has been used to derive an overall single valuation of Regional importance for bats at this stage. Surveys for bats are ongoing, and this valuation may change as new data is collected and analysed.

Table 7-4 - Bat Roosts in the Survey Area and their Importance for Biodiversity

Importance Level	Bat Roosts/Activity
Regional importance	• Two natterer's maternity roosts • Foraging activity in habitats in the vicinity of the Link Road comprising passes of rare bat species including barbastelle, Bechstein's and lesser horseshoe bats • Barbastelle foraging activity around habitats in the vicinity of the A4019, as well as around Junction 10
County importance	• Five common pipistrelle maternity roosts • One common pipistrelle hibernation roost • 13 lesser horseshoe roosts (day, night, feeding and transitional) • Four noctule day and transitional roosts • One barbastelle transitional tree roost • 15 natterer's roosts (day, night, transitional, feeding and mating) • Two whiskered roosts (day, night, feeding, and transitional)
Local importance	• Common pipistrelle roosts (transitional, occasional, day, night, feeding and mating) • Soprano pipistrelle roosts (transitional, occasional, day, night, and feeding) • Brown long-eared roosts (day, night, transitional and feeding)

Dormouse

7.5.34. GCER provided one record of a dormouse nest within the study area. The nest was found in a nest tube in a hedgerow to the northwest of Gallagher Retail Park, located approximately 150 m north of the Scheme and within survey area 9 (which is subject to current surveys). Another dormouse nest record was identified through review of a report for a nearby housing development scheme. This record is from approximately 415 m north of the Scheme, and 800 m east of the GCER record, but connected to survey area 9.

7.5.35. Suitable habitat for dormouse was observed during the walkover survey, including woodland and hedgerows. However, the overall habitat was considered to be suboptimal for dormouse populations, with the majority of the hedgerows being species-poor and well managed, and the areas of woodland predominantly comprising trees of a similar age without a well-developed understorey.

7.5.36. During the dormouse surveys carried out using nest tubes in 2019 (within survey areas 1, 2, 3, 4, 5, 6 and 7), no evidence of dormouse was identified. Dormouse surveys along the A4019 (within survey areas 8 and 9) are ongoing at the time of writing this report, and will be completed in November 2021. During the surveys here in May and July 2021, no dormouse were recorded. Due to the records of dormouse nests described above, the presence of dormouse is assumed to the north of the A4019 within survey area 9 on a precautionary basis. This will be reviewed as the surveys progress in this area, and the results are analysed.

7.5.37. Based on the survey data to date and absence of desk study records, dormouse are likely absent south of the A4019. Hazel dormouse have been known to cross roads and other open areas[88], and roads less than 12 m wide are generally not considered barriers to

[88] People's Trust for Endangered Species Why didn't the dormice cross the gaps? The Dormouse Monitor (2012)

hazel dormouse movements[89]. However, the A4019 is a busy road varying in width between approximately 30 m and 10 m. Due to its heavy traffic flow and its overall width, it would likely act as a barrier to hazel dormouse dispersal. At the eastern extent of the A4019 within the Scheme, on the southern side of the road, habitats are unsuitable for hazel dormouse, comprising industrial units and residential properties and gardens on the outskirts of the western edge of Cheltenham. This will be reviewed as the surveys in survey area 8 progress and the results are analysed.

7.5.38. Based on the survey data and absence of desk study records, dormouse are likely absent from the study area to the west of the M5. Although assumed to be present to the east of the M5, at survey area 9 north of the A4019, the motorway would act as a barrier to hazel dormouse dispersal.

7.5.39. As no dormice were found in May to estimate the size of the hazel dormouse population in line with Standing Advice[90], reference has been made to the population densities discussed in The Dormouse Conservation Handbook[91]. Dormice live at low densities. In early summer (before breeding) there are typically only three to five (but sometimes up to ten) adults per hectare in deciduous and conifer habitats. The National Dormouse Monitoring Programme (NDMP) suggests an average of between 1.75 and 2.5 adults per hectare pre-breeding (cited in The Dormouse Conservation Handbook, 2006) and across the country, including sub-optimal habitats, the average population density is approximately 2.2 adults per hectare[92]. Taking into account the largely sub-optimal habitats present, a value of 2.2 adults per hectare is considered an appropriate density for the Scheme.

7.5.40. Assuming that hazel dormice are present within survey area 9 only, there is approximately 1.7 ha of suitable hazel dormouse habitat within this area. This gives a total number of three to four (3.74) adult hazel dormice within survey area 9.

7.5.41. The hazel dormouse receives the highest level of protection as an EPS. It is also a Species of Principal Importance for the Conservation of Biodiversity in England, as listed in accordance with Section 41 of the NERC Act 2006, and is identified as a priority species in the Gloucestershire Local BAP[93]. The hazel dormouse is categorised as rare and vulnerable to extinction in the UK[94]. The State of Britain's Dormice report in 2019[95] highlighted that nationally the population has fallen by a half (51%) since 2000, decreasing on average by 3.8% per year.

7.5.42. Given the high level of protection afforded to hazel dormice, their rarity and declining status, as well as consideration of the limited distribution of hazel dormouse within the Scheme, and that the species may be present in an area previously thought not to be occupied by hazel dormouse[96], the population within the hazel dormouse survey area is considered to be of County importance. This valuation will be confirmed or updated following completion of the ongoing surveys.

Badger

7.5.43. GCER provided three recent records of badger within the study area.

[89] P. Chanin and L. Gubert, (2012) Common dormouse (*Muscardinus avellanarius*) movements in a landscape fragmented by roads, Lutra (2012)
[90] The process of estimating population density is provided at https://www.gov.uk/guidance/hazel-or-common-dormice-surveys-and-mitigation-for-development-projects
[91] Bright, P. W., Morris, P. A. & Mitchell-Jones, A. J. (2006) The Dormouse Conservation Handbook. 2nd Edition. Natural England, Peterborough.
[92] Bright, P. W., Morris, P. A. & Mitchell-Jones, A. J. (2006) The Dormouse Conservation Handbook. 2nd Edition. Natural England, Peterborough.
93 Gloucestershire Biodiversity Partnership (2000) Summary of the Biodiversity Action Plan for Gloucestershire
94 Dormouse Status and Conservation, People's Trust for Endangered Species url: https://ptes.org/get-informed/facts-figures/hazel-common-dormouse-muscardinus-avellanarius/, accessed October 2018.
95 David Wembridge, Nida Al-Fulaij and Steve Langdon (2019), The State of Britain's Dormice 2019, People's Trust for Endangered Species
[96] A report produced for a separate planning application (the Elms Park development, north of the A4019, planning application 16/02000/OUT) states 'Anecdotally dormice had not been recorded locally in recent history and this had also been confirmed by Gloucestershire Wildlife Trust who generally considered the species to be absent from this area of the Severn Valley' (Persimmon Homes/Bloor Homes (October 2017) Framework Dormouse and Reptile Mitigation Strategy).

7.5.44. The field surveys identified that the habitats within the study area are suitable for badger foraging and sett creation. Twenty-five badger setts were found during the targeted badger surveys, and incidentally during other surveys. Ten of these are located within 50 m of the Scheme. This includes four main setts, five outlier setts and one subsidiary sett.

7.5.45. Badgers are common and widespread within Gloucestershire, and are not considered to be a species of nature conservation concern. Badger has therefore been ascribed a value of less than Local importance for biodiversity. However, appropriate mitigation is included in Section 7.7 where necessary to ensure legal compliance.

Otter

7.5.46. GCER provided three records of otter within the study area. These were on the River Chelt at Withy Bridge, at Piffs Elm and immediately south west of M5 Junction 10.

7.5.47. Suitable riparian habitats for otter have been recorded within the study area during the walkover surveys, primarily along the River Chelt and connecting habitats including minor watercourses and ponds.

7.5.48. The surveys have confirmed otter presence on the River Chelt and minor watercourse MW5. Three otter resting site features along the River Chelt and one resting site feature on MW5 have been assigned low value, indicating that the features are not suitable as a breeding/natal site, and are unlikely to afford sufficient seclusion to be an important resting site. They are more likely to provide a temporary 'stop off' for otters when moving throughout their territory. Potential breeding behaviour was observed between two adult otters during the otter monitoring surveys along the River Chelt.

7.5.49. In addition, the potential presence of otter has been highlighted at several suitable habitat features (Leigh Brook, minor watercourse MW4, Pond 22, Pond 23 and Pond 24) due to the habitat connectivity between these features and other suitable habitat. Otters have large home ranges and may use different habitats throughout the year. Therefore, it is considered appropriate to consider these additional habitat features in this assessment despite a lack of positive evidence recorded during the presence / likely absence surveys.

7.5.50. Suitable otter habitat has been recorded throughout the study area. It is considered likely that these habitats comprise the home range of a small number of individual otters with the potential for territory overlap, and the River Chelt and Leigh Brook provide connectivity to the wider landscape. Therefore, this area is likely to be of importance in maintaining the local population of this species. Otter has been identified as a priority species in the Gloucestershire Local BAP[97]. Otter has therefore been ascribed a value of Local importance for biodiversity.

Water vole

7.5.51. GCER provided no previous records or incidental observations of water vole within the study area.

7.5.52. Suitable habitat for water vole was identified during the habitat suitability assessment surveys undertaken in 2019 and 2021 along the River Chelt and connecting minor watercourses. Subsequently, two presence / likely absence surveys have been undertaken (in September 2019 and June 2020) at the River Chelt and a minor watercourse. No signs of water vole were observed during either of the surveys at either location. Based on the results of the habitat suitability assessments and presence / likely absence surveys carried out in 2019 and 2020 (and the lack of records within the area), it is considered that water vole is likely absent from the study area.

7.5.53. No impacts to water vole are anticipated as a result of the Scheme, and water voles are therefore not considered further within this report.

[97] Gloucestershire Biodiversity Partnership (2000) Summary of the Biodiversity Action Plan for Gloucestershire

Other priority mammals

7.5.54. GCER provided details of one other priority mammal species – hedgehog, which has been recorded at many locations across the study area.

7.5.55. Three other priority mammals have been observed within the study area during ongoing surveys:

- Brown hare – recorded on the Boddington Estate
- Polecat – dead on road near Hayden
- Harvest mouse – nest found underneath reptile refuge

7.5.56. Suitable habitats for these species have been observed throughout the study area.

7.5.57. No further surveys for priority mammal species are considered necessary, as the assessment will be based on the assumption that hedgehog, brown hare, polecat and harvest mouse occur intermittently in suitable habitats throughout the study area and that these are the only other priority mammal species present. In accordance with this assumption, other priority mammals have been ascribed a value of Local importance for biodiversity.

Breeding and wintering birds

7.5.58. GCER provided details of 34 priority bird species which have been recorded within the study area, of which 27 species were recorded within the wintering season (i.e. September to March inclusive) and 25 were recorded within the breeding season (i.e. March to August inclusive).

7.5.59. The Gloucestershire Local BAP includes action plans for 13 bird species in total, which comprise bittern, nightjar, woodlark, spotted flycatcher and 'farmland birds' (skylark, linnet, reed bunting, corn bunting, tree sparrow, grey partridge, bullfinch, turtle dove and song thrush).

Wintering birds

7.5.60. During the field surveys, a total of 64 species were recorded within the study area, of which 27 are priority species. This includes:

- Five species listed on Schedule 1 of the Wildlife and Countryside Act 1981 (as amended) (barn owl, fieldfare, kingfisher, red kite and redwing).
- Thirteen species on the Red List[98] (fieldfare, grey wagtail, herring gull, house sparrow, lapwing, linnet, mistle thrush, redwing, skylark, song thrush, spotted flycatcher, starling and yellowhammer) and 12 species on the Amber List[99] (black-headed gull, dunnock, house martin, kestrel, lesser black-backed gull, mallard, meadow pipit, redstart, reed bunting, stock dove and willow warbler).
- Ten species listed as species of principal importance for the conservation of biodiversity in England (dunnock, herring gull, house sparrow, linnet, reed bunting, skylark, song thrush, starling, spotted flycatcher and yellowhammer).
- Three species listed on Annex 1 of the Birds Directive (merlin, peregrine and red kite).

[98] Eaton MA, Aebischer NJ, Brown AF, Hearn RD, Lock L, Musgrove AJ, Noble DG, Stroud DA and Gregory RD (2015) Birds of Conservation Concern 4: the population status of birds in the United Kingdom, Channel Islands and Isle of Man. British Birds 108, pp708–746.
[99] Eaton MA, Aebischer NJ, Brown AF, Hearn RD, Lock L, Musgrove AJ, Noble DG, Stroud DA and Gregory RD (2015) Birds of Conservation Concern 4: the population status of birds in the United Kingdom, Channel Islands and Isle of Man. British Birds 108, 708–746. Available at: britishbirds.co.uk/wp-content/uploads/2014/07/BoCC4.pdf

- Five species listed on the Gloucestershire Local BAP (linnet, reed bunting, skylark, song thrush and spotted flycatcher)[100].
- Two qualifying species of the Severn Estuary SPA (lapwing and mallard); and
- Two species identified on the Severn Estuary Ramsar Information Sheet (herring gull, identified as noteworthy fauna and lesser-back backed gull, identified as a species subsequent to designation for possible future consideration under criterion 6).

7.5.61. Three additional species were recorded during other ecology surveys undertaken during the winter and passage period (September to March inclusive) that were not observed during the wintering and passage bird surveys: little owl (no legal/conservation status), snipe and tawny owl (both on the Amber List[101]).

7.5.62. The assemblage of wintering and passage birds is considered to be largely typical of agricultural areas, woodland and scrub and built-up areas within Gloucestershire.

7.5.63. Sixty of the 67 species recorded during the wintering and passage bird survey or as an incidental observation have a Gloucestershire resident, wintering or passage population status that is abundant, common or fairly common[102].

7.5.64. Seven species recorded during the wintering and passage bird survey or as an incidental observation have a Gloucestershire resident, wintering or passage population status that is uncommon or scarce[103]. These comprise barn owl, chiffchaff, kingfisher, lesser whitethroat, raven, red kite and stonechat.

7.5.65. Two qualifying species of the Severn Estuary SPA have been recorded: Lapwing (two individuals) and mallard (peak count of nine individuals). Given the low numbers recorded they are unlikely to be a significant component of the SPA populations. Furthermore, at this distance from the SPA (located over 20 km south west of the Scheme at the nearest point), it is considered highly unlikely that the individuals recorded within the study area are part of the SPA qualifying feature populations. This is supported by a recent study[104] which identifies functionally linked land associated with the Severn Estuary SPA. The maps which accompany this study do not identify that these species regularly move between the SPA and the study area for the Scheme.

7.5.66. However, the study also indicates that lapwing have been recorded within the survey area (in the vicinity of Boddington Manor Farm, at the west of the Scheme) in numbers which reached or exceeded the equivalent of the 1% SPA population criterion for importance on at least one occasion. No lapwing were recorded at this location during the wintering and passage bird surveys, and as the study indicates that there are no regular movements between the SPA and this location, it is therefore considered that this area is not regularly used by or of significant importance for lapwing.

7.5.67. Two species identified on the Severn Estuary Ramsar Information Sheet have been recorded. Herring gull (identified as noteworthy fauna occurring at levels of national importance during the breeding season) was recorded in reasonably high numbers on two occasions (September and December 2019, with a peak count of 306). Lesser black-backed gull (identified as a species subsequent to designation for possible future consideration under criterion 6) was recorded in reasonably high numbers on one occasion (a peak count of 148 in September 2019). It is considered that these individuals

[100] Gloucestershire Local Nature Partnership (2000) Biodiversity Action Plan for Gloucestershire Available from: https://www.gloucestershirenature.org.uk/biodiversity-action-plan-bap
[101] Eaton MA, Aebischer NJ, Brown AF, Hearn RD, Lock L, Musgrove AJ, Noble DG, Stroud DA and Gregory RD (2015) Birds of Conservation Concern 4: the population status of birds in the United Kingdom, Channel Islands and Isle of Man. British Birds 108, 708–746. Available at: britishbirds.co.uk/wp-content/uploads/2014/07/BoCC4.pdf
[101] Gloucestershire Local Nature Partnership (2000) Biodiversity Action Plan for Gloucestershire Available from: https://www.gloucestershirenature.org.uk/biodiversity-action-plan-bap
[102] Goodhall, R., Kirk, G. and Petrek, S. (2020) Gloucestershire Bird Report 2014-16. Gloucestershire Ornithological Co-ordinating Committee
[103] Goodhall, R., Kirk, G. and Petrek, S. (2020) Gloucestershire Bird Report 2014-16. Gloucestershire Ornithological Co-ordinating Committee
[104] Link Ecology Ltd (September 2020) Identification of land with proven or possible functional linkages with the Severn Estuary SSSI/SPA Phase 5 (Gloucestershire and Worcestershire) A report to Natural England.

are likely to be from breeding populations within urban areas such as Cheltenham and/or Gloucester, which are closer to the Scheme than the Ramsar site breeding colonies at Steep Holm and Flat Holm[105] (approximately 90 km south west). Cheltenham Borough Council states that "Herring Gulls and Lesser Black-Backed Gulls nest in the residential areas of Cheltenham and on industrial units in the Kingsditch area"[106]. The JNCC Seabird Monitoring Programme online database states that the Gloucestershire Urban Gulls Cheltenham site (85627) supported 46 herring gull apparently occupied territories and 273 lesser black-backed gull apparently occupied territories in 2011 (year of last count) and the Gloucester City: Gloucester site (86737) supported 657 herring gull apparently occupied nests and 2230 lesser black-backed gull apparently occupied nests in 2009 (year of last count)[107]. It follows that the lesser black-backed gulls recorded are unlikely to be part of the Ramsar qualifying feature population.

7.5.68. The habitats within the Survey Area are not considered to provide a role in maintaining the SPA or Ramsar populations or be functionally linked to any SPAs or Ramsar sites. Further information is included in Technical Appendix 7.13.

7.5.69. Although five species are listed on the Gloucestershire Local Biodiversity Action Plan, these species are currently listed as either common, formerly common or fairly common within Gloucestershire. The peak counts for these species within the study area are not considered to be of county importance in relation to Gloucestershire populations.

7.5.70. Therefore, taken as a whole, the wintering and passage bird assemblage is considered to appreciably enrich the habitat resource within the local context, which includes features of importance for migration. The assemblage of these wintering and passage birds is therefore considered to be of Local importance for biodiversity.

Breeding birds

7.5.71. During the field surveys, a total of 62 species were recorded within the study area, of which 26 are priority species. This includes:

- Three species are listed on Schedule 1 of the Wildlife and Countryside Act 1981 (as amended) (hobby, kingfisher and red kite);
- Ten species on the Red List (grey wagtail, herring gull, house sparrow, linnet, mistle thrush, skylark, song thrush, starling, yellow wagtail and yellowhammer) and 13 species on the Amber List[108] (black-headed gull, bullfinch, dunnock, house martin, kestrel, kingfisher, lesser black-backed gull, mallard, meadow pipit, reed bunting, stock dove, swift and willow warbler).
- Eleven species listed as species of principal importance for the conservation of biodiversity in England (bullfinch, dunnock, herring gull, house sparrow, linnet, reed bunting, skylark, song thrush, starling, yellow wagtail and yellowhammer);
- Three species listed on Annex 1 of the Birds Directive (kingfisher, little egret and red kite);
- Five species listed on the Gloucestershire Local Biodiversity Action Plan (bullfinch, linnet, reed bunting, skylark and song thrush);
- One qualifying feature of the Severn Estuary SPA (mallard); and
- Three species identified on the Severn Estuary Ramsar Information Sheet have been recorded. Herring gull and little egret are identified as noteworthy fauna and

[105] Burton, N.H.K., Musgrove, A.J., Rehfisch, M.M., and Clark N.A. (2010) Birds of the Severn Estuary and Bristol Channel: Their current status and key environmental issues. Marine Pollution Bulletin 61 (2010) 115–123
[106] Cheltenham Borough Council (2018) Urban Gulls Scrutiny Task Group Report. Available at https://democracy.cheltenham.gov.uk/documents/s27390/2018_12_04_CAB_Urban_Gulls_scrutiny_report.pdf
[107] Available at https://app.bto.org/seabirds/public/index.jsp
[108] Eaton MA, Aebischer NJ, Brown AF, Hearn RD, Lock L, Musgrove AJ, Noble DG, Stroud DA and Gregory RD (2015) Birds of Conservation Concern 4: the population status of birds in the United Kingdom, Channel Islands and Isle of Man. British Birds 108, 708–746. Available at: britishbirds.co.uk/wp-content/uploads/2014/07/BoCC4.pdf

lesser-black backed gull is identified as a species subsequent to designation for possible future consideration under criterion 6.

7.5.72. Of the 62 species recorded, 33 species are confirmed as breeding or considered to have bred, 15 species are probable breeders, and 10 species are possible breeders within the study area.

7.5.73. Two additional species were recorded during other ecology surveys undertaken during the breeding period (March to August inclusive) that were not observed during the breeding bird surveys: barn owl and tawny owl. Barn owl was observed on six separate occasions at the same location on two occasions and is considered to be probably breeding. Tawny owl was seen on one occasion in suitable breeding habitat and is considered to be possibly breeding.

7.5.74. The assemblage of breeding birds is considered to be largely typical of agricultural areas, woodland and scrub and built-up areas within Gloucestershire.

7.5.75. Five species are identified in a county or equivalent authority area plan or strategy, i.e. within the Gloucestershire Local BAP (under 'farmland birds'): bullfinch (peak count of two), linnet (peak count of seven), reed bunting (peak count of one), skylark (peak count of 31) and song thrush (peak count of 15).

7.5.76. Fifty-six of the 62 species recorded during the breeding bird survey or as an incidental observation have a Gloucestershire breeding population status that is abundant, common or fairly common[109].

7.5.77. Seven species recorded during the breeding bird survey or as an incidental observation have a Gloucestershire breeding population status that is uncommon or scarce[110]. These comprise barn owl, grey wagtail, herring gull, hobby, lesser whitethroat, red kite and yellow wagtail.

7.5.78. One qualifying species of the Severn Estuary SPA has been recorded; i.e. mallard (peak count of ten). Given the low numbers of mallard recorded, they are unlikely to be a significant component of the SPA populations. Furthermore, at this distance from the SPA (located over 20 km south west of the Scheme at the nearest point), it is considered highly unlikely that the individuals recorded within the study area are part of the SPA qualifying feature populations. This is supported by a recent study[111] which identifies functionally linked land associated with the Severn Estuary SPA. The maps which accompany this study do not identify that these species regularly move between the SPA and the study area.

7.5.79. Three features identified on the Severn Estuary Ramsar Information Sheet have been recorded. Herring gull and little egret (identified as noteworthy fauna) and lesser black-backed gull (identified as a species subsequent to designation for possible future consideration under criterion 6) were generally recorded in low numbers (peak counts of 18, 4 and 57 respectively). It is considered that the gull species are likely to be breeding within urban areas such as Cheltenham and/ or Gloucester, as opposed to the Ramsar site breeding colonies at Steep Holm and Flat Holm[112] (located approximately 90 km south west). Cheltenham Borough Council states that "Herring Gulls and Lesser Black-Backed Gulls nest in the residential areas of Cheltenham and on industrial units in the Kingsditch area"[113]. The JNCC Seabird Monitoring Programme online database states that the Gloucestershire Urban Gulls Cheltenham site (85627) supported 46 herring gull apparently occupied territories and 273 lesser black-backed gull apparently occupied territories in 2011 (year of last count) and the Gloucester City: Gloucester site (86737)

[109] Goodhall, R., Kirk, G. and Petrek, S. (2020) Gloucestershire Bird Report 2014-16. Gloucestershire Ornithological Co-ordinating Committee
[110] Goodhall, R., Kirk, G. and Petrek, S. (2020) Gloucestershire Bird Report 2014-16. Gloucestershire Ornithological Co-ordinating Committee
[111] Link Ecology Ltd (September 2020) Identification of land with proven or possible functional linkages with the Severn Estuary SSSI/SPA Phase 5 (Gloucestershire and Worcestershire) A report to Natural England.
[112] Burton, N.H.K., Musgrove, A.J., Rehfisch, M.M., and Clark N.A. (2010) Birds of the Severn Estuary and Bristol Channel: Their current status and key environmental issues. Marine Pollution Bulletin 61 (2010) 115–123
[113] Cheltenham Borough Council (2018) Urban Gulls Scrutiny Task Group Report. Available at https://democracy.cheltenham.gov.uk/documents/s27390/2018_12_04_CAB_Urban_Gulls_scrutiny_report.pdf

supported 657 herring gull apparently occupied nests and 2230 lesser black-backed gull apparently occupied nests in 2009 (year of last count)[114].

7.5.80. The habitats within the Survey Area are not considered to provide a role in maintaining the SPA or Ramsar populations or functionally linked to any SPAs or Ramsar sites. Further information is included in Technical Appendix 7.13.

7.5.81. Although five species are listed on the Gloucestershire Local BAP, these species are currently listed as either common or fairly common resident breeders within Gloucestershire. The peak counts for these species within the survey area are not considered to be of county importance in relation to breeding numbers for Gloucestershire.

7.5.82. Therefore, taken as a whole, the breeding bird assemblage is considered to appreciably enrich the habitat resource within the local context. The assemblage of breeding birds is therefore considered to be of Local importance for biodiversity.

Reptiles

7.5.83. GCER provided records of two reptile species within the study area, two common lizards and two slow worms. The common lizard records are within the Scheme boundary.

7.5.84. The walkover surveys identified suitable habitat for grass snake, slow worm and common lizard throughout the study area such as woodland edge, hedgerows, scrub, rough grassland, gardens and embankments.

7.5.85. During the targeted reptile surveys in 2019 and 2020, no reptiles were recorded within the study area. A grass snake and a common lizard were recorded incidentally during the walkover surveys in 2019, and a juvenile slow worm was recorded during a bird survey in 2019.

7.5.86. Slow-worm, common lizard and grass snake are protected under the Wildlife and Countryside Act 1981 (as amended) from killing and injury. All three species are species of Principal Importance for the conservation of biodiversity in England, as listed in accordance with Section 41 of the NERC Act 2006.

7.5.87. Given the low numbers of reptiles recorded incidentally, it is considered that only low numbers of grass snake, slow worm and common lizard are present within the study area, and reptiles have therefore been ascribed a value of Local nature conservation importance. This will be updated as necessary following the surveys currently underway.

Great crested newt (and other amphibians)

7.5.88. No Natural England great crested newt EPS licences were identified within the study area.

7.5.89. GCER provided two records of great crested newt within the study area (one from approximately 400 m south of the Scheme, and one from approximately 1 km west of the Scheme). GCER also provided one record of common toad from Hayden Road Allotments.

7.5.90. A total of 37 waterbodies were identified within 500 m of the Scheme. Sixteen of these were scoped out as follows, and no HSI assessments were undertaken:

- Two were scoped out as they are located on the opposite side of the River Chelt from the Scheme. The River Chelt is a large, flowing watercourse which is considered to represent a barrier to great crested newt dispersal.
- Nine waterbodies were scoped out as they were completely dry with no aquatic vegetation present.
- One waterbody was scoped out as it was completely saturated in dense algae.
- Although access was not permitted, information gathered through the desk study indicated that four waterbodies are either no longer present, or they are unlikely to be suitable for supporting great crested newts: One appeared to be absent, one

[114] Available at https://app.bto.org/seabirds/public/index.jsp

was described in another report as being used for manure storage, and two are considered likely to be fishing lakes.

7.5.91. Twenty waterbodies were subject to HSI survey. Five waterbodies were classed as having poor suitability, six as below average suitability, seven as average suitability, one as good suitability, and one as excellent suitability.

7.5.92. Nineteen of these waterbodies were subject to eDNA survey. One waterbody was not considered safe to survey, and it was subsequently scoped out as being unsuitable for great crested newts due to the high levels of visible pollution (human waste) present. Of the 19 waterbodies surveyed, five waterbodies returned positive results for great crested newts, with the remining returning a negative eDNA result.

7.5.93. Access was not possible at one waterbody, and great crested newts are assumed to be present here, particularly given its proximity to confirmed great crested newt waterbodies.

7.5.94. The waterbodies where great crested newts have been confirmed, or are assumed, can be grouped into two metapopulations[115].

7.5.95. One of these is located approximately 470 m north from the Scheme, at the edge of the great crested newt study area. Given this distance, the study area is unlikely to be of particular importance to this metapopulation, although small numbers of great crested newts from this metapopulation could be present within the Scheme. The other metapopulation is located immediately south of the Scheme, south of the A4019, and the great crested newt study area is likely to be important in maintaining this metapopulation.

7.5.96. Great crested newts receive the highest level of protection, being a EPS. Great crested newts are also a species of Principal Importance for the conservation of biodiversity in England, as listed in accordance with Section 41 of the NERC Act 2006, and are identified as a priority species in the Gloucestershire Local BAP[116].

7.5.97. Surveys have shown that great crested newts are widespread throughout the South Midlands, being present in around a third (32%) of ponds in the South Midlands region. Although this varies in places, it is usually higher than the national average (13%)[117].

7.5.98. Despite being widespread in the region, given their high level of protection, and the proximity, and therefore the potential importance of the study area for great crested newts, this species has been ascribed a value of County importance.

7.5.99. Two common toads (one juvenile and one adult) were recorded during reptile surveys undertaken in September 2019 in the south east part of the Scheme. Common toad is assumed to occur in suitable habitats throughout the study area. Common toad is a species of Principal Importance for the conservation of biodiversity in England, as listed in accordance with Section 41 of the NERC Act 2006. Common toad is considered to appreciably enrich the habitat resource within the local context and has been ascribed a value of Local value for biodiversity.

Terrestrial invertebrates

7.5.100. GCER provided details of seven priority terrestrial invertebrate species recorded within the study area. These were all recorded towards the south east end of the A4019 corridor: cinnabar moth, ghost moth, mouse moth, brown-spot pinion (moth), deep-brown dart (moth), green-brindled crescent (moth) and small heath (butterfly).

7.5.101. These species are typically associated with a range of habitats, including grasslands, woodlands, hedgerows and gardens. The most selective of these species is the cinnabar moth, which requires open grassy habitats with common ragwort.

7.5.102. While priority species, such as the moths listed from the desk study, may occur occasionally, the intensive agricultural habitats which dominate most of the study area are

[115] Groups of spatially separated waterbodies, generally within 500 m of one another and linked by suitable terrestrial habitat, where presence has been confirmed or assumed and interchange of individual great crested newts is likely or possible.
[116] Gloucestershire Biodiversity Partnership (2000) Summary of the Biodiversity Action Plan for Gloucestershire
[117] Gloucestershire County Council, the great crested newt district licensing scheme document available to download from: gcn_district_licence_option_note_gcc.pdf (gloucestershire.gov.uk)

unlikely to support priority assemblages of terrestrial invertebrates. However, traditional orchards at Hayden Hill Fruit Farm, Millhouse Farm and Stanboro Lane could potentially support noble chafer beetle. The Severn and Avon Vales National Character Area[118] is a stronghold for this priority species, which requires decaying wood on fruit trees for the larval stage of its life-cycle.

7.5.103. Assuming the presence of a key population of noble chafer at Hayden Hill Fruit Farm, Millhouse Farm and Stanboro Lane, the terrestrial invertebrate assemblage has been ascribed a value of County importance for biodiversity.

Protected and priority plants

7.5.104. GCER provided no records of protected and priority plant species within the study area.

7.5.105. Only common and widespread plant species were observed during the walkover survey. The intensive agricultural habitats which dominate the study area are unlikely to support priority plant species. While the small areas of semi-improved grassland could potentially support priority plant species, the absence of any observations during the walkover survey (which was undertaken at an optimal time of year for botanical survey), indicates that important populations of such species are likely to be absent. Protected and priority plant species are not considered further within this report.

7.5.106. Invasive non-native plant species GCER provided no records of invasive non-native plant species (INNS) within the study area.

7.5.107. During the walkover survey, Himalayan balsam was recorded at multiple locations. This species does not have any nature conservation value but is an INNS subject to legal control under the Wildlife and Countryside Act 1981 (as amended). This makes it illegal to plant or otherwise cause Himalayan balsam to grow in the wild.

Aquatic habitats and species

Watercourses

7.5.108. Twenty three watercourses were identified within the study area. All of the watercourses are located within the Chelt Hatherley and Normans Brook, and the Avon Midlands West operational catchments. The following five WFD waterbodies are located within the study area:

- Chelt – source to M5 (GB109054032820).
- Chelt – M5 to confluence of the River Severn (GB109054032810).
- Leigh Bk – source to confluence of the River Chelt (GB109054039770).
- Swilgate - source to confluence of the River Avon (GB109054039780).
- Hatherley Bk - source to confluence of the River Severn (GB109054032801).

7.5.109. Four of the watercourses are classified as Main River[119]: the River Chelt, River Swilgate, Hatherley Brook and Dean Brook.

7.5.110. The River Chelt is crossed by the Scheme at two locations:

- The existing M5 crossing (SO 90020 24812) - at a location where the Overall WFD classification is ‘Poor’, with biological quality elements at ‘Poor’; and
- By a new proposed crossing (SO 90743 24593) - at a location where the Overall WFD classification is ‘Moderate’, with biological quality elements at ‘Good’.

7.5.111. The River Swilgate has an Overall WFD classification of ‘Moderate’ (with biological quality elements at Moderate) and is within the redline boundary. However, there are no

[118] http://publications.naturalengland.org.uk/publication/1831421?map=true&category=587130 [Accessed 02/09/19].
[119] A watercourse shown on the statutory main river map dataset. These are typically larger streams and rivers, but some of them are small watercourses of significance.

anticipated impacts associated with the Scheme, so it has not been considered further within the assessment. The Dean Brook also lies within the River Swilgate WFD catchment and whilst crossed by the redline boundary there are no anticipated impacts associated with the Scheme. Subsequently it has also been scoped out of further assessment. See Technical Appendix 7.12 for screening methodology.

7.5.112. Hatherley Brook has an Overall WFD classification of 'Moderate' (with biological quality elements at Moderate) and is within the aquatic habitats and species study area although lies outside of the redline boundary. There are no anticipated impacts to the Hatherley Brook associated with the Scheme, so it has been screened out of further assessment.

7.5.113. Nineteen unnamed ordinary watercourses[120] were identified within the study area, which are largely comprised of ditches. One OS named Ordinary Watercourse, the Leigh Brook, is also located within the study area (Overall WFD classification - 'Moderate'). At the point of interaction with the Scheme, it is an Ordinary Watercourse. However, further downstream it is classified as Main River at SO 89267 26801.

7.5.114. Fourteen watercourses in total have been screened in for further assessment on the basis that they are potentially important biodiversity resources and there is a potential impact pathway. These are the River Chelt, Leigh Brook and twelve unnamed watercourses (MW3, Drain 8, Drain 9, Drain 10, Drain 11, Drain 12, Drain 14, Drain 15, Drain 16, Drain 20, Drain 21 and Drain 22). These are shown on Figure 7.12A in Technical Appendix 7.12.

7.5.115. There are no available desk study records in relation to habitats and species (less than five years old) available for the watercourses in the study area. However, a review of Environment Agency fish data from a wider area from the last ten years was also undertaken in the absence of more recent data. Six sites were identified on the River Chelt which have been surveyed within the last ten years. All six of these sites were identified as supporting varying life stages of European eel, a critically endangered species[121].

7.5.116. Baseline field survey aquatic ecological data are presented under the following headings: walkover survey, river habitat surveys and aquatic species surveys (aquatic macroinvertebrates, aquatic macrophytes and fish), for each of the watercourses.

River Chelt

Walkover survey

7.5.117. The walkover survey identified the River Chelt as having a varied channel with moderate flows and a diverse range of habitat typologies (e.g. riffles and pools) within the surveyed reaches.

7.5.118. At the proposed new River Chelt crossing (SO 90743 24593) the channel is approximately 3 m wide and has banks up to 5 m high. Such channel incision is indicative of historical management of the watercourse e.g. dredging. Despite these modifications, the channel contains a range of habitat types, including riffles and pools, resulting in varying depths of up to 0.5 m.

7.5.119. The existing M5 crossing on the River Chelt is a box culvert (assumed to be embedded due to the presence of gravel and silt substrates through the culvert). Downstream of the M5 at SO 89652 25311 the watercourse is wider (approximately 6 m), although relatively similar in character with steep banks and low gradient.

River Habitat Surveys (RHS & RCS)

7.5.120. Following the walkover surveys, RHS and RCS have been conducted at two 500 m reaches on the River Chelt.

[120] All other watercourses are defined as ordinary watercourses. The Lead Local Flood Authority (LLFA) or, if within an Internal Drainage District, the Internal Drainage Board (IDB) have similar permissive powers to maintain and improve ordinary watercourses.
[121] European eel is a Critically Endangered species on the International Union for Conservation of Nature (IUCN) Red List of Threatened Species (2010), species of Principal Importance under section 41 of the Natural Environment and Rural Communities (NERC) Act 2006, and a UK Biodiversity Action Plan (BAP; 2007) priority fish species.

7.5.121. One location that incorporates the existing M5 crossing (SO 90182 24760 – SO 89869 25052) was surveyed on 27 and 29 July 2020. The River Chelt at this location is a lowland watercourse flowing through predominantly agricultural land characterised by tilled ground and broadleaved plantation. There is evidence of historical channel realignment and over deepening associated with the surrounding land-use.

7.5.122. Channel substrate was composed of gravel, pebble and sand, with low energy flow types. Large in-channel geomorphological features were absent. Few macrophyte functional groups (indicators of vegetative river habitat diversity) were recorded.

7.5.123. The RHS Habitat Modification Class (HMC) of 5 classifies the reach as severely modified.

7.5.124. Surveys at the new proposed crossing (SO 90963 24606 – SO 90490 24660) were undertaken on 27 and 29 July 2020. The River Chelt at this location has been characterised as a lowland watercourse flowing through predominantly tilled, rough pasture and suburban land use. There is evidence of historical channel realignment and over deepening associated with the surrounding land-use, in addition to impoundment created by a weir.

7.5.125. Channel substrates were composed of gravel, pebble and sand, with both low and high energy flow types. Bank profiles (including eroding cliff habitats) and channel features such as un-vegetated side bars and a mature island, with large woody debris contributed to habitat complexity. Few macrophyte functional groups were recorded.

7.5.126. A HMC of 5 classifies the reach as severely modified.

Aquatic macroinvertebrates

7.5.127. At each point of interaction with the Scheme on the River Chelt (the existing M5 crossing and the new proposed crossing), two surveys were conducted upstream and downstream from the point of interaction for aquatic macroinvertebrates on 13 October 2020.

7.5.128. At the upstream site of the existing M5 crossing (SO 90184 24781), biological metrics were indicative of moderate taxon richness (20) and good water quality (Whalley, Hawkes, Paisley & Trigg (WHPT122) Average Score Per Taxon (ASPT): 5.25). The macroinvertebrate assemblages are highly sensitive to reduced flows (LIFE123: 7.54) and are indicative of a moderately sedimented channel bed (PSI124: 59.3).

7.5.129. At the downstream site of the existing M5 crossing (SO 89915 24885), biological metrics were indicative of moderate taxon richness (20) and water quality (WHPT ASPT: 4.70). Again, the macroinvertebrate assemblages are highly sensitive to reduced flows (LIFE: 7.61) and indicative of a moderately sedimented channel bed (PSI: 55.6).

7.5.130. At the upstream site of the new proposed crossing (SO 90859 24556), biological metrics were indicative of moderate taxon richness (19) and water quality (WHPT ASPT: 4.95). The macroinvertebrate assemblages are highly sensitive to reduced flows (LIFE: 7.76), and indicative of a slightly sedimented channel bed (PSI: 62.5).

7.5.131. At the downstream site of the new proposed crossing (SO 90605 24615), biological metrics were indicative of low taxon richness (13) and moderate water quality (WHPT ASPT: 4.54), where macroinvertebrate assemblages are highly sensitive to reduced flows (LIFE: 8.33), with a slightly sedimented channel bed (PSI: 62.5).

[122] WFD-UKTAG (2014), River Assessment Method. Benthic Invertebrate Fauna. Invertebrates (General Degradation): Whalley, Hawkes, Paisley & Trigg metric in River Invertebrate Classification Tool (RICT) UKTAG Method Statement. ISBN: 978-1-906934-62-0.
[123] Extence, CA, Balbi, DM and Chadd, RP (1999) River flow indexing using British benthic macroinvertebrates: A framework for setting hydroecological objectives. Regulated Rivers: Research and Management 15, 543-574.
[124] Extence, CA, Balbi, DM & Chadd, RP (1999) River flow indexing using British benthic macroinvertebrates: A framework for setting hydroecological objectives. Regulated Rivers: Research and Management 15, 543-574. Ecological Indicators 82, 344-356

Aquatic macrophytes

7.5.132. Two aquatic macrophyte surveys were undertaken on the River Chelt on 29 July 2020. One between SO 90042 24796 and SO 90096 24787 at the existing M5 crossing and the other between SO 90714 234607 and SO 90625 24617, at the new proposed crossing.

7.5.133. At the existing M5 crossing there was limited total macrophyte cover (3%) and filamentous algae cover (3%). Shading on both banks was extensive (100%).

7.5.134. A total of nine scoring taxa[125] were recorded, comprised of green algae (*Enteromorpha intestinalis* and *Cladophora glomerata*), fool's water cress, floating sweet-grass, amphibious bistort, reed canary grass, water cress, brooklime and water crowfoot (of the subgenus Batrachium).

7.5.135. At the new proposed crossing, there was limited total cover of macrophytes (1%) and filamentous algae cover (3%). Shading on both banks was extensive (70%).

7.5.136. Only one scoring species was identified (branched bur-reed). Four additional species were identified, which comprised crescent-cup livewort, pink-fruited thread moss, water figwort and the liverwort species (*Marchantia polymorpha* subspecies *ruderalis*).

7.5.137. No priority or invasive macrophyte species were recorded in either survey. Although it should be noted that Himalayan balsam was previously recorded along the river banks during the walkover.

White-clawed crayfish

7.5.138. Potentially suitable habitat for white-clawed crayfish was identified within the River Chelt, although the channel was noted as being very sandy with an overall lack of refuges in the main channel. The most abundant habitat was noted as being tree and riparian vegetation roots. This watercourse was subject to manual searches for white-clawed crayfish. During the surveys, a juvenile signal crayfish was recorded.

7.5.139. Due to the lack of white-clawed crayfish desk study records, the negative result during field surveys, and taking into consideration the presence of signal crayfish which limit the viability of white-clawed crayfish populations, white-clawed crayfish are considered to be likely absent from the River Chelt and are therefore not considered further within this report

Fish

7.5.140. Electric fishing was undertaken at two locations on 29 July 2020 at the existing M5 crossing (SO 90140 24760) and at the new proposed crossing (SO 90645 24606 – SO 90518 24634). Extensive glide habitat and areas of shallow riffle habitat were present, although the size of channel and low water depths observed at survey are likely to limit salmonid and other major species use of the habitat resource.

7.5.141. At the existing M5 crossing lithophilic spawners such as minnow and bullhead were present in high numbers, in addition to eurytopic species such as European eel. The fish assemblage here is indicative of a small stony bed watercourse.

7.5.142. At the new proposed crossing, lithophilic gravel spawners such as bullhead and stone loach were also present in high numbers, in addition to eurytopic species such as European eel. Again, this assemblage is indicative of a small stony bed watercourse.

7.5.143. Two brook/river lamprey ammocoetes (young/larvae) were recorded in the downstream survey site. Although only recorded in low numbers, river lamprey are an Annex II species listed as a primary reason for selection of the Severn Estuary SAC and a species of Principal Importance for the conservation of biodiversity in England, as listed in accordance with Section 41 of the NERC Act 2006. It is difficult to distinguish between brook and river lamprey when in the ammocoete stage. As a precaution, they are assumed to be river lamprey.

[125] Those aquatic taxa which contribute to biological metric calculations. Additional marginal or terrestrial taxa were also recorded, but these are not 'truly aquatic species. See Appendix 7.12 for full species lists.

7.5.144. European eel is an interest feature of the downstream Severn Estuary SAC, Ramsar Site and SSSI and a species of Principal Importance for the conservation of biodiversity in England, as listed in accordance with Section 41 of the NERC Act 2006. The European eel is also critically endangered[126].

River Chelt importance valuation

7.5.145. Based on the information that is currently available concerning the presence and composition of aquatic species within the study area, the presence of European eel and brook/river lamprey, in addition to the availability of suitable habitat and connectivity with the wider catchment, the River Chelt has been valued to be of County importance for biodiversity.

Leigh Brook

Walkover survey

7.5.146. The reach surveyed is a heavily managed agricultural drainage ditch within the headwaters of the Leigh Brook system. The channel within the study area exhibits limited habitat complexity and is choked with terrestrial herbs and scrub (indicating an ephemeral flow).

7.5.147. The existing M5 culvert was only partially visible during the survey due to the dense growth of tall herbs.

7.5.148. No flow was observed at the time of survey and only small pools of stagnant water were present. Nonetheless, Leigh Brook is likely to provide some limited value for aquatic species when temporarily acting to convey surface water flows.

River habitat surveys (RHS & RCS)

7.5.149. Following the walkover surveys, RHS (SO 90737 26057 – SO 90546 26443) and RCS (SO907260 - SO905264) were conducted on Leigh Brook on the 27 and 28 July 2020.

7.5.150. Habitat surveys have identified Leigh Brook as a typical lowland watercourse flowing through predominantly agricultural land characterised by improved grasslands and broadleaved plantations.

7.5.151. At the point of interaction with the Scheme, Leigh Brook is a small heavily modified ditch. Further downstream the brook becomes less modified as it heads towards its confluence with the River Chelt, which in turn discharges to the River Severn.

7.5.152. There is evidence of historical channel modifications associated with realignment and over deepening. Limited bed substrates (gravel-pebble and silt), low energy flow types, and re-sectioned bank profiles. Few macrophyte functional groups were recorded.

7.5.153. The HMC of 5 classifies the reach as severely modified.

Aquatic macroinvertebrates

7.5.154. One location was surveyed on Leigh Brook (SO 90667 26090) on 13 October 2020.

7.5.155. Biological metrics were indicative of low taxon richness (13) and poor water quality (WHPT ASPT: 3.92). The macroinvertebrate assemblage has a low sensitivity to reduced flows (LIFE: 6.30) and is indicative of a heavily sedimented channel bed (PSI: 10.3).

7.5.156. The INNS the New Zealand mud snail was recorded, although this is now widespread throughout most of the UK.

[126] Jacoby, D. & Gollock, M. 2014. Anguilla anguilla. The IUCN Red List of Threatened Species 2014: e.T60344A45833138. http://dx.doi.org/10.2305/IUCN.UK.2014-1.RLTS.T60344A45833138.en

Aquatic macrophytes

7.5.157. One survey was conducted on 28 July 2020, between SO 90742 26044 and SO 90642 26106.

7.5.158. At this site, there was very limited total macrophyte cover (< 1%) with no filamentous algae cover. Shading on both banks was extensive (100%). Two species were identified: fool's water-cress and hairy willowherb.

7.5.159. No priority or invasive species were recorded.

White-clawed crayfish

7.5.160. The Leigh Brook was not considered to be suitable for populations of white-clawed crayfish. Very few suitable habitats were identified. The channel was very silty and anoxic, with very little water in places. Large quantities of litter were present in the water and few suitable in-channel or marginal habitats suitable for crayfish were identified. Overall, the Leigh Brook was not considered suitable for white-clawed crayfish.

Fish

7.5.161. Leigh Brook was not screened in for fish survey since it was deemed during the walkover survey that the Leigh Brook did not provide suitable habitat for fish at the point of interaction with the Scheme or within the field survey area.

Leigh Brook importance valuation

7.5.162. Based on the information that is currently available concerning presence and composition of aquatic species within the study area, the absence of any site designations and the availability of suitable habitat and connectivity with the wider catchment, Leigh Brook has been valued to be of Local importance for biodiversity.

Other Ordinary Watercourses

Walkover Survey

7.5.163. Ordinary Watercourses screened in for walkover survey, on the basis that they were identified as being potentially impacted by the Scheme, were visited on 23 and 24 February 2019. Drain 9, 11, 21 and 22 were not surveyed due to access restrictions. However, based on review of aerial imagery and professional judgement, they are assumed to support similar habitats to the ordinary watercourses which were visited (Drain 8, Drain 10, Drain 12, Drain 14, Drain 15, Drain 16, Drain 20 and MW3).

7.5.164. These Ordinary Watercourses were identified as minor tributary systems and heavily managed drainage ditches with limited habitat complexity, typically choked with terrestrial herbs and scrub (indicating their ephemeral nature) and/or shaded by trees.

7.5.165. Straightened planforms exhibited a limited range of habitat typologies for aquatic species. They are considered likely to provide only limited value for aquatic species when temporarily acting to convey surface water flows.

Aquatic Species

7.5.166. Aquatic species were not screened in for survey, as it was identified that the unnamed ordinary watercourses within the study area potentially impacted by the Scheme did not exhibit suitable habitat for the detailed survey type. Assessment of importance value is considered to be adequately made using walkover survey observations only.

Other ordinary watercourses importance valuation

7.5.167. Based on the information that is currently available concerning habitat condition and function, the predominantly agricultural setting, and the limited availability of suitable

habitat for aquatic species, the other ordinary watercourses have been valued to be of Local importance for biodiversity.

Standing waterbodies

7.5.168. Seventeen ponds were identified within the study area. There are no lake habitats.

7.5.169. No desk study or detailed pond field survey data are available for the ponds identified within the study area.

7.5.170. HSI pond survey data have been reviewed where available. This is detailed within Technical Appendix 7.11. These data have identified a range of broad pond habitat typologies, that include ephemeral ponds, small ponds set within woodland and hedgerows, and ornamental ponds.

7.5.171. None of the ponds have been screened in for detailed pond habitat/aquatic species surveys e.g. Predictive System for Multimetrics (PSYM)[127], as no pond habitat loss or other potential impact pathways have been identified in relation to the proposed Scheme. This assumes standard best practice construction procedures are adopted and adhered to (as detailed in the embedded mitigation).

7.5.172. In the absence of detailed pond surveys, the ponds have been ascribed an assumed value based on the predominantly agricultural setting, the absence of any site designations and professional judgement in line with findings from previous highway schemes within the region. It is considered that ponds are likely to be of Local importance (this excludes any valuation for great crested newts, which is considered as a separate resource in its own right).

Summary of Receptors

7.5.173. Table 7-5 below provides a summary of the ecological receptors and their biodiversity value.

Table 7-5 - Biodiversity resources and their Importance

Biodiversity resource	Importance
Wye Valley and the Forest of Dean Bat Sites SAC	International
Walmore Common SPA/Ramsar	International
Severn Estuary SAC/SPA/Ramsar	International
Coombe Hill Canal SSSI	National
Non-statutory designated nature conservation sites	County
Terrestrial habitats - Broadleaved semi-natural woodland and traditional orchards	County
Terrestrial habitats - Traditional orchards	County
Other terrestrial habitats including hedgerows	Local
Bats	Regional

[127] Horwood, S., 2002. A guide to monitoring the ecological quality of ponds and canals using PSYM. Environment Agency, 1-14

Biodiversity resource	Importance
Dormouse	County
Badger	Less than Local
Otter	Local
Water Vole	N/A (likely absent)
Other priority mammals	Local
White-clawed crayfish	N/A (likely absent)
Wintering birds	Local
Breeding birds	Local
Reptiles	Local
Great Crested Newt	County
Common Toad	Local
Terrestrial Invertebrates	County
Protected and priority plant species	N/A (likely absent)
INNS plant species	Less than Local
River Chelt	County
Leigh Brook	Local
Other Ordinary Watercourses	Local
Standing waterbodies (not including assessment for great crested newts)	Local

7.6. Potential impacts

7.6.1. This section characterises the potential impacts and the subsequent potential effects (both positive and negative) of the Scheme on the important biodiversity resources within the study area, taking into consideration any embedded mitigation measures[128].

7.6.2. Biodiversity resources that are considered to be absent from the study area as a result of desk study and field survey have been scoped out of further assessment, as they will not be affected by the Scheme. This includes water vole, white-clawed crayfish and protected and priority plants.

7.6.3. Similarly, biodiversity resources that were recorded in the desk study but where there is absence of an impact pathway, have also been scoped out of further assessment. This includes terrestrial invertebrates and traditional orchard habitat. Terrestrial invertebrates have been assigned a precautionary value of County, assuming the presence of a key population of noble chafer at Hayden Hill Fruit Farm, Millhouse Farm and north of Stanboro Lane. Traditional orchards have been assigned a value of County importance. Despite the potential presence of noble chafer, the Scheme would not impact the suitable habitat, as potentially suitable traditional orchard habitat is located outside of the Scheme boundary. Therefore, there would be no direct impacts and, taking into consideration the embedded mitigation measures, no indirect impacts to either of these resources.

7.6.4. This is also the case for broadleaved semi-natural woodland, which has been assigned a value of County importance. The single copse of broadleaved semi-natural woodland is located approximately 80 m south of the Scheme and, taking into consideration this distance and embedded mitigation measures, no impacts are anticipated.

7.6.5. Wye Valley and Forest of Dean Bat Sites SAC has also been scoped out from the remainder of this assessment. At a distance of 21 km from the Scheme, separated by towns, villages and major roads, this is well beyond the zone of influence for any Scheme impacts relating to direct habitat loss, habitat degradation, habitat fragmentation or disturbance (via noise/vibration or artificial lighting). The distance is also considered to be too great for there to be a significant functional linkage between the Scheme and the qualifying feature bat populations. This is because the distance is at least seven times larger than the core sustenance zones[129] identified by the BCT[130] for lesser horseshoe bats (2 km) and greater horseshoe bats (3 km)[131]. In addition, the SAC is more than 200 m from the ARN for the Scheme and, as a result, will not be impacted by air quality pollution impacts. Further details are provided within the HRA (Technical Appendix 7.13).

7.6.6. Walmore Common SPA and Ramsar has been scoped out of this assessment. The qualifying feature of the SPA and Ramsar, Bewick's swan, was not identified during breeding or wintering bird surveys. No records of Bewick's swan was provided by GCER and a review of existing literature indicated that the agricultural grassland habitats surrounding the Scheme are not key areas for populations of Bewick's swan[132]. The results of the wintering and migratory bird surveys and desk study therefore indicate that Bewick's swan does not regularly use or is dependent on the habitat in the vicinity of the Scheme. There is no hydrological connection between the Scheme and the SPA/Ramsar, so no hydrological impacts are anticipated. The SPA/Ramsar is also more than 200 m from the ARN for the Scheme and, as a result, will not be impacted by air quality pollution impacts. Further details are provided within the HRA (Technical Appendix 7.13).

7.6.7. Coombe Hill Canal SSSI has also been scoped out of this assessment. Given the nature of this predominantly wetland SSSI, its distance from the Scheme (1.9 km north west of

[128] Considered to be mitigation measures incorporated into the Scheme design.
[129] The area surrounding a communal bat roost within which habitat availability and quality will have a significant influence on the resilience and conservation status of the colony using the roost.
[130] Collins, J. (ed.) (2016) Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd edn). The Bat Conservation Trust, London.
[131] CSZs specific to the Wye Valley and Forest of Dean Bat Sites SAC have not been published.
[132] Robinson, JA, K Colhoun, JG McElwaine & EC Rees (2004). Bewick's Swan *Cygnus columbianus bewickii* (Northwest Europe population) in Britain and Ireland 1960/61 – 1999/2000. Waterbird Review Series, The Wildfowl & Wetlands Trust/Joint Nature Conservation Committee, Slimbridge.

the Scheme) and the absence of any hydrological connections, no impacts are anticipated, and this site is not considered further within this report.

7.6.8. Road traffic is a source of nitrogen oxides (NOx emissions), a pollutant that can have adverse effects on plants and habitats as a result of nitrogen deposition, which can cause nutrient enrichment of the soil and changes to the soil pH. This can have adverse effects on sensitive habitats. However, the results of the air quality assessment have identified air quality improvements at the six non-statutory designated nature conservation sites and the veteran tree located within 200 m of the ARN, with a reduction in nitrogen deposition rate estimated at all locations with the Scheme in place. Further detail is included in Chapter 5. Therefore, these resources are not considered further within this report.

Those biodiversity resources that have been scoped out are summarised in Table 7-6 below.

Table 7-6 - Scoped out Biodiversity Resources

Ecological Receptor (importance)	Reason for scoping out
Wye Valley and the Forest of Dean Bat Sites SAC (International)	Resource would obviously not be impacted by the Scheme.
Walmore Common SPA/Ramsar (International)	Resource would obviously not be impacted by the Scheme.
Coombe Hill Canal SSSI (National)	Resource would obviously not be impacted by the Scheme.
Non-statutory designated nature conservation sites (County)	Resource would obviously not be impacted by the Scheme.
Terrestrial habitats – veteran tree (National)	Resource would obviously not be impacted by the Scheme.
Terrestrial habitats - Broadleaved semi-natural woodland (County)	Resource would obviously not be impacted by the Scheme.
Terrestrial habitats - Traditional orchards (County)	Resource would obviously not be impacted by the Scheme.
Water Vole (N/A)	Desk study and field surveys indicate likely absence.
White-clawed crayfish (N/A)	Desk study and field surveys indicate likely absence.
Terrestrial Invertebrates (County)	Resource would obviously not be impacted by the Scheme.
Protected and priority plant species (N/A)	Desk study and field surveys indicate likely absence.

7.6.9. Biodiversity resources that are of less than local value are not considered to be important biodiversity resources and are therefore not included in the impact assessment. This includes badger and INNS. However, appropriate mitigation is included in Section 7.7 where necessary to ensure legal compliance.

7.6.10. The following biodiversity resources are considered in this section as a result of their ecological importance being Local or greater and the predicted impacts of the Scheme:

- Severn Estuary SAC/SPA/Ramsar
- Other terrestrial habitats
- Bats
- Dormouse
- Otter
- Other priority mammals
- Breeding birds
- Wintering birds
- Reptiles
- Great crested newt
- Common toad
- River Chelt
- Leigh Brook
- Other Ordinary Watercourses
- Standing waterbodies

7.6.11. The following general impacts have been identified. It should be noted that this is not an exhaustive list, and will be updated as the assessment continues and as the Scheme design develops.

General Construction Impacts

7.6.12. A highways scheme can impact biodiversity in a number of ways during construction and operation. General construction impacts are as follows:

- Permanent habitat loss (e.g. loss of land comprising habitats that plants and animals rely on).
- Temporary habitat loss (e.g. land used during construction that is subsequently to be restored).
- Habitat degradation (e.g. through sediment release, pollution events, construction traffic, air quality impacts, and dust).
- Habitat severance and fragmentation affecting movements of protected and priority species.
- Injury or mortality of protected and priority species through construction activities.
- Disturbance from noise, light and vibration to protected and priority species.
- Changes to hydrological conditions.

General Operation Impacts

7.6.13. General operational impacts are as follows:

- Habitat degradation (e.g. through pollution events and air quality impacts).
- Injury and mortality of protected and priority species from collision with vehicles.
- Disturbance from noise, lighting and vibration to protected and priority species.
- Changes to discharge volume and water quality.

- Watercourse habitats may be affected through changes in hydro-morphological character both upstream and downstream of their location. Associated alterations to sediment delivery rates and changes in flow character have the potential to reduce morphological diversity and reduce habitat complexity.

Embedded Mitigation

7.6.14. Some mitigation measures are embedded at the design stage to minimise impacts on biodiversity. These are as follows and are shown on the Design Figures in Appendix 2.1 and the Environmental Design Figures in Appendix 2.2.

7.6.15. Design measures include:

- River Chelt bridge will be a clear span structure over the river, thereby avoiding direct impacts to the river and riverbanks and ensuring fauna can continue to move along the river unimpeded.
- Embankments on the M5 at the point where the River Chelt passes under the motorway have been designed so that the existing culvert does not require extending on either side of the motorway, and consequently there will be no direct loss of river habitat or alterations to channel bed and banks in this location.

7.6.16. Wildlife crossings include:

- Retrofitting an otter ledge within the existing River Chelt culvert beneath the M5, on the opposite side of the footbridge. Otters currently use the footbridge, but camera footage and observations have identified that it floods. Retro-fitting an otter ledge will provide safe passage during times of flood.
- Otter ledges will be installed on both sides of the River Chelt bridge, along the Link Road, and landscape planting has been designed to encourage use of these features and prevent otters from accessing the carriageway.
- Underpass to the south of the River Chelt, within 50 m of the watercourse, designed for use by badger and otter, as well as other mammals, reptiles and amphibians.
- Underpasses along the Link Road at existing hedgerows where badger activity has been identified, designed for use by badger, as well as other mammals, reptiles and amphibians.
- A series of culverts under the Link Road so as not to impede the existing periodic movement of floodwater that occurs in a westerly direction out of the River Chelt from a point upstream of the Link Road. These will also function as underpasses for badgers. A ledge has been incorporated in the northern-most culvert to enable use by badgers during flood conditions.

7.6.17. Habitat Retention and Creation measures include:

- Existing vegetation is to be retained as far as possible.
- Habitats to be created include: grassland with bulbs, species-rich grassland, woodland, native species-rich hedgerow, native hedgerow with trees, wet grassland, and wet woodland. Native species will be used, which are of local provenance where possible. Table 7-7 below indicates the habitat areas proposed to be created. These habitat creation areas will contribute towards meeting any biodiversity net gain targets and will aim to contribute to the SNAs where possible.
- Road verge planting will follow Highways England's Low Nutrient Grasslands policy[133], by removing nutrient-rich topsoil and adding subsoil or bare substrate to promote wildflower growth.

[133] Major Projects Delivery Services (October 2020), Low Nutrient Grasslands (version number MPI-85-102020)

- Riparian vegetation will be appropriately managed along the River Chelt and the Leigh Brook to limit vegetation loss as far as practically possible and reinstate where permanent structures are not required.
- Several drainage ditches will need to be realigned as part of the Scheme. New drains will replace any lost due to encroachment with like for like habitat as a minimum. These will be sown with a wet grassland seed mix of appropriate provenance and to represent geographical context.
- Addition of green roofs to bus stops along A4019.

Table 7-7 - Proposed Habitat Creation Areas

Habitat type	Area/length
Grassland with bulbs	4.66 ha
Species-rich grassland	16.5 ha
Woodland	13.5 ha
Native hedgerow	1,041 m
Native hedgerow with trees	10.4 km
Scattered trees	175 individual trees
Waterbodies and planting	4.4 km
Banks and ditches sown with wet grassland	6.6 ha

7.6.18. To mitigate the potential for a pollution incident to occur during construction, works will proceed following standard good practice working methods for environmental protection, which will adhere to GPPs[134] and CIRIA C715[135] Environmental good practice. These detail good practice advice for undertaking works which may have the potential to cause water pollution, including management of fine sediment run-off from construction areas. This also includes use of designated, bunded areas away from sensitive biodiversity resources for fuel storage and refuelling.

7.6.19. The above pollution control measures will be secured along with other environmental protection measures via a Construction Environmental Management Plan (CEMP), which will be adhered to by all contractors involved in construction of the Scheme. The CEMP will include the following measures:

- All debris arising from the construction and works will be effectively encapsulated and removed from site.
- No pollutants will enter drainage or run-off to a watercourse.
- The contractor will ensure that they have a robust Pollution Response Plan in place before works start.
- Any pollution incident will be contained and cleaned up immediately and reported.
- No storage of oils or chemicals will be allowed within 10 m of a watercourse.
- Establishment of an appropriately sized, resourced and experienced site environmental management team (including at least one ECoW) to ensure effective implementation of all environmental mitigation.

[134] https://www.netregs.org.uk/environmental-topics/guidance-for-pollution-prevention-gpp-documents/guidance-for-pollution-prevention-gpps-full-list/
[135] CIRIA (2006), CIRIA C648 Control of water pollution from linear construction projects Technical guidance. London.

- Ecological briefings and toolbox talks for all site operatives to make them aware of relevant constraints and requirements prior to commencing work on the Scheme.
- Clear demarcation of retained habitats and no allowance of vehicles or storage of materials within these areas.
- Location of haul roads away from sensitive features and use of dust suppression measures during dry periods.
- Covering excavations overnight or incorporating features such as ramps to prevent animals getting trapped.
- Good working practices will be employed in order to minimise noise impacts during construction and operation. This includes fitting all vehicles, plant and tools with silencers and/or mufflers, and installing temporary noise barriers or other noise containment measures to minimise construction noise levels where possible. Low noise road surfacing will be used where practicable in order to reduce noise levels during the operation of the Scheme.

7.6.20. Lighting measures include:

- As agreed within the consultation period, no lighting is proposed after approximately 150 m from Old Gloucester Road and 150 m from the A4019 on the new Link Road.
- Wildlife-friendly lighting is to be implemented throughout the Scheme, where lighting is required. Lighting is proposed along both sides of the A4019 from Gallagher Retail Park (the eastern extent of the Scheme) to Junction 10. Lighting columns are proposed to be 12 m mounting height, and it is proposed to use LED luminaires with a colour temperature of 2700k which emit no upward light. Colour temperature is in accordance with ILP guidance GN08 Bats and Artificial Lighting[136].

7.6.21. Drainage measures include:

- The construction and operation drainage will be designed to maintain or enhance the existing hydrological conditions.
- The operational drainage will be designed to minimise the risk of pollution from the road surface coming into contact with sensitive habitats.
- Six attenuation basins will be created along the M5, A4019 and the Link Road. Attenuation basins will include features to enhance biodiversity, such as submerged and marginal planting; variations in bed topography; shallow bank slopes to create drawdown zones; island features; and marginal shelves. Additional surrounding planting will also be included to help embed the basin into the landscape.
- For the M5 J10 and A4019, collection systems are to be a kerb and gully arrangement or combined drainage and kerbs as per the existing arrangement. Grassed channels will be introduced where space allows. Flows will be conveyed via pipes to new ponds prior to discharge to watercourses via new ditches for at least 8 m upstream of the outfalls. Due to several private land parcels along the A4019 being retained, there is limited space to add additional open ditch features or swales. Flows are to be restricted to existing rates. Basins will include forebay areas to manage contaminants and contain spillages.
- The Link Road includes roadside swales to collect runoff and convey it to new basins. Outgoing pipes from basins will discharge to new ditches at least 8 m upstream of the outfalls. Flows are to be restricted to greenfield runoff rates. Basins will include forebay areas to manage contaminants and contain spillages.

[136] Bat Conservation Trust (2018). Guidance Note: Bats and Artificial Lighting in the UK.

Impacts to Designated Sites

7.6.22. The European designated sites within the study area of the Scheme are considered within the HRA, which is provided as a standalone report and also as Technical Appendix 7.13. The impacts to the sites are summarised here.

Severn Estuary SAC/SPA/Ramsar/SSSI

7.6.23. Although there is a direct hydrological connection between the Scheme and the Severn Estuary designations, at a distance of more than 40 km, it is considered that the potential for direct impacts via release of pollutants from the Scheme would be eliminated by dilution. DMRB guidance LA 113 states that "for assessment of impacts associated with soluble pollutants, outfalls within 1 km (measured along the watercourse) shall be aggregated for the purposes of cumulative assessment[137]". It therefore follows that soluble pollutants are considered to be sufficiently diluted beyond 1 km. Furthermore, pollution prevention measures and an appropriate drainage strategy will be in place as part of the embedded mitigation.

7.6.24. There is potential for functional linkage between the Scheme and the qualifying feature populations of migratory fish within the River Chelt, as these species can all migrate over 40 km upstream where there are no barriers, such as weirs or waterfalls[138,139]. Impacts to functionally linked habitat within the River Chelt as a result of a pollution event during construction and operation, and consequent detrimental effects to qualifying species are considered unlikely, taking into account the embedded mitigation measures.

7.6.25. Disturbance impacts to migratory European eel associated with the Severn Estuary Ramsar site and river lamprey associated with the Severn Estuary SAC and Ramsar using functionally linked habitat within the River Chelt during construction cannot be ruled out. The Scheme therefore has the potential to impact on a site which is of international importance.

7.6.26. Taking into consideration the embedded mitigation measures, which would avoid any pollution impacts as far as possible, no hydrological impacts are anticipated during construction or operation. There is potential for a moderate adverse impact on the Severn Estuary SAC and Ramsar site as a result of disturbance to European eel and river lamprey during construction.

Impacts to other terrestrial habitats

7.6.27. The Scheme will result in permanent and temporary habitat loss, as summarised in Table 7-8 below.

Table 7-8 - Habitat Loss and Creation

Habitat type	Temporary area to be lost (ha, or m in the case of linear features)	Permanent area to be lost (ha, or m in the case of linear features)	Proposed Habitat Creation (ha, or m in the case of linear features)
Semi-natural broadleaved woodland	-	-	-
Plantation broadleaved woodland	1.42	3.51	-
Plantation mixed woodland	0.80	3.01	-

[140] Bat Conservation Trust (2018). Guidance Note: Bats and Artificial Lighting in the UK.
[140] Bat Conservation Trust (2018). Guidance Note: Bats and Artificial Lighting in the UK.
[140] Bat Conservation Trust (2018). Guidance Note: Bats and Artificial Lighting in the UK.

Habitat type	Temporary area to be lost (ha, or m in the case of linear features)	Permanent area to be lost (ha, or m in the case of linear features)	Proposed Habitat Creation (ha, or m in the case of linear features)
Woodland (undefined type)	-	-	13.5
Dense scrub	0	0.17	-
Scattered scrub	0.005	-	-
Broadleaved parkland/ scattered trees	-	0.002	-
Improved grassland	6.96	4.92	-
Poor semi-improved grassland	14.55	11.34	-
Semi-improved neutral grassland	-	0.11	-
Amenity grassland	1.07	1.80	-
Grassland with bulbs	-	-	4.66
Species-rich grassland	-	-	16.5
Wet grassland in banks and ditches	-	-	6.6
Tall ruderal	-	0.50	-
Arable	-	14.41	-
Other (buildings, bare ground, hardstanding, land not subject to survey, which from aerial photographs primarily includes motorway verge habitats and hardstanding)	7.29 (comprising approximately 2.87 ha of verge habitats, with the remainder comprising predominantly hardstanding)	29.69 (comprising approximately 10.9 ha of verge habitats, with the remainder comprising predominantly hardstanding)	-
Running water (length impacted by shading)	563.98	363.08	
Planting around waterbodies	-	-	4,400
Channel restoration planting area	-	-	1.7
Hedgerow	4,735.78	4,257.37	1,041
Defunct hedgerow	222.81	129.61	
Hedgerow with trees	1,262.97	2,732.37	10,400
Scattered trees	-	-	175 individual trees

7.6.28. There will be direct permanent loss of habitats, primarily in the immediate vicinity of the motorway and existing Junction 10. Sixty-nine hectares of habitat will be permanently lost as a result of the Scheme, as well as 7.6 km of linear habitat. The habitats lost are primarily

of lower value for biodiversity, such as arable and improved grassland habitats. However, woodland and hedgerows will also be lost as a result of the Scheme.

7.6.29. In total, 32 ha of land will be temporarily lost as a result of construction work, as well as nearly 7 km of linear habitat, such as hedgerows.

7.6.30. In addition to direct loss, habitats may also be subject to degradation as a result of air and water pollution. It is anticipated that pollution events will be avoided or minimised through the embedded pollution prevention mitigation measures.

7.6.31. Construction of roads will also result in habitat fragmentation and severance between previously connected areas of the landscape. This has impacts on the species which use the habitats as well as reducing the robustness and resilience of the habitats themselves.

7.6.32. However, habitat creation will offset the effects of habitat loss and fragmentation, and will enhance and improve on the habitats on site through increasing the area and quality of more valuable habitats. For example, 8.74 ha of plantation woodland will be removed, and 13.5 ha of woodland will be created; the majority of grassland habitat to be removed is of low nature conservation value, and 21.16 ha of species-rich grassland and grassland with bulbs will be created. Habitat creation will also contribute to any biodiversity net gain targets and, where possible, will aim to contribute to the SNAs.

7.6.33. Movement of topsoil as a result of the Scheme could potentially result in the spread of INNS between different areas of the landscape.

7.6.34. Taking into account embedded mitigation, there will be minor adverse impacts on habitats during the construction phase, and minor beneficial effects to habitats during the operation phase.

Impacts to Bats

7.6.35. During the construction phase of the Scheme, 24 bat roosts will be lost, and a further 28 bat roosts are within 100 m of the Scheme and therefore may be subject to disturbance impacts. Roosts to be lost are detailed in Table 7-9.

Table 7-9 - Summary of Bat Roosts to be Lost (Demolished or Felled)

Species	Roost type	Total number
Common pipistrelle	Transitional roost	1
	Occasional roost	1
	Day roost	3
	Maternity roost	2
Soprano pipistrelle	Transitional roost	1
	Occasional roost	1
	Day roost	4
Lesser horseshoe	Day roost	3
	Feeding roost	3
	Transitional	1
Noctule	Day roost	1

Species	Roost type	Total number
Barbastelle	Transitional roost	1
Unknown	Unknown	2
Total		**24** **Made up of 13 structures and one tree**

7.6.36. The creation of the new Link Road will result in 12 hedgerows being severed which could lead to important flight lines being impacted. The creation of an all-movements junction will necessitate the demolition of the existing overbridge and construction of a new roundabout junction over the M5, with removal of the two existing Junction 10 slip roads and the construction of four new slip roads. This will result in increased fragmentation of the habitats surrounding the existing Junction 10. As a result of these fragmentation impacts, bats' usual foraging and commuting routes will be affected, potentially resulting in bats using alternative, less direct routes which may result in reduced fitness as a result of longer flight times between roosts and foraging areas, or injury or mortality to bats as a result of collision with vehicles if bats were to use the same or alternative routes.

7.6.37. In addition, the loss of areas of vegetation, particularly around the motorway junction, will affect bats which may forage in those areas.

7.6.38. Loss of bat foraging and commuting habitat will be mitigated through the creation of replacement habitat, which includes a net increase in broadleaved woodland, hedgerow planting and the creation of species-rich grasslands, shrubs and scrub. These new habitats are likely to support an abundance of invertebrate prey providing foraging habitat for bats. There would be an initial reduction of habitat during the construction period, however, there is sufficient suitable habitat (consisting of hedgerows and woodland immediately adjacent to the scheme) that would be available until the newly created habitat matures and becomes available.

7.6.39. The A4019 is currently largely unlit, and despite new lighting following ILP guidance GN08 Bats and Artificial Lighting[140], lighting a previously unlit road that bats may currently cross freely, may affect the long-term behaviour of bats in the area. This may result in alterations to the bats' commuting routes which may expose them to new risks.

7.6.40. The creation of the new Link Road may result in 73 known bat roosts becoming fragmented between the new Link Road and the M5. This includes two known Natterer's maternity roosts. This could lead to the long-term loss of a maternity roost site, and could affect the population of Natterer's bats.

7.6.41. The impacts from the Scheme on bat foraging and commuting habitat may result in barriers to movement, mortality through road traffic collisions, or an alteration to commuting routes, which may expose bats to different risks that would normally be avoided.

7.6.42. The fragmentation and severance of these roosts could lead to long-term bat losses (from potential collisions of bats with traffic, or the abandonment of the roost due to unsafe access route(s) to other key roosts / foraging sites). This could affect the population of Natterer's bats and whiskered bat roosts which are regionally important, as well as other bat species.

7.6.43. The embedded mitigation measures include a clear span bridge over the River Chelt, thereby ensuring continued movement along this feature by bats. In addition, the embedded mitigation includes for the creation of strong linear planting features such as hedgerows, hedgerows with trees and woodland, with the intention of providing a network of habitat features to ensure bats can move around the landscape.

[140] Bat Conservation Trust (2018). Guidance Note: Bats and Artificial Lighting in the UK.

7.6.44. Taking into consideration the embedded mitigation measures, and in the absence of essential mitigation, and taking a precautionary approach given that surveys are ongoing, the Scheme could result in major adverse impacts to bats during the construction phase and operational phase.

Impacts to Dormouse

7.6.45. Based on the results, it is assumed that dormice are only present to the north of the A4019, to the east of the M5. The habitats in this area comprise mostly improved grassland and arable habitat, however hedgerows are present which will be impacted by the Scheme and which provide connectivity between different areas to the north of the A4019.

7.6.46. The Scheme will involve the removal of vegetation that is assumed to support dormice. There are areas of suitable habitat surrounding the Scheme and links to the wider landscape that are considered likely to support any dormice from within the Scheme area that will be displaced temporarily until new hedgerow planting becomes established.

7.6.47. The Scheme could temporarily increase habitat fragmentation and severance to the north of the A4019 and the east of the M5, until new hedgerow planting becomes established.

7.6.48. Vegetation clearance and Scheme construction could result in incidental mortality, injury or disturbance (noise, lighting and visual) to individuals and damage or destruction of nests (e.g. resting or breeding sites) during construction.

7.6.49. Hedgerow planting to the north of the A4019 will replace any habitat lost in this area with better quality habitat, comprising native species-rich hedgerow and trees. The new planting will strengthen the linear vegetation features within the Scheme and improve connectivity to the wider landscape.

7.6.50. Taking into consideration the embedded mitigation measures, and in the absence of essential mitigation, the Scheme would result in negligible adverse impacts to populations of dormice during construction. During operation, there will be no change to dormouse populations.

Impacts to Otter

7.6.51. The Scheme will not result in the removal of suitable otter aquatic and terrestrial habitats (including identified resting site features, which monitoring surveys identified to be of low value). The proposed works at M5 Junction 10 and along the A4019 are largely confined to existing hardstanding and road verge and adjacent habitats which are not considered to be suitable to support otter.

7.6.52. However, there is the potential for the Scheme to result in disturbance to commuting, foraging and resting otters during the construction and operational phases, particularly where works are located directly adjacent to suitable otter habitat (River Chelt, Leigh Brook and MW4). In addition, there is the possibility of degradation impacts to these habitats during the construction and operational phases i.e. via pollution events, although this would be avoided as far as possible taking into consideration the embedded mitigation measures.

7.6.53. The proposed new road will comprise a clear span structure over the River Chelt, and therefore the River Chelt channel and banks will be retained beneath. The installation of otter ledges within the new bridge structure and associated landscape planting, and an otter underpass within 50 m to the south of the River Chelt, will minimise injury/mortality to otters as a result of collision with vehicles. An otter ledge will be retrofitted to the existing River Chelt culvert beneath the M5 to improve this crossing feature for otters. Two culverts which span the M5 (Leigh Brook culvert and Piffs Elm culvert) are considered unlikely to be used by commuting otters due to a lack of suitable habitat on both sides of the M5. Therefore, the proposed modifications to these structures are not anticipated to result in operational impacts to otter.

7.6.54. Taking into consideration the embedded mitigation measures, and in the absence of essential mitigation, there would be negligible adverse impacts to otters during

construction as a result of temporary disturbance. No change is anticipated during operation.

Impacts to Other Priority Mammal Species

7.6.55. The Scheme will result in temporary removal of vegetation that supports hedgehog, brown hare, polecat and harvest mouse. Although vegetation clearance will be kept to a minimum and will be compensated for with mitigation planting, there will be a short-term loss in habitat availability during the construction phase of the Scheme. There are large areas of suitable habitat surrounding the Scheme and links to the wider landscape that are likely to support priority mammal species that are displaced temporarily until newly planted habitats become established.

7.6.56. Habitat creation including grassland, scrub, hedgerow and woodland planting will result in a permanent long-term increase in the total area of suitable habitat available for priority mammal species.

7.6.57. The Scheme could result in populations becoming fragmented, and collision with vehicles, but these impacts will be minimised through the installation of wildlife crossing features as part of the embedded design.

7.6.58. Taking into account the embedded mitigation measures, the Scheme would result in negligible adverse impacts to priority mammal species during construction and no change to priority mammal species during operation.

Impacts to Breeding Birds

7.6.59. The Scheme will result in temporary loss of foraging and nesting habitat for breeding birds. Although vegetation clearance will be kept to a minimum and will be compensated for with mitigation planting, there will be a short-term loss in habitat availability as newly created habitats become established.

7.6.60. Once established, habitat creation including hedgerow and woodland planting and species-rich grassland creation will result in a permanent long-term increase in the total area of suitable foraging and nesting habitat available to birds.

7.6.61. Construction activities in the vicinity of known Schedule 1 bird sites (surveys have indicated the presence of barn owl and kingfisher) could result in disturbance impacts which could prevent these bird species from using their entire territory.

7.6.62. There is the potential for noise and visual disturbance to breeding birds during the operational phase of the Scheme, which may deter birds from foraging or nesting close to the Scheme. However, given that the M5 motorway and the A4019 already exist, birds are already habituated to a degree of noise and visual disturbance, and it is not considered that the Scheme would appreciably add to this during the operational phase.

7.6.63. Taking into account the embedded mitigation measures, there will be a negligible adverse impact to breeding birds during construction. During operation, there will be no change to the breeding bird population.

Impacts to Wintering Birds

7.6.64. The Scheme will result in temporary loss of foraging habitat for wintering birds. Although vegetation clearance will be kept to a minimum and will be compensated for with mitigation planting, there will be a short-term loss in habitat availability as newly created habitats become established. Once established, habitat creation including hedgerow and woodland planting and species-rich grassland creation will result in a permanent long-term increase in the total area of suitable foraging habitat available to birds.

7.6.65. Construction activities could result in disturbance impacts which could prevent birds from using certain areas of habitat.

7.6.66. There is the potential for noise and visual disturbance to birds during the operational phase of the Scheme, which may deter birds from foraging close to the Scheme. However, given

that the M5 motorway and the A4019 already exist, birds are already habituated to a degree of noise and visual disturbance, and it is not considered that the Scheme would appreciably add to this during the operational phase.

7.6.67. Taking into account the embedded mitigation measures, there will be a negligible adverse impact to wintering birds during construction. During operation, there will be no change to wintering bird populations.

Impacts to Reptiles

7.6.68. The Scheme will result in temporary removal of vegetation suitable for common reptile species. Although vegetation clearance will be kept to a minimum and will be compensated for with mitigation planting, there will be a short-term loss in habitat availability during the construction phase of the Scheme. There are large areas of suitable habitat surrounding the Scheme and links to the wider landscape that are likely to support any reptiles that are displaced temporarily until newly planted habitats become established. There is also there is the potential to incidentally kill or injure reptiles during construction.

7.6.69. Habitat creation including grassland, scrub, hedgerow and woodland planting will result in a permanent long-term increase in the total area of suitable reptile habitat available. The new planting will strengthen the linear vegetation features within the Scheme and improve connectivity to the wider landscape.

7.6.70. The Scheme could result in populations becoming fragmented, and collision with vehicles, but these impacts will be minimised through the installation of wildlife crossing features as part of the embedded design.

7.6.71. Taking into account the embedded mitigation measures, and in the absence of essential mitigation, the Scheme would result in negligible adverse impacts to populations of common species of reptile during construction and no change during operation.

Impacts to Great Crested Newt

7.6.72. None of the waterbodies supporting great crested newts will be lost or directly impacted by the construction works or the operation of the Scheme and the embedded mitigation measures would reduce as far as possible the potential for any indirect impacts as a result of a pollution event.

7.6.73. Impacts to the metapopulation located approximately 470 m north from the Scheme will be minimal, with only a small amount of grassland habitat located over 450 m from the nearest waterbody temporarily lost. Due to the distance of the nearest waterbody from the proposed works area, and taking into account the limited connectivity and availability of more suitable habitat in closer proximity to the waterbody, it is considered unlikely that great crested newts associated with this metapopulation would be present within the Scheme in anything other than small numbers.

7.6.74. For the metapopulation that is immediately adjacent to the Scheme, to the south of the A4019, the Scheme is likely to result in the loss of terrestrial habitat used as foraging and commuting habitat by this population. Although the majority of habitats to be impacted within 500 m of this metapopulation are sub-optimal for great crested newts (comprising species-poor semi-improved grassland, arable habitat and improved grassland) there will be temporary and permanent loss of small areas of more suitable habitat, including hedgerows, and works will be required adjacent to the waterbodies.

7.6.75. Habitat creation, including species-rich grassland, hedgerow and woodland planting, will result in a permanent long-term increase in the total area of suitable great crested newt terrestrial habitat available.

7.6.76. There is also there is the potential to incidentally kill or injure great crested newts during construction.

7.6.77. The Scheme could result in populations becoming fragmented, and collision with vehicles, but these impacts will be minimised through the installation of wildlife crossing features as part of the embedded design.

7.6.78. Taking into account the embedded mitigation measures, and in the absence of essential mitigation, the Scheme would result in moderate adverse impacts to great crested newt during construction and no change to great crested newt populations during operation.

Impacts to Common Toad

7.6.79. The Scheme will result in temporary removal of vegetation that supports common toad. Although vegetation clearance will be kept to a minimum and will be compensated for with mitigation planting, there will be a short-term loss in habitat availability during the construction phase of the Scheme. There are large areas of suitable habitat surrounding the Scheme and links to the wider landscape that are likely to support individual common toads that are displaced temporarily until newly planted habitats become established.

7.6.80. Habitat creation including grassland, scrub, hedgerow and woodland planting will result in a permanent long-term increase in the total area of suitable terrestrial habitat available for common toad.

7.6.81. The Scheme could result in populations becoming fragmented, and collision with vehicles, but this will be minimised through the installation of wildlife crossing features as part of the embedded design.

7.6.82. Taking into account the embedded mitigation measures, the Scheme would result in negligible adverse impacts to common toads during construction and no change to common toad during operation.

Impacts to Aquatic Habitats and Species

Construction Impacts

7.6.83. Risk to aquatic habitats and species may arise from in-channel works that include bed and bank alterations, new crossing structures, changes in water quantity or quality as a result of construction drainage, general construction disturbance (e.g. noise, vibration and light disturbance) and riparian habitat and vegetation loss.

7.6.84. Construction activities, such as excavation and material movements to accommodate new watercourse crossings, in addition to the spillage of fuels or other contaminating liquids may also impact the watercourses and ponds within the combined study area. However, as outlined within the embedded mitigation, it is assumed that best practice pollution prevention measures and silt management/control measures will be implemented throughout the construction period.

7.6.85. As such, impacts arising from pollution and siltation of aquatic habitats as a result of construction activities are considered to be appropriately mitigated for to avoid or prevent adverse effects on aquatic resources (albeit this will need to be re-assessed during the ES following confirmation of embedded mitigation measures and construction details). Subsequently, no further assessment of these impacts have been undertaken at this stage.

Watercourses

7.6.86. Construction impacts to watercourses and associated species as understood at this preliminary stage are detailed in Table 7-10. The watercourses listed are shown on Figure 7.12A in Technical Appendix 7.12.

Table 7-10 - Watercourse construction impact pathways

Watercourse Name	Construction Impact Pathway	Level of impact (in the absence of essential mitigation)
River Chelt	A new 25 m long, 17 m wide and 2.8 m high clear span crossing over the River Chelt will result in permanent localised channel shading and loss of riparian habitat associated with earthworks for the construction of the bridge. Shading is likely to directly impact in-channel and riparian vegetation structure under the bridge, as well as potentially have minor adverse impacts on other species such as aquatic invertebrates and fish though reducing habitat quality and/or acting as a deterrent to fish passage. Abutments will be set back from the channel on both sides by approximately 4 m removing the requirement for any in-channel piers. At this stage, no in channel works are expected, however this will need to be reviewed within the ES following further design details. Additional temporary de-vegetation of the riparian zone is likely to be required to facilitate construction of the structure. Construction activities such as excavation, plant/material movements and piling to accommodate the new watercourse crossing may result in disturbance to aquatic species. Works to Drain 21, that is hydrologically connected to the River Chelt, may result in minor riparian habitat loss, whilst siltation and pollution will be managed through embedded mitigation. No change to the existing M5 River Chelt Culvert is expected.	Minor adverse
Leigh Brook	The Barn Farm Culvert under the M5 is to be extended by 10 m either side of its existing alignment, resulting in permanent open water and in-channel/riparian habitat loss. Construction activities such as excavation and plant/material movements to accommodate the culvert extension and compensatory flood storage works, may result in temporary disturbance to aquatic species. However, species most likely to be sensitive to construction disturbance (namely noise, vibration and light disturbance) are fish. The section of the Leigh Brook within and immediately adjacent to the redline boundary where the works will take place is not considered to have a significant fish population since the channel was observed to have very shallow water and be dry in sections. The ephemeral nature of the channel is likely to limit the presence of key sensitive species, such as migratory eel, salmonids and brook/river lamprey. Some minor species such as stickleback may be present but impacts from disturbance are not expected to affect these populations within the local area.	Minor adverse
MW3	Minor temporary loss of riparian vegetation may be required to facilitate construction of an attenuation basin and associated drainage outfall. No direct realignments or crossing structures are anticipated. Despite the potential for minor temporary habitat loss associated with construction works, the Scheme is not expected to result in any effect on the integrity or key characteristics of this resource within the combined study area.	Negligible

Watercourse Name	Construction Impact Pathway	Level of impact (in the absence of essential mitigation)
	Moreover, it will not result in any measurable impact on the aquatic ecological function of the watercourse in the long term.	
Drain 8	Required earthworks will result in the need for localised realignment of sections of this drain which is incorporated into the drainage strategy for the Scheme. Despite the temporary habitat loss associated with the realignment works, the Scheme is not expected to result in any effect on the integrity or key characteristics of this resource within the combined study area. Moreover, it will not result in any measurable impact on the aquatic ecological function of the watercourse in the long term.	Negligible
Drain 9	Required earthworks will result in the need for localised realignment of sections of this drain and the potential inclusion of a new pipe culvert as part of the drainage strategy. Despite the minor permanent habitat loss associated with a new culvert and temporary habitat loss associated with realignment works, the Scheme is not expected to result in any effect on the integrity or key characteristics of this resource within the combined study area. Nonetheless, minor permanent loss of habitat associated with a new culvert will result in a minor adverse effect in the long term.	Minor adverse
Drain 10	This watercourse is within the footprint of the Scheme and interacts with both widening of the M5 and A4019. Required earthworks will result in the need for localised realignment of sections of this drain which is incorporated into the drainage strategy for the Scheme. Additionally, approximately two new pipe culverts are required within the realigned channel to account for the Link Road and access track crossings. Despite the addition of two new culverts and the temporary habitat loss associated with realignment works, the Scheme is not expected to result in any effect on the integrity or key characteristics of this resource within the combined study area. Nonetheless, minor permanent loss of habitat associated with new culverts will result in a minor adverse effect in the long term.	Minor adverse
Drain 11	Required earthworks will result in the need for localised realignment of sections of this drain. Despite the temporary habitat loss associated with realignment works, the realignment which is incorporated into the drainage strategy for the Scheme is not expected to result in any effect on the integrity or key characteristics of this resource within the combined study area. Moreover, it will not result in any measurable impact on the aquatic ecological function of the watercourse in the long term.	Negligible
Drain 12	A 200 m viaduct (carrying the road above the floodplain), which also crosses the River Chelt, will span this drain. Underneath the viaduct, there will be a series of flood culverts. Drain 12 will be crossed by a box culvert 2 m high, 6 m wide and 34 m long, which will result in permanent open channel and riparian habitat loss. The culvert invert will be set 300 mm below bed level and set perpendicular to the road. Construction activities such as excavation, plant/material movements and piling to accommodate the new watercourse crossing may result in temporary disturbance to aquatic	Minor adverse

Watercourse Name	Construction Impact Pathway	Level of impact (in the absence of essential mitigation)
	habitats and species. However, the taxon most likely to be at risk from construction disturbance (namely noise, vibration and light disturbance) is fish. Drain 12 is not considered to have a significant fish population since the channel was observed to be dry. The ephemeral nature of the channel is likely to limit the presence of fish including key sensitive species, such as migratory eel, salmonids and brook/river lamprey. As such, disturbance impacts are considered to be negligible.	
Drain 14	At this stage, impacts to Drain 14 are uncertain. There is a potential requirement for a culvert extension under the B4634 resulting in minor permanent loss of open channel habitat, as well as a minor loss of riparian vegetation associated with the realignment of Drain 16 and tie into the proposed drainage strategy. Despite the potential for permanent loss of open channel, it is not anticipated that the extent of impact will affect the integrity or key characteristics of the resource. As such, on a precautionary basis, there is potential for a minor adverse effect. Construction activities such as excavation, plant/material movements and piling to accommodate the culvert extension may result in temporary disturbance to aquatic habitats and species. However, the taxon most likely to be at risk from construction disturbance (namely noise, vibration and light disturbance) is fish. Drain 14 is not considered to have a significant fish population since the channel was observed to be dry. The ephemeral nature of the channel is likely to limit the presence of fish including key sensitive species, such as migratory eel, salmonids and brook/river lamprey. As such, disturbance impacts are considered to be negligible.	Minor adverse
Drain 15	Required earthworks are expected to result in the extension of the existing culvert under the B4634 by approximately 10 m resulting in permanent loss of open channel habitat. Construction activities such as excavation, plant/material movements and piling to accommodate the new watercourse crossing may result in temporary disturbance to aquatic habitats and species. However, the taxon most likely to be at risk from construction disturbance (namely noise, vibration and light disturbance) is fish. Drain 15 is not considered to have a significant fish population since the channel was observed to be dry. The ephemeral nature of the channel is likely to limit the presence of fish including key sensitive species, such as migratory eel, salmonids and brook/river lamprey. As such, disturbance impacts are considered to be negligible.	Minor adverse
Drain 16	Required earthworks will result in the need for localised realignment of sections of this drain and the potential inclusion of a new pipe culvert under the junction for the link road and B4634 which is incorporated into the drainage strategy for the Scheme. Despite the addition of a new culvert and the temporary habitat loss associated with realignment works, the Scheme is not expected to result in any effect on the integrity or key characteristics of this resource within the combined study area. Nonetheless, minor permanent loss of habitat	Minor adverse

Watercourse Name	Construction Impact Pathway	Level of impact (in the absence of essential mitigation)
	associated with the new culvert will result in a minor adverse effect in the long term.	
Drain 20	Required earthworks may result in minor encroachment on this watercourse resulting in the loss of approximately 10 m of open channel and associated riparian habitat/vegetation. This habitat loss is not expected to result in any effect on the integrity or key characteristics of this resource within the combined study area. Nonetheless, minor permanent loss of habitat will result in a minor adverse effect in the long term.	Minor adverse
Drain 21	This watercourse is expected to be regraded for continuity of flow and receive a discharge from an attenuation basin. During construction, this will result in temporary habitat loss due to vegetation clearance; however, in the long term this regrading could be beneficial for the maintenance of flows and improved channel form. At this stage, construction effects have been assessed as no change on the overall condition. Review of potential for enhancement should be undertaken during the ES.	No change
Drain 22	The Scheme will result in the extension of Piffs Elm Culvert by approximately 90 m, resulting in a loss of open channel habitat. Drain 22 is an isolated ditch, thought to be taking drainage from the existing M5. As such, it is likely to be heavily modified and provide limited habitat for aquatic species. Nonetheless, the loss of open channel is considered to have a permanent adverse effect on the resource.	Major adverse

Standing waterbodies

7.6.87. No ponds are located under the footprint of the Scheme or within the redline boundary. Taking into account the embedded mitigation, no construction impacts to standing water bodies (ponds) have been identified.

Operational impacts

7.6.88. Potential operational impacts on aquatic resources are likely to arise from the operation of the Scheme drainage, resulting in water quality and quantity impacts, if appropriate attenuation and treatment of road run-off is not in place.

7.6.89. Embedded mitigation has been incorporated into the drainage strategy to allow for management of volumes and quality of any surface water run-off. The drainage strategy consists of six attenuation basins along the M5, A4019 and the Link Road.

7.6.90. At this stage, potential for adverse effects on water quality associated with the operation of the drainage strategy cannot be ruled out for some catchments (principally the Leigh Brook catchment).

7.6.91. At this stage of the assessment, only the with Scheme routine runoff assessment within the Highways England Risk Assessment Tool (HEWRAT) has been completed to determine the impacts to surface water quality. The routine runoff test which has been conducted to date suggests the drainage strategy may not be providing enough mitigation to compensate for the impacts to the Leigh Brook. Further testing is required to get a better understanding of these impacts. This will include a full sweep of the HEWRAT tool to include the baseline scenario, spillage assessments and metal bioavailability modelling to

determine appropriate Environmental Quality Standards for the watercourse based on toxicity. Following this, if the tests still fail, additional mitigation is likely to be required.

Watercourses

7.6.92. Operational impacts to watercourses and associated species as understood at this preliminary stage are detailed in Table 7-11.

Table 7-11 - Watercourse operational impact pathways

Watercourse Name	Operational Impact Pathway	Level of impact (pre-mitigation)
River Chelt	Minor changes to out of bank flood flow behaviour and interchange of water between the River Chelt and the Leigh Brook during flood events may result from works to the A4019 and creation of the flood compensation area. However, this is expected to have a negligible effect on channel flow velocities that are important for the maintenance of in-channel habitat structure and stream ecology. The River Chelt is the receiving watercourse from the A4019 main line at Elms park drainage catchment and the S1 drainage catchment. Changes in water quality associated with the Scheme drainage design are not anticipated to occur given the HEWRAT routine runoff assessment passes for all surface water tests. Further assessment will be required during the ES to confirm water quality impacts. No changes in water quantity are anticipated, beyond those outlined above during flood events, as the drainage design is assumed to incorporate suitable attenuation to greenfield runoff rates.	Negligible
Leigh Brook	Minor changes to out of bank flood flow behaviour and interchange of water between the River Chelt and the Leigh Brook during flood events may result from works to the A4019 and creation of the flood compensation area. However, this is expected to have a negligible effect on channel flow velocities that are important for the maintenance of in-channel habitat structure and stream ecology. Leigh Brook is also expected to have a new drainage outfall from an adjacent attenuation basin within the S2 drainage catchment which may result in permanent changes in water quality in the absence of mitigation. Further assessment will be required during the ES to confirm water quality impacts. No changes in water quantity are anticipated as the drainage design incorporates suitable attenuation to greenfield runoff rates.	Minor adverse
MW3	MW3 sits within the S1 drainage catchment. Changes in water quality associated with the Scheme drainage design are not anticipated to occur given the HEWRAT routine runoff assessment passes for all surface water tests. Further assessment will be required during the ES to confirm water quality impacts. No changes in water quantity are anticipated, as the drainage design is assumed to incorporate suitable attenuation to greenfield runoff rates.	No change
Drain 8	Drain 8 sits within the J1 drainage catchment. Changes in water quality associated with the Scheme drainage design are not anticipated to occur given the HEWRAT routine runoff assessment passes for all surface water tests. Further assessment will be required during the ES to confirm water quality impacts. No changes in water quantity are anticipated	No change

Watercourse Name	Operational Impact Pathway	Level of impact (pre-mitigation)
	as the drainage design is assumed to incorporate suitable attenuation to greenfield runoff rates.	
Drain 9	No operational effects identified.	No change
Drain 10	Drain 10 sits within the combined pond drainage catchment. The drainage design may result in permanent changes in water quality within this feature in the absence of mitigation. Further assessment will be required during the ES to confirm water quality impacts. No changes in water quantity are anticipated as the drainage design is assumed to incorporate suitable attenuation to greenfield runoff rates.	Minor adverse
Drain 11	Drain 11 is expected to have a new drainage outfall from an adjacent attenuation basin and sits within the combined pond drainage catchment. The drainage design may result in permanent changes in water quality within this feature in the absence of mitigation. Further assessment will be required during the ES to confirm water quality impacts. No changes in water quantity are anticipated, as the drainage design is assumed to incorporate suitable attenuation to greenfield runoff rates.	Minor adverse
Drain 12	No operational effects identified.	No change
Drain 14	No operational effects identified.	No change
Drain 15	Drain 15 is expected to have a new drainage outfall from an adjacent attenuation basin in the Link Road drainage catchment. Changes in water quality associated with the Scheme drainage design are not anticipated to occur given the HEWRAT routine runoff assessment passes for all surface water tests. Further assessment will be required during the ES to confirm water quality impacts. No changes in water quantity are anticipated as the drainage design is assumed to incorporate suitable attenuation to greenfield runoff rates.	No change
Drain 16	No operational effects identified.	No change
Drain 20	No operational effects identified.	No change
Drain 21	Drain 21 is expected to have a new drainage outfall from an adjacent attenuation basin (receiving drainage from the A4019 main line at Elms park drainage catchment). Changes in water quality associated with the Scheme drainage design are not anticipated to occur given the HEWRAT routine runoff assessment passes for all surface water tests. Further assessment will be required during the ES to confirm water quality impacts. No changes in water quantity are anticipated as the drainage design is assumed to incorporate suitable attenuation to greenfield runoff rates.	No change
Drain 22	No operational effects identified.	No change

Standing waterbodies

7.6.93. No ponds are located under the footprint of the Scheme or within the redline boundary. Moreover, no existing ponds are incorporated into the drainage strategy and as such are not expected to experience any changes in water quality or quantity. Taking into account the embedded mitigation, no operational impacts to standing water bodies (ponds) have been identified.

7.7. Potential mitigation measures

7.7.1. In addition to the embedded measures set out in the previous section, there are additional, essential mitigation measures[141] which could be implemented to mitigate or offset potential impacts for specific biodiversity resources. These measures are described for the relevant resources in the subsections below, along with measures to ensure legal compliance with regard to badger and Himalayan balsam. In addition, potential enhancement measures are also discussed.

7.7.2. As with the rest of this assessment, these measures are based on incomplete information regarding the distribution and abundance of biodiversity resources within the study area. Refinement of these mitigation measures will be required once further survey information becomes available and when the design has been further developed.

7.7.3. The essential mitigation measures, once further refined and developed, will be secured via a CEMP.

Designated Sites

7.7.4. To mitigate the potential for disturbance to migratory fish species using functionally linked habitat within the River Chelt, the following measures will be put in place overseen by a suitably qualified and experienced ECoW:

- Soft start procedures will be implemented, to gradually increase the sound/vibration intensity over a period of time. The aim is to deter river lamprey and European eels before the full volume/vibration intensity is reached, so that noise exposure is reduced. Soft start up methods will be employed on plant being used for the in-channel works / works adjacent to watercourses identified as suitable for fish at the start of each working day, to ensure sudden disturbance to fish and other wildlife is minimised as far as practically possible. Piling activities adjacent to watercourses suitable for fish are limited to a relatively small geographical area at the proposed River Chelt Bridge.
- Start up and run down of plant will be undertaken at least 20 m from the watercourse where practicable. At this stage, there is not expected to be a need to pump water from any temporary dammed area, further minimising noise from the works area. If in-channel works were to be required, these will minimise noise as far as possible and ensure maintenance of flow within channel to facilitate ongoing fish movement/passage. Furthermore, appropriate screening of any pumping equipment during dewatering activities would be required (2 mm screens) to avoid any potential entrainment of fish during the works.
- It should also be stated that as mobile species (albeit confined to the watercourses), any fish subject to disturbance have the ability to temporarily move away from the source. This may temporarily and locally displace fish from feeding and shelter resources within the project site but is unlikely to cause any reduced fitness or individual mortality that could result in a long term or population level effect.
- Wherever possible, works will be timed outside the key ecologically sensitive periods for river lamprey and European eel. For European eel, this is the migratory period (upstream migration February to July, downstream migration October to November[142]); for river lamprey, this is considered to be the spawning period given that the field survey recorded ammocoetes, indicating that a spawning ground is present close to the Scheme. The key period is considered to be winter

[141]Measures required to reduce and if possible offset likely significant adverse environmental effects, in support of the reported significance of effects in the environmental assessment.
[142] https://www.fishsec.org/2020/05/15/eel-migration-report-provides-insights-but-also-highlights-data-gaps/

and spring, with animals migrating upstream to spawning grounds during these seasons, with mating taking place in March and April[143].

- No night-time (taken to be between 30 minutes prior to sunset until 30 minutes following sunrise) vibration work will occur during migratory periods. If night working is essential, minimal and directional lighting should be used
- Ecologically sensitive design of structures such as culverts will be incorporated into the Scheme, to main connectivity, continuity of flow, and natural substrate establishment.

Terrestrial Habitats

7.7.5. The flood compensation area between the M5 carriageway and the Link Road has the potential to be enhanced to gain environmental benefits. Feasibility assessments are currently under way to understand if there is a possibility to create a wetland as part of the flood compensation area. Possibility for the inclusion of permanent or ephemeral standing water and riparian planting is being investigated. At this stage, it is not currently known if this opportunity will be technically feasible in terms of groundwater flow and level. In any case, it is anticipated that this area will be used for additional habitat creation, and the design will take into account the SNAs.

Bats

Mitigation for Roosting Bats

7.7.6. Alternative roosts sites are likely to be necessary to replace any building or tree roosts lost or isolated as a result of the Scheme. This is likely to be a condition of the EPS licence that would be required to legally destroy the roosts. Any destruction of bat roosts must be undertaken in accordance with the timing and methods specified by the EPS licence for those activities and must be overseen by a suitably qualified and experienced ECoW.

7.7.7. Twenty four bat roosts will be directly lost as a result of the Scheme. These roosts are within 13 structures and one tree. A bat mitigation building[144] will be constructed, which will be situated within the flood compensation area, where the vegetation bordering the field will be retained or enhanced. The habitat in this area will be managed so that it provides additional foraging opportunities for bats (rather than being residential gardens and arable land as it currently is). Although the design of the area is not complete, it is anticipated that habitats will comprise wetland areas, wet woodland, scrub and grassland. The proposed location of the bat mitigation building is included in the Environmental Design Figures in Appendix 2.2. In addition, artificial bat boxes are proposed. Sixteen boxes are currently proposed, but the exact number would need to be agreed with Natural England as part of the licence application.

7.7.8. Dark corridors would be maintained around any artificial bat boxes and the bat mitigation building through ensuring that minimal lighting and vegetation screening is used and ensuring that any artificial roosts are not directly illuminated.

7.7.9. Twenty eight additional bat roosts are within 100 m of the Scheme, which may be subject to disturbance. 15 artificial bat boxes are proposed to compensate for this.

7.7.10. The artificial bat boxes would be installed as far as possible from the roads, in order to reduce the risk of road casualties. Bat boxes would include a mixture of Schwegler 2F, 1FF, and 2FN (or similar) bat boxes to provide a range of roosting spaces. Two potential hibernation boxes, including Schwegler 1WQ Summer and Winter Bat Roost and Schwegler 1FW (or similar), will also be installed.

7.7.11. As there is a known transitional barbastelle bat roost to the north west of Junction 10 within the Scheme, it is also recommended that at least two additional tree features are installed

[143] Maitland, P. (2003) Ecology of the River, Brook and Sea Lamprey. Conserving Natura 2000, Ecology Series No.5. English Nature, Peterborough.
[144] It will be necessary to identify who is responsible for maintenance of this structure.

close to this location. Barbastelle typically prefer to roost in naturally damaged and decaying trees, although they can roost in structures. Any tree that is proposed to be felled as a result of the Scheme, that provides some bat roosting opportunities (including the barbastelle tree roost), will be sectionally felled with the bat roosting features retained where possible. This is so that the limb / section, that has the bat roost feature in it, can be strapped on to other trees or carefully positioned on telegraph poles in the northern quadrant of the study area as additional roosting features.

7.7.12. To reduce risk of disturbance to bats, it is proposed to implement buffer zones and sensitive timings (such as undertaking works within 50 m of a known bat roost outside key periods, including the breeding period).

7.7.13. Some structures with identified bat roosts will remain in-situ. On this basis, a dark corridor (with no more than 0.1 lux for at least a 10 m stretch) will be enforced around these structures (using hoods and cowls to avoid light spill onto the structures, if lighting along this stretch of the road is necessary).

7.7.14. The new bridge over the River Chelt could incorporate additional roosting opportunities (mainly for Myotis species including Daubenton's or Natterer's bats) as enhancements. Therefore, it is proposed that at least four integrated bat tubes should be installed within the bridge. These would comprise 1FR Schwegler Bat Tubes (or similar design) and would be located in suitable locations on the eastern and western aspects.

7.7.15. Birds frequently occupy bat boxes, but this can be reduced by the installation of bird boxes in close proximity to bat boxes to reduce competition. Therefore, for each bat box installed, an equivalent number of bird boxes should ideally be installed at the same location, where feasible.

Mitigation for Commuting and Foraging Bats

7.7.16. Due to the increased risk of bat mortality at crossing point locations along the Link Road, bat hop-overs will be created at each of these locations which would consist of tall vegetation planted on either side of a road. The aim is to guide bats across the road at a safe height above traffic and avoid road casualties. There is evidence that bats would cross highways at greater heights in the presence of high canopy cover or roadside embankments. These bat hop-overs will be required at each intersected hedgerow along the Link Road, with the exception of crossing point 3 (where it is still recommended as an enhancement), as bat activity at this location was deemed to be low. The vegetation would need to be maintained at approximately 4 m - 5 m high and be adjoined by additional species-rich hedgerow or woodland planting to facilitate movement. Such features may be required in other locations, following analysis of the 2021 crossing point surveys.

Dormouse

7.7.17. All clearance of dormouse habitat will be carried out using, where appropriate, a combination of a Precautionary Method of Working (PMW) and Natural England EPS mitigation licence for dormice.

7.7.18. Advance habitat creation to provide continued habitat resource and connectivity for dormice, as well as installation of dormouse nest boxes within retained vegetation prior to vegetation clearance to mitigate for temporary habitat loss (and provide a long-term enhancement), are likely to be a requirement of any EPS licence. The exact number and location of the nest boxes will be agreed with Natural England as part of the licence application.

7.7.19. Vegetation clearance will be phased, and will take place in the presence of a licensed ecologist. The methods and timing of vegetation clearance will be set out in the PMW, and in the licence method statement.

7.7.20. Post-construction monitoring of the dormouse population will be undertaken in accordance with the Method Statement that will form part of the licence application, which will be agreed with Natural England.

Badger

7.7.21. Where badger setts are to be disturbed/destroyed, it is likely that measures will need to be taken to displace and translocate the badgers from the affected sett area prior to commencement of construction. Sett monitoring and closure apparatus would need to be installed ahead of sett closure/destruction and suitable apparatus will need to be installed to prevent badgers from returning.

7.7.22. Alternative sett provision is likely to be necessary if construction of the Scheme were to require closure of any active main setts. This is likely to be a condition of the licence that would be required to legally destroy any active badger setts. Badger bait marking surveys and badger sett monitoring are required to inform the extents of badger sett territories and identify suitable locations for alternative setts.

7.7.23. Any closure of badger setts must be undertaken in accordance with the timing (usually between 1 July and 30 November, except in exceptional circumstances) and methods specified by the licence for those activities and must be overseen by a suitably qualified and experienced ECoW.

7.7.24. Given the potential for new setts to be excavated in a short space of time, it is necessary for the Scheme footprint to be re-surveyed for badger setts several weeks prior to commencement of construction.

7.7.25. It may be appropriate to install badger-proof fencing to prevent badgers from reaching the live carriageway.

Otter

7.7.26. It may be appropriate to install otter-proof fencing to prevent otters from reaching the live carriageway. Alternatively, landscape planting could be designed to discourage otters from the live carriageway.

7.7.27. None of the identified resting sites will be permanently lost as a result of the Scheme. However, there is considered to be the potential for disturbance to otter resting sites where these lie within 250 m of the Scheme. Further monitoring surveys will be undertaken prior to the start of works to ascertain the current status of these resting sites. Noise and vibration will be minimised within a 250 m buffer of any active otter resting sites. In addition, night-time working will be avoided where possible within this buffer (no work between sunset and sunrise).

7.7.28. In-channel works will be avoided where possible, and potential otter commuting routes within suitable habitats (River Chelt, Leigh Brook, MW4) including existing underpass structures beneath the M5 will remain open and unblocked to avoid forcing otters to cross over the M5 carriageway instead.

7.7.29. All haul roads, lay down areas and compounds will be located at least 15 m from watercourses used by otter, except where access is required to specific locations for works to bridges/culverts for example.

Breeding & Wintering Birds

7.7.30. In order to avoid destruction of active bird nests, clearance of suitable bird nesting habitat will be undertaken outside of the main bird nesting season (generally March to August inclusive in southern England) as far as possible. Any clearance during this period must be preceded by a nesting bird check and overseen by an ECoW. In the event that active bird nests are found, an appropriate buffer zone must be established around the nest and clearance activities delayed within that zone until the nesting attempt has reached its natural conclusion.

7.7.31. In order to prevent disturbance of nesting Schedule 1 bird species (e.g. barn owl and kingfisher), it may be necessary to restrict construction activities in the vicinity of Schedule 1 bird nests while they are active. Pre-construction breeding surveys would be required

during the relevant breeding seasons to determine the exact location of nesting Schedule 1 species.

7.7.32. Bird boxes will be erected to compensate for the loss of territory suitable for priority hole-nesting species. The precise location would need to be agreed at the next stage of the project, but will include a minimum of ten nest boxes suitable for displaced hole-nesting species and at least one nest box specifically designed for tawny owl (such as that provided by Schwegler or the RSPB) erected in retained woodland at a height of approximately 4 m; and one grey wagtail box , which could be attached to the underside of bridges on the River Chelt. Note, these are in addition to the bird boxes discussed in paragraph 7.7.14.

7.7.33. The loss of breeding habitat for non-hole-nesting species, e.g. dunnock, linnet, reed bunting and song thrush, will be mitigated for in the long term by the landscape planting which includes woodland and native species-rich hedgerows with trees.

7.7.34. In addition, night-time working will be avoided where possible (no work between sunset and sunrise).

7.7.35. Enhancements for hole-nesting species of birds in the form of additional nest boxes will be provided on retained mature trees, ideally situated at least 50 m from the construction footprint, and preferably prior to the commencement of any works. The precise location and number of boxes to be provided would need to be agreed at the next stage of the project, but all boxes will be located on suitable trees between 2 m and 4 m from ground level. The boxes will comprise up to 20 open-fronted and hole nest boxes made of 'woodcrete' and 'woodstone' and suitable for a range of species associated with woodland and residential areas, such as 1SP Schwegler Sparrow Terrace, 3S Schwegler Starling Nest Box, 1B Schwegler Nest Box and Barcelona Open Nest Box for example. Note, these are in addition to the bird boxes discussed in paragraph 7.7.14.

Reptiles

7.7.36. Habitat creation will include the provision of natural refugia / habitat piles within retained and newly created habitat areas. The provision of habitat will be provided in advance of commencement of construction works, during vegetation clearance, to allow reptiles to be displaced into suitable established habitat.

7.7.37. Vegetation clearance will take place under a PMW with guidance from an ECoW, using a two-stage cut to persuade reptiles away from the working area.

Great Crested Newt

7.7.38. All clearance of great crested newt habitat will be carried out using, where appropriate, a combination of a PMW and Natural England EPS Mitigation licence for great crested newt.

7.7.39. Activities within suitable habitat around the ponds to the south of the A4019 will require an EPS licence and compensatory habitat will have to be provided. This habitat will need to be established prior to any translocation and it is likely that herptile fencing would have to be installed to prevent newts from returning to the construction area.

7.7.40. Any translocation/displacement of great crested newts or destruction great crested newt habitat must be undertaken in accordance with the timing and methods specified by the EPS licence for those activities and must be overseen by a suitably qualified and experienced ECoW.

7.7.41. It may be possible to undertake the works under a District Level Licensing Scheme for great crested newts. This scheme can be used by developers, for a fee, and focuses on landscape scale compensation for great crested newts, reducing on-site mitigation and compensation measures to a certain extent. The great crested newt mitigation will be agreed in due course with statutory consultees.

7.7.42. Unwanted logs from vegetation clearance and stones from ground works will be used to create piles close to existing or newly created ponds. Split logs, dead wood, rocks and bricks, loosely filled with topsoil on gentle slope provide a good refuge and hibernaculum

for great crested newts. Careful consideration of placement and design to maximise use and prevent possible flooding, drying out and aesthetic complaints from the public will be necessary.

7.7.43. These mitigation measures will have benefits for other species of amphibian, such as common toad.

Himalayan Balsam

7.7.44. Specific vegetation and soil management measures will be required during construction to prevent the spread of Himalayan balsam and any other INNS present within the Scheme footprint and ensure compliance with the Wildlife and Countryside Act 1981 (as amended).

7.7.45. The seeds of Himalayan balsam can be ejected over 7 m from the parent plant and remain viable for two years. In addition to the requirements of the WCA, soils containing Himalayan balsam seeds are classified as controlled waste by the Environmental Protection Act 1990.

7.7.46. A pre-construction INNS survey will be undertaken to enable mapping and demarcation of all stands of INNS within the Scheme footprint and identification of an appropriate control/eradication strategy. Biosecurity protocols will be followed to prevent the spread of propagules, such as restricting access to the demarcated areas and requiring boots and machinery to be cleaned before leaving these areas.

Aquatic Habitats & Species

7.7.47. The design will need to consider the interaction of the Scheme with watercourses. Whilst some design details are known for the new crossing structure of the River Chelt (clear span crossing), elements of the design are still in development and subject to change at this stage. If any additional new crossings need to be incorporated into the design, as a general standard, single span crossings should be the preferred crossing type rather than culverts, particularly on Main Rivers, as they typically have less effect on watercourse form and ecological function, and may negate the need for in-channel working and de-watering. Bridges have the least impact on the natural fluvial regime and provide greater opportunity for maintaining existing in-stream and bank side habitat structure. Sediment transport and migration of aquatic species (e.g. fish passage) is also less likely to be negatively affected.

7.7.48. Where a clear span structure is not technically feasible or economically viable (e.g. where culverts already exist or on smaller drains), a closed culvert is likely to be required. Key considerations in environmentally sensitive culvert design are:

- Provision of embedded culvert inverts should box or piped culverts be required to allow for formation of a natural watercourse bed (culvert invert to a depth of at least 0.15 m to 0.3 m below existing bed level) and to reduce the potential for significant habitat severance and effects on fish passage;
- Maintenance of the existing channel gradient to avoid erosion at the upstream or downstream end of a culvert;
- Avoidance of reduction of watercourse length through shortening of watercourse planform and minimisation of culvert length through adoption of a perpendicular alignment to the highway and use of wingwalls;
- Minimising impact of the structure on natural flow and sediment process during construction and operation. For instance, an open arch/portal frame structure that avoids disturbing the natural bed of the river is preferred to a box culvert;
- The allowance for the appropriate conveyance of water and sediment for a range of flows (including at low flow conditions). Flow rates and depths during normal and low flows will need to be conducive to wildlife requirements such as fish passage; and
- Capacity may be required for environmental mitigation (e.g. mammal shelves and ensuring natural flow/sediment process).

7.7.49. The following key reference sources when designing river crossings should be consulted:

- Environment Agency (2010). Fluvial Design Guide: Chapter 8 – working in the river channel145;
- CIRIA (2010). Culvert design and operation guide (C689) (in particular, Chapter 4)146;
- Advice on minimising impact on fish passage in the Environment Agency's Fish Pass Manual147; and
- Scottish Environment Protection Agency (SEPA) advice on river crossings and position statement on culverting148.

7.7.50. The interaction of the Scheme with watercourses will also need to consider the requirement for bed and bank reinforcement. Hard engineered bed and bank reinforcement should be avoided, except at locations where it can be demonstrated that it prevents potential loss of life or is necessary to protect critical infrastructure. 'Softer', bioengineered solutions will in many cases afford appropriate erosion protection and be a cheaper/more sustainable design approach.

7.7.51. The role that vegetation can play in promoting channel stability should be investigated and consultation with a landscape engineer/architect should be undertaken at the earliest opportunity.

7.7.52. During construction, percussive (hammer) piling will be avoided in favour of softer alternatives (e.g. silent sheet piling, vibratory sheet piling) where ground conditions allow. Where not possible, soft start piling procedures will be utilised. The soft-start duration will be a period of not less than 20 minutes and should piling cease for a period greater than 20 minutes, the soft start procedure must be repeated.

7.7.53. Construction works adjacent to and over watercourses will avoid ecologically sensitive periods for fish species e.g. migratory/spawning periods, in particular for European eel and river lamprey. Specific sensitive periods for fish species within the River Chelt have been proposed in paragraph 7.7.3, but will be confirmed with the Environment Agency.

7.7.54. To minimise disturbance to fish, all haul roads, lay down areas and compounds will be located at least 15 m from watercourses, except where access is required to specific locations for works to bridges/culverts for example.

7.7.55. Re-instatement/enhancement of riparian vegetation and habitat lost following construction will be considered in all instances that acts to link and improve ecological connectivity within the wider site landscape.

7.7.56. Where watercourses require realignment outside of the footprint of the Scheme ecologically and geomorphologically sensitive design will be applied to improve habitat condition.

7.7.57. It is likely that additional improvement and restoration to in-channel habitats will be required to offset the impacts to the River Chelt associated with in-channel shading form the proposed River Chelt Bridge. Moreover, if any bed/bank reinforcement is required to facilitate the crossing, then additional channel improvements are likely to be required.

145 environment Agency (2010). Fluvial Design Guide: Chapter 8 – working in the river channel. Available at: Microsoft Word - FDG2-Ch8-Final4b.doc (publishing.service.gov.uk) [Accessed September 2021]
146 Available at: https://www.ciria.org/ItemDetail?iProductCode=C689F&Category=FREEPUBS [Accessed September 2021]
147 Environment Agency (2010). Fish Pass Manual. Document – GEHO 0910 BTBP-E-E. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/298053/geho0910btbp-e-e.pdf [Accessed: September 2021].
148 SEPA, 2015. WAT-PS-06-02: Culverting of Watercourses – Position Statement and Supporting Guidance. (Published Nov 2010, second edition) Available at: http://www.sepa.org.uk/media/150919/wat_ps_06_02.pdf [Accessed: September 2019] and SEPA, 2010. Engineering in the water environment: good practice guide - River crossings. (Published Nov 2010, second edition) Available at: http://www.sepa.org.uk/media/151036/wat-sg-25.pdf [Accessed: September 2021].

Enhancements to aquatic habitats

7.7.58. There are potential opportunities for enhancements to aquatic features across the Scheme, which will contribute to any biodiversity net gain targets and may contribute to the SNAs.

7.7.59. Opportunities to enhance and restore sections of the River Chelt may be available within the redline boundary, which will work towards improving watercourse and riparian condition and align with WFD status objectives, e.g. improving in-channel and riparian habitat diversity, bank re-profiling, riparian planting and removal of invasive species (namely Himalayan balsam). The redline boundary has been extended 100 m upstream and downstream of the two River Chelt crossings to allow for enhancements along these sections of channel.

7.7.60. The flood compensation area between the M5 carriageway and the link road has the potential to be enhanced to gain environmental benefits. Feasibility assessments are currently underway to understand if there is a possibility to create a wetland as part of the flood compensation area. Possibility for the inclusion of permanent or ephemeral standing water and riparian planting is being investigated. At this stage, it is not currently known if this opportunity will be technically feasible in terms of groundwater flow and level.

7.8. Residual impacts

7.8.1. Table 7-12 below provides an assessment of the construction and operational impacts and subsequent effects of the Scheme on important biodiversity resources, at this stage. The assessment takes account of all mitigation measures to be included in the Scheme.

Table 7-12 - Summary of impacts and effects from construction and operation of the Scheme

Biodiversity resource	Value	Summary of impacts	Mitigation (including embedded mitigation and essential mitigation)	Residual effect (with mitigation)	Significance category
Severn Estuary SAC/SPA/Ramsar	International	Construction: Impacts to functionally linked habitat within the River Chelt as a result of a pollution event during construction, and consequent detrimental effects to qualifying species. Potential disturbance impacts to migratory fish using functionally linked habitat within the River Chelt during construction.	Works will proceed following standard good practice working methods for environmental protection. These will be secured via a CEMP. Soft start procedures will be implemented. Wherever possible, works will be timed outside the key ecologically sensitive periods for European eel and river lamprey. No night-time vibration work will occur during migratory periods. If night working is essential, minimal and directional lighting should be used. Ecologically sensitive design of structures such as culverts will be incorporated into the Scheme, to maintain connectivity, continuity of flow, and natural substrate establishment. Where possible, all haul roads, lay down areas and compounds will be located at least 15 m from watercourses to minimise disturbance to fish.	No change	Neutral
		Operation:	The drainage strategy to be implemented by the Scheme	No change	Neutral

Biodiversity resource	Value	Summary of impacts	Mitigation (including embedded mitigation and essential mitigation)	Residual effect (with mitigation)	Significance category
		Impacts to functionally linked habitat within the River Chelt as a result of a pollution event during operation, and consequent detrimental effects to qualifying species.	incorporates SuDS to mitigate the pollution risk associated with road runoff as well as accidental spills.		
Other terrestrial habitats	Local	Construction: Temporary and permanent habitat loss and potential for habitat degradation as a result of air and water pollution.	Existing vegetation will be retained as far as possible. Works will proceed following standard good practice working methods for environmental protection. These will be secured via a CEMP followed by the Principal Contractor. Habitat creation will offset the effects of habitat loss and fragmentation.	Minor adverse	Neutral
		Operation: Habitat degradation as a result of air and water pollution.	The drainage strategy to be implemented by the Scheme incorporates SuDS to mitigate the pollution risk associated with road runoff as well as accidental spills.	Minor beneficial	Neutral
Bats	Regional	Construction: Loss and disturbance of roosts Severance of flight lines as a result of the new Link Road, and the junction improvement works Temporary loss of foraging habitat before the habitat creation areas become established	All works that could impact on bats would be carried out under a Natural England EPS mitigation licence for bats. Construction of a bat mitigation building and installation of additional bat roosting features including bat boxes and tree features.	Moderate Adverse (precautionary assessment given that surveys are ongoing)	Moderate (precautionary assessment given that surveys are ongoing)

Biodiversity resource	Value	Summary of impacts	Mitigation (including embedded mitigation and essential mitigation)	Residual effect (with mitigation)	Significance category
			Implementation of buffer zones and sensitive timings of works (such as undertaking works within 50 m of a known bat roost outside key periods, including the breeding period). Construction of a clear span bridge over the River Chelt. Planting to create bat "hop-overs". Creation of replacement habitat, which includes a net increase in broadleaved woodland, hedgerow planting and the creation of species-rich grasslands, shrubs and scrub.		
		Operation: Increased lighting could result in alterations to the bats commuting routes which may expose them to new risks. Fragmentation of 73 known bat roosts as a result of the new Link Road which could lead to long-term bat losses (from potential collisions of bats with traffic, or the abandonment of the roost due to unsafe access route(s) to other key roosts / foraging sites).	Wildlife-friendly lighting to be installed on site. A dark corridor will be enforced around bat roosts and any compensatory bat roosting features. Planting to create bat "hop-overs". Creation of replacement habitat, which includes a net increase in broadleaved woodland, hedgerow planting and the creation of species-rich grasslands, shrubs and scrub. Creation of strong linear planting features such as hedgerows, hedgerows with trees and woodland, with the intention of providing a network of habitat features to ensure bats can move around the landscape	Moderate Adverse (precautionary assessment given that surveys are ongoing)	Moderate (precautionary assessment given that surveys are ongoing)

Biodiversity resource	Value	Summary of impacts	Mitigation (including embedded mitigation and essential mitigation)	Residual effect (with mitigation)	Significance category
Dormouse	County	Construction: Temporary loss of habitat which could support dormouse, including hedgerows. Temporary habitat fragmentation and severance to the north of the A4019 and the east of the M5, until new hedgerow planting becomes established. Incidental mortality, injury or disturbance (noise, lighting and visual) to individuals and damage or destruction of nests (e.g. resting or breeding sites) during construction.	All clearance of dormouse habitat will be carried out using where appropriate a combination of a PMW and Natural England EPS Mitigation licence for dormice. Advance habitat creation to provide continued habitat resource and connectivity for dormice, as well as installation of dormouse nest boxes within in adjacent to retained vegetation prior to vegetation clearance. Hedgerow planting will replace any habitat lost in this area with better quality habitat that will strengthen the linear vegetation features. Phased vegetation clearance undertaken in the presence of a licensed ecologist. Post-construction monitoring of the dormouse population will be undertaken in accordance with the Method Statement that will form part of the licence application, which will be agreed with Natural England.	Negligible adverse (to be confirmed on completion of surveys)	Neutral (to be confirmed on completion of surveys)
		Operation: N/A	NA	No change	Neutral
Otter	Local	Construction: Disturbance to commuting, foraging and resting otter.	Noise and vibration will be minimised within a 250 m buffer of any active otter resting sites.	Negligible adverse	Neutral

Biodiversity resource	Value	Summary of impacts	Mitigation (including embedded mitigation and essential mitigation)	Residual effect (with mitigation)	Significance category
		Degradation of habitats via pollution events.	Night-time working will be avoided where possible within this buffer In-channel works will be avoided where possible, and potential otter commuting routes within suitable habitats (River Chelt, Leigh Brook, MW4) including existing underpass structures beneath the M5 will remain open and unblocked to avoid forcing otters to cross over the M5 carriageway instead. Provision of artificial lighting during the construction phase of the Scheme will be minimised and designed to avoid artificial illumination of watercourses adjacent to the site including the River Chelt, Leigh Brook, and MW4, and adjacent scrub/woodland habitats).		
		Operation: Possibility of injury/mortality to otters as a result from collision with vehicles if the carriageway is accessible from adjacent land.	The proposed new road will comprise a clear span structure over the River Chelt, and therefore the River Chelt channel and banks will be retained beneath. The installation of otter ledges within the new bridge structure and associated landscape planting, and an otter underpass within 50 m to the south of the River Chelt, will avoid	No change	Neutral

Biodiversity resource	Value	Summary of impacts	Mitigation (including embedded mitigation and essential mitigation)	Residual effect (with mitigation)	Significance category
			injury/mortality to otters as a result of collision with vehicles. An otter ledge will be retrofitted to the existing River Chelt culvert beneath the M5 to improve this crossing feature for otters. Install otter proof fencing to prevent otters from reaching the live carriageway or design landscape planting to discourage otters from the live carriageway.		
Other priority mammals	Local	Construction: Temporary removal of vegetation that supports hedgehog, brown hare, polecat and harvest mouse.	Vegetation clearance will be kept to a minimum. Ecological briefings and toolbox talks for all site operatives to make them aware of relevant constraints and requirements prior to commencing work on the Scheme. Covering excavations overnight or incorporating features such as ramps to prevent animals getting trapped. Habitat creation including grassland, scrub, hedgerow and woodland planting will result in a permanent long-term increase in the total area of suitable habitat available for priority mammal species.	Negligible adverse	Neutral
		Operation:	Underpasses are proposed to allow safe movement of mammals	No change	Neutral

Biodiversity resource	Value	Summary of impacts	Mitigation (including embedded mitigation and essential mitigation)	Residual effect (with mitigation)	Significance category
		Fragmentation and collision with vehicles	and prevent populations becoming fragmented.		
Breeding birds	Local	Construction: Short term loss of foraging and nesting habitat for breeding and wintering birds. Construction activities in the vicinity of known Schedule 1 bird sites could result in disturbance impacts which could prevent these bird species from using their entire territory.	Vegetation clearance will be kept to a minimum. Habitat creation including hedgerow and woodland planting and species-rich grassland creation will result in a permanent long-term increase in the total area of suitable foraging and nesting habitat available to birds. Clearance of suitable bird nesting habitat will be undertaken outside of the main bird nesting season (generally March to August inclusive in southern England) as far as possible. Any clearance during this period must be preceded by a nesting bird check and overseen by an ECoW. In the event that active bird nests are found, an appropriate buffer zone must be established around the nest and clearance activities delayed within that zone until the nesting attempt has reached its natural conclusion. Restrict construction activities in the vicinity of Schedule 1 bird nests while they are active. Pre-construction breeding surveys will be required during the relevant breeding seasons to determine the	Negligible adverse	Neutral

Biodiversity resource	Value	Summary of impacts	Mitigation (including embedded mitigation and essential mitigation)	Residual effect (with mitigation)	Significance category
			exact location of nesting Schedule 1 species. Bird boxes will be erected to compensate for the loss of territory suitable for priority hole-nesting species. Night working will be avoided where possible and any lighting required for construction will be designed sensitively to avoid illuminating features used by roosting birds such as hedgerows and woodland/scrub edge. Good working practices will be employed in order to minimise noise impacts during construction and operation.		
		Operation: Noise and visual disturbance which may deter birds from foraging or nesting close to the Scheme.	Installation of additional nest boxes situated at least 50 m from the construction footprint.	No change	Neutral
Wintering birds	Local	Construction: Short term loss of foraging habitat. Construction activities could result in disturbance impacts which could prevent birds from using certain areas of habitat.	Vegetation clearance will be kept to a minimum. Habitat creation including hedgerow and woodland planting and species-rich grassland creation will result in a permanent long-term increase in the total area of suitable foraging habitat available to birds. Night working will be avoided where possible and any lighting	Negligible adverse	Neutral

Biodiversity resource	Value	Summary of impacts	Mitigation (including embedded mitigation and essential mitigation)	Residual effect (with mitigation)	Significance category
			required for construction will be designed sensitively to avoid illuminating features used by roosting birds such as hedgerows and woodland/scrub edge. Good working practices will be employed in order to minimise noise impacts during construction and operation.		
		Operation: Noise and visual disturbance which may deter birds from foraging or nesting close to the Scheme.	N/A	No change	Neutral
Reptiles	Local	Construction Removal of vegetation suitable for common reptile species. Short-term loss in habitat availability during the construction phase of the Scheme. Potential to incidentally kill or injure reptiles during construction.	Habitat creation including grassland, scrub, hedgerow and woodland planting, and provision of natural refugia / habitat piles within retained and newly created habitat areas, will result in a permanent long-term increase in the total area of suitable reptile habitat available. The provision of habitat will be provided in advance of commencement of construction works during vegetation clearance to allow reptiles to be displaced into suitable established habitat. Vegetation clearance will take place under a PMW with guidance from an onsite ecologist, using a	Negligible adverse	Neutral

Biodiversity resource	Value	Summary of impacts	Mitigation (including embedded mitigation and essential mitigation)	Residual effect (with mitigation)	Significance category
			two-stage cut to persuade reptiles away from the working area.		
		Operation: Fragmentation and collision with vehicles	Underpasses are proposed to allow safe movement of reptiles and prevent populations becoming fragmented.	No change	Neutral
Great crested newt	County	Construction: Loss of terrestrial habitat. Potential to incidentally kill or injure great crested newts during construction.	All clearance of great crested newt habitat will be carried out using, where appropriate, a combination of a PMW and Natural England EPS Mitigation licence for great crested newt / district level licensing. Habitat creation including species-rich grassland, hedgerow and woodland planting will result in a permanent long-term increase in the total area of suitable great crested newt terrestrial habitat available. No specific ponds for great crested newts are anticipated to be created. Depending on the option chosen, provision of compensatory habitat and installation of herptile fencing during construction may be required.	Minor adverse	Neutral
		Operation: Fragmentation and collision with vehicles	Underpasses are proposed to allow safe movement of reptiles and prevent populations becoming fragmented.	No change	Neutral

Biodiversity resource	Value	Summary of impacts	Mitigation (including embedded mitigation and essential mitigation)	Residual effect (with mitigation)	Significance category
Common toad	Local	Construction: Temporary removal of vegetation that supports common toad.	Vegetation clearance will be kept to a minimum. Ecological briefings and toolbox talks for all site operatives to make them aware of relevant constraints and requirements prior to commencing work on the Scheme. Covering excavations overnight or incorporating features such as ramps to prevent animals getting trapped. Habitat creation including grassland, scrub, hedgerow and woodland planting will result in a permanent long-term increase in the total area of suitable terrestrial habitat available for common toad.	Negligible adverse	Neutral
		Operation: Fragmentation and collision with vehicles	Underpasses are proposed to allow safe movement of common toads and prevent populations becoming fragmented.	No change	Neutral
River Chelt	County	Construction: Shading of the River Chelt under a proposed new bridge. Temporary de-vegetation of the riparian zone is likely to be required to facilitate construction of the structure. Construction disturbance to aquatic species.	The new River Chelt Bridge to accommodate the Link Road has been designed to be clear span with no permanent interactions with the river bed and banks. The Scheme design has been developed to ensure there is no physical alterations to the existing M5 River Chelt Culvert or the channel bed and banks.	Minor adverse	Slight

Biodiversity resource	Value	Summary of impacts	Mitigation (including embedded mitigation and essential mitigation)	Residual effect (with mitigation)	Significance category
		Minor riparian habitat loss associated with works to Drain 21 (a tributary of the River Chelt)	Best practice pollution prevention measures and silt management/control measures will be implemented throughout the construction period to avoid pollution to watercourses. Construction of the River Chelt bridge will avoid ecologically sensitive periods for fish species e.g., migratory/spawning periods, in particular for European eel. To minimise disturbance to aquatic species, all haul roads, lay down areas and compounds will be located at least 15 m from watercourses, except where access is required to specific locations for works to bridges/culverts for example.		
		Operation: Minor changes to out of bank flood flow.	Re-instatement of riparian vegetation and habitat following construction. Embedded mitigation has been incorporated into the drainage strategy to allow for management of volumes and quality of any surface water run-off. Flows from drainage ponds will be restricted to greenfield runoff rates reducing any impact to flow velocities and volumes from runoff. At this stage, potential for adverse effects on water quality associated with the	Negligible	Neutral

Biodiversity resource	Value	Summary of impacts	Mitigation (including embedded mitigation and essential mitigation)	Residual effect (with mitigation)	Significance category
			operation of the drainage strategy cannot be ruled out for some catchments (principally the Leigh Brook catchment) and associated watercourses. As such, further assessment will be required during the ES to confirm water quality impacts and additional drainage mitigation may be required.		
Leigh Brook	Local	Construction Permanent loss of open channel and riparian habitat resulting from an extension of Barn Farm Culvert 10 m either side of the existing alignment. Temporary disturbance to aquatic species.	Best practice pollution prevention measures and silt management/control measures will be implemented throughout the construction period to avoid pollution to watercourses. Re-instatement of riparian vegetation and habitat following construction. Provision of embedded culvert inverts to allow for formation of a natural watercourse bed (culvert invert to a depth of at least 0.15 m to 0.3 m below existing bed level) and to reduce the potential for significant habitat severance and effects on fish passage. Maintenance of the existing channel gradient to avoid erosion at the upstream or downstream end of a culvert. To minimise disturbance to aquatic species, all haul roads, lay down areas and compounds will be	Minor adverse	Slight

Biodiversity resource	Value	Summary of impacts	Mitigation (including embedded mitigation and essential mitigation)	Residual effect (with mitigation)	Significance category
			located at least 15 m from watercourses, except where access is required to specific locations for works to bridges/culverts for example.		
		Operation Minor changes to out of bank flood flow. Potential permanent changes in water quality in the absence of additional drainage mitigation.	Embedded mitigation has been incorporated into the drainage strategy to allow for management of volumes and quality of any surface water run-off. Flows from drainage ponds will be restricted to greenfield runoff rates reducing any impact to flow velocities and volumes from runoff. At this stage, potential for adverse effects on water quality associated with the operation of the drainage strategy cannot be ruled out for some catchments (principally the Leigh Brook catchment) and associated watercourses. As such, further assessment will be required during the ES to confirm water quality impacts and additional drainage mitigation may be required.	Minor adverse	Slight
Other ordinary watercourses (MW3, Drain 8, Drain 9, 10, 11, 12, 14, 15, 16, 20, 21, 22)	Local	Construction Minor temporary riparian vegetation loss to facilitate construction of an adjacent attenuation basin and associated drainage outfall (MW3,	Best practice pollution prevention measures and silt management/control measures will be implemented throughout the construction period to avoid pollution to watercourses. Ecologically and geomorphologically sensitive	Major adverse (as a result of impacts to Drain 22)	Slight

Biodiversity resource	Value	Summary of impacts	Mitigation (including embedded mitigation and essential mitigation)	Residual effect (with mitigation)	Significance category
		Localised realignment resulting in temporary habitat loss during construction (Drains 8, 9, 10, 11, 14, 16) Permanent loss of habitat associated with new culverts/culvert extensions (Drains 9, 10, 12, 14, 15, 16, 20). At Drain 22 this is approximately 90 m of open channel habitat of limited value for aquatic species. Temporary disturbance (Drains 12, 14, 15) to aquatic species Regrading of watercourse to improve continuity of flow and facilitate drainage (Drain 21)	realignment design to be applied to improve habitat condition. Details to be developed during later project stages. Provision of embedded culvert inverts to allow for formation of a natural watercourse bed (culvert invert to a depth of at least 0.15 m to 0.3 m below existing bed level) and to reduce the potential for significant habitat severance and effects on fish passage. Maintenance of the existing channel gradient to avoid erosion at the upstream or downstream end of a culvert. Minimisation of culvert length through adoption of a perpendicular alignment to the highway and use of wingwalls. To minimise disturbance to aquatic species, all haul roads, lay down areas and compounds will be located at least 15 m from watercourses, except where access is required to specific locations for works to bridges/culverts for example.		
		Operation MW3, Drains 8, 15 and 21 are incorporated into the drainage strategy, as such further	Re-instatement of riparian vegetation and habitat following construction.	Minor adverse	Neutral

Biodiversity resource	Value	Summary of impacts	Mitigation (including embedded mitigation and essential mitigation)	Residual effect (with mitigation)	Significance category
		assessment will be required during the ES to confirm no water quality impacts. Potential permanent changes in water quality in the absence of additional drainage mitigation (Drains 10, 11)	Embedded mitigation has been incorporated into the drainage strategy to allow for management of volumes and quality of any surface water run-off. Flows from drainage ponds will be restricted to greenfield runoff rates reducing any impact to flow velocities and volumes from runoff. At this stage, potential for adverse effects on water quality associated with the operation of the drainage strategy cannot be ruled out for some catchments (principally the Leigh Brook catchment) and associated watercourses. As such, further assessment will be required during the ES to confirm water quality impacts and additional drainage mitigation may be required.		
Standing waterbodies	Local	Construction No construction impacts identified.	Best practice pollution prevention measures and silt management/control measures will be implemented throughout the construction period to avoid pollution to adjacent standing waterbodies.	No change	Neutral
		Operation No operational impacts identified.	N/A	No change	Neutral

7.8.2. The assessment indicates that, even taking into consideration the embedded and essential mitigation measures proposed for bats, a significant residual effect may remain. In order to compensate for this residual effect, it may be appropriate to provide an additional, strategically located, bat mitigation building closer to the lesser horseshoe bat roosts along the A4019 close to the Gallagher Retail Park. This would compensate for the residual effect associated with loss of roosting potential throughout the landscape. It may also be appropriate to incorporate an underpass beneath the A4019 where the A4019 will be raised up on an embankment to the east of Junction 10. This would compensate for residual fragmentation effects and ensure that the bat mitigation building to be located within the flood compensation area, would function more effectively.

7.8.3. The level of residual effect, and any measures required to compensate for any residual effects will be reviewed following analysis of the 2021 bat survey data, and as the Scheme design progresses. In addition, surveys are ongoing for dormice, meaning that the level of residual impact will need to be reassessed following the outcome of surveys.

7.8.4. As outlined in the table above, taking into account the embedded and essential mitigation measures proposed, significant residual effects in relation to other ecological receptors are not anticipated as a result of the Scheme.

7.9. Cumulative effects

7.9.1. The impacts considered in the above sections consider impacts on biodiversity resources in terms of numerous impacts. It is therefore considered that this assessment inherently considers combined effects from these different sources (intra-scheme effects).

7.9.2. Cumulative effects on biodiversity may occur from interaction with other committed and planned developments in the vicinity of the Scheme. The RFFP in Chapter 15 provides a list of these developments (at the time of the submission of the PEIR). The cumulative effects of the Scheme and these other developments on biodiversity will be addressed as part of the ES process.

7.10. NPS compliance

7.10.1. Paragraphs 5.22 and 5.23 outline the requirement to ‘ensure that the environmental statement clearly sets out any likely significant effects on internationally, nationally and locally designated sites of ecological or geological conservation importance’. Furthermore, the applicant should show the extent to which the project has ‘taken advantage of opportunities to conserve and enhance biodiversity and geological conservation interests’. This report details clearly the potential impacts of the Scheme on biodiversity features, and opportunities for mitigation and enhancement are detailed.

7.10.2. Paragraph 5.27 discusses international sites, stating that these are the most important sites for biodiversity, and are provided statutory protection under the Habitats Regulations. International sites within the study area are considered within this report, as well as separately under a HRA (Technical Appendix 7.13).

7.10.3. Paragraph 5.28 discusses SSSIs as requiring a high degree of protection. Paragraph 5.29 goes on to state that ‘where a proposed development is likely to have an adverse effect on a SSSI, development consent should not normally be granted. Where an adverse effect on the site’s notified special interest features is likely, an exception should be made only where the benefits of the development at this site clearly outweigh both the impacts that it is likely to have on the features of the site that make it of special scientific interest, and any broader impacts on the national network of SSSIs’. This report considers the potential impacts of the Scheme on the Coombe Hill Canal SSSI.

7.10.4. Paragraph 4.23 sets out that any application should be accompanied by sufficient information to enable examining authority to undertake an appropriate assessment under the Habitats Regulations. A separate HRA has been produced (Technical Appendix 7.13).

7.11. Assumptions and limitations

7.11.1. Feature-specific limitations are included in the relevant Technical Appendix reports. General limitations are included here.

7.11.2. GCER do not hold exhaustive records of all the species that occur within a given area. Therefore, the absence of records for a particular species does not demonstrate that the species is absent. Similarly, the Woodland Trust's Ancient Tree inventory is not an exhaustive list and other ancient and veteran trees may be present in an area. These limitations have been factored into the assessment, which does not rely solely on desk study data.

7.11.3. Ecological surveys are limited by factors which affect the presence of plants and animals such as the time of year, migration patterns and behaviour. The ecological surveys undertaken to-date have not therefore produced a complete list of plants and animals and the absence of evidence of any particular species should not be taken as conclusive proof that the species is not present or that it will not be present in the future.

7.11.4. Full access to the study area was not available for the field surveys, due to landowners refusing access. If access can be obtained, these areas will be surveyed to enable a more robust assessment for later stages of the project, but full access is unlikely. In these areas, the assessment has relied on desk study data, survey data from adjacent land parcels where available and professional judgement. Where high levels of uncertainty remain, the precautionary approach has been applied.

7.11.5. A number of surveys are currently incomplete and are continuing to ensure a robust baseline is established. These limitations have been addressed in the assessment undertaken to-date by application of the precautionary principle.

7.11.6. Assuming submission in summer 2022, the survey data from 2019 will be three years old. It is proposed to undertake update extended Phase 1 habitat surveys in targeted areas in order to determine whether any of the baseline conditions have changed significantly, and validate, or otherwise, the results described in this report. The scope of any future surveys will be agreed in due course with statutory consultees. This report will be updated to include these surveys and will be submitted as part of the ES.

7.12. Chapter summary

7.12.1. Ecological baseline data associated with the Scheme has been gathered, and further surveys are ongoing or proposed. Available information from desk study and field surveys has been used to identify and evaluate biodiversity resources to undertake an assessment of potential impacts for the Scheme. In some cases, where the full suite of data has not yet been collected, this assessment is preliminary and precautionary.

7.12.2. The following important biodiversity resources have been identified:

- Wye Valley and the Forest of Dean Bat Sites SAC
- Walmore Common SPA/Ramsar
- Severn Estuary SAC/SPA/Ramsar
- Coombe Hill Canal SSSI
- Non-statutory designated nature conservation sites
- Terrestrial habitats – veteran tree
- Terrestrial habitats - Broadleaved semi-natural woodland
- Terrestrial habitats - traditional orchards
- Other terrestrial habitats including hedgerows
- Bats
- Dormouse

- Otter
- Other priority mammals
- Wintering and breeding birds
- Reptiles
- Great crested newt
- Common toad
- Terrestrial invertebrates
- River Chelt
- Leigh Brook
- Other Ordinary Watercourses
- Standing waterbodies

7.12.3. Badgers and INNS are considered to be of less than local value and as such are not considered to be important biodiversity resources. Although they are not included in the impact assessment, appropriate mitigation is included in this report to ensure legal compliance.

7.12.4. No impacts are anticipated on broadleaved semi-natural woodland, traditional orchards, terrestrial invertebrates, Wye Valley and Forest of Dean Bat Sites SAC, Walmore Common SPA/Ramsar, Coombe Hill Canal SSSI, the non-statutory designated nature conservation sites and veteran tree and they have been scoped out of the assessment. Water voles, white-clawed crayfish and priority plants are considered to be absent and have been scoped out of the assessment.

7.12.5. Numerous potential impacts have been identified and a range of measures have been identified to avoid, mitigate and compensate for the effects of these impacts. These include design specifications and construction management requirements.

7.12.6. Taking into account the embedded and essential mitigation measures proposed, significant residual effects in relation to bats may remain, and measures have been proposed to compensate for such effects. However, it should be noted that this is a preliminary, precautionary assessment, which will be reviewed following analysis of the 2021 bat survey data, and as the Scheme design progresses.

7.12.7. In addition, surveys are ongoing for dormice, meaning that the level of residual impact will need to be reassessed following the outcome of surveys.

7.12.8. Taking into account the embedded and essential mitigation measures proposed, significant residual effects in relation to other biodiversity resources are not anticipated as a result of the Scheme.

7.12.9. Consultation with key stakeholders will be carried out as the Scheme design progresses.

7.12.10. The next steps are as follows, which will be completed between statutory consultation and completion of the ES:

- Further assess the impacts of the Scheme on biodiversity by completing the remaining baseline surveys and refining the mitigation, compensation and enhancement measures proposed as required.
- Continue to develop habitat creation proposals to ensure that they provide biodiversity gain and, where possible, contribute to the SNAs.
- Undertake a biodiversity net gain assessment using the Defra 3.0 metric.
- Develop a bat mitigation strategy to ensure that the mitigation and compensation proposed is effective at the Scheme level, and also joins up with habitat in the wider landscape, taking into account other developments and the SNAs.
- Develop proportionate monitoring as required.

- Develop a landscape and ecology management plan which will set out how the landscape design and ecology mitigation measures will be delivered and managed.

8. Road Drainage and the Water Environment

9. Landscape and Visual

10. Geology and Soils

11. Cultural Heritage

12. Materials and Waste

13. Population and Human Health

14. Climate

15. Cumulative Effects Assessment

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- Appendix 7.3
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Appendix 7.1 – Phase 1 habitat survey

Please contact the project team through the contact details provided in the Document accessibility section at the start of this document.

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1. Introduction

1.1. Terms of Reference

1.1.1. Atkins, member of the SNC-Lavalin group, was commissioned by Gloucestershire County Council (GCC) to undertake a Phase 1 habitat survey to inform the Environmental Statement (ES) for the M5 Junction 10 Improvements Scheme (hereafter referred to as 'the Scheme').

1.1.2. The purpose of the Phase 1 habitat survey was to identify the habitats present within the zone of influence of the Scheme; provide recommendations to enable compliance with legislation and policy; and, where appropriate, identify the need for avoidance, mitigation, compensation, or enhancement measures.

1.1.3. This Technical Appendix summarises the results of the Phase 1 habitat survey, including the methods used, and provides an evaluation of the nature conservation value of habitats within the survey area. This report covers terrestrial habitats only; aquatic habitats are covered in Technical Appendix 7.12 Aquatic Ecology.

1.1.4. This report provides factual information to support the ES, which will accompany the planning application for the Scheme.

1.2. Legislation and Policy

1.2.1. Selected habitats are legally protected in England via the designation of the following types of statutory nature conservation site:

- Special Areas of Conservation (SACs) – these sites support habitats listed on Annex I and/or populations of species listed on Annex II of Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora (the Habitats Directive) and are protected under the Conservation of Habitats and Species Regulations 2017 (as amended[1]);
- Special Protection Areas (SPAs) – these sites support internationally important populations and/or assemblages of birds, as defined by Directive 2009/147/EC on the protection of wild birds (the Birds Directive), and are protected under the Conservation of Habitats and Species Regulations 2017 (as amended)[1];
- Sites of Special Scientific Interest (SSSIs) – these sites support nationally important biological (or geological) interest features and are protected under the Wildlife and Countryside Act 1981 (as amended). Criteria for the selection of biological SSSIs are defined by the Joint Nature Conservation Committee (JNCC)[2].
- National Nature Reserves (NNRs) – these are sites which have been established under the National Parks and Access to the Countryside Act 1949 and the Wildlife and Countryside Act 1981 (as amended) due to their national importance for the conservation of wildlife (or geological features). They may receive protection from byelaws made by the appropriate conservation body (Natural England).
- Local Nature Reserves (LNRs) – these are sites which have been established under the National Parks and Access to the Countryside Act 1949 due to their importance for the conservation of wildlife (or geological features) within the locality. They may receive protection from byelaws made by the local authority.

1.2.2. In addition to their legal protections, the site designations listed above also receive protection via the planning system, as prescribed by the National Planning Policy Framework (NPPF) 2021 and Policy SD9 of the Gloucester, Cheltenham, and

[1] As amended by The Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019.
[2] JNCC, Guidelines for selection of biological SSSIs, available from Guidelines for selection of SSSIs | JNCC - Adviser to Government on Nature Conservation

Tewkesbury Joint Core Strategy 2011 – 2031[3]. The NPPF also applies the same level of protection afforded to SACs and SPAs to possible or candidate SACs (pSACs and cSACs), potential SPAs (pSPAs), and listed or proposed Ramsar Sites.

1.2.3. Non-statutory nature conservation sites also support a rich diversity of habitats that provide refuges and corridors for wildlife. These areas are designated as Local Wildlife Sites in Gloucestershire. Habitats within these sites, as well as those that form wildlife corridors and stepping-stones that connect these areas, receive protection via the planning system.

1.2.4. The planning system also provides protection for 'irreplaceable habitats' (such as ancient woodland and ancient or veteran trees). The NPPF states that development resulting in the loss or deterioration of such habitats should be refused, unless there are wholly exceptional reasons, and a suitable compensation strategy exists.

1.2.5. Section 41 of the Natural Environment and Rural Communities (NERC) Act 2006 requires the Secretary of State to publish a list of habitats (and species) which are of principal importance for the purpose of conserving biodiversity. Habitats listed in accordance with Section 41 of the NERC Act 2006, also known as 'priority habitats', receive protection via the planning system. Section 41 list priority habitats include the priority habitats previously listed in the UK Biodiversity Action Plan (BAP)[4].

1.2.6. As well as being listed as habitats of principal importance (and thereby receiving protection via the planning system), hedgerows also receive legal protection under The Hedgerow Regulations 1997.

1.2.7. The Gloucestershire Local Nature Partnership (GLNP) has identified areas of core woodland habitats, traditional orchards, core open habitats and core wetland habitats across the county and used these to identify Strategic Nature Areas (SNAs)[5]. Policy SD9 of the Gloucester, Cheltenham and Tewkesbury Joint Core Strategy 2011-2031 encourages habitat creation and restoration within these SNAs.

[3] Gloucester City, Cheltenham Borough and Tewkesbury Borough (Adopted December 2017) Joint Core Strategy 2011 – 2031 available from jcs.pdf (gloucester.gov.uk) [Accessed: August 2021]
[4] https://jncc.gov.uk/our-work/uk-bap-priority-habitats/ [Accessed: 21/09/21]
[5] https://naturalcapital.gcerdata.com/ [Accessed: 21/09/21]

2. Methodology

2.1. Desk Study

2.1.1. A desk-based data gathering exercise was undertaken to collect relevant habitat information. Details of the various searches, search areas and data sources are provided below.

2.1.2. The Natural England website[6] was reviewed to obtain contextual information on the Natural Character Area (NCA) in which the Scheme is located.

2.1.3. The MAGIC website[7] was reviewed to identify:

- Statutory designated nature conservation sites within 2 km of the Scheme, within 200 m of the Affected Road Network (ARN) or with a direct hydrological connection to the Scheme;
- Priority habitats within 1 km of the Scheme; and
- Ancient woodland within 1 km of the Scheme and within 200 m of the ARN.

2.1.4. The Woodland Trust's Ancient Tree Inventory website[8] was reviewed to locate records of ancient and veteran trees within 250 m of the Scheme and within 200 m of the ARN.

2.1.5. Gloucestershire Centre for Environmental Records (GCER) was contacted on 11th September 2019 and again on 21st April 2021 to obtain recent records[9] of the following:

- Non-statutory designated nature conservation sites within 1 km of the Scheme and within 200 m of the ARN;
- Protected and notable[10] plant species within 1 km of the Scheme; and
- Invasive non-native plant species[11] within 1 km of the Scheme.

2.1.6. Historic and recent aerial imagery was reviewed using Google Earth Pro (version 7.3.3) to supplement and refine the boundaries between habitats that were noted in the field and to characterise habitats that could not be accessed during the field survey (see Section 2.5)

2.2. Survey Area

2.2.1. The extent of the Phase 1 habitat survey was based on the zone of influence of the Scheme for this particular ecological receptor. It included all land within the Scheme boundary and a 250 m buffer extending out in all directions from the Scheme boundary where permitted and safe access allowed.

2.2.2. At the time the survey was undertaken, there were a number of Scheme options under consideration. This report only considers the survey data collected within 250 m of the current Scheme, hereafter referred to as the Phase 1 Habitat Survey Area. The Phase 1 Habitat Survey Area totals approximately 400 ha in area and is shown in Figure 7.1A in Appendix A.

[6] http://publications.naturalengland.org.uk/category/587130 [Accessed 2nd September 2019].
[7] Defra. c2019. Magic Map Application. [Online]. [Accessed 5th September 2019]. Available from: https://magic.defra.gov.uk/MagicMap.aspx
[8] Woodland Trust. 2019. Ancient Tree Inventory - Woodland Trust. [Online]. [Accessed 5th September 2019]. Available from: https://ati.woodlandtrust.org.uk/
[9] Records of observations within the last 10 years.
[10] Notable plant species in this context comprise those which are listed in accordance with Section 41 of the NERC Act 2006 as species of principal importance for the purpose of conserving of biodiversity in England; and species which are nationally scarce or rare.
[11] As listed on Schedule 9 to the Wildlife and Countryside Act 1981 (as amended).

2.3. Field Survey

2.3.1. The Phase 1 habitat survey was led by suitably experienced ecologists who are members of the Chartered Institute of Ecology and Environmental Management (CIEEM) and considered competent to undertake Phase 1 habitat survey in accordance with the CIEEM competency criteria[12].

2.3.2. The Phase 1 habitat survey was undertaken on 16th, 17th, 20th, 22nd and 23rd May 2019, and on 23rd, 26th and 27th September 2019 once permitted access was available.

2.3.3. The survey involved a walkover of the Phase 1 habitat survey Area to record the habitats present and any other features of interest (e.g. presence of invasive non-native plants). Habitat classification was undertaken in accordance with the Joint Nature Conservation Committee (JNCC) Phase 1 habitat survey methodology[13]. Habitats were recorded on base maps of the Phase 1 habitat Survey Area along with target notes to describe the characteristic plant species and any habitats/features of interest. Plant names recorded followed Stace (2019)[14]. In order to efficiently characterise the nature conservation value of the habitats within the very large survey area, built-up areas (e.g. buildings, hardstanding, and private gardens) were generally not recorded in detail during the field survey,

2.3.4. The field survey did not include a systematic search of the Phase 1 habitat Survey Area for invasive non-native plant species. However, the locations of such species were recorded where they were encountered.

2.4. Assessment

2.4.1. The terrestrial habitat and plant species resource has been valued in a geographical context following the framework provided in LA 108[15]. The evaluation is based on the information gathered from the desk study and field surveys, using a combination of professional judgement and accepted criteria[16] (e.g. diversity, rarity, and naturalness).

2.5. Limitations

2.5.1. GCER does not hold exhaustive records of all the plant species that occur within a given area. Therefore, the absence of records for a particular species does not demonstrate that the species is absent. Similarly, the Woodland Trust's Ancient Tree inventory is not an exhaustive list and other ancient and veteran trees may be present in the area. These limitations have been factored into the assessment, which does not rely solely on desk study data.

2.5.2. Access was not permitted to some parts of the Phase 1 Habitat Survey Area, which precluded a walkover of these areas. Areas that could not be accessed during the survey are shown in Figure 7.1A in Appendix A. These areas where access was not permitted total 101.69 ha and are approximately 19% of the overall Phase 1 Habitat Survey Area. From review of aerial imagery (available in Google Earth Pro (version 7.3.3)), the area that was not surveyed was characterised as comprising a mix of scattered scrub (0.68%); agricultural grassland/cultivated land (53.88%); residential gardens (17.15%); amenity grassland (1.19%); buildings/bare ground/hardstanding (25.19%); water (1.71%); woodland (0.20%). The majority of this area that was not surveyed is located at least 50 m from the Scheme and is unlikely be subject to direct impacts. The absence of these survey data for this area, most of which won't be directly impacted and approximately 80% of which is likely to be of negligible nature conservation value (agricultural

[12] https://cieem.net/resource/competencies-for-species-survey-css/
[13] JNCC (2016). Handbook for Phase 1 Habitat Survey – A Technique for Environmental Audit [Online]. Available at: http://data.jncc.gov.uk/data/9578d07b-e018-4c66-9c1b-47110f14df2a/Handbook-Phase1-HabitatSurvey-Revised-2016.pdf
[14] Stace, C. (2019) New Flora of the British Isles (4th edition). C&M Floristics.
[15] Highways England. March 2020. LA 108 Biodiversity [Online]. [Accessed October 2020]. Available from: https://www.standardsforhighways.co.uk/dmrb/search?discipline=SUSTAINABILITY_AND_ENVIRONMENT
[16] Set out in Ratcliffe, D.A (1977). A Nature Conservation Review. Cambridge University Press.

grassland/cultivated land, buildings, bare ground, hardstanding and amenity grassland), is not considered to pose a significant constraint to the assessment.

2.5.3. In addition to the land that could not be surveyed as no permitted access was available, the majority of the M5 motorway verge habitats within the Phase 1 Habitat Survey Area could not be surveyed, as they could not be accessed safely. To account for this limitation, the habitats along the motorway verges, which are typically 10-15 m wide, were broadly characterised using a combination of aerial and street level imagery available in Google Earth Pro (version 7.3.3). The motorway verge habitats total approximately 19 ha and are approximately 3.38% of the overall Phase 1 Habitat Survey Area. The verge habitats are located within the footprint of the Scheme and will therefore be directly affected. Given that motorway verge habitats are affected by spray and run-off from the motorway, including salt and pollutants, and as a result generally comprise relatively common and widespread habitat types, this approach combined with desk study records, is considered to be sufficiently reliable for the purpose of the assessment at this stage of the project. However, considering that these areas will be directly impacted by the Scheme and desk study records may not have captured the presence of individual protected or notable plant species, a Phase 1 habitat survey of the motorway verges is currently scheduled to be undertaken during September 2021.

2.5.4. Phase 1 habitat surveys are limited by factors which affect the presence/visibility of plants and the appearance of habitats, such as the time of year, recent management (e.g. mowing) and the weather. Furthermore, the aim of the survey was to characterise habitats and, therefore, did not include systematic recording of all plants observed within the Phase 1 Habitat Survey Area. The surveys have not, therefore, produced a complete list of plants and the absence of evidence of any particular species should not be taken as conclusive proof that the species is not present or that it will not be present in the future.

2.5.5. Due to land access permissions being granted at separate times, the Phase 1 habitat survey was undertaken during two different seasons within the year. Most of the Phase 1 Habitat Survey Area was surveyed in mid-late May 2019, which is an optimal time of year for Phase 1 habitat survey, and a relatively small (approximately 13 ha) part of the Phase 1 Habitat Survey Area was surveyed in late September 2019. While some plant species are less conspicuous / less easily identifiable in late September compared with May, it was still possible to characterise the observed habitats based on the visible species present. Therefore, this limitation does not pose a significant constraint to the results or assessment.

2.5.6. It is assumed that the planning application for the Scheme will be submitted during Summer 2022. At that point, the survey data from 2019 will be three years old. It is proposed to undertake an update Phase 1 habitat survey in targeted areas in order to determine whether any of the baseline conditions have changed significantly, and validate, or confirm any changes, to the results described in this report. This report will be updated to include the results of these surveys and will be submitted as part of the ES.

3. Results

3.1. Desk Study

3.1.1. Designated sites are shown on Figure 7.1B in Appendix A.

National Character Area Context

3.1.2. The Scheme is located within the Severn and Avon Vales NCA[17]. This is an open agricultural landscape, dominated by the lower valleys of the rivers Severn and Avon. Woodland is sparse but traditional orchards are widespread. The area also contains important concentrations of lowland meadow and floodplain grazing marsh. The otherwise flat vale landscape is punctuated in places by Cotswold outliers, such as Bredon Hill.

Designated Sites within 2 km of the Scheme

3.1.3. There is one statutory designated nature conservation site within 2 km of the Scheme: Coombe Hill Canal SSSI, the north-east end of which is located approx. 1.9 km north-west of the Scheme (see Figure 7.1B in Appendix A). Coombe Hill Canal SSSI consists of a 3.7 km stretch of disused canal flanked by ditches, neutral grassland, scattered scrub and trees, an area of inundation fen and a withy bed[18]. The site is of special interest for its assemblages of nationally rare and scarce invertebrates and nationally scarce plants. It is one of the most important known wetland sites for these features within Gloucestershire.

3.1.4. There are no other statutory or non-statutory designated sites for nature conservation within 2 km of the Scheme.

Designated Sites within 200 m of the ARN

3.1.5. There are six non-statutory designated nature conservation sites within 200 m of the ARN:

- Norton (A38) Conservation Road Verge – a wide band of dwarf elder, with rough grassland, tall herb and hedgerow.
- Pegmore Farm, The Leigh 'Meadow 2' potential LWS – a diverse wet meadow grassland.
- Cotswold Farm, The Leigh Conservation Road Verge – a stand of dwarf elder within tall herb and rank grassland, with encroaching scrub and tree saplings.
- Tewkesbury Nature Reserve potential LWS – a nature reserve important to the local community.
- Tewkesbury Railway Line (Disused) LWS – an area with invertebrate interest, specifically glow worm.
- Walton Cardiff Ponds LWS – an area with amphibian interest, specifically great crested newt.

Designated Sites with Hydrological Connections to the Scheme

3.1.6. All of the watercourses that are crossed by the Scheme flow into the River Severn, at least 7.5 km downstream. From the nearest confluence point, where the River Chelt joins the River Severn, just upstream of Wainlode Cliff, the Severn Estuary is a further 40 km downstream.

[17] http://publications.naturalengland.org.uk/publication/1831421?map=true&category=587130 [Accessed 02/09/19]
[18] An area where willow is grown for coppicing.

3.1.7. The Severn Estuary is designated as a SAC, SPA, Ramsar Site and SSSI. It supports the following features of nature conservation importance:

- Estuarine habitats, including estuaries; mudflats and sandflats not covered by seawater at low tide; Atlantic salt meadows; sandbanks, which are slightly covered by seawater all the time; and reefs;
- Populations of sea lamprey (***Petromyzon marinus***), river lamprey (***Lampetra fluviatilis***), twaite shad (***Alosa fallax***), Atlantic salmon (***Salmo salar***), sea trout (***Salmo trutta***), Allis shad (***Alosa alosa***) and European eel (***Anguilla Anguilla***);
- >4% of the British overwintering population of Bewick's swan (***Cygnus columbianus bewickii***);
- Significant wintering populations of curlew (***Numenius arquata***), dunlin (***Calidris alpina alpina***), pintail (***Anas acuta***), redshank (***Tringa totanus***) and shelduck (***Tadorna tadorna***);
- Significant passage population of ringed plover (***Charadrius hiaticula***); and
- Regular assemblages of over 20,000 wildfowl, which qualify the site as a wetland of international importance.

3.1.8. There are no other statutory or non-statutory designated sites for nature conservation within the desk study area.

Priority Habitats

3.1.9. Priority habitats identified during the desk study within 1 km of the Scheme are detailed in Table 3-1 below and shown in Figure 7.1C in Appendix A.

Table 3-1 - Priority Habitat records within 1 km of the Scheme

Priority habitat type	Approximate nearest distance and direction from the Scheme
Deciduous woodland	Within Scheme
Traditional orchard	Within Scheme
Good quality semi-improved grassland (lowland meadows and pastures)	640 m west
Coastal and floodplain grazing marsh	680 m west

Ancient Woodland and Ancient/Veteran Trees

3.1.10. There are no ancient woodlands within 1 km of the Scheme, and no records of ancient or veteran trees within 250 m of the Scheme. One veteran tree is located within 200 m of the ARN, as shown in Figure 7.1B in Appendix A.

Protected and Notable Plant Species

3.1.11. There are no records of protected plant species within 1 km of the Scheme.

3.1.12. There is one record of a black poplar tree (***Populus nigra***) located over 800 m west of the Scheme on the Boddington Estate. Black poplar is one of Britain's rarest trees and is identified by GCER as being a Key Gloucestershire Species.

Invasive Non-native Plant Species

3.1.13. There are no records of invasive non-native plant species within 1 km of the Scheme.

3.2. Field Survey

Overview

3.2.1. The Scheme is located within a low-lying, mainly agricultural landscape to the north-west of Cheltenham (see paragraph 3.1.1). The Phase 1 Habitat Survey Area is dominated by large arable fields, improved grasslands, and poor semi-improved grasslands (see Figure 7.1A in Appendix A). The dominant arable and grassland habitats are interspersed with pockets of other terrestrial habitats of greater nature conservation value, including broadleaved and mixed woodland, traditional orchard, and semi-improved neutral grassland.

3.2.2. These habitats exist either side of the M5 motorway, which runs south west to north east, and the A4019, which runs north west to south east. The Survey Area is also bisected by the River Chelt, which flows through the area from east to west.

3.2.3. There is some variation in the relative abundance of the dominant habitat types across the Phase 1 Habitat Survey Area:

- The northern 'quadrant' (north-west of the M5 and north-east of the A4019) is dominated by improved grassland pasture fields, mainly grazed by cattle;
- The eastern quadrant (south-east of the M5 and north-east of the A4019) is dominated by large arable fields, with a network of sheep-grazed improved grassland pasture fields to the north;
- The southern quadrant (south-west of the A4019 and south-east of the M5) is dominated by large arable fields close to the M5 (see Figure 3-1), with an increasing abundance of smaller poor semi-improved grassland pasture fields (grazed by cattle or sheep) to the east;
- The western quadrant (north-west of the M5 and south-west of the A4019) is dominated by large arable fields; and
- The 'A4019 corridor', which extends south-east from the Scheme towards Cheltenham, is dominated by small, improved grassland pasture fields (grazed by sheep or horses) and residential gardens to the south-west of the A4019. To the north-east of A4019 is primarily a mix of large arable fields, small areas of improved and semi-improved grassland, residential gardens and tall ruderal / scrub vegetation associated with derelict horticultural nurseries.

3.2.4. Details of the approximate total area of each habitat type recorded within the Phase 1 Habitat Survey Area are provided in Table 3-2 - Breakdown of habitat areas within the Phase 1 Habitat Survey Area shown in hectares (and as a percentage of the total survey area)Table 3-2. The distribution of these habitats is shown on Figure 7.1A in Appendix A.



Figure 3-1 - View north across arable fields in the southern quadrant towards the M5 motorway (the line of trees is associated with the River Chelt)

Table 3-2 - Breakdown of habitat areas within the Phase 1 Habitat Survey Area shown in hectares (and as a percentage of the total survey area)

Habitat type	Total area (ha) (% of total survey area in brackets)
Semi-natural broadleaved woodland	0.54 (0.10)
Plantation broadleaved woodland	6.57 (1.20)
Plantation coniferous woodland	0.71 (0.13)
Plantation mixed woodland	4.15 (0.76)
Dense/continuous scrub	0.83 (0.15)
Scattered scrub	0.16 (0.03)
Scattered trees	0.92 (0.17)
Traditional orchard	5.63 (1.03)
Semi-improved neutral grassland	6.57 (1.20)

Habitat type	Total area (ha) (% of total survey area in brackets)
Improved grassland	92.65 (16.91)
Poor semi-improved grassland	53.47 (9.76)
Scattered bracken	0.04 (0.01)
Tall ruderal	3.45 (0.63)
Standing water	0.50 (0.09)
Arable	215.15 (39.27)
Amenity grassland	8.85 (1.62)
Building/bare ground/hardstanding	27.46 (5.01)
Area surveyed by aerial photograph interpretation	120.22 (21.94) broken down as follows: Scattered scrub 0.69 (0.13) Agricultural grassland/cultivated land 54.79 (10.00) Amenity grassland 1.21 (0.22) Building 10.72 (1.96) Bare ground 1.68 (0.31) Hardstanding 13.21 (2.41) Residential garden 17.44 (3.18) Roadside/verge 18.53 (3.38) Water 1.73 (0.32) Woodland 0.21 (0.04)

Descriptions of Main Terrestrial Habitat Types

3.2.5. Descriptions of the typical main habitat types recorded within the Phase 1 Habitat Survey Area are provided below.

Improved Grassland

3.2.6. The improved grasslands (see Figure 3-2) are typically dominated by the grasses perennial rye-grass (***Lolium perenne***), meadow foxtail (***Alopecurus pratensis***) and/or Timothy (***Phleum pratense***), with abundant creeping buttercup (***Ranunculus repens***) and white clover (***Trifolium repens***). There are patches dominated by common nettle (***Urtica dioica***). Occasional species include broad-leaved dock (***Rumex obtusifolius***), creeping thistle (***Cirsium arvense***), yarrow (***Achillea millefolium***) and common chickweed (***Stellaria media***).



Figure 3-2 - View east across improved grassland fields in the eastern quadrant

Poor Semi-improved Grassland

3.2.7. The poor semi-improved grasslands are characterised by a more diverse range of grasses than the improved grasslands, typically including abundant rough meadow-grass (***Poa trivialis***), meadow foxtail and yellow oat-grass (***Trisetum flavescens***); frequent perennial rye-grass, cock's-foot (***Dactylis glomerata***) and soft brome (***Bromus hordeaceus***); and occasional smooth meadow-grass (***Poa pratensis***) and Yorkshire fog (***Holcus lanatus***). There is also a greater diversity and abundance of forbs, typically including frequent cow parsley (***Anthriscus sylvestris***), common vetch (***Vicia sativa***), red clover (***Trifolium pratense***), white clover, creeping buttercup, common mouse-ear (***Cerastium fontanum***), hogweed (***Heracleum sphondylium***) and common chickweed, with patches of abundant common nettle. Sward structure is also more variable; ranging from a uniform, close-grazed sward in some locations to a tall, coarse sward in others.



Figure 3-3 - View north across poor semi-improved grassland fields in the southern quadrant

Semi-improved Neutral Grassland

3.2.8. There are five plots of grassland within the Survey Area where the botanical diversity is greater than that typically found within the poor semi-improved grassland described above, yet not as high as would be expected within an area of unimproved neutral grassland. Two of these are located at the southern end of the southern quadrant. The other three are located within the A4019 corridor.

3.2.9. The characteristics and management of the habitats within this category varied from one plot to the next; one appearing to be managed as a hay meadow, one as occasional grazing (see Figure 3-4); one appearing to be unmanaged; and one appearing to be the result of recent colonisation of recently cleared land (due to the abundance of ruderal species and the extent of bare ground). Typical grass species recorded within these plots included red fescue, yellow oat-grass, false oat-grass (***Arrhenatherum elatius***), rough meadow-grass, Yorkshire fog, meadow foxtail and cock's-foot. Frequently recorded forbs included red clover, dandelion, ribwort plantain, creeping buttercup, common mouse-ear, bird's foot trefoil and hogweed.



Figure 3-4 - View south across small field of semi-improved neutral grassland pasture between the A4019 and the River Chelt

Broadleaved and Mixed Plantation Woodland

3.2.10. Within the Survey Area, this habitat is mainly found alongside the M5, although there are three other copses located away from the motorway (see Figure ***3-5*** in Appendix A). The canopy is typically dominated by ash ***(Fraxinus excelsior***) (see Figure 3-5), with frequent horse chestnut (***Aesculus hippocastanum***), pedunculate oak (***Quercus robur***), sycamore (***Acer pseudoplatanus***) and/or Scots pine (***Pinus sylvestris***) in places. Occasional canopy species include alder (***Alnus glutinosa***), aspen (***Populus tremula***), beech (***Fagus sylvatica***) and silver birch (***Betula pendula***). Understorey diversity is variable between locations, completely dominated by hawthorn (***Cratageus monogyna***) in some places, while others typically including a mix of occasional cherry (***Prunus*** sp.), field maple ***(Acer campestre***), elder (***Sambucus nigra***), crab apple (***Malus sylvestris***), hazel (***Corylus avellana***) and hornbeam (***Carpinus betulus***). The field layer typically includes abundant common nettle, common chickweed, cleavers (***Galium aparine***) and grasses, such as rough meadow-grass and hairy brome (***Bromus ramosus***); frequent dock species (***Rumex*** spp.), lords-and-ladies (***Arum maculatum***), cow parsley and wood avens (***Geum urbanum***); and locally dominant bramble (***Rubus fruticosus*** agg.) and ivy (***Hedera helix***).

3.2.11. A number of these areas are mapped as priority habitat: deciduous woodland on the MAGIC website (as shown on Figure 7.1C in Appendix A). However, they are not considered to meet the criteria for this priority habitat type[19], as the priority habitat description indicates that it is associated with semi-natural woodland rather than plantation woodland.

[19] Maddock, A. (ed) (2008). ***UK Biodiversity Action Plan Priority Habitat Descriptions – Lowland Mixed Deciduous Woodland***. Online: https://data.jncc.gov.uk/data/2829ce47-1ca5-41e7-bc1a-871c1cc0b3ae/UKBAP-BAPHabitats-30-LowlandMixedDecWood.pdf) [Accessed: 21/09/21]



***Figure** 3-5 - Copse of broadleaved plantation woodland in the northern quadrant dominated by semi-mature ash trees*

Broadleaved Semi-natural Woodland

3.2.12. There is one copse of broadleaved semi-natural woodland within a large arable field at the southern end of the Survey Area (see Figure 3-6). It has a fairly open canopy dominated by mature pedunculate oak trees, with occasional ash. The dense understorey is dominated by blackthorn (***Prunus spinosa***) and hawthorn with occasional hazel, field maple and elder. The field layer includes abundant common nettle, cleavers, and greater burdock (***Arctium lappa***).

3.2.13. This woodland meets the criteria for the priority habitat type: lowland mixed deciduous woodland[20].

[20] Maddock, A. (ed) (2008). ***UK Biodiversity Action Plan Priority Habitat Descriptions – Lowland Mixed Deciduous Woodland***. Online: https://data.jncc.gov.uk/data/2829ce47-1ca5-41e7-bc1a-871c1cc0b3ae/UKBAP-BAPHabitats-30-LowlandMixedDecWood.pdf [Accessed: 21/09/21]



***Figure** 3-6 - View north east towards a copse of mature broadleaved semi-natural woodland in southern quadrant*

Traditional Orchard

3.2.14. There are several pockets of traditional orchard in varying condition. One of the largest and most intact is located at Hayden Hill Fruit Farm (towards the southern end of the Survey Area; see Figure ***3-7***), where there is one poor semi-improved pasture field containing numerous mature fruit trees, many with rot hole features. Another notable example is located at Stanboro Lodge (just north of the A4019, in the northern quadrant). Here there is a mosaic of amenity grassland, coarse poor-semi-improved grassland and dense scrub containing scattered mature fruit trees, many of which are moribund. A further example is at Millhouse Farm, where there is a field of poor semi-improved grassland containing eight overmature fruit trees.

3.2.15. These three areas of traditional orchards (as shown on Figure 7.1A in Appendix A) meet the criteria for the priority habitat type: traditional orchard[21]. They broadly align with the traditional orchard areas shown on the MAGIC website, and on Figure 7.1C in Appendix A, although there are some slight differences in extent. The Phase 1 Habitat Survey map (Figure 7.1A in Appendix A) is considered to be more accurate as it is based on detailed field surveys.

3.2.16. One area, just south of the A4019 at Uckington, is mapped as priority habitat: traditional orchard on the MAGIC website (as shown on Figure 7.1C in Appendix A). However, it is not considered to meet the criteria for this priority habitat type, as the fruit trees and surrounding grassland are too intensively managed and historic aerial imagery on Google Earth shows that the fruit trees were planted between 1999 and 2005.

[21] Maddock, A. (ed) (2008). ***UK Biodiversity Action Plan Priority Habitat Descriptions – Traditional Orchards***. Online: https://data.jncc.gov.uk/data/2829ce47-1ca5-41e7-bc1a-871c1cc0b3ae/UKBAP-BAPHabitats-56-TraditionalOrchards.pdf [Accessed: 21/09/21]



***Figure** 3-7 - View south across traditional orchard at Hayden Hill Fruit Farm*

Boundary Features and Trees

3.2.17. The fields across the study area are typically bordered by species-poor hedgerows, with fences instead of hedgerows in a few locations (see Figure 7.1A in Appendix A). The hedgerows generally range in condition from tightly flailed lines of hawthorn and/or blackthorn to tall, unmanaged treelines, with the most frequent tree species including ash, pedunculate oak and crack willow (***Salix fragilis***). None of these are veteran or ancient trees. Some of the hedgerows are also associated with ditches, several of which were wet at the time of the surveys. Almost 36 km of hedgerows are present within the Phase 1 Habitat Survey Area.

3.2.18. A specific hedgerow survey has been undertaken to enable a more detailed assessment of the hedgerows within the Survey Area. Further information on this assessment is provided in the Hedgerow Survey Report (Technical Appendix 7.2).

3.2.19. Aside from trees within field boundaries and areas of woodland/orchard, individual trees within fields were recorded infrequently within the Phase 1 Habitat Survey Area. None of these are veteran or ancient trees, but some are mature or over-mature, with deadwood features (see Figure ***3-8***).



***Figure** 3-8 - View north towards a moribund over-mature ash tree at Butler's Court*

Other Terrestrial Habitats

3.2.20. Buildings, hardstanding and private gardens were typically excluded from the survey (see Section 2.5). However, it is important to note that such features are present within the Phase 1 Habitat Survey Area.

3.2.21. There are numerous buildings (and associated gardens), which are mostly located along the A4019 corridor, in particular at Stanboro Lane, Withybridge Gardens, Uckington and Homecroft Drive. There are also several other clusters of farm buildings and residential properties, mostly in the southern quadrant. These include farms at Butler's Court and Withybridge, and various properties at Hayden and along the B4634 (Old Gloucester Road). Although buildings were not surveyed, those within 100 m of the Scheme have been surveyed for bats and barn owl (***Tyto alba***). Details of these surveys are provided in the Bat Survey Report (Technical Appendix 7.3) and the Bird Survey Report (Technical Appendix 7.8).

3.2.22. There are areas of hardstanding associated with most of the buildings mentioned above. In addition, the existing roads comprise a substantial area of hardstanding, most notably the M5 motorway (including the existing Junction 10 slip roads), the A4019, the B4634, and Withybridge Lane.

3.2.23. The majority of the M5 motorway verges were also not included in the surveys undertaken to-date. From analysis of aerial and street level imagery, these were found to comprise continuous or scattered lines of broadleaved trees, interspersed with a mix of coarse grassland, tall ruderals, and scrub.

3.2.24. Although making up only a very small proportion of the Phase 1 Habitat Survey Area, the mosaic of habitats found at the derelict horticultural nurseries along the north side of the A4019 (at Stanboro Lane and Uckington) are a notable habitat feature. They comprise complex patchworks of unmanaged coarse grassland, coniferous plantation woodland, young fruit trees, tall ruderal, and scrub, interspersed with various types of temporary and permanent structure, hardstanding and debris (see Figure ***3-9***).



***Figure** 3-9 - View north across a mosaic of habitats at one of the derelict nurseries at Uckington*

Aquatic Habitats

3.2.25. Although aquatic habitats are not detailed and assessed within this report, a summary of the main aquatic habitats within the Phase 1 Habitat Survey Area is provided as follows:

- The River Chelt, which flows west across the Scheme, south of the A4019 (see Figure ***3-10***);
- An unnamed tributary of the River Chelt, which flows north-west across the Scheme, to the south of the River Chelt, and connects with the River Chelt at Boddington (west of the Phase 1 Habitat Survey Area);
- An unnamed tributary of Leigh Brook, which flows north-west across the Scheme, north of the A4019, and connects with Leigh Brook near Coombe Hill (north-west of the Phase 1 Habitat Survey Area);
- Several wet ditches associated with field boundaries;
- Four ponds; and
- A moat.

3.2.26. Rivers and ponds are both listed as priority habitats in accordance with Section 41 of the NERC Act 2006. Further information on these aquatic habitats is provided in the Aquatic Ecology Report (Technical Appendix 7.12), with further details of the ponds and moat also provided in the Great Crested Newt Survey Report (Technical Appendix 7.11).



***Figure** 3-10 - View east along the River Chelt, east of Withybridge*

Invasive Non-native Plant Species

3.2.27. The following invasive non-native plant species were recorded and are shown on Figure 7.1D in Appendix A:

- Himalayan balsam (***Impatiens glandulifera***) – adjacent to Old Gloucester Road at Hayden and within the woodland on the west side of the M5, next to the River Chelt culvert. Also recorded on the River Chelt upstream of the Phase 1 Habitat Survey Area, south of Uckington;
- Cotoneaster (***Cotoneaster*** sp.) – in a bank of introduced shrub planting between Withybridge Gardens and the A4019,
- Rhododendron (***Rhododendron ponticum***) – within mixed plantation woodland between the M5 off slip and the A4019 at Junction 10.

4. Evaluation

4.1. Designated Sites

4.1.1. In accordance with the evaluation guidance provided in Table 3.9 of LA 108[22], the four designated sites identified during the desk study have each been ascribed an importance value based on their respective levels of designation, as set out below:

- Severn Estuary SAC – International value;
- Severn Estuary SPA – International value;
- Severn Estuary Ramsar Site – International value;
- Coombe Hill SSSI – National value; and
- Non-statutory designated nature conservation sites – County value.

4.2. Terrestrial Habitats

4.2.1. In accordance with the evaluation guidance provided in Table 3.9 of LA 108, the veteran tree identified within 200 m of the ARN has been ascribed a value of National importance.

4.2.2. The terrestrial habitats recorded within the Phase 1 Habitat Survey Area are dominated by arable fields and poor-quality grassland, with sparsely distributed, small areas of priority habitats (lowland mixed deciduous woodland and traditional orchard).

4.2.3. Although primarily species-poor, the hedgerow network adds to the value of the terrestrial habitat features through the provision of ecological connectivity, combining with the strips of plantation woodland, motorway verge habitats and riverside habitats to form a network of habitat corridors through an otherwise ecologically impoverished landscape. A separate evaluation of the hedgerow network is provided in the Hedgerow Survey Report (Technical Appendix 7.2).

4.2.4. While aquatic habitats are evaluated separately to terrestrial habitats in the Aquatic Ecology Report (Technical Appendix 7.12), the proximity of the terrestrial habitats to aquatic habitats and the connectivity provided by the aquatic habitats is considered to enhance the overall value of the terrestrial habitats present.

4.2.5. Taking all of this into consideration, along with the extensive overall area of the features and their position within the landscape, terrestrial habitats (excluding the priority habitats) have been ascribed a value of Local importance. This aligns with the evaluation guidance provided in Table 3.9 of LA 108, which defines habitat features of Local importance as:

"Areas of habitat considered to appreciably enrich the habitat resource within the local context including features of importance for migration, dispersal, or genetic exchange".

4.2.6. The two terrestrial priority habitats identified within the Phase 1 Habitat Survey Area (lowland mixed deciduous woodland and traditional orchards) have each been ascribed a value of County importance. This evaluation deviates from the guidance provided in Table 3.9 of LA 108, which indicates that priority habitats should be ascribed a value of National importance. The reason for this deviation is that the habitats in question are all small, isolated examples of habitat types that are fairly common in the wider region. They are not particularly notable examples of these habitat types and are only considered to be of County importance as opposed to Local by virtue of their inclusion on the Section 41 list of habitats of principal importance for conservation of biodiversity in England.

[22] Highways England. March 2020. LA 108 Biodiversity [Online]. [Accessed January 2021]. Available from: https://www.standardsforhighways.co.uk/dmrb/search?discipline=SUSTAINABILITY_AND_ENVIRONMENT

Appendix to Appendix 7.1

- Appendix A

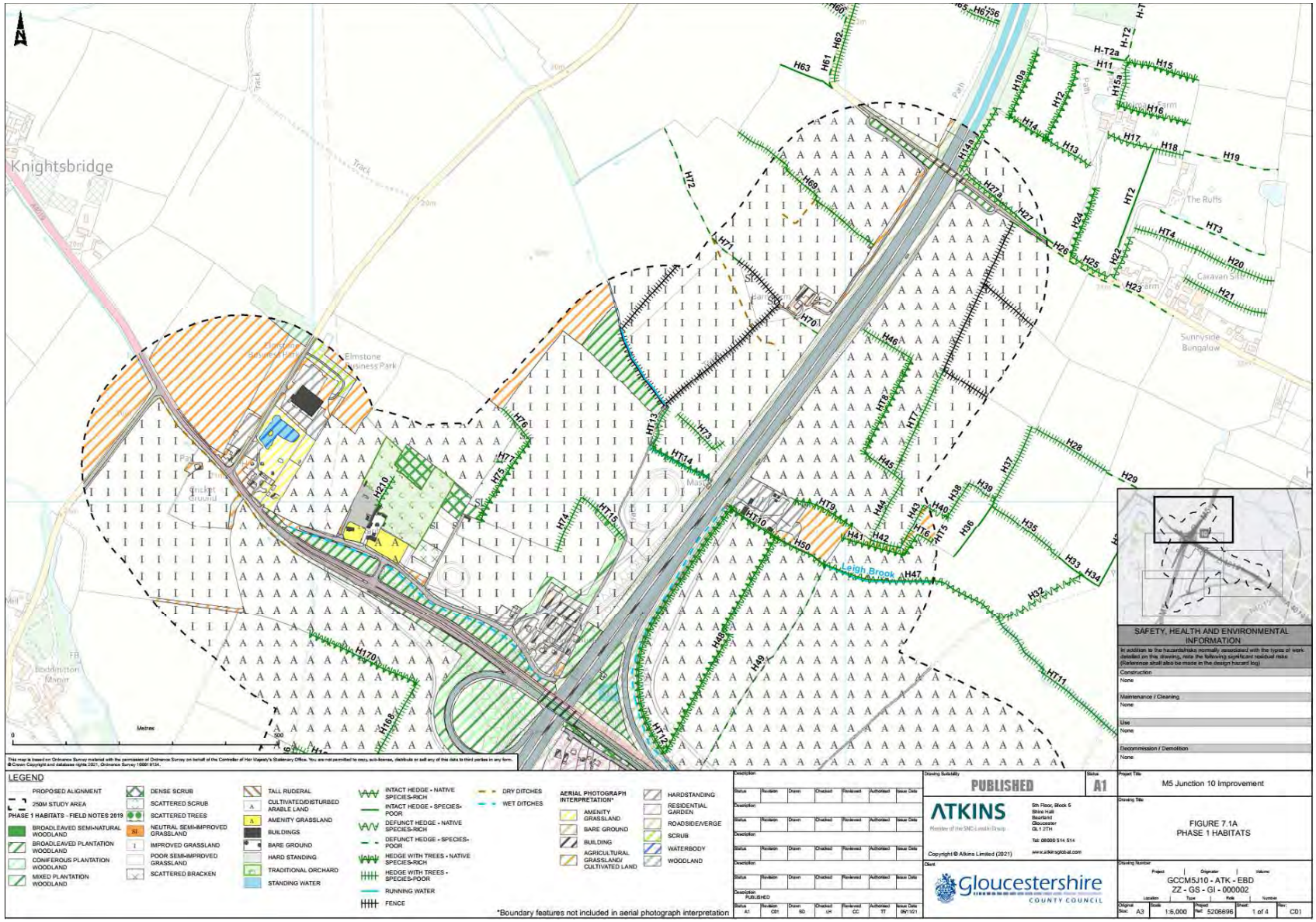
Appendix A

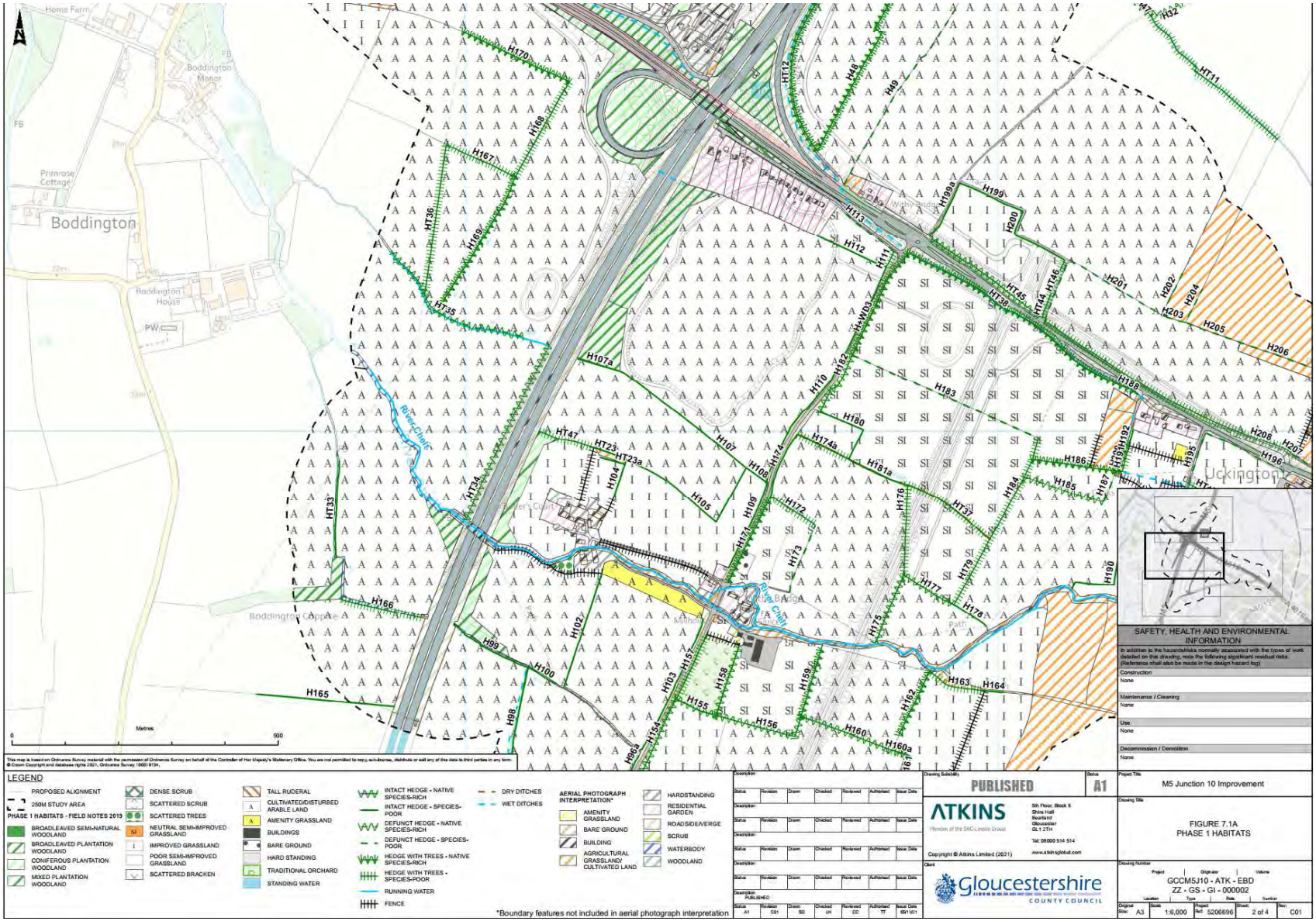
Figure 7.1A Phase 1 Habitat Survey Map

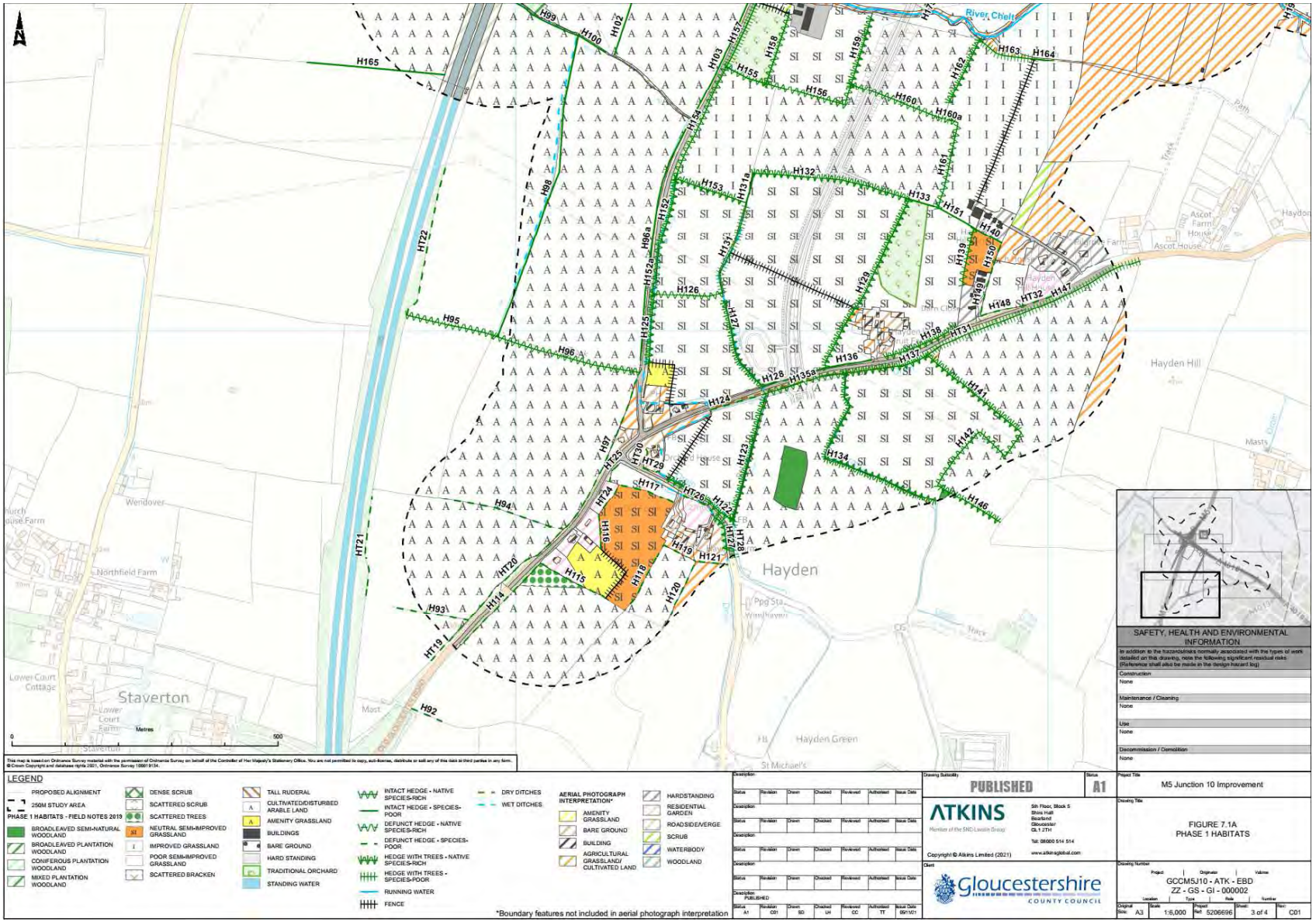
Figure 7.1B Designated Sites

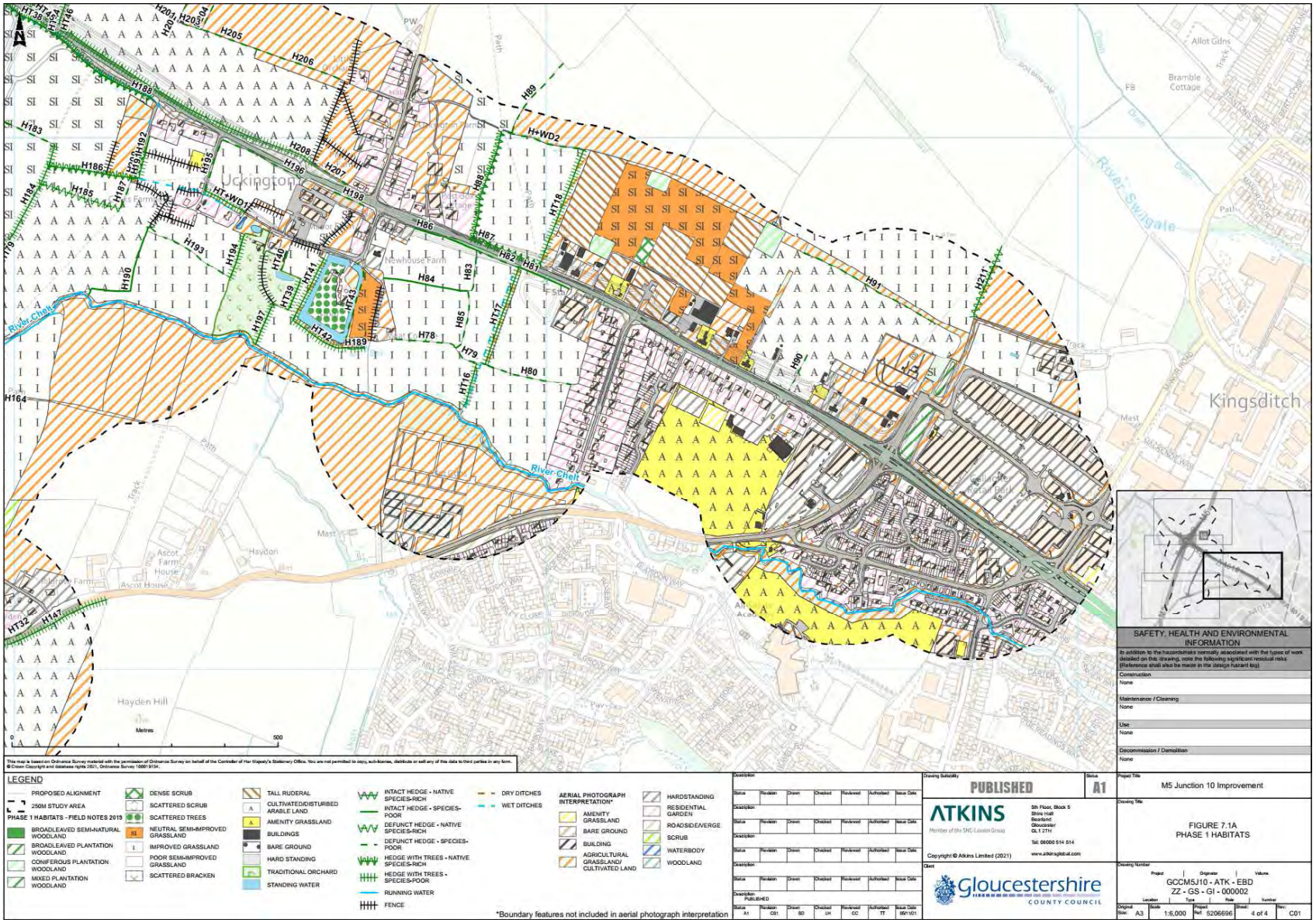
Figure 7.1C Priority Habitats

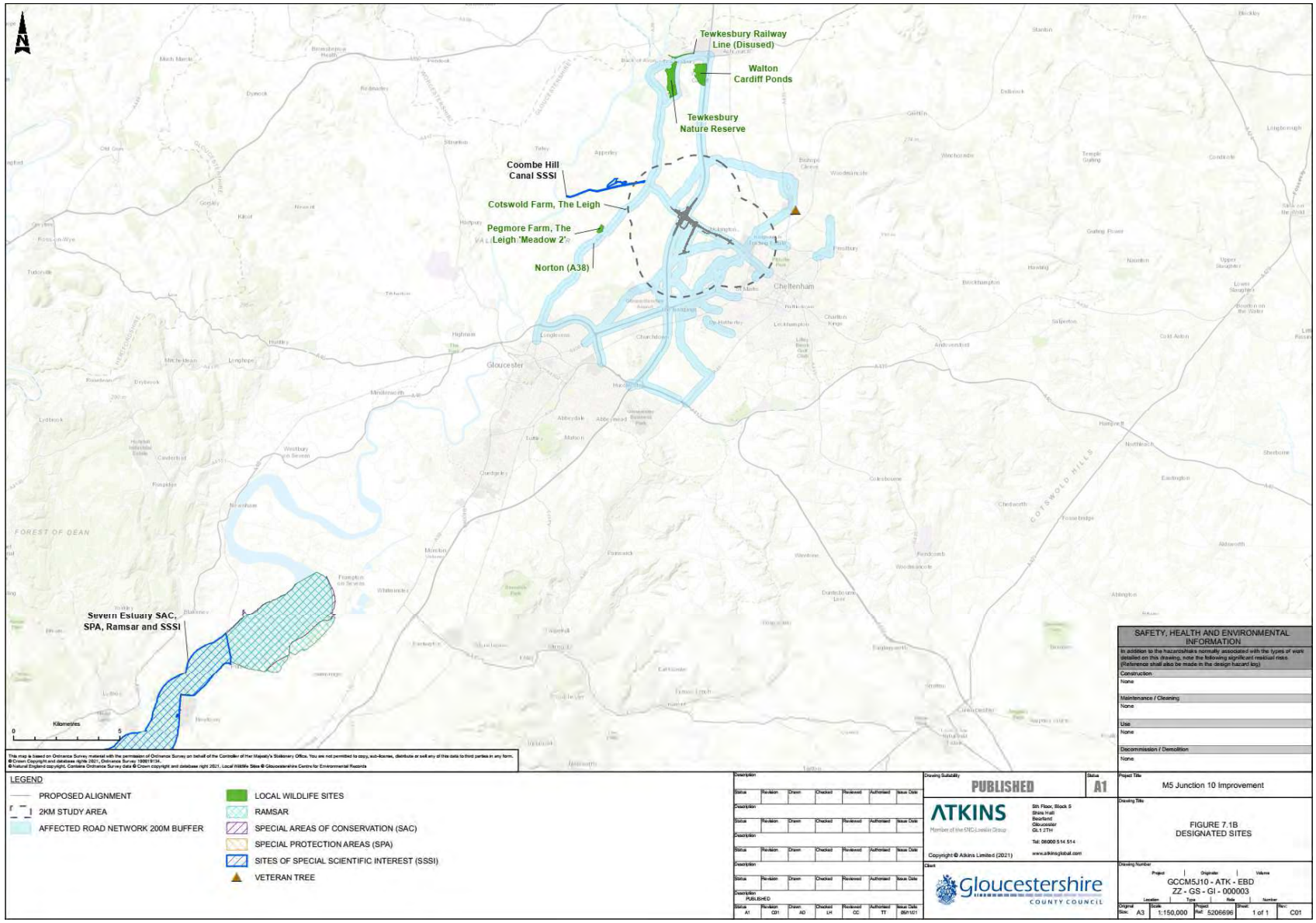
Figure 7.1D Invasive Non-Native Plant Species

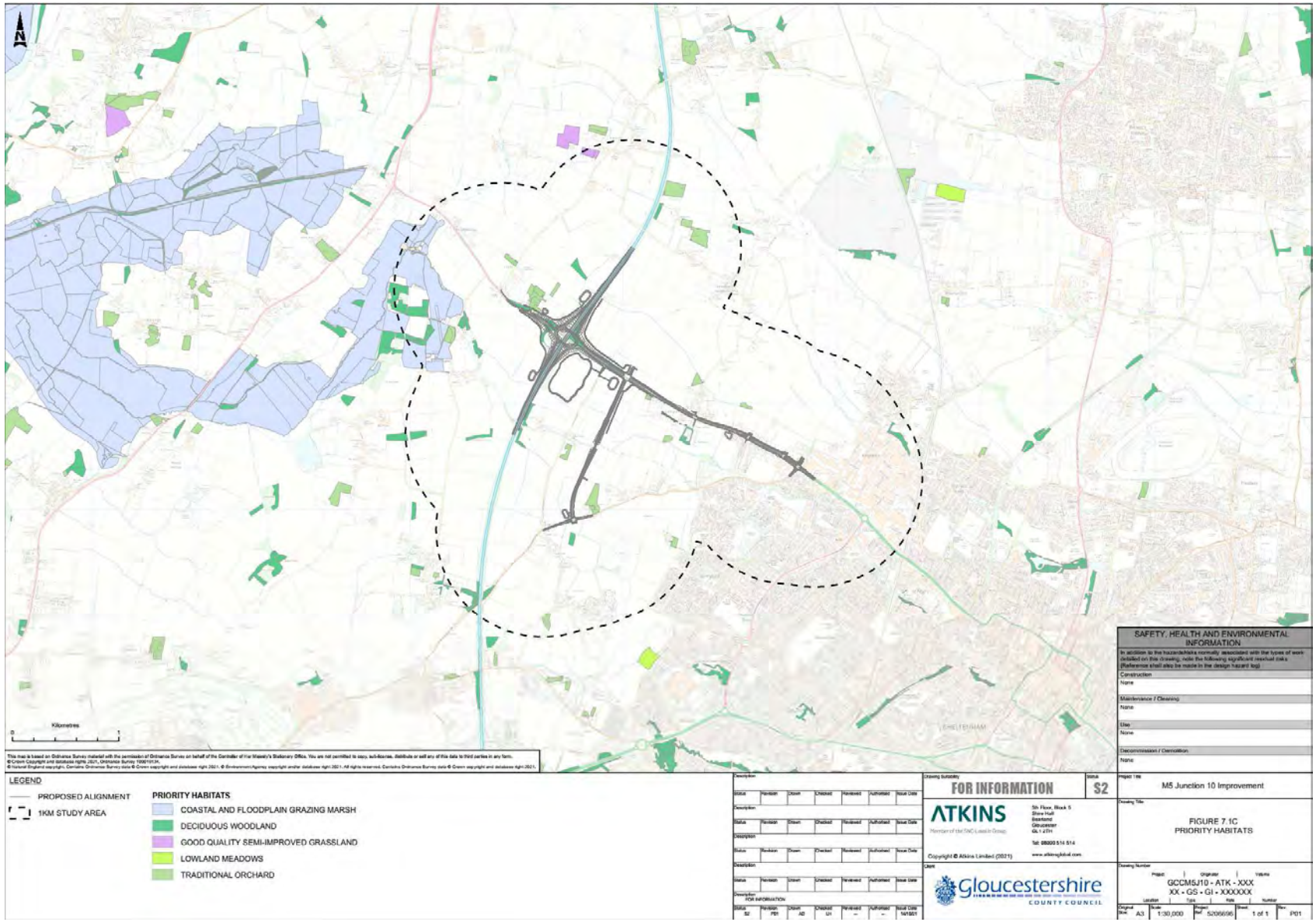

Knightsbridge
Elmstone Business Park
Leigh Brook
LEGEND
PROPOSED ALIGNMENT
250M STUDY AREA
PHASE 1 HABITATS - FIELD NOTES 2019
BROADLEAVED SEMI-NATURAL WOODLAND
BROADLEAVED PLANTATION WOODLAND
CONIFEROUS PLANTATION WOODLAND
MIXED PLANTATION WOODLAND
DENSE SCRUB
SCATTERED SCRUB
SCATTERED TREES
NEUTRAL SEMI-IMPROVED GRASSLAND
IMPROVED GRASSLAND
POOR SEMI-IMPROVED GRASSLAND
SCATTERED BRACKEN
TALL RUDERAL
CULTIVATED/DISTURBED ARABLE LAND
AMENITY GRASSLAND
BUILDINGS
BARE GROUND
HARD STANDING
TRADITIONAL ORCHARD
STANDING WATER
INTACT HEDGE - NATIVE SPECIES-RICH
INTACT HEDGE - SPECIES-POOR
DEFUNCT HEDGE - NATIVE SPECIES-RICH
DEFUNCT HEDGE - SPECIES-POOR
HEDGE WITH TREES - NATIVE SPECIES-RICH
HEDGE WITH TREES - SPECIES-POOR
RUNNING WATER
FENCE
DRY DITCHES
WET DITCHES
AERIAL PHOTOGRAPH INTERPRETATION*
AMENITY GRASSLAND
BARE GROUND
BUILDING
AGRICULTURAL GRASSLAND/ CULTIVATED LAND
HARDSTANDING
RESIDENTIAL GARDEN
ROADSIDE/VERGE
SCRUB
WATERBODY
WOODLAND
*Boundary features not included in aerial photograph interpretation
SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION
PUBLISHED
A1
M5 Junction 10 Improvement
FIGURE 7.1A
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C01

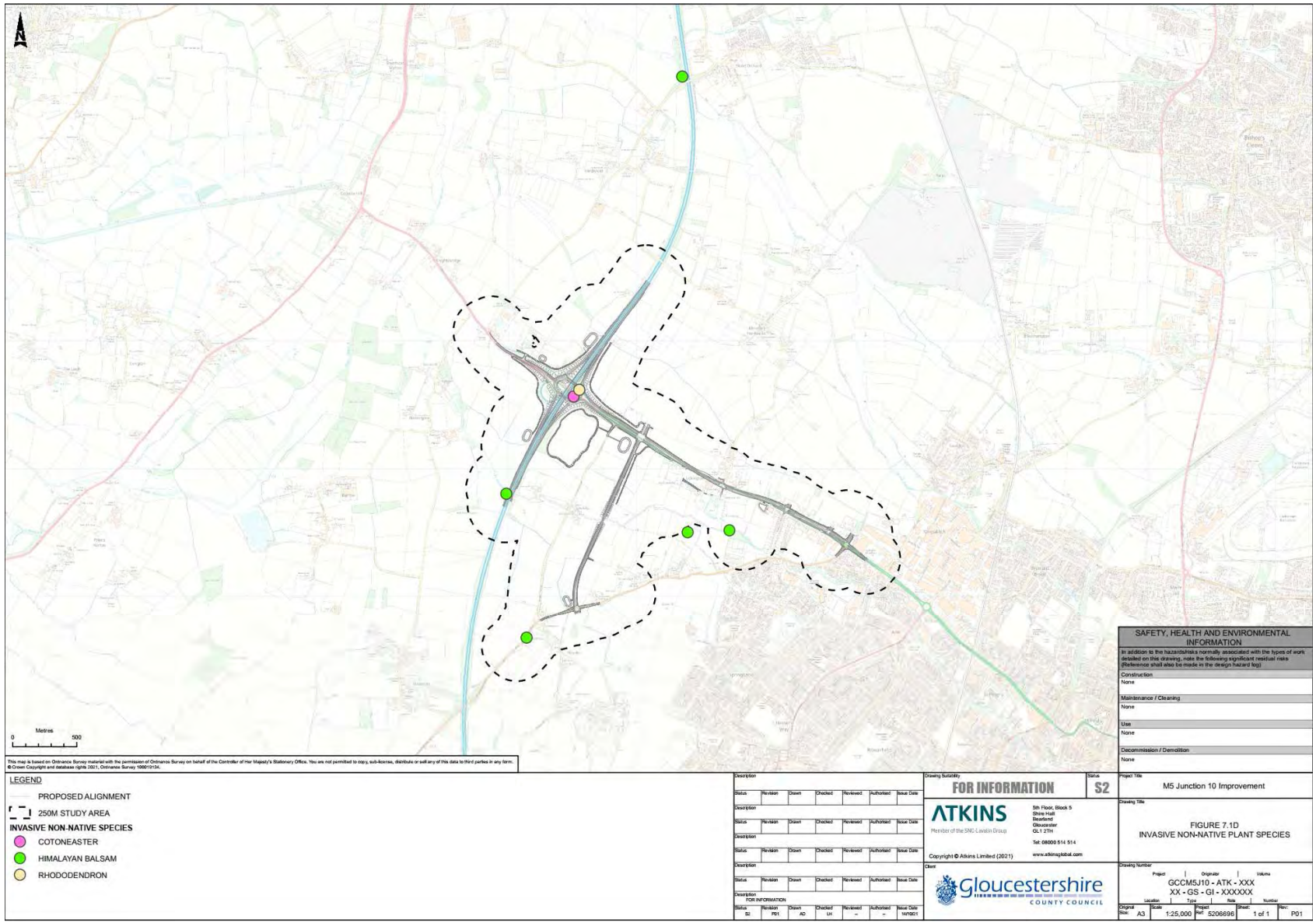

Boddington
Home Farm
Boddington Manor
Primrose Cottage
Boddington House
Boddington Copse
River Chain
Uckington
Metres
0
500
LEGEND
PROPOSED ALIGNMENT
250M STUDY AREA
PHASE 1 HABITATS - FIELD NOTES 2019
BROADLEAVED SEMI-NATURAL WOODLAND
BROADLEAVED PLANTATION WOODLAND
CONIFEROUS PLANTATION WOODLAND
MIXED PLANTATION WOODLAND
DENSE SCRUB
SCATTERED SCRUB
SCATTERED TREES
NEUTRAL SEMI-IMPROVED GRASSLAND
IMPROVED GRASSLAND
POOR SEMI-IMPROVED GRASSLAND
SCATTERED BRACKEN
TALL RUDERAL
CULTIVATED/DISTURBED ARABLE LAND
AMENITY GRASSLAND
BUILDINGS
BARE GROUND
HARD STANDING
TRADITIONAL ORCHARD
STANDING WATER
INTACT HEDGE - NATIVE SPECIES-RICH
INTACT HEDGE - SPECIES-POOR
DEFUNCT HEDGE - NATIVE SPECIES-RICH
DEFUNCT HEDGE - SPECIES-POOR
HEDGE WITH TREES - NATIVE SPECIES-RICH
HEDGE WITH TREES - SPECIES-POOR
RUNNING WATER
FENCE
DRY DITCHES
WET DITCHES
AERIAL PHOTOGRAPH INTERPRETATION*
AMENITY GRASSLAND
BARE GROUND
BUILDING
AGRICULTURAL GRASSLAND/ CULTIVATED LAND
HARDSTANDING
RESIDENTIAL GARDEN
ROADSIDE/VERGE
SCRUB
WATERBODY
WOODLAND
*Boundary features not included in aerial photograph interpretation
SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION
Construction
None
Maintenance / Cleaning
None
Use
None
Decommission / Demolition
None
PUBLISHED
A1
ATKINS
Gloucestershire COUNTY COUNCIL
M5 Junction 10 Improvement
FIGURE 7.1A
PHASE 1 HABITATS
GCCM5J10 - ATK - EBD
ZZ - GS - GI - 000002
1:6,000
5206696
2 of 4
C01


River Chelt
Hayden
Hayden Hill
Staverton
Weirdover
Northfield Farm
Lower Court Cottage
Hayden Green
Ascot House
Ascot Farm House
Masts
LEGEND
PROPOSED ALIGNMENT
250M STUDY AREA
PHASE 1 HABITATS - FIELD NOTES 2019
BROADLEAVED SEMI-NATURAL WOODLAND
BROADLEAVED PLANTATION WOODLAND
CONIFEROUS PLANTATION WOODLAND
MIXED PLANTATION WOODLAND
DENSE SCRUB
SCATTERED SCRUB
SCATTERED TREES
NEUTRAL SEMI-IMPROVED GRASSLAND
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POOR SEMI-IMPROVED GRASSLAND
SCATTERED BRACKEN
TALL RUDERAL
CULTIVATED/DISTURBED ARABLE LAND
AMENITY GRASSLAND
BUILDINGS
BARE GROUND
HARD STANDING
TRADITIONAL ORCHARD
STANDING WATER
INTACT HEDGE - NATIVE SPECIES-RICH
INTACT HEDGE - SPECIES-POOR
DEFUNCT HEDGE - NATIVE SPECIES-RICH
DEFUNCT HEDGE - SPECIES-POOR
HEDGE WITH TREES - NATIVE SPECIES-RICH
HEDGE WITH TREES - SPECIES-POOR
RUNNING WATER
FENCE
DRY DITCHES
WET DITCHES
AERIAL PHOTOGRAPH INTERPRETATION*
AMENITY GRASSLAND
BARE GROUND
BUILDING
AGRICULTURAL GRASSLAND/ CULTIVATED LAND
HARDSTANDING
RESIDENTIAL GARDEN
ROADSIDE/VERGE
SCRUB
WATERBODY
WOODLAND
*Boundary features not included in aerial photograph interpretation
Metres
0
500
SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION
Construction
None
Maintenance / Cleaning
None
Use
None
Decommission / Demolition
None
PUBLISHED
A1
M5 Junction 10 Improvement
FIGURE 7.1A
PHASE 1 HABITATS
ATKINS
Gloucestershire COUNTY COUNCIL
GCCM5J10 - ATK - EBD
ZZ - GS - GI - 000002
1:6,000
5206696
3 of 4
C01


Uckington
Newhouse Farm
Kingsditch
Hayden Hill
Haydon
Ascot Farm House
Ascot House
River Chelt
River Swigate
Allot Gilns
Bramble Cottage
Metres
0
500
LEGEND
PROPOSED ALIGNMENT
250M STUDY AREA
PHASE 1 HABITATS - FIELD NOTES 2019
BROADLEAVED SEMI-NATURAL WOODLAND
BROADLEAVED PLANTATION WOODLAND
CONIFEROUS PLANTATION WOODLAND
MIXED PLANTATION WOODLAND
DENSE SCRUB
SCATTERED SCRUB
SCATTERED TREES
NEUTRAL SEMI-IMPROVED GRASSLAND
IMPROVED GRASSLAND
POOR SEMI-IMPROVED GRASSLAND
SCATTERED BRACKEN
TALL RUDERAL
CULTIVATED/DISTURBED ARABLE LAND
AMENITY GRASSLAND
BUILDINGS
BARE GROUND
HARD STANDING
TRADITIONAL ORCHARD
STANDING WATER
INTACT HEDGE - NATIVE SPECIES-RICH
INTACT HEDGE - SPECIES-POOR
DEFUNCT HEDGE - NATIVE SPECIES-RICH
DEFUNCT HEDGE - SPECIES-POOR
HEDGE WITH TREES - NATIVE SPECIES-RICH
HEDGE WITH TREES - SPECIES-POOR
RUNNING WATER
FENCE
DRY DITCHES
WET DITCHES
AERIAL PHOTOGRAPH INTERPRETATION*
AMENITY GRASSLAND
BARE GROUND
BUILDING
AGRICULTURAL GRASSLAND/ CULTIVATED LAND
HARDSTANDING
RESIDENTIAL GARDEN
ROADSIDE/VERGE
SCRUB
WATERBODY
WOODLAND
*Boundary features not included in aerial photograph interpretation
SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION
In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log).
Construction
None
Maintenance / Cleaning
None
Use
None
Decommission / Demolition
None
PUBLISHED
A1
M5 Junction 10 Improvement
FIGURE 7.1A
PHASE 1 HABITATS
GCCM5J10 - ATK - EBD
ZZ - GS - GI - 000002
1:6,000
5206696
4 of 4
C01
ATKINS
Gloucestershire
COUNTY COUNCIL


Tewkesbury Railway Line (Disused)
Walton Cardiff Ponds
Tewkesbury Nature Reserve
Coombe Hill Canal SSSI
Cotswold Farm, The Leigh
Pegmore Farm, The Leigh 'Meadow 2'
Norton (A38)
Severn Estuary SAC, SPA, Ramsar and SSSI
Cheltenham
Gloucester
FOREST OF DEAN
COTSWOLD HILLS
Kilometres
LEGEND
PROPOSED ALIGNMENT
2KM STUDY AREA
AFFECTED ROAD NETWORK 200M BUFFER
LOCAL WILDLIFE SITES
RAMSAR
SPECIAL AREAS OF CONSERVATION (SAC)
SPECIAL PROTECTION AREAS (SPA)
SITES OF SPECIAL SCIENTIFIC INTEREST (SSSI)
VETERAN TREE
SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION
Construction
None
Maintenance / Cleaning
None
Use
None
Decommission / Demolition
None
PUBLISHED
A1
M5 Junction 10 Improvement
FIGURE 7.1B
DESIGNATED SITES
GCCM5J10 - ATK - EBD
ZZ - GS - GI - 000003
1:150,000
5206696
1 of 1
C01


N
Kilometres
0
1
LEGEND
PROPOSED ALIGNMENT
1KM STUDY AREA
PRIORITY HABITATS
COASTAL AND FLOODPLAIN GRAZING MARSH
DECIDUOUS WOODLAND
GOOD QUALITY SEMI-IMPROVED GRASSLAND
LOWLAND MEADOWS
TRADITIONAL ORCHARD
SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION
Construction
None
Maintenance / Cleaning
None
Use
None
Decommission / Demolition
None
FOR INFORMATION
S2
ATKINS
Gloucestershire COUNTY COUNCIL
M5 Junction 10 Improvement
FIGURE 7.1C
PRIORITY HABITATS
GCCM5J10 - ATK - XXX
XX - GS - GI - XXXXXX
A3
1:30,000
1 of 1
P01


N
Metres
0
500
LEGEND
PROPOSED ALIGNMENT
250M STUDY AREA
INVASIVE NON-NATIVE SPECIES
COTONEASTER
HIMALAYAN BALSAM
RHODODENDRON
SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION
In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log)
Construction
None
Maintenance / Cleaning
None
Use
None
Decommission / Demolition
None
FOR INFORMATION
S2
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GL1 2TH
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www.atkinsglobal.com
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Gloucestershire COUNTY COUNCIL
M5 Junction 10 Improvement
FIGURE 7.1D
INVASIVE NON-NATIVE PLANT SPECIES
GCCM5J10 - ATK - XXX
XX - GS - GI - XXXXXX
A3
1:25,000
5206696
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P01

Appendix 7.2 – Hedgerow survey

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1. Introduction

1.1. Terms of Reference

1.1.1. Atkins, member of the SNC-Lavalin group, was commissioned by Gloucestershire County Council (GCC) to undertake hedgerow surveys to inform the Environmental Statement (ES) for the M5 Junction 10 Improvements Scheme (hereafter referred to as 'the Scheme').

1.1.2. The purpose of the hedgerow surveys was to determine whether hedgerows of ecological importance are present within the Scheme area; provide recommendations to enable compliance with legislation and policy; and, where appropriate, identify the need for avoidance, mitigation, compensation, or enhancement measures.

1.1.3. This Technical Appendix summarises the results of the hedgerow surveys undertaken, including the methods used, and provides an evaluation of the nature conservation value of hedgerows within the survey area.

1.1.4. This report provides factual information to support the ES, which will accompany the planning application for the Scheme.

1.2. Legislation and Policy

1.2.1. Relevant legislation in relation to hedgerows is provided in Table 1-1 below.

Table 1-1 - Summary of Relevant Legislation

Legislation/guidance	Further information
The Hedgerows Regulations 1997	Under the regulations, it is against the law to remove or destroy certain hedgerows without permission from the local planning authority in England. In general, permission will be required before removing hedgerows that are at least 20 metres in length, over 30 years old and contain certain species of plant. The local planning authority will assess the importance of the hedgerow using criteria set out in the regulations.
Natural Environment and Rural Communities (NERC) Act 2006	S.40 of the NERC Act 2006 sets out the duty for public authorities to conserve biodiversity in England. Habitats and species of principal importance for the conservation of biodiversity identified by the Secretary of State for England, in consultation with Natural England, are referred to in S.41 of the NERC Act for England. The list, known as the 'England Biodiversity List', includes hedgerows as a habitat of principal importance (also referred to as a 'priority habitat'). To qualify as a priority habitat, a hedgerow must consist predominantly (i.e. at least 80% cover) of at least one woody UK native species[1]. The England Biodiversity List is used as a guide for decision makers such as public bodies, including local and regional authorities, in implementing their duty under Section 40 of the NERC Act 2006 to have regard to the conservation of biodiversity in England when carrying out their normal functions. The England Biodiversity List priority habitats, including hedgerows, were previously listed in the UK Biodiversity Action Plan (BAP)[2].

[1] Maddock, A. (ed) (2008). ***UK Biodiversity Action Plan Priority Habitat Descriptions – Hedgerows***. Online: https://data.jncc.gov.uk/data/ca179c55-3e9d-4e95-abd9-4edb2347c3b6/UKBAP-BAPHabitats-17-Hedgerows.pdf [Accessed: 21/09/21].
[2] https://jncc.gov.uk/our-work/uk-bap-priority-habitats/ [Accessed: 21/09/21]

2. Methodology

2.1. Desk Study

2.1.1. Ordnance Survey (OS) mapping and aerial imagery provided on the MAGIC website[3] were reviewed to identify potentially important hedgerows within 250 m of the Scheme.

2.2. Survey Area

2.2.1. The extent of the hedgerow survey was based on the zone of influence of the Scheme for this particular ecological receptor. It included all land within the Scheme boundary and a 250 m buffer extending out in all directions from the Scheme boundary where permitted and safe access allowed.

2.2.2. At the time the survey was undertaken, there were a number of Scheme options under consideration. This report only considers the survey data collected within 250 m of the current Scheme, hereafter referred to as the Hedgerow Survey Area. The Hedgerow Survey Area is shown in Figure 7.1A in Appendix A of Technical Appendix 7.1 (the Phase 1 Habitat Survey report).

2.3. Field Survey

2.3.1. Surveys were led by suitably experienced ecologists who are members of the Chartered Institute of Ecology and Environmental Management (CIEEM) and considered competent to undertake Phase 1 habitat and hedgerow surveys in accordance with the CIEEM competency criteria[4].

2.3.2. An extended Phase 1 habitat survey of accessible land within 250 m of the Scheme was undertaken by Atkins in May 2019, and in September 2019 once permitted access was available. These surveys identified and mapped habitats in accordance with the Phase 1 habitat survey methodology[5], which included the recording of intact/defunct hedgerows, with/without trees.

2.3.3. Hedgerows identified as being potentially important, located either partially or entirely within 250 m of the Scheme, were subject to a hedgerow survey, where permitted and safe access allowed.

2.3.4. Hedgerow surveys were undertaken between June and August 2019 and in June 2021. The survey methodology followed the guidelines provided in the Hedgerow Survey Handbook[6], including taking the definition of a hedgerow to be; 'any boundary line of trees or shrubs over 20 m long and less than 5 m wide at the base, provided that at one time the trees or shrubs were more or less continuous.'

2.3.5. During the surveys, the following features were recorded:

- General height and width of the hedgerow;
- Number and length of any gaps;
- Presence of banks, walls, and ditches;
- Presence, number and spacing of standard trees;
- Adjacent land use and proximity of ecological features such as ponds, woodlands or parallel hedgerows, and any connections to other hedgerows not evident on existing maps;

[3] DEFRA. c2019. Magic Map Application. [Online]. Available from: https://magic.defra.gov.uk/MagicMap.aspx
[4] https://www.cieem.net/competency-framework
[5] Joint Nature Conservation Committee (2010). ***Handbook for Phase 1 habitat survey – a technique for environmental audit***
[6] DEFRA (2007) Hedgerow Survey Handbook. A standard procedure for local surveys in the UK. DEFRA, London

- The presence and abundance of woody species listed on Schedule 3 of The Hedgerows Regulations 1997 within representative 30 m sections;
- The presence and abundance (as above) of species listed on Schedule 2 of The Hedgerows Regulations 1997 with ground flora to a distance of 1 m from the hedgerow base;
- Evidence of past or recent management; and,
- Evidence of use by animal species, in particular protected species.

2.4. Assessment

2.4.1. Following the field survey, the results were assessed against the wildlife and landscape criteria for determining 'important' hedgerows set out in Schedule 1, Part 2 of The Hedgerow Regulations 1997.

2.4.2. The hedgerow resource has been valued in a geographical context following the framework provided in LA 108[7]. The evaluation is based on the information gathered from the desk study and field surveys, using a combination of professional judgement and accepted criteria[8] (e.g. diversity, rarity, and naturalness).

2.5. Limitations

2.5.1. Ecological surveys are limited by factors which affect the presence of plants and appearance of habitats, such as time of year, recent management (e.g. flailing) and the weather. Therefore, the survey has not produced a complete list of plants and the absence of any particular species should not be taken as conclusive proof that the species is not present or that it will not be present in the future.

2.5.2. The optimal period for hedgerow survey is June-July, to capture woody species in flower and spring ground flora[9]. Whilst the majority of hedgerow surveys were undertaken during this optimum period, a small number were undertaken in August. Despite being undertaken outside of the optimum period, the surveys were only slightly outside of it, and still at a good time of year for botanical identification. It is therefore considered unlikely that this would have resulted in misidentification or omission of flora and is not considered a significant constraint to the hedgerow surveys.

2.5.3. Of the 247 hedgerows identified for survey, 39 were not surveyed as permitted access was not available. Only three of these (H124, H207 and HT46) could potentially be impacted by the Scheme. In any case, the survey coverage is considered sufficient to enable a robust assessment of the value of the hedgerow resource within the study area.

2.5.4. It is assumed that the planning application for the Scheme will be submitted during Summer 2022. At that point, the survey data from 2019 will be three years old. It is proposed to undertake an update Phase 1 habitat survey in targeted areas in order to determine whether any of the baseline conditions have changed significantly, and validate, or confirm any changes, to the results described in this report. This report will be updated to include the results of these surveys and will be submitted as part of the ES.

2.5.5. Overall, the results of this survey work are considered sufficient to inform an ecological assessment of the hedgerow resource relevant to the Scheme.

[7] Highways England. March 2020. LA 108 Biodiversity [Online]. [Accessed October 2020]. Available from: https://www.standardsforhighways.co.uk/dmrb/search?discipline=SUSTAINABILITY_AND_ENVIRONMENT
[8] Set out in Ratcliffe, D.A (1977). A Nature Conservation Review. Cambridge University Press.
[9] DEFRA (2007) Hedgerow Survey Handbook. A standard procedure for local surveys in the UK. DEFRA, London.

3. Results

3.1. Desk Study

3.1.1. A total of 262 hedgerows were identified from aerial imagery and OS maps within 250 m of the Scheme. Following Scheme updates and route option changes, 15 of these hedgerows were scoped out of hedgerow surveys as they were no longer within the survey area. As a result, a total of 247 hedgerows were identified for further survey within the Hedgerow Survey Area. Of these, 39 were not surveyed as access was not permitted (see Section 2.5 Limitations above for further details).

3.2. Field Survey

3.2.1. A total of 201 hedgerows were surveyed between June and August 2019. Seven hedgerows were surveyed in June 2021.

3.2.2. A total of 75 hedgerows were found to be species-rich, i.e. at least five woody species were present within the length of the hedgerow. The remaining 128 were found to be species-poor, and five were found to be fences rather than hedgerows, as aerial mapping and OS maps had suggested.

3.2.3. The most abundant species included hawthorn (***Cratageus monogyna***) and blackthorn (***Prunus spinosa).*** Other species frequently recorded included field maple (***Acer campestre***), elder (***Sambucus nigra***), dog rose (***Rosa canina***), wild privet (***Ligustrum vulgare***), butterfly-bush (***Buddleja davidii***), hazel (***Corylus avellana***), elm (***Ulmus*** sp.), dogwood (***Cornus sanguinea***), apple (***Malus domestica***) and ash (***Fraxinus excelsior***).

3.2.4. Following the hedgerow surveys and data review, it was found that two hedgerows (H169 & H177) are 'important' as per The Hedgerow Regulations 1997. The survey results in relation to these hedgerows are detailed in Table 3-1 below.

Table 3-1 - Data recorded for 'Important' hedgerows

Hedgerow ID	Length (m)	Width (m)	Height (m)	Number of 30m sections surveyed	Woody species recorded	Features	Importance
H169	282	3	2.5	3	Elder Blackthorn Elm Field maple Hawthorn Average per 30 m section = 4	Active badger sett present	Yes – Hedge supports a protected species.
H177	110	2.5	2.75	2	Elder Hawthorn Blackthorn Dog rose Fied maple Dogwood Elm Hazel	Intact 4 connection points Adjacent to footpath	Yes – At least five woody species listed on Schedule 3 per 30 m section, adjacent to a footpath, and two features listed in

Hedgerow ID	Length (m)	Width (m)	Height (m)	Number of 30m sections surveyed	Woody species recorded	Features	Importance
					Average per 30m section = 5		paragraph 4 (at least 4 connection points and intact; gaps not exceeding 10% of hedgerow).

3.2.5. H169 is located approximately 200 m to the west of the M5 motorway and H177 is located partially within the footprint of the proposed Link Road. The locations of these hedgerows, and all other hedgerows within the Hedgerow Survey Area, are shown on Figure 7.1A in Appendix A of Technical Appendix 7.1 (the Phase 1 Habitat Survey report).

4. Evaluation

4.1.1. A total of 137 intact and 59 defunct hedgerows were found to consist predominantly (i.e. 80% or more cover) of at least one woody UK native species and therefore qualify as a priority habitat[10].

4.1.2. A total of 75 hedgerows were species-rich (i.e. at least five woody species were present within the length of the hedgerow).

4.1.3. Two hedgerows within the survey area (H169 and H177) are 'Important', as defined by the wildlife and landscape criteria set out in Schedule 1 of The Hedgerows Regulations 1997.

4.1.4. LA 108[11] advises that UK BAP priority habitats and habitats of principal importance should be considered to be of national nature conservation value. However, the majority of the hedgerows within the survey area are species poor, and only relatively short stretches of hedgerow are present within the Scheme. Furthermore, although there has been loss of hedgerows and field boundaries in recent decades due to agricultural intensification, hedgerows and hedgerows with trees are frequent throughout Gloucestershire.

4.1.5. Taking all of this into consideration, the hedgerow network within the zone of influence of the Scheme is considered to enrich the habitat resource within the local context, providing ecological connectivity, and is therefore considered to be of Local importance.

[10] Maddock, A. (ed) (2008). ***UK Biodiversity Action Plan Priority Habitat Descriptions – Hedgerows***. Online: https://data.jncc.gov.uk/data/ca179c55-3e9d-4e95-abd9-4edb2347c3b6/UKBAP-BAPHabitats-17-Hedgerows.pdf [Accessed: 21/09/21].
[11] Highways England. March 2020. LA 108 Biodiversity [Online]. [Accessed October 2020]. Available from: https://www.standardsforhighways.co.uk/dmrb/search?discipline=SUSTAINABILITY_AND_ENVIRONMENT

Appendix 7.3 – Bat survey

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1. Introduction

1.1. Purpose of the Report

1.1.1. The purpose of this report is to identify how the M5 Junction 10 Improvement Scheme (the Scheme) could potentially impact bats. This technical appendix has been prepared in accordance with best practice guidance for ecological impact assessment of road schemes including the Design Manual for Roads and Bridges (DMRB) LA 108[1], LD 118[2], LA 104[3] and the Chartered Institute of Ecology and Environmental Management (CIEEM) Guidelines for Ecological Impact Assessment.

1.1.2. For the purpose of this report, the main parts of the Scheme that may impact bats are as follows:

- The erection of an all-movements junction (this includes large areas of habitats to be removed, as well as properties to be demolished, see below). This work will result in there being no flight paths for bats under the junction, where there currently is on both sides of the M5. Additional lighting will also be required around the junction, including where the junction meets the A4019.
- Junction Improvements - There will be works along the M5 itself to facilitate new slip roads and verges. This will include the extension of two existing culverts: Piff Elms culvert (which will be extended 54.8 m to the north and 47.9 m to the south) and Barn Farm culvert (Leigh Brook) (will be extended by up to 7.9 m to the north and 8 m to the south); The M5 River Chelt culvert and surrounding vegetation will be retained. The Scheme red line boundary extends much further along the M5 in north and south directions, due to online works only being proposed in the existing carriageway at these locations.
- Link Road - A new Link Road will be created, joining the A4019 to Old Gloucester Road. This will include a new clear span road bridge (24.85 m) over the River Chelt, set back by at least 4 m on either side of the river. It will have a height of 2.8 m clearance between the underside of the bridge and ground level (top of the River Chelt's bank). The bridge will be 22.4 m wide across the width of the carriageway and verges. Where ditches cross this Link Road, box culverts will be used to facilitate movement of water from one side of the road to the other. Other than the northern and southern 150m of this road, the Link road will not be lit; and
- A4019 Improvements - Dualling of the A4019 to the east of the junction will include widening the A4019 (including the removal of vegetation and demolition of properties, see below), as well as the addition of a new lighting scheme along this currently unlit section of road).
- Permeant land take will consist of:

Table 1-1 - Permanent Land Take as a Result of the Scheme

Habitat	Area (ha)
Semi-Natural Broadleaved Woodland	1.71
Plantation Broadleaved Woodland	3.51
Plantation Mixed Woodland	1.30

[1] DMRB LA 108 Biodiversity (formerly Volume 11, Section 3, Part 4 Ecology and Nature Conservation and IAN 130/10) Revision 1.
[2] DMRB LD 118 Biodiversity Design (formerly LA 118 which superseded HA 59/92, HA 67/93, HA 80/99, HA 81/99, HA 84/01, HA 97/01, HA 98/01, HA 116/05, IAN 116/08, IAN 116/08(W)) Revision 0.
[3] DMRB LA 104 Environmental assessment and monitoring (formerly HA 205/08, HD 48/08, IAN 125/15, and IAN 133/10) Revision 1.

Habitat	Area (ha)
Dense/Continuous Scrub	0.17
Broad-leaved Parkland Scattered Trees	0[4]
Semi-Improved Neutral Grassland	0.11
Improved Grassland	4.92
Poor Semi-Improved Grassland	11.34
Tall Ruderal	0.50
Arable Land	14.41
Amenity Grassland	1.80
Building	0.62
Bare Ground	0.03
Hardstanding	0.60
Un-surveyed	28.44
Running Water	363.1 m
Hedgerow	4257.4 m
Defunct Hedgerow	129.6 m
Hedgerow with Trees	2,732.4 m
Defunct Hedgerow with Trees	23.8 m

Table 1-2 - Permanent Land Take of Linear Habitats as a Result of the Scheme

Habitat	Length (m)
Running Water	363
Hedge	4257
Defunct hedge	130
Hedge with trees	2732
Defunct hedge with trees	24

1.2. Location of the Scheme

1.2.1. M5 Junction 10 is located 48 miles to the south of Birmingham, five miles to the south of Tewkesbury, four miles to the north-west of Cheltenham, and eight miles to the north-east of Gloucester. It is the northernmost of four junctions serving the Gloucester and Cheltenham urban areas.

1.2.2. This places the junction in a strategically important location for the region, particularly as northern and western Cheltenham are the sites of a number of large retail parks and

[4] This equates to approximately 18.94 m^2

employment areas, and the location of planned future housing and nationally-significant business development.

1.2.3. The locations of the proposed infrastructure improvements that make up the M5 Junction 10 Improvements Scheme are illustrated in the main report.

2. Methodology

2.1. Study Areas

2.1.1. The extent to which the study area extends beyond the Scheme was determined by the likely spatial scale of potential significant effects for each type of ecological feature, i.e. the Zones of Influence (ZOI). These are based on good practice guidance, where available (references provided where applicable), but in most cases are determined by professional judgement and taking guidance from Interim Advice Note 116/08[5].

2.1.2. This report only details findings of surveys in 2019 and 2020, unless specifically stated. Surveys in 2021 will be reported separately. Study areas in relation to bats are as follows:

Desk Study

2.1.3. A desk-based data gathering exercise was undertaken in April 2021 by contacting Gloucestershire Centre for Environmental Records (GCER) to obtain recent records of:

- Bat species records within 2 km of the Scheme[6].

2.1.4. The Magic website[7] was reviewed to identify all:

- European Sites[8] where bats are one of the qualifying features[9] within 30 km of the Scheme; and
- Granted European Protected Species (EPS) licences[10] within 1 km of the Scheme (2 km for bats).

Daytime Roost Assessment of Buildings and Trees

2.1.5. The study area was 100 m from the Scheme for assessment of building's and tree's bat roost suitability. This is extended where buildings and trees beyond 100 m would be isolated by the Scheme (i.e. between the link road and the M5). This study area can be seen in Figure 7-1.

2.1.6. The Scheme originally only had online works along the A4019 and therefore the study area was decreased at this location to 50 m for assessment of building's and tree's bat roost suitability. However, in early 2021 the works along the A4019 were increased to include widening and lighting the road. On this basis, the study area along the A4019 was increased from 50 m to 100 m north of the A4019, to be in line with the study area for the rest of the Scheme. The distance has been retained at 50 m along the south of the A4019 (or as far as the first row of houses), as the work in this area is at the north of the A4019. It's also been considered that the study area will not extend east beyond Hayden Road (located west of the dualled section of the A4019 carriageway); this is on the assumption that there are street lights already in this location and it's already well used, and assuming the noise survey does not determine impacts are likely to extend further than this study area. This will be confirmed during a site walk-over, and following any project updates, and adapted if necessary.

[5] Interim Advice Note 116/08: Nature Conservation Advice In Relation To Bats. October 2008.
[6] Using the minimum distance of 2 km was considered to be sufficient due to the vast number of surveys and methods being completed within the study area, providing detailed information of the bat species and assemblages present.
[7] Licences granted by Natural England to permit activities that might otherwise cause a breach of the Conservation of Habitats and Species Regulations 2018, with respect to species protected by that legislation.
[8] A European site is defined within Regulation 8 of the Habitats Regulations as a Special Area of Conservation (SAC) or a Special Protection Area (SPA).
[9] Design Manual for Roads and Bridges. 2019. LA 104 Environmental assessment and monitoring. Online https://www.standardsforhighways.co.uk/dmrb/search/78a69059-3177-43dc-94bd-465992cfda82. [Accessed August 2021]
[10] Licences granted by Natural England to permit activities that might otherwise cause a breach of the Conservation of Habitats and Species Regulations 2018, with respect to species protected by that legislation.

Bat Activity Surveys (Transects and Static Detectors)

2.1.7. The study area was 250 m from the Scheme for assessment of habitat and suitability to support bats. As part of this assessment using Bat Survey Guidelines[11], the local landscape was assigned a suitability of low, moderate or high for bats.

Crossing Point Surveys

2.1.8. Areas where bats were deemed likely to be using features to commute/ forage along[12] that would be intersected/ directly crossed by the Scheme were identified. Of these locations, surveys focused on locations with the best quality hedgerows; surveys were completed using the below methodology to identify if they would be defined as crossing points for bats.

Preliminary Roost Assessments/ Ground Level Tree Assessments

2.1.9. Preliminary Roost Assessment (PRAs) and Ground Level Tree Assessments (GLTAs) were undertaken in line with Bat Survey Guidelines.

2.1.10. PRA surveys were undertaken during daylight hours and involved the identification of suitable roosting features within a structure (building, bridge or culvert) or tree, and then looking for further evidence of use by bats. Surveys were aided by the use of high-powered torches, endoscopes and binoculars (where appropriate). The use of torches or endoscopes was only completed by appropriately licensed bat ecologists. Photographs were taken of each suitable feature, and any evidence of bats was recorded (where not provided, these can be supplied upon request).

2.1.11. The majority of PRAs undertaken of structures as part of this Scheme involved an external assessment only, due to the potential presence of asbestos which required dedicated asbestos surveys to be carried out prior to internal inspections, as well as the increased risk of transmission due to Covid-19.

2.1.12. Internal inspections entailed physical entry by a surveyor, including into the roof void or cellar/ basement (if present). Where internal surveys were possible, the surveyor ensured that they made notes of any bats or evidence of bats including bat droppings or staining. The internal inspection allowed for an accurate assessment of the structure's hibernation suitability. However, where structures were very open, such as Dutch barns, these were fully surveyed as part of this initial PRA survey.

2.1.13. Where areas of woodland were found (defined as groups of more than20 trees), the woodland was assessed for bat roosting suitability as a whole and the highest bat roosting suitability for any individual tree within the woodland was assigned to the whole group.

2.1.14. If bat droppings were found within any tree or structure, they were collected (if possible), and sent for DNA testing (see 2.2).

2.1.15. Limitations: The majority of the surveys undertaken did not include internal assessments of structures due to the Covid-19 pandemic and the need to reduce entering internal spaces. This could significantly reduce the surveyors' ability to identify/ characterise bat roosts. Therefore, for most sites a precautionary approach was adopted when assigning bat roost suitability to structures or trees. Combined, with bat emergence / re-entry surveys, and professional judgement, it is felt that this was not a significant limitation.

[11] Collins, J. (ed) (2016) Bat Surveys for professional Ecologists: Good Practice Guidelines (3rd edn). The Bat Conservation Trust, London.

[12] These were deemed as a proportion of the hedgerows that may be intersected by the Scheme (or extended for culverts). With regards to roads that already intersect hedgerows, surveys were deemed necessary where impacts to the road would affect the current habitat (i.e. the addition of lighting at these locations).

2.2. DNA Surveys

2.2.1. Where bat droppings were found within any tree or structure, they were collected (if possible) in line with Bat Survey Guidelines, with minimal disturbance by the licensed ecologist. A sample was collected in a sealed pot and labelled. In addition, photographs of the droppings and their general distribution was taken prior to collection, where possible, and the location of droppings noted on the survey proforma or annotated on a plan. Where more than one species was suspected, these were separated where possible for analysis and detailed within the survey proforma and sample label.

2.2.2. The survey team were responsible for the safe transportation of the droppings. Surveyors aimed for five/ six droppings to be collected per sample (i.e. species and location). Two or three droppings were then extracted and sent to Swift Ecology for DNA analysis.

2.2.3. The remaining droppings were stored in a cool dry location for a minimum of 12 months, in case the droppings sent off did not provide accurate results. Droppings were all sent off for testing within two weeks of being collected at the latest.

2.2.4. Limitations: Some bat droppings were not sent off for DNA testing as only a single dropping was found. Where roosts are proposed to be demolished, or are within the ZOI, attempts will be made to collect more droppings for DNA testing prior to a Natural England licence being submitted (which will be necessary before construction works proceed on site). In the meantime, assessments of roost characterisation have been conducted using surveyor professional judgement and bat sound analysis to determine species identification.

2.3. Structural Hibernation Surveys

2.3.1. Any structure with hibernation suitability was subject to hibernation surveys (where possible). This entailed a minimum of two visits, one in mid-January and one in mid-February. Hibernation surveys were extended into March where the weather remained cold enough (considered to be a minimum night-time temperature of 5^{o}C or below).

2.3.2. Full spectrum static recorders (see survey details below) were left within structures where internal cavities were present that could not be fully inspected (i.e. roof voids where all features could not be easily assessed) for a minimum of two weeks during each survey visit (January and February/ March) with a EasyLog USB - Lascar temperature and humidity data logger (taking hourly readings). The location of each static and humidity/ temperature recorder was mapped.

2.3.3. Limitations: Due to the Covid-19 pandemic, internal surveys could not proceed in winter 2020/ 2021 as planned. Therefore, in eleven cases, Anabat Swifts (Swift) and data loggers were given to residents to be placed in roof voids for a month, in order to gain relevant hibernation data in the absence of internal inspections. Internal inspections proceeded where properties were vacant, and they had up-to-date asbestos surveys. For one property where this was not possible, a landowner provided a video of their roof void for a basic visual assessment by the licensed ecologist to assess its suitability to support hibernating bats. Based on these adopted methods, combined with factoring in that some hibernation sites may have gone un-detected due to this limitation, it is considered that an appropriate overall assessment of the study area was possible.

2.4. Emergence/ Re-entry Structural Surveys

2.4.1. Following PRA, structures with low to high suitability for roosting bats were subject to emergence/ re-entry surveys. These surveys included one survey for low suitability, two surveys for moderate suitability and three surveys for high suitability, in line with the Bat Survey Guidelines.

2.4.2. Dusk emergence surveys began approximately 15 minutes before sunset and continued until two hours after sunset (or one and a half hours if bat activity was low, or late

emerging species were considered un-likely to be present). Dawn re-entry surveys commenced two hours before sunrise and continued until 15 minutes after sunrise. If there was still bat activity 15 minutes after sunrise, the survey continued until 15 minutes after the last bat activity.

2.4.3. All surveys were carried out in accordance with the weather conditions described in the Bat Survey Guidelines (or specific survey limitations were detailed within the analysis/ roost characterisation). Maps were drawn from all roost surveys detailing each surveyor location, the location of any static detectors/ infra-red camera positions, any emergence/ re-entry points and any observed flight lines. Flight lines were noted within the survey proforma for any important commuting or foraging habitats, and for any emergence or re-entry observed, with attention noted to the time of observation to allow for call analysis to identify the species.

2.4.4. Surveyors were strategically positioned around the structure to allow for visibility of all features suitable for roosting bats. Visual observations of bats were primarily supported by ultrasonic bat detectors, using full spectrum handheld detectors (see section 2.8.7).

2.4.5. The use of infra-red or thermal imaging cameras was used where deemed necessary, specifically where bats with low amplitude echolocation calls are likely to be present (e.g. brown long-eared bats), and for all culverts or underpasses.

2.5. Tree surveys (Aerial Tree Climbs, Hibernation and Emergence/ Re-entry).

2.5.1. Trees identified within the study area are shown in Appendix F. Trees within the study area that were assessed during the GLTA as having moderate, high or confirmed roosting suitability were subjected to aerial tree climbs, hibernation and/ or emergence/ re-entry surveys. Surveys (with the exception of emergence/ re-entry surveys) were carried out during daylight hours. These surveys included the use of ladders, tree climbing equipment, endoscope and torches (as necessary).

2.5.2. Any evidence of bats was recorded in the field using a survey proforma; all evidence was marked on a location map. Following the aerial tree-climbing assessment, the bat roosting suitability of the tree was updated (where necessary). Photographs taken of features/ evidence were referenced appropriately, and any changes to the GLTA map annotated (such as a change in the roosting suitability, incorrect location for a feature or a new feature identified).

2.5.3. Tree climbs were completed throughout the bat active season (May to September) in replacement of emergence/ re-entry surveys. In such cases, trees with moderate suitability were climbed two times in the survey season to search for evidence of roosting bats, and trees with high suitability were climbed three times.

2.5.4. Any features which were difficult to fully access, such as being unable to fully inspect with an endoscope or trees identified as unsafe to climb, were surveyed by emergence/ re-entry surveys in place of aerial tree climbs. Where bat roosts were identified during tree climbing and the number/ species of bat(s) could not be confirmed, then an emergence survey was carried out for roost characterisation from call analysis.

2.5.5. Dusk emergence surveys began 15 minutes before sunset and continued until two hours after sunset. Where only one dusk survey was being undertaken, surveys began 30 minutes prior to sunset to ensure that early emerging bats were recorded.

2.5.6. Dawn re-entry surveys commenced two hours before sunrise and continued until 15 minutes after sunrise. If there was still bat activity 15 minutes after sunrise the survey was extended until 15 minutes after the last bat activity.

2.5.7. Emergence/ re-entry surveys were complemented by the use of infra-red night vision cameras in all instances for tree surveys and ultrasonic bat detectors (see section 0).

2.5.8. Limitation: The tree emergence surveys were weighted preferentially towards the use of infra-red cameras over surveyors. It is accepted that this goes against the current Bat

Survey Guidelines, which state that 'while such equipment is very useful as a complementary technique, it should not be used to replace surveyors to any significant degree; the majority of any site should be observed by surveyors. The more recent Thermal Imaging: Bat Survey Guidelines (produced in association with the BCT) endorses the use of thermal imaging cameras as a replacement for one or more surveyors. It is considered that there is a trend towards using cameras in place of surveyors, and that this is at least as reliable, if not more so, than surveyors. It is anticipated that the guidance regarding the use of infra-red cameras will be brought into line with the thermal imaging guidance in the near future.

2.5.9. Hibernation tree climbs have taken place for trees within the study area assessed as having hibernation suitability. This involved a single tree-climb in the hibernation period[13] (January to February), and the methodology used to complete the survey was in accordance with the tree climbing protocols in the Bat Survey Guidelines.

2.6. Activity Surveys - Transects

2.6.1. The study area was assessed to be of moderate suitability for foraging and commuting bats (using criteria listed in Table 4.1 in the Bat Survey Guidelines). A representative sample of habitats within the study area identified as having suitability to support foraging/ commuting bats were subject to transect surveys to identify levels of activity, key foraging and commuting areas, and the bat species present. Approximately one transect was completed for every 40 hectares of habitat within the study area. Pre-defined transect routes (with pre-defined point counts) were weighted towards areas likely to be used by commuting/ foraging bats, i.e. woodland, hedgerows and river corridors.

2.6.2. The survey scope included seven predefined transects that were surveyed during 2019 and 2020. Three transects were removed from the scope after design changes in early 2021, as the locations were no longer deemed to be within the ZOI. In early 2021 two additional transects were included along the A4019 (transect 11 and transect 12), however, there are no results from these transects within this report due to their late addition. All nine transects that are within the current scope can be seen in Table 2-1.

Table 2-1 - Transects within the 2019/ 2020 Survey Scope

Transect	Survey Scope
Transect 1	Removed from the survey scope due to being outside of the ZOI
Transect 2	Surveys completed in 2019 / 2012
Transect 3	Removed from the survey scope due to being outside of the ZOI
Transect 4	Surveys completed in 2019 / 2012
Transect 5	Surveys completed in 2019 / 2012
Transect 6	Removed from the survey scope due to being outside of the ZOI
Transect 7	Surveys completed in 2019 / 2012
Transect 8	Surveys completed in 2019 / 2012
Transect 9	Surveys completed in 2019 / 2012
Transect 10	Surveys completed in 2019 / 2012

[13] Although standard methodology suggests two hibernation surveys should be completed, this methodology was agreed in discussion with Stephanie Wray (a leading Bat Ecologist). She believed, along with the Bat Project Team that there was little benefit of two hibernation tree climbs due to the likelihood of encountering bats being low as the same features will be surveyed on each occasion and as bats are unlikely to move in the winter months. This method was on the basis that if hibernating bats, or evidence of bats was found, then additional surveys would be scheduled.

Transect	Survey Scope
Transect 11	No survey data for 2019 / 2020
Transect 12	No survey data for 2019 / 2020
Southern quadrant, directly south east of the junction	No transect in this location as the area was deemed unsafe for a walked transect

2.6.3. In line with the Bat Survey Guidelines for areas with moderate suitability for bats, each transect was surveyed once monthly throughout the survey season from April to October (surveys spanned from June 2019 to May 2020). As per the survey Bat Survey Guidelines one was a dusk and dawn survey (August 2019).

2.6.4. Each walked activity transect commenced at dusk and lasted at least three hours. The transect in August was at dawn and began two hours before sunrise and finished at sunrise.

2.6.5. Routes were selected to encompass a range of habitats but were also influenced by access throughout the survey season. Along each walked activity transect route there were designated point counts, referred to as points, representing different habitats or features with high bat suitability along the survey route. Each pre-defined point was stopped at for three minutes and visited at least twice during each survey following Bat Survey Guidelines. The starting location for each transect changed, or the transect route was reversed, with each repeated survey to reduce any temporal bias.

2.6.6. Surveyors completed a transect proforma detailing observations of bat flight paths to note foraging or commuting habitats, with particular attention paid to the time to allow for the identification of the species from the bat calls.

2.6.7. Limitations: The transect routes remained as similar as possible throughout the surveys to provide comparable data; however, some alterations were necessary due to health and safety and land access issues, as detailed within Table 4-51 and Table 4-57 where applicable .

2.6.8. Additionally, no transect was possible within the southern quadrant of the study area as the area was deemed unsafe for survey as it would require the unsafe crossing of a main road at night, and cows in the field. As two statics were in this location, and as this location is proposed to be enhanced for bats within the scheme, this was not deemed to be a significant limitation.

2.6.9. The following paragraphs provide a description of each transect route and the habitats that were present.

Transect 2

2.6.10. Transect 2 ran parallel to the M5, located on the west of the motorway. Surveyors followed the outside field margins of four arable fields. The two most northern fields were bordered by the River Chelt as it exits the M5 River Chelt culvert.

Transect 4

2.6.11. Transect 4 was located west of the M5, north west of the junction. The survey encompassed five fields (comprising arable and pasture) bordered by hedgerows. Barn Farm was directly adjacent to this route. This transect also incorporated a long hedgerow bordered access track running parallel to the M5.

Transect 5

2.6.12. Transect 5 was located south of the A4019, where the Link Road is proposed. The surveyors walked five pasture fields, bordered by both intact and defunct hedgerows. At

the south of the transect route was the River Chelt, which was steep sided with thick vegetation along its banks.

Transect 7

2.6.13. Transect 7 was located just north of where the new Link Road will join with Old Gloucester Road. It comprised five pasture fields, including a small area of fruit orchard on a gently sloping hill to the east. The route was located to the north of a large complex of farm structures and to the west of Withybridge Lane.

Transect 8

2.6.14. Transect 8 was located between transects 5 and 7, and was located to the south of the River Chelt. It comprised five fields including arable, orchard and pasture, located to the south of a small complex of farm and residential structures. Hedgerows were located throughout.

Transect 9

2.6.15. Transect 9 was located at the south west of the junction in the western quadrant. It comprised a series of four large arable fields, bordered by hedgerows and trees and with the River Chelt running along the south.

Transect 10

2.6.16. Transect 10 was located at the north west of the junction. It included surveyors walking along Stanboro Lane which was bordered by a hedgerow and woodland, and also included three fields (arable and pasture) surrounding a large complex of farm, residential and industrial structures. There were pockets of woodland located at the north, east and within the centre of the transect route.

Transects 11 and 12

2.6.17. Transects 11 and 12 were not surveyed in 2019/ 2020. Further details will be provided in subsequent reporting.

2.7. Static Bat Detector Surveys

2.7.1. Static bat detectors were deployed across the Scheme to support the bat transect surveys as shown in Table 2-2, and their locations can be seen in Appendix F. Statics were deployed along the transect routes, with additional statics deployed in areas of particular impact (e.g. Highways England land, where junction works are proposed) or areas inaccessible for transects (e.g. in the southern quadrant of the study area, south east of the junction).

2.7.2. The sensitivity of the recording devices was adjusted to accommodate for the background noise. The minimum frequency was set to 13kHz and the maximum frequency was set to 200 kHz. The minimum event of 3 ms, and a trigger window of 2 seconds, was used to maximise the number of bats recorded, compared to noise files.

2.7.3. The detectors were deployed primarily within areas of hedgerow and woodland, and other dominant habitat types which may be directly or indirectly affected (fragmented) by the Scheme. The detectors were securely hidden within vegetation with microphones positioned to allow for adequate recording. Each static detector was photographed in-situ and its grid reference recorded as eastings, northings. In areas of high public footfall, locks were used.

2.7.4. The static deployment locations were selected to help determine the use of the landscape by bats, therefore features such as hedgerows or watercourses that were likely to be used by commuting bats were selected.

2.7.5. Limitation: Due to the vast number of statics required a set number of statics were moved through the month to different locations, rather than all being placed out on the same survey nights. This will lead to a level of difference in the bats that were recorded. However, as this survey was aimed at providing details on showing presence/ absence of species and comparing assemblages of species across the survey area, due to the vast amount of data over the survey season, this was not considered to be a significant limitation.

Table 2-2 - Static Detectors and Associated Transects and Crossing Points

Transect	Static Reference	Crossing Point locations (Details Provided Below)	Area of Impact Surveys were due to Assess
Transect 2	3	CP1	Junction improvements
	4		
Transect 4	7	N/A	
	8		
Transect 9	15	CP9 - covers transects 9 and 10 as this crossing point will identify where bats cross the A4019, west of the junction	
	16		
Transect 10	17		
	18		
Southern quadrant, directly south east of the junction	21	N/A	
	35		
Highways England land	22	N/A	
	23		
Transect 5	9	CP3	New Link Road
	10		
Transect 7	11	CP5	
	12		
Transect 8	14	CP4	
	36		
Transect 11	39	CP2, CP6, CP7 and CP8 – cover transects 11 and 12 as these are identifying where bats cross the A4019, between the two transects	A4019 improvements
Transect 12	33		

2.7.6. The statics were left out for a minimum of five consecutive nights of recording. After the recording was complete, surveyors analysed the local weather conditions from local weather stations to determine the survey dates which had the optimum weather conditions, deemed to be minimal overnight rain or strong winds. If there were not five full nights of optimal weather, then the most favourable survey night's data was retained,

and this limitation was provided in the survey details. Static detector surveys were repeated each month to allow for comparison where possible.

2.8. Crossing Point Surveys

2.8.1. Five crossing point locations (CP1 – CP5) were identified across the Scheme as locations where bats are likely to be using as key linear features and which may be impacted. Due to a Scheme change in 2021, four additional crossing point locations (CP6 – CP9) were identified, however, no details of these surveys are provided within this report. The locations of the crossing points are shown in Appendix F, and the statics and transects associated with these crossing points are shown in Table 2-2.

2.8.2. A total of six crossing point surveys were undertaken at the five locations (CP1 – CP5) across the 2020 survey season, one per month between May and September.

2.8.3. The full survey methodology[14] includes a minimum of six 60-minute dusk or dawn surveys, of which at least three will be dusk surveys. The length of these surveys was increased after survey two in order to ensure that the movements of late emerging species was also recorded (such as ***Myotis*** and horseshoe bats), see limitations below.

2.8.4. Surveyors completed a crossing point proforma detailing observations of bat flight paths in relation to the identified features, to note foraging or commuting. Maps were provided with survey results showing the locations of observed flight lines in addition to the completed proformas where appropriate (these can be provided upon request).

2.8.5. Visual observations of bats were supported by ultrasonic bat detectors and by at least one infra-red or thermal imaging camera as a visual aid.

2.8.6. Using the survey methodology, after the first two surveys the results were analysed for all bats that crossed the selected feature(s) (at any height). Using Table 2-3, points were calculated, and providing ten points were achieved, then the full six surveys were completed, and the location was defined as a bat 'crossing point'. The points within this table were calculated based on rarity of bat species within England (Wray et al., (2010)[15].

Table 2-3 - Methodology to Determine if it is a Crossing Point

Bat Species	Crossing Point Score
Common pipistrelle	1 point per crossing
Soprano pipistrelle	
Long-eared (brown or grey as not distinguished between)	
Myotis (excluding greater mouse-eared or Bechstein's if these can be distinguished)	3 points per crossing
Lesser horseshoe	
Leisler's	
Noctule	
Nathusius pipistrelle	
Serotine	
Greater horseshoe	10 points per crossing

[14] Appendix G. Local effects of transport infrastructure & mitigation: Best practice survey protocol and data analysis (2015) Anna Berthinussen & John Altringham School of Biology, University of Leeds, Leeds LS2 9JT
[15] Wray ***et al.,*** Valuing Bats in Ecological Impact Assessment (provided within CIEEM (2010) In Practice Number 70)

Bat Species	Crossing Point Score
Greater mouse-eared	
Barbastelle	
Bechstein's	

2.8.7. Limitations: All 2020 crossing point locations, for the first two surveys were one hour as per the survey methodology. This was then extended by 15 minutes in some locations for the preliminary two surveys due to late emerging species known to be present. After the preliminary two surveys, the decision was made to extend all crossing point survey locations to one and a half hours to account for late emerging species across the study area.

2.9. Survey Details

Survey Equipment

2.9.1. All recording equipment used recorded in full-spectrum. Recording devices for emergence surveys included:

- Batlogger (various models);
- Echo Meter Touch 2 (EMT 2);
- Anabat Walkabout (Walkabout);
- Anabat Scout (Scout)
- Anabat Swift (Swift);
- Song Meter SM4BAT – FS (SM4) used with a BatBox Duet (Duet)[16]; and
- Peersonic RPA3.

2.9.2. In some instances, surveyors used zero-crossing bat detectors, however, these surveys were always assisted by thermal imaging cameras, therefore this was not deemed to be a significant limitation to these surveys, as roosting bats would not have gone un-detected.

2.9.3. Limitation: Although ideally recording equipment would remain the same for all surveys (i.e. one detector brand across all of the transect surveys), due to the vast number of surveys and surveyor effort required on this project, that was not deemed to be reasonably practicable. However, this was not deemed to be a significant limitation as the primary purpose of the surveys was to detect bat species and assemblages within the different locations of the survey area, rather than to make comparisons across locations.

2.9.4. For static detector surveys the following recording devices were used:

- Anabat Swifts; and
- SM4s.

2.9.5. Any alternative equipment used has been stated within the limitations of this report.

2.9.6. All detectors were set to record in automatic mode, not manual, to ensure no bats were missed.

2.9.7. A suitable torch was required for all intrusive bat surveys. Where there was a risk that a bat may be disturbed by artificial light, torches were only permitted to be used a suitably licensed ecologist.

[16] This was not deemed to be a limitation as bat calls were recording this method.

2.9.8. Other survey specific equipment is listed within the individual methodologies set out in this report.

Weather Recording

2.9.9. No specific weather recording equipment was used during the surveys, including temperatures being taken by a range of methods including thermometers on site, temperature record on bat detectors (where possible) or via recordings from local weather stations. On this basis there may be an element of inaccuracy when recording temperatures between the different surveys/ surveyors (see limitations).

2.9.10. Cloud cover was recorded by surveyors using the Okta scale (the unit of measure for cloud cover is the Okta). Using this scale, cloud cover is measured on an eight point scale, 0 Oktas being clear sky, one Okta being 1/ 8 of the sky covered in cloud, and so on, up to 8 Oktas - completely overcast.

2.9.11. Windspeed was recorded against Beaufort scale (with scores of 0-12). Using this scale 0 = calm, 2 = light breeze, 4 = Moderate breeze, 6 = strong breeze, 7 = High wind, 9 = Strong gale, 12 = Hurricane.

2.9.12. Additionally, weather details were taken at the start of surveys, unless two sets of weather details were provided for the start and end time of the survey.

2.9.13. Limitations: The differences in recording temperatures and the subjectivity of surveyors recording wind spend and cloud cover (detailed above) is not considered to be a significant limitation as all surveys were conducted within the range of appropriate survey parameters as set out in the Bat Survey Guidelines and where the lead bat surveyor felt there were limitations to the survey, these were specifically noted in the limitations section.

2.9.14. An additional limitation is that on some occasions no weather details were recorded. Although this is considered to be a limitation, all surveys were only carried out if the weather forecast was deemed to be suitable for that evening/ survey the following morning. Additionally all surveyors made notes of any weather limitations, and therefore the this is not deemed to be a significant limitation.

Call Analysis

2.9.15. For activity surveys, call analysis was completed using Auto ID software (Kaleidoscope Pro or Anabat Insight set at least 70%[17]). Where auto ID software was not available, files were processed through the basic software version, however additional checks through the check process were carried out. The data received from the 2019 / 2020 survey period was processed following the methodology set out below.

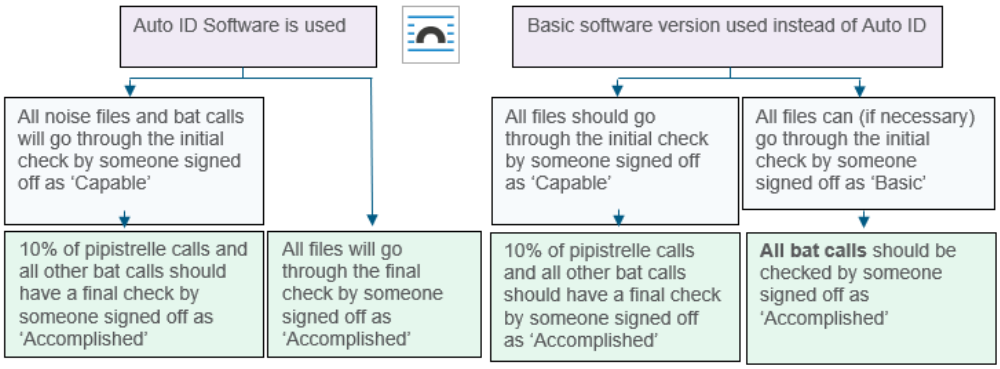


Figure 2-1 - Flow Diagram of Call Analysis QA (2019/2020)

[17] The program is at least 70% confident that outputs are bats.

2.9.16. All calls and sound files, including noise were then checked by an appropriately experienced ecologist and subjected to the QA process.

2.9.17. Some bat calls were not recorded to species level due to the uncertainty in bat call analysis (caused by the overlapping nature of bat call characteristics for some species) and due to the vast number of bat calls. Instead ***Myotis*** bat calls were recorded to genus level. Nyctaloid was used for bigger bats such as Noctule, Leisler's or serotine where a clear definition was not possible. If these species could be identified to species level, then this happened.

2.9.18. Please note that for this analysis, common pipistrelles were recorded as calls between 42 kHz and 49 kHz; calls that were 52 kHz and over were defined as soprano pipistrelles; calls 40 kHz and below were labelled as Nathusius' pipistrelles. All other pipistrelle calls were labelled as Pipistrellus.

2.9.19. Identification of multiple species, and multiple bats within each sound file was required. The number of species within each sound file was recorded, and where multiple bats of the same species were evidenced, then this was also recorded. Results have been provided as 'bat passes' within this report, rather than number of bats (i.e. if a single bat passed the same detector ten times in one night, this would be recorded as 10 bat passes at this location).

2.10. Assumptions/ Limitations

2.10.1. Where possible, bats were identified to species level, however, for some species this was not possible due to overlapping call characteristics, for example the ***Myotis*** bats. The following terms are used throughout this report:

- Pipistrelle – refers to the UK's three resident species within the pipistrelle genus, the common pipistrelle, soprano pipistrelle and Nathusius' pipistrelle. These species were identified to species level during analysis where possible. However, within the bat auto-ID process, it was not possible to identify which species of pipistrelle was present when the peak frequency was between 49 and 51 kHz or 41kHz. In this situation the bat call was identified as 'pipistrelle'. This was not considered to be a significant limitation as where bat roosts were present manual identification was conducted to confirm the pipistrelle species. For transects and static surveys, all three pipistrelle species are known to frequent the study area, and it was deemed that any mitigation/ compensation for these species would be similar, therefore grouping these bats as 'pipistrelle' was not a significant limitation.
- ***Myotis*** – refers to species from the ***Myotis*** genus. There are seven species from this genus occurring in the UK[18] which display similar call characteristics: Natterer's bat, whiskered bat, Brandt's bat, Daubenton's bat, Bechstein's and Alcathoe bat. As Bechstein's bats are Annex II[19] 'rare' bat species (which are known to be roosting just outside of the study area), grouping these species has been considered as a limitation. This has therefore been detailed within the analysis of this report and also within the further surveys section, to further distinguish between the ***Myotis*** bat species within the study area.
- For the purpose of this report, all long-eared bats are referred to as brown long-eared bats. This is because although bat calls of brown long-eared and grey long-eared bats are indistinguishable, there are no known records of grey long-eared bats within the study area and all DNA results obtained confirmed the presence of brown long-eared bats only. This is not considered to be a significant limitation as all mitigation/ compensation for these species would be similar.
- Similarly, within the bat auto-ID process, Noctules, Leisler's and serotines have been labelled as Nyctaloids (big bats). A surveyor deemed to be accomplished has checked a percentage of all the data and it has been confirmed that all three of

[18] This includes greater mouse-eared which are only located in Sussex, so unlikely to be present in the survey area.
[19] Listed under the Conservation of Habitats and Species Regulations 2017 (as amended)

these species frequent the study area. This was not considered to be a significant limitation as where bat roosts were present manual identification has been used to confirm the bat species. For activity surveys, as it was deemed that any mitigation/ compensation for these species on a landscape scale would be similar, grouping these bats as 'Nyctaloids' was not considered to be a significant limitation.

- During the 2019 static deployment, the Anabat Swift detectors recorded large volumes of data including over 64 GB of data in fewer than the five day deployment. This was largely due to the number of noise files being recorded due to the static detector settings, which were the standard settings of an Anabat Swift and minor adjustments were made following this to reduce the amount of noise files recorded subsequently. These files were run through Kaleidoscope Pro auto-identification software and subsequently 100% of all files that were deemed to be bat calls were checked manually and 10% of all noise files were checked.
- Where greater than 10% of all noise files checked were found to contain bat calls, then an additional 10% of files was checked. Following this, it was possible to estimate likely percentages of bats within the noise files from a sample, this sample found 81% of noise files analysed were noise, 9% of these files were ***Myotis*** species, 7% were pipistrelle species and fewer than 1% of these calls were other bat species including lesser horseshoe, barbastelle, Nyctaloids and brown long-eared bats. This was not considered to be a significant limitation based on the over number of surveys completed at each location (including statics, transects and crossing point surveys), and as validation surveys are proposed for 2021.

3. Results

3.1. Desk Study

Statutory Designated Sites

Table 3-1 - Details the statutory designated sites for bats within 30 km of the Scheme.

Site Name	Designation	Approximate Location of Designated Site	Features of Interest (including qualifying features of internationally designated sites	Importance Level
Wye Valley and Forest of Dean Bat Sites	SAC	24 km south-west	Lesser and greater horseshoe bats	International Importance

Desk Study Records

3.1.1. This section provides a summary of the results of the desk study for bats. These are shown in Appendix F.

Table 3-2 - Details the Bat Records from the Record Centre within 2km of the Scheme

Species	Number of records	Closest record (approximate distance)
Bechstein's	13	650 m west of M5
Brown long-eared	4	210 m south of Old Gloucester Road
Common pipistrelle	18	210 m south of Old Gloucester Road
Daubenton's	4	750 m east of A4019
Lesser horseshoe	5	150 m east of M5
Noctule	2	1.6 km south-east of M5
Soprano pipistrelle	8	1.3 km south of A4019
Unidentified bat records	5	Within 2 km

Bat EPS Licences

3.1.2. This section provides a summary of EPS licences for bats within 2 km of the Scheme.

Table 3-3 - Details of EPS licences for Bats within 2 km of the Scheme

EPS Licence Reference	Details of EPS including Species	Approximate Distance and Direction from the Scheme
2015-8404-EPS-MIT	To allow the destruction of a resting place dating between 18/06/2015 and 17/06/2025 for brown long-eared and lesser horseshoe bats	170 m east of the M5
2017-28135-EPS-MIT	To allow the destruction of a resting place dating between 29/03/2017 and 31/03/2022 for common pipistrelle, lesser horseshoe and soprano pipistrelle	500 m west of the M5

3.2. DNA Survey Results

3.2.1. The full results of all the DNA surveys are provided between tables Some data from 2021 is included within these tables, however, these details are not included in this assessment as full 2021 data is not available.

3.2.2. Table 4-3 and Table 4-42 And summarised in Table 3-3.

3.2.3. No DNA survey has been carried out at the following structures: BU_357, BU_376, BU_761, BU_762, BU_763, BU_765 and BU_747. No DNA surveys were carried out on droppings from trees.

Table 3-4 - Details of DNA Results

Species	Number of Structures	Structure References
Common pipistrelle	5	BU_378, BU_766, BU_854, BU_855 and BU_857
Soprano pipistrelle	2	BU_364 and BU_766
Lesser horseshoe	5	BU_507, BU_574, BU_611, BU_709 and BU_819
Natterer's	6	BU_574, BU_642, BU_752, BU_766, BU_854 and BU_857
Whiskered	2	BU_857 and BU_992
Brown long-eared	1	BU_854

3.3. Hibernation Survey Results

3.3.1. Table 3-5 shows where hibernation surveys have been completed on structures. Table 3-6 shows where hibernation surveys on trees have been completed.

Table 3-5 - Details of Hibernation Surveys of Structures

Surveys Complete	Number of Structures	Structure References
Structures not surveyed (both no access and no survey to date)	201	N/A
Structures deemed to have hibernation suitability, however surveys not possible	19	BU_1006, BU_1012b, BU_1030, BU_1033, BU_1039, BU_1043, BU_1477, BU_360, BU_662, BU_701, BU_834, BU_909, BU_968, BU_971, BU_972, BU_982, BU_985, BU_992, junction bridge
Hibernation survey completed – no evidence	13	BU_964, BU_1005, BU_574, BU_988, BU_965, BU_705, BU_735, BU_862, BU_981, BU_376, BU_839, BU_753, BU_567
Hibernation survey completed – with evidence	1	BU_638 - A static bat detector was deployed by the landowner into the roof space as no internal access was possible due to Covid-19. Common pipistrelle were recorded on the 21st, 22nd, 24th of February and 15th, 17th, 21st and 31st March. During the February recording of bats the temperature within the roof space was recorded to be around 17°C, just after a cooler period. In the absence of further information, it has been assumed that the pipistrelle(s) were hibernating somewhere within the property.

Surveys Complete	Number of Structures	Structure References
Structures with no hibernation suitability	133	
Total	367	N/A

Table 3-6 - Details of Hibernation of Trees

Surveys Complete	Number of Trees	Tree References (no tree groups had hibernation potential)
Tree with hibernation suitability and surveyed (no hibernation potential[20])	85	34, 41, 42, 43, 45, 48, 49, 50, 54, 55, 56, 57, 60, 61, 62, 64, 65, 66, 67, 70, 72, 73, 86, 87, 89, 93, 96, 97, 101, 106, 116, 123, 124, 125, 126, 132, 156, 200, 201, 202, 203, 204, 235, 235a, 236, 237, 241, 242, 244, 245, 246, 247, 248, 249, 251, 252, 253, 254, 257, 276, 487, 488, 490, 494, 496, 499, 502, 521, 522, 543, 553, 576, 578, 584, 616, 620, 627, 639, 644, 645, 646, 647, 648, 649 and 650
Tree deemed to have hibernation suitability, however surveys not possible due to land access or surveys incomplete	13	169, 174, 176, 211, 229, 230, 581, 582, 596, 602, 607, 635 and 637
Total	98	N/A

3.4. Bat Roost Survey Results

Overview

3.4.1. Table 3-7 shows all 367 structures identified within the study area. Further details of the results of these assessments are listed in Table 4-2 and are shown in Appendix F.

Table 3-7 - Summary of Structure Surveys

Suitability	Number of Structures	Structure References
Negligible	72	N/A
Low	59	N/A
Moderate	35	BU_1005, BU_1006, BU_1027, BU_1039, BU_1041, BU_1042, BU_1047, BU_1468, BU_1477, BU_1492, BU_356, BU_362, BU_368, BU_54, BU_629, BU_641, BU_661, BU_662, BU_667, BU_694, BU_755, BU_803, BU_824, BU_841, BU_965, BU_966, BU_968, BU_971, BU_972, BU_983, BU_988, BU_988a, M5 River Chelt culvert, junction bridge, Piff Elms culvert
High	10	BU_1033, BU_1408/768, BU_360, BU_367, BU_567, BU_645, BU_660, BU_701, BU_735, BU_737

[20] No trees identified with hibernation suitability, have had any bats recorded using these features during the hibernation period

Suitability	Number of Structures	Structure References
Confirmed Roost	43	BU_1030, BU_1034, BU_1034a, BU_357, BU_364, BU_370, BU_376, BU_378, BU_379, BU_507, BU_574, BU_610, BU_611, BU_638, BU_642, BU_653, BU_709, BU_723, BU_747, BU_751, BU_752, BU_753, BU_757, BU_761, BU_762, BU_763, BU_765, BU_766, BU_771, BU_819, BU_834, BU_850, BU_853, BU_854, BU_855, BU_857, BU_862, BU_963, BU_981, BU_987, BU_990, BU_992, BU_993
Unknown (surveys not complete or no access has been permitted)	148	N/A (including Barn Farm culvert (Leigh Brook))
Total	367	N/A

Identified Bat Roosts

3.4.2. As part of the 2019 and 2020 surveys, 42 structure roosts (including hibernation roosts) and five tree roost were detected as detailed within Table 3-8 (with surveys in 2021 still underway). Full survey results of these trees and structures are provided between Some data from 2021 is included within these tables, however, these details are not included in this assessment as full 2021 data is not available.

Table 3-8 - Confirmed Structure Bat Roosts

Total number	Structure/ tree reference	Results to date	Surveys complete?	Roost characterisation[21]	Proposals (discussed in detail in Section 5)
1	BU_1034	The only surveys that were conducted were in mid-August, comprising a day-time inspection and one dusk emergence/ re-entry survey at the later end of the maternity period, after which access was refused. A maximum count of one common and one soprano pipistrelle was recorded. No hibernation survey possible.	No, access permission has been retracted. Surveys outstanding include a hibernation survey and two nocturnal surveys	Common pipistrelle - transitional/ occasional roost; and Soprano pipistrelle - transitional/ occasional roost	To be demolished
2	BU_1034a	Only an external assessment and a single emergence (with no roosts recorded) was completed before all access was refused. However, during the daytime survey the owner made an un-verified comment about seeing dead bats within this structure on two occasions. No hibernation survey possible.	No, access permission has been retracted. Surveys outstanding include a hibernation survey and two nocturnal surveys	Bat – unknown roost (assumed, with limitations)	To be demolished
3	BU_638	During mid-May 2021 a lesser horseshoe was recorded emerging from the property from the east facing roof. In early July 2021 a maximum of two common pipistrelle bats were recorded emerging. During the hibernation survey, common pipistrelles were recorded within the roof void during the end of February, and again late march. At the time of recording the common pipistrelles the temperature within the roof void was 17°C after a cooler period suggesting that the bats had likely come out of torpor. In the absence of further information, it has been assumed that the common pipistrelle(s) were hibernating somewhere within the property.	No, full access available - surveys outstanding. Surveys outstanding include one nocturnal survey	Common pipistrelle - day roost; Lesser horseshoe – day roost; and Common pipistrelle - hibernation roost	Within 50 m of Scheme

[21] Not all surveys have been completed and the characterisation might change once they are complete, despite the precautionary approach

Total number	Structure/ tree reference	Results to date	Surveys complete?	Roost characterisation[21]	Proposals (discussed in detail in Section 5)
4	BU_364	During the hibernation survey, common pipistrelles were recorded within the roof void during the end of February, and again late march. At the time of recording the common pipistrelles the temperature within the roof void was 17oC after a cooler period suggesting that the bats had likely come out of torpor. In the absence of further information, it has been assumed that the common pipistrelle(s) were hibernating somewhere within the property.	No, access permission has been retracted. Surveys outstanding include one nocturnal survey and a hibernation survey	Common pipistrelle - Night/ feeding roost; Soprano pipistrelle - Night/ feeding roost; Brown long-eared - Night/ feeding roost Lesser horseshoe - Night/ feeding roost	Will become fragmented
5	BU_771	The final survey has had access refused; therefore surveys were all conducted in August and September, at the later end of the maternity period. A maximum of one common pipistrelle was recorded on two occasions. No hibernation survey possible.	No, access permission has been retracted. Surveys outstanding include one nocturnal survey and a hibernation survey	Common pipistrelle - transitional/ occasional roost	Will become fragmented between the new Link Road and the M5
6	BU_762	Droppings likely from pipistrelle were recorded inside car port, on top of wood pile at eastern end of barn (no DNA has been carried out). A survey in early September recorded no bats emerging. In mid-September a single common pipistrelle bat emerged from the southern elevation, although the exact location was unknown. A further common pipistrelle emerged from under the apex ridge tile and headed south at 19:40 (23 minutes after sunset).a maximum of two bats was recorded on one survey. No hibernation survey possible.	No, access permission has been retracted. Surveys outstanding include one nocturnal survey and a hibernation survey	Common pipistrelle - transitional/ occasional roost	Will become fragmented between the new Link Road and the M5
7	BU_376	A single common pipistrelle bat emerged in mid-July 2020 and in later June a maximum count of three common pipistrelles recorded emerging from two locations. No bats were seen to emerge in mid-September 2020. No hibernation activity.	Yes, surveys complete	Common pipistrelle - day roost	Within 50m

Total number	Structure/ tree reference	Results to date	Surveys complete?	Roost characterisation[21]	Proposals (discussed in detail in Section 5)
8	BU_378	No emergences were recorded during the surveys, and no likely roosting locations were noted. Based on the dropping recorded (common pipistrelle, from DNA) the site is considered likely to be a feeding or night roost for common pipistrelle and soprano pipistrelle also (as they were also recorded during the surveys). No hibernation suitability.	Yes, surveys complete	Common pipistrelle - Night/ feeding roost; and Soprano pipistrelle - Night / feeding roost	Within 50m
9	BU_379	A single ***Myotis*** (considered likely to be Natterer's based on call analysis) was recorded roosting within the south facing gable end verge between the soffit and the barge board in July 2019. In June 2021 a single soprano pipistrelle bat was recorded roosting also. No hibernation suitability.	Yes, surveys complete	Natterer's – day roost Soprano pipistrelle – day roost	Within 100m
10	BU_834	One common pipistrelle emerged from east facing roof pitch in July, with one survey outstanding due for July 2021. Hibernation survey to be carried out in winter 2021/2022.	No, full access available - surveys outstanding including a hibernation survey proposed for winter 2021/2022.	Common pipistrelle - day roost	Within 50m
11	BU_507	Evidence suggests that the structure is likely to be used by lesser horseshoe (confirmed by DNA) from a concentration of droppings found in the middle room of the extension which can be accessed via an open door. One soprano pipistrelle returned to roost on the east side of the porch under the tiles in June 2021. Two surveys outstanding, due in July 2021. Hibernation survey to be carried out in winter 2021/2022.	No, full access available - surveys outstanding	Soprano pipistrelle - day roost; and Lesser horseshoe – day/ feeding roost	To be demolished
12	BU_610	Noctule emerged 39 minutes after sunset from the base of the chimney on the same night that a common pipistrelle also emergence from a gap under the tile, observed by a surveyor on the south eastern observation. No emergences in mid-July 2021 and only a single common pipistrelle emergence in early August 2021. Hibernation survey to be carried out in winter 2021/2022.	No, full access available - surveys outstanding including a hibernation survey proposed for winter 2021/2022.	Common pipistrelle - day roost; and Noctule – day roost	To be demolished

Total number	Structure/ tree reference	Results to date	Surveys complete?	Roost characterisation[21]	Proposals (discussed in detail in Section 5)
13	BU_611	Evidence suggests that the structure is likely to be used by lesser horseshoe (confirmed by DNA) from a concentration of droppings found in the extension which can be accessed via an open door. Hibernation survey to be carried out in winter 2021/2022. No bats emerged from this property during surveys in June to August 2021.	No, full access available - surveys outstanding including a hibernation survey proposed for winter 2021/2022.	Lesser horseshoe - day/ feeding roost	To be demolished
14	BU_709	Evidence suggests that the structure is likely to be used by lesser horseshoe (confirmed by DNA) from a concentration of droppings found in the extension which can be accessed via an open door. Only two emergence/ dawn surveys have been carried out to date (July 2021), and no emergences were recorded. Hibernation survey to be carried out in winter 2021/2022.	No, full access available - surveys outstanding including one further emergence survey and a hibernation survey proposed for winter 2021/2022.	Lesser horseshoe - day/ feeding roost	To be demolished
15	BU_819	Two of the emergence surveys (dusk and dawn) have been completed in July 2021 with no bats recorded emerging. It is therefore assumed that this is a transitional lesser horseshoe (confirmed by DNA) roost. Hibernation survey to be carried out in winter 2021/2022.	No, full access available - surveys outstanding including one further emergence survey and a hibernation survey proposed for winter 2021/2022.	Lesser horseshoe - transitional roost (assumed, with limitations)	To be demolished
16	BU_574	In the absence of emergence/ re-entry survey to date (proposed for 2021), it is assumed that this is a lesser horseshoe (confirmed by DNA) and Natterer's roost, accessed via an open door and window. No hibernation activity recorded.	No, full access available - surveys outstanding	Lesser horseshoe - day roost; and Natterer's – day roost (both assumed, with limitations)	Within 100m
17	BU_1030	Two common pipistrelle bats emerged from apex and flew south in late August 2020, with two emergence/ dawn surveys	No, full access available - surveys	Common pipistrelle – maternity / day roost	To be demolished

Total number	Structure/ tree reference	Results to date	Surveys complete?	Roost characterisation[21]	Proposals (discussed in detail in Section 5)
		outstanding. Mid-May and July 2021 surveys were cancelled due to weather and lack of access being granted. No daytime evidence recorded. In the absence of further emergence/ dawn survey data during the early summer period this has been assumed on a 'worst case' scenario as a maternity/ day roost, until proved otherwise. No access for hibernation survey to be carried out.	outstanding including two further emergence surveys and a hibernation survey proposed for winter 2021/2022.	(assumed, with limitations)	
18	BU_747	Access was refused after one emergence survey, so limited data available. Based on one to four small sized bat droppings on stored wood being recorded (no DNA analysis) during the daytime inspection, combined with a lesser horseshoe being seen to exit the structure 29 minutes after sunset (during the one survey in early September), it is assumed that this is used by small numbers of lesser horseshoe bats (due to the limited suitability of the structure it was not deemed to assume a further worst case scenario on this structure) . No access for hibernation survey to be carried out.	No, access permission has been retracted	Lesser horseshoe - day roost	Will become fragmented between the new Link Road and the M5
19	BU_748 / BU_850	Only one survey able to be completed in early September 2019. A single common pipistrelle emergence from gable end of 'BU_748'. No access for hibernation survey to be carried out.	No, access permission has been retracted	Common pipistrelle - day roost	Will become fragmented between the new Link Road and the M5
20	BU_751	A max of four common pipistrelle bats emerged from the west elevation in late July 2019, (three from the ridge tiles at gable end 21 minutes after sunset, and one 33 minutes after sunset. During the same survey an assumed brown long-eared bat was seen returning to the roost at 47 minutes after sunset but was not echo-locating. In September 2020, was believed to be a brown long-eared bat (no echo-locating was picked up) emerged 22 minutes after sunset from wooden slats on the gable end. In the absence of additional data (access has been refused for the final	No, access permission has been retracted	Common pip – day roost; and Brown long-eared – day roost	Will become fragmented between the new Link Road and the M5

Total number	Structure/ tree reference	Results to date	Surveys complete?	Roost characterisation[21]	Proposals (discussed in detail in Section 5)
		emergence survey) this is assumed to be a day roost for pipistrelles and brown long -eared bats. No access for hibernation survey to be carried out.			
21	BU_752	In mid-August 2019, a lesser horseshoe bat was seen through a window roosting before the survey began, then also recorded feeding and hanging on a perch 51 minutes after sunset. During the same survey a ***Myotis*** (likely to be Natterer's based on DNA analysis) returned to roost 5 minutes after sunset, and a ***Myotis*** (also assumed to be Natterer's) emerged 10 minutes after sunset, although the exact roost site was not observed. A further ***Myotis*** (also assumed to be Natterer's) emerged 17 minutes after sunset, however, the location it came from could not be confirmed. In late September 2020 no bats were seen to emerge or re-enter the structure. No access for hibernation survey to be carried out. Based on the behaviour and emergence time during the August survey, juveniles are suspected, and therefore on a precautionary basis a maternity roost is assumed	No, access permission has been retracted	Natterer's – maternity / day / night roost; and Lesser horseshoe - day / night / feeding roost	Will become fragmented between the new Link Road and the M5
22	BU_757	Based on the behaviour and emergence time during the August survey, juveniles are suspected, and therefore on a precautionary basis a maternity roost is assumed	No, access permission has been retracted	Common pipistrelle – maternity/ mating roost/ transitional roost; and Lesser horseshoe – day roost	Will become fragmented between the new Link Road and the M5
23	BU_761	A single dropping was found on caravan inside shed (no DNA carried out). A single emergence survey was conducted in late September 2020 (before all access was refused to the site). During the survey a maximum count of two ***Myotis*** (from call analysis deemed to be Natterer's), which started emerging from at 50 and 53 minutes after sunset were recorded. During the same survey a brown long-eared bat was recorded within the barn	No, access permission has been retracted	Brown long-eared bat - night/ feeding roost; and ***Myotis*** (assumed to be Natterer's) - transitional roost.	Will become fragmented between the new Link Road and the M5

Total number	Structure/ tree reference	Results to date	Surveys complete?	Roost characterisation[21]	Proposals (discussed in detail in Section 5)
		assumed to be using the barn. No access for hibernation survey to be carried out.			
24	BU_763	A surveyor observed bat droppings in doorway at the beginning of survey on 09/09/2020 (no DNA survey undertaken). In mid-August 2019, no bats were recorded emerging. In early September 2020, roosting pipistrelle species were recorded under the northern apex of the structure, 15 and 25 minutes after sunset, both assumed to be common pipistrelle (based on later emerging species and emergence times). 34 minutes after sunset a further common pipistrelle bat emerged. During the same survey, both 46 and 49 minutes after sunset, ***Myotis*** (assumed based on call ID to be Natterer's) were seen to emerge (two in total, with one briefly re-entering). Finally, an incidental sighting of a common pipistrelle bat in late September (while surveyors were completing a survey of an adjacent structure) was observed. Access for the final emergence survey was refused. No access for hibernation survey to be carried out.	No, access permission has been retracted	Common pipistrelle - Mating roost/ transitional roost; and ***Myotis*** (assumed to be Natterer's) - transitional roost	Will become fragmented between the new Link Road and the M5
25	BU_765	Few droppings likely from brown long-eared and pipistrelle bats (no DNA analysis carried out) on cars at western end of structure. A dawn in late August and an emergence survey in mid-September were carried out with no bats recording roosting in the structure. The final survey has been refused due to access. In the absence of additional data (the final emergence and no DNA analysis) it is assumed from the initial surveyors notes that this is a night roost for brown long-eared and pipistrelle bats (common and soprano pipistrelle bat activity was recorded). No hibernation suitability.	No, access permission has been retracted	Common pipistrelle - Night/ feeding roost; Soprano pipistrelle - Night/ feeding roost; and Brown long-eared - Night/ feeding roost	Will become fragmented
26	BU_766	Scattered droppings (Natterer's, common pipistrelle and soprano pipistrelle from DNA analysis) and moth wing fragments (likely to be feeding remains) recorded. May be used as a feeding roost or night roost as no roosting locations recorded. A single emergence	No, access permission has been retracted	Natterer's - Night/ feeding roost;	Will become fragmented

Total number	Structure/ tree reference	Results to date	Surveys complete?	Roost characterisation[21]	Proposals (discussed in detail in Section 5)
		survey was completed in early September before all remaining access was refused. No hibernation suitability.		Common pipistrelle - Night/ feeding roost; and Soprano pipistrelle - Night/ feeding roost	
27	BU_981	Six emerging pipistrelle bats from three different locations on the structure in mid-June 2021, two further surveys are proposed for 2021. Precautionary approach of assuming a maternity colony and night roost until further surveys are completed. No hibernation bat activity recorded.	No. Full access available - surveys outstanding including one further emergence survey	Common pipistrelle – maternity roost (assumed, with limitations)	To be demolished
28	BU_853	During a survey in late June 2019, 59 minutes after sunset a ***Myotis*** (likely to be Natterer's from sound analysis) emerged from a lifted roof tile. 1 hr 14 minutes after sunset a brown long-eared bat was seen to emerge from the barn also. Finally, 22:50 a further ***Myotis*** (likely to be Natterer's from sound analysis) bat was seen to emerge from the open front of the shed 1 hr 22 min after sunset. A survey in late July 2019 recorded no bats emerging, then all access was refused for future surveys. No hibernation suitability.	No, access permission has been retracted	***Myotis*** (assumed to be Natterer's) – Day roost; and Brown long-eared – Day roost	Will become fragmented between the new Link Road and the M5
29	BU_854	In late June 2019, eleven common pipistrelle bats (also confirmed with DNA) were observed emerging out of the main barn. Additionally, eight ***Myotis*** (assumed to be Natterer's from DNA analysis) emerged from the barn. In late July 2019, only a single common pipistrelle was recorded returning to roost during a dawn survey. In late May 2021, no bats were recorded emerging. Additionally, brown long eared DNA was recorded within the barn. No access for hibernation survey to be carried out. As access was refused for any further surveys, no surveys (static detectors or emergence) were possible in late summer / autumn. Therefore, on a precautionary basis this structure is also assumed	No, access permission has been retracted	Common pipistrelle - maternity roost/ day/ transitional roost; Natterer's - maternity/ transitional/ mating roosts; and Brown long-eared – day feeding/ transitional roosts.	Will become fragmented between the new Link Road and the M5

Total number	Structure/ tree reference	Results to date	Surveys complete?	Roost characterisation[21]	Proposals (discussed in detail in Section 5)
		to be a transitional roost for all species, and also a mating roost for Natterer's.			
30	BU_855	As access was refused for any further surveys, no surveys (static detectors or emergence) were possible in late summer/ autumn. Therefore, on a precautionary basis this structure is also assumed to be a transitional roost for all species, and also a mating roost for Natterer's.	No, access permission has been retracted	Common pipistrelle - day roost	Will become fragmented between the new Link Road and the M5
31	BU_857	In early September 2019, no bats were recorded emerging, however in late May 2021, two common pipistrelle bats were seen to emerge from the garage. No final emergence survey was carried out due to access being refused. Bat droppings from within the structure were confirmed at common pipistrelle bat. No access for hibernation survey to be carried out. No hibernation suitability.	No, access permission has been retracted	Common pipistrelle - Night/ feeding roost; Soprano pipistrelle - Night/ feeding roost; Natterer's - Night/ feeding roost; Whiskered - Night/ feeding roost; and Brown long-eared - Night/ feeding roost	
32	BU_862	On the 20th of July 2020 a maximum of six common pipistrelle bats emerged from three locations. In late September 2020 and early August 2021, no bats emerged. No hibernation activity was recorded.	Yes, surveys complete	Common pipistrelle – day roost	Within 50m
33	BU_963	In early July 2019, no bats emerged. In late August a single soprano pipistrelle was recorded roosting within the property. A final survey in early July 2021 recorded no bats emerging. Hibernation survey to be carried out.	No, full access available - surveys outstanding including a hibernation survey proposed for winter 2021/2022.	Soprano pipistrelle - Day roost	To be demolished

Total number	Structure/ tree reference	Results to date	Surveys complete?	Roost characterisation[21]	Proposals (discussed in detail in Section 5)
34	BU_370	Only an external assessment was carried out before all access was refused (where the structure was defined as high bat roosting suitability). However, during the daytime survey the tenant made an un-verified comment about seeing a bat leave the structure. No hibernation survey was possible due to access.	No, access permission has been retracted	Bat – unknown roost (assumed, with limitations)	Major
35	BU_987	In early September, a single soprano pipistrelle bat emerged from the apex of south gable end. Two final surveys are proposed for summer 2021. Hibernation survey to be carried out. Further surveys are proposed for summer 2021.	No Full access available - surveys outstanding including two further emergence surveys and a hibernation survey proposed for winter 2021/2022.	Soprano pipistrelle - day roost	To be demolished
36	BU_990	In late July 2019 a single bat emerged from the end of the barn. No data as the card was corrupt, however common pipistrelle was recorded by the other surveyor at the same time, so this species was assumed to be a single common pipistrelle bat. In mid-August 2019 no bats were seen to enter the structure. In late July 2020, one common pipistrelle bat was seen to emerge from the northern gable that is vegetated with elder or the south eastern elevation (the exact location was unknown). No hibernation suitability. As all surveys were in July and August, this was considered to be a slight limitation, therefore it is assumed that this is a transitional roost also for soprano pipistrelles on a precautionary basis.	Yes, surveys complete	Common pipistrelle - day/ transitional roost	Within 50m
37	BU_992	During the daytime inspection whiskered bat droppings were detected (confirmed using DNA analysis). Common pipistrelle bats were recorded from the eaves of the house on the north east gable and from under the eaves and from the south west gable. A total of four common pipistrelle bats emerged from two locations in late July 2019. In mid-August 2019 a single common pipistrelle	No, full access available - surveys outstanding including a hibernation survey proposed for winter 2021/2022.	Common pipistrelle - day/ transitional roost Whiskered – day/ transitional roost	Within 100m

Total number	Structure/ tree reference	Results to date	Surveys complete?	Roost characterisation[21]	Proposals (discussed in detail in Section 5)
		bat emerged from the raised roof tiles nearest to the chimney stack, and on a dawn the subsequent night one common pipistrelle bat re-entered out of sight of the surveyors on the south west side of the structure (exact location unknown as surveyors was watching an adjacent structure. In mid-July 2020 a common pipistrelle bat exited from the gable wall, then a common pipistrelle bat was seen foraging and then re-entering the same location. At the same location a common pipistrelle bat was seen to exit from the same location. Hibernation survey to be carried out. As all surveys were in July and August, this was considered to be a slight limitation, therefore it is assumed that this is a transitional roost on a precautionary basis.			
38	BU_993	In mid-August 2019 no bat emergences were recorded. In late July 2020 a common pipistrelle bat is likely to have emerged from the north elevation. Seven further common pipistrelle bats were recorded within the cattle shed; No emergence was seen, but it's assumed that the bats emerged from within the barn and were flying within the cattle shed (lean-to) before they exited the structure. Access for the final emergence survey was refused. No hibernation suitability. Given floor heavily poached and surveys all being completed in the later summer months (over two years), there may be a limitation over detection of droppings/ signs indicating other species. On a precautionary basis this site is also considered as a lesser horseshoe and brown long-eared roost.	No, access permission has been retracted	Common pipistrelle - maternity roost Brown long-eared - Day roost Lesser horseshoe - Day roost	Within 100m
39	BU_723 / BU_642	Based on the droppings recorded (Natterer's, from DNA analysis) the site is considered likely to be a feeding or night roost for Natterer's bats. No hibernation suitability.	No, full access available - surveys outstanding include all three emergence surveys	Natterer's - Night/ feeding roost	Within 50m

Total number	Structure/ tree reference	Results to date	Surveys complete?	Roost characterisation[21]	Proposals (discussed in detail in Section 5)
40	BU_357	No emergences were recorded during the surveys (one survey outstanding), and no night roosting location s were observed. Based on the droppings recorded (no DNA analysis carried out) the site is considered likely to be a feeding or night roost for common pipistrelle and soprano pipistrelle also (as they were also recorded during the surveys). No hibernation suitability.	No, access permission has been retracted	Common pipistrelle - Night/ feeding roost; and Soprano pipistrelle - Night/ feeding roost	Will become fragmented between the new Link Road and the M5
41	BU_753	During the survey in mid-September a single bat that was not echolocating was seen to emerge from the property. In late July a further soprano pipistrelle bat was seen to emerge from the property, therefore allowing a conclusion that the bat in the previous year may also have been a pipistrelle bat. No hibernation activity was recorded. Due to access now being refused and only two surveys being caried out(in July and September), on a precautionary basis this site is also considered as a brown long-eared roost (as a bat was recorded not echolocating).	No, access permission has been retracted	Brown long-eared – day roost Common pipistrelle – day roost; and Soprano pipistrelle – day roost	Will become fragmented between the new Link Road and the M5
42	BU_653	During the first survey in June 2021 a non-echolocating bat, believed to be a pipistrelle species, based on visual characteristics, emerged from the soffit box on the north west aspect of the property.	No, full access available - surveys outstanding including two emergence surveys and a hibernation survey proposed for winter 2021/2022.	Common pipistrelle – day roost; and Soprano pipistrelle – day roost	To be demolished
1	Tree 172	During the summer tree inspections in 2020, this feature was endoscoped on three occasions at the end of July, mid-August and the beginning of September. On each occasion a single Bechstein's bat was present within the feature.	Yes, surveys complete	Bechstein's bat – day roost	Outside Zone of Influence (ZOI), 110m from the south eastern

Total number	Structure/ tree reference	Results to date	Surveys complete?	Roost characterisation[21]	Proposals (discussed in detail in Section 5)
					corner of the work
2	Tree 576	During the summer tree inspections in 2020, this feature was inspected and found to have a single Noctule bat present in mid-August and early September.	Yes, surveys complete	Noctule – day roost	Within 50m
3	Tree 578	During the summer tree inspections in 2020, this feature was inspected and in mid-August found to have a single Noctule bat present. In early September this feature was found to have a small number (likely 2 or 3) Noctule bats present.	Yes, surveys complete	Noctule – day roost	Within 100m
4	Tree 496	During the initial ground level inspections of this tree a single barbastelle was located at the end of October. All consequent inspections showed no evidence of roosting bats.	Yes, surveys complete	Barbastelle – transitional roost	To be felled
5	Tree 627	During the tree climbing inspections this tree was assessed to have low suitability to support roosting bats due to a large open feature. During a transect undertaken in October 2019, a single noctule was observed emerging from the tree. Further surveys are required in summer 2021.	No, full access available - surveys outstanding including three emergence / tree climbing surveys.	Noctule – transitional roost	Within 100m

3.5. Activity Surveys

Transect Surveys Overview

3.5.1. The seven transect surveys were completed between June 2019 and May 2020. The locations of the transects are shown in Appendix F. The weather and temperature conditions, sunset, and timings for each survey, are provided between Table 4-51 and Table 4-57.

3.5.2. A summary of the total number of bat passes from each species on each of the transect surveys are provided in Table 4-58. Full survey results, including the time record for each bat pass, are available on request.

3.5.3. A summary of all the activity across the different transects is provided in Figure 3-1.

Static Survey Overview

3.5.4. The 20 static surveys that were undertaken were completed between June 2019 and May 2020. The locations of the static detectors are shown in Appendix F. The weather and temperature conditions for each survey are provided between in Table 4-59.

3.5.5. A summary of the bat species and peak counts over all months at each static location are provided in Table 4-60. A summary graph of all the activity across the different statics is provided in Figure 3-2.

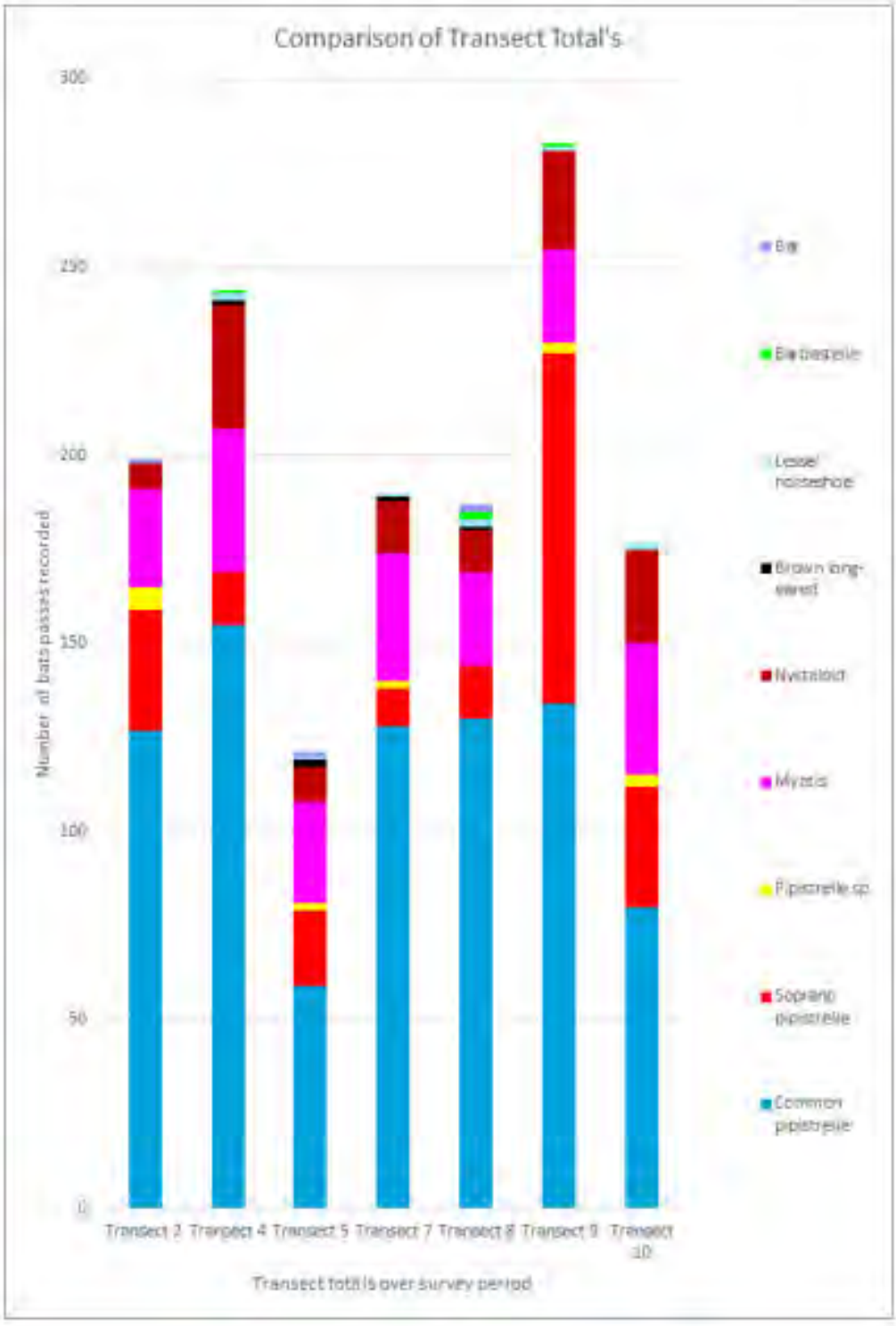


Figure 3-1 - Graph to Show Overview of Transect Surveys

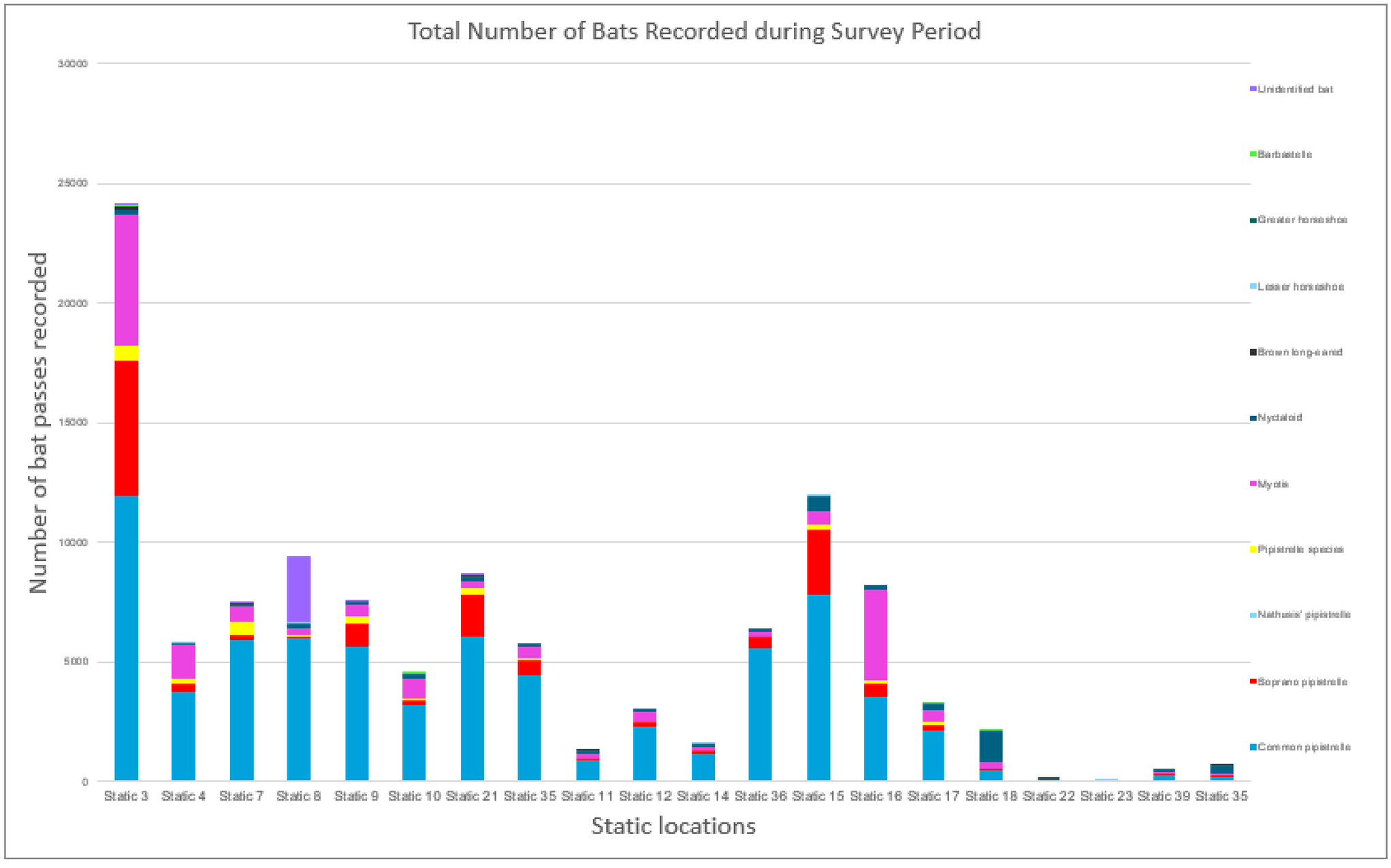


Figure 3-2 - Graph to Show Overview of all Static Survey Locations

3.6. Transect Survey 2

Transect Surveys

3.6.1. A total of at least four bat species or species groups (common pipistrelle, soprano pipistrelle, pipistrelle species, ***Myotis***, noctule, Nyctaloid and unconfirmed bat species) were recorded during the six surveys that were undertaken. These results can be seen on Figure 3-3.

3.6.2. Across all the surveys at this location, pipistrelle bats comprised of 127 common pipistrelle bats and 32 soprano pipistrelle bat passes. There were also six passes of a pipistrelle species, where the exact species could not be determined from call analysis. Pipistrelle species' passes were recorded across most of the transect with high frequency occurrence towards the River Chelt (Point Counts (PC) 2 and 7), as well as towards the hedgerows at the south of the transect (PCs 4,5 and C).

3.6.3. ***30 Myotis*** passes were recorded in total, (between three and six times on each survey, with the exception of the June transect, where there was only one ***Myotis pass was detected***. ***Myotis*** species bats were throughout the transect route and not in one area in particular.

3.6.4. Nyctaloid bats in particular, noctule were recorded in May, July and October only (with only six passes altogether). They were recorded at PCs: 7 to 6 (x3), 1 to 2, B, 4 and 5 to D. Just over half of these passes (7 to 6 and 1 to 2) were picked up at the north of the study area, close to the River Chelt. Three passes (PCs B,4, and 1 to 2) were picked up when surveyors were towards the south of the transect.

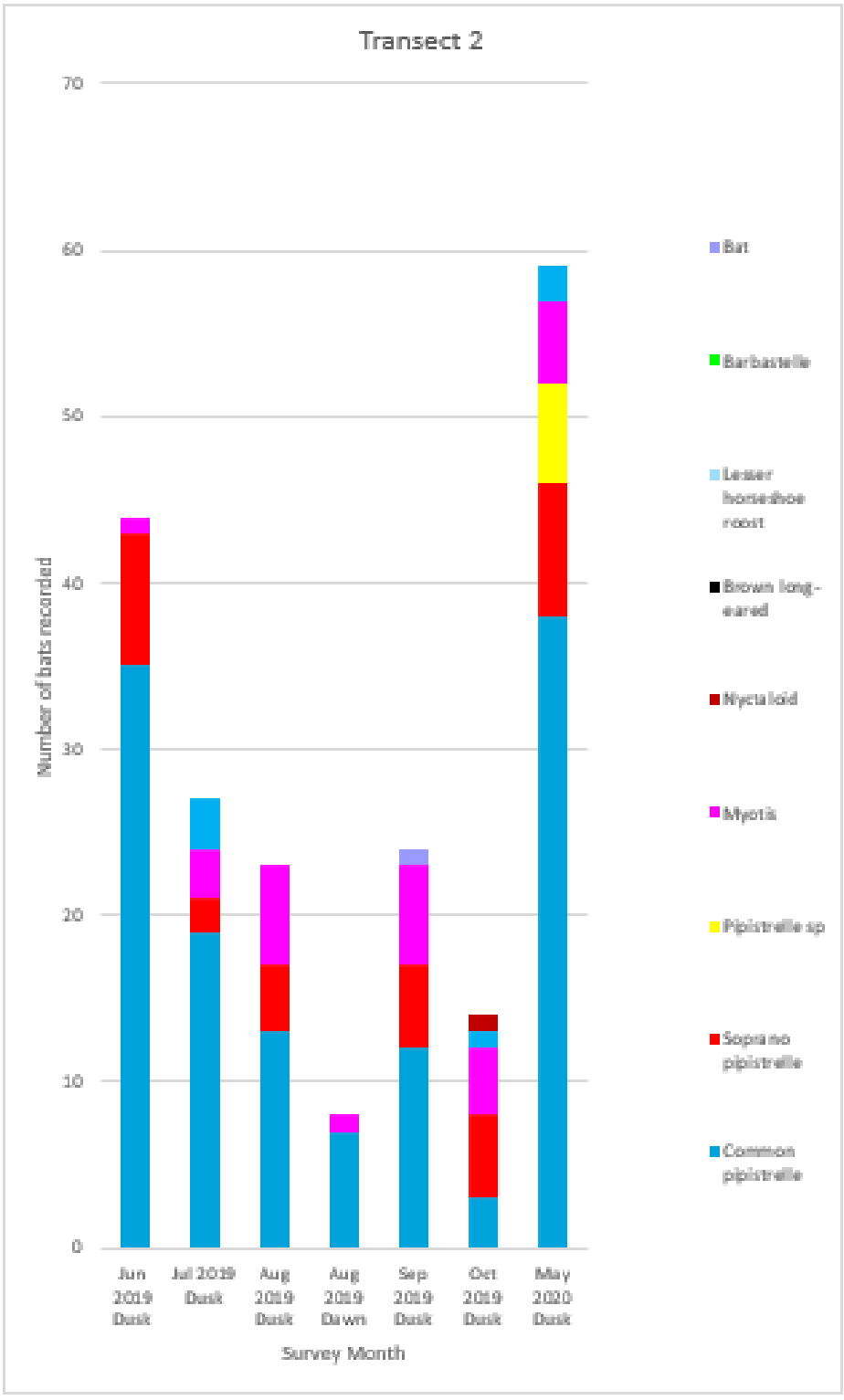


Figure 3-3 - Graph to Show Transect 2 Overview of Results

Automated Surveys

3.6.5. At least eleven species of bat were recorded between static 3 (M5 River Chelt culvert) and static 4 (along vegetation parallel to the M5) during the automated bat surveys associated with transect 2; common pipistrelle, soprano pipistrelle, Nathusius' pipistrelle, ***Myotis***. species, noctule, Leisler's, brown long-eared, lesser horseshoe, greater horseshoe, serotine, barbastelle and unidentified bats). Full survey results are provided within Table 4-60 and summarised in Figure 3-4.

3.6.6. Static 3 had more than twice as many overall bat passes in comparison to all other static locations (20 statics in total). Static 3 also had the most bat passes (more than four times the number of passes) in comparison to static 4. Bat activity at both static 3 and 4 locations was highest in May (40% of all the total passes at both static locations).

3.6.7. As with the manual transect surveys, common pipistrelle passes were the most frequent species across the two static locations. Nathusius' pipistrelle bat passes were recorded in June 2019 (once) and three times in May 2020, all at static 3 (along the River Chelt).

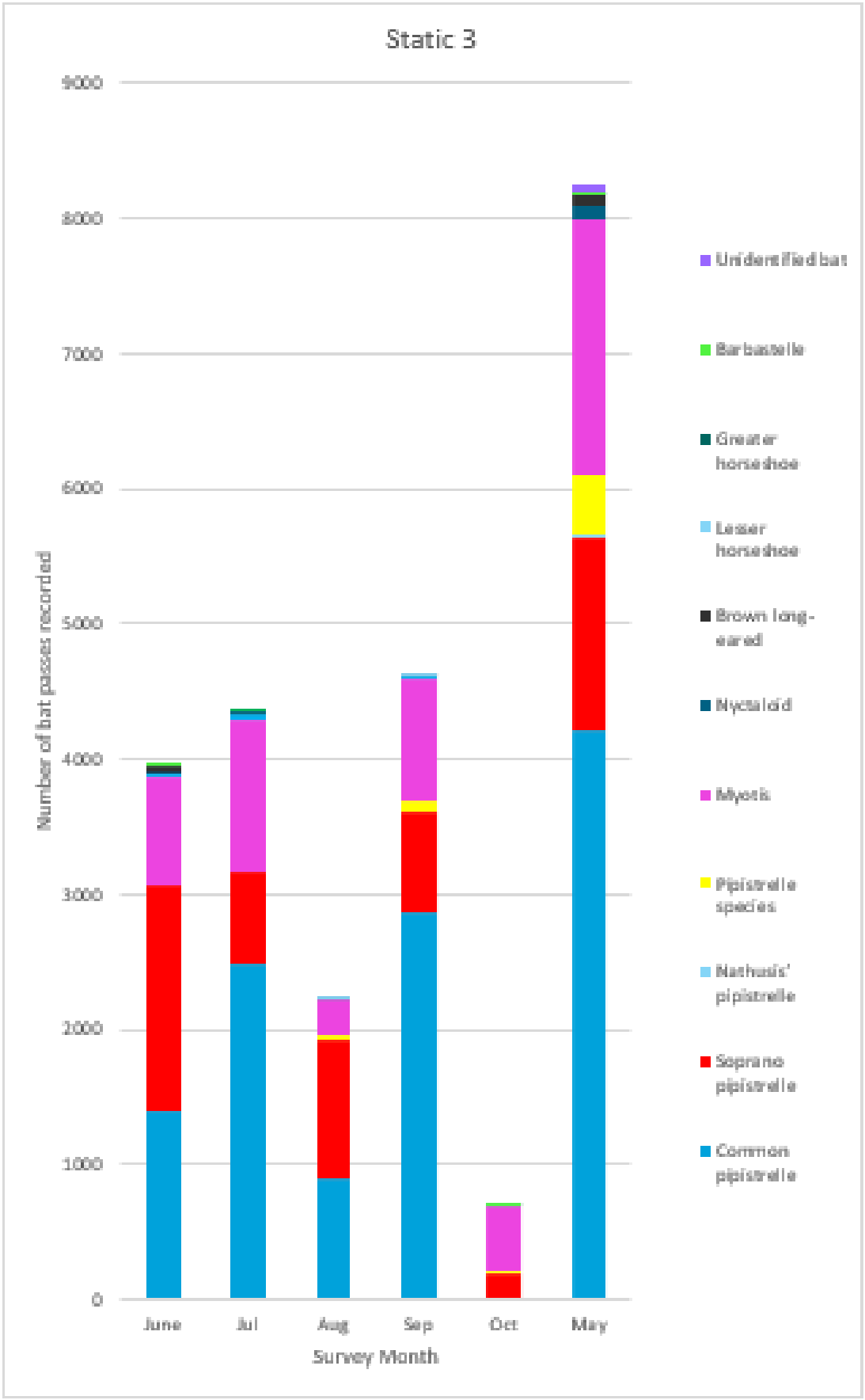
3.6.8. ***Myotis*** species bat passes were recorded frequently at static 3 (M5 River Chelt culvert) with 5467 passes in total, and with 1430 passes at static 4 in total.

3.6.9. Brown long-eared bat passes were recorded 142 times at static 3, across all the months, however, May was the busiest with 80 passes, followed closely by 48 passes in June. Only one brown long-eared bat pass was recorded at static 4, in May.

3.6.10. Annex II bat species recorded at these locations included lesser horseshoe, greater horseshoe and barbastelle. Lesser horseshoe passes were recorded at least once during every month at both static locations (with the exception of static 4 in July 2020 (although survey limitations meant two nights of the recording were during heavy rain which is likely to explain this difference). Greater horseshoe bat passes were recorded twice in September and three times in May at static 3. One greater horseshoe bat pass was also recorded in September at static 4. Barbastelle was not recorded at static 4, however there were 11 passes of this species through all the surveys at static 3.

3.6.11. Five serotine passes were recorded at each of the static locations throughout all of the surveys.

3.6.12. Noctule, Leisler's and Nyctaloid bats were recorded at both locations. At static 3 these included 230 passes, and 71 passes at static 4.


Static 3
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
Number of bat passes recorded
June
Jul
Aug
Sep
Oct
May
Survey Month
Unidentified bat
Barbastelle
Greater horseshoe
Lesser horseshoe
Brown long-eared
Myotis sp.
Myotis
Pipistrelle species
Nathusis' pipistrelle
Soprano pipistrelle
Common pipistrelle

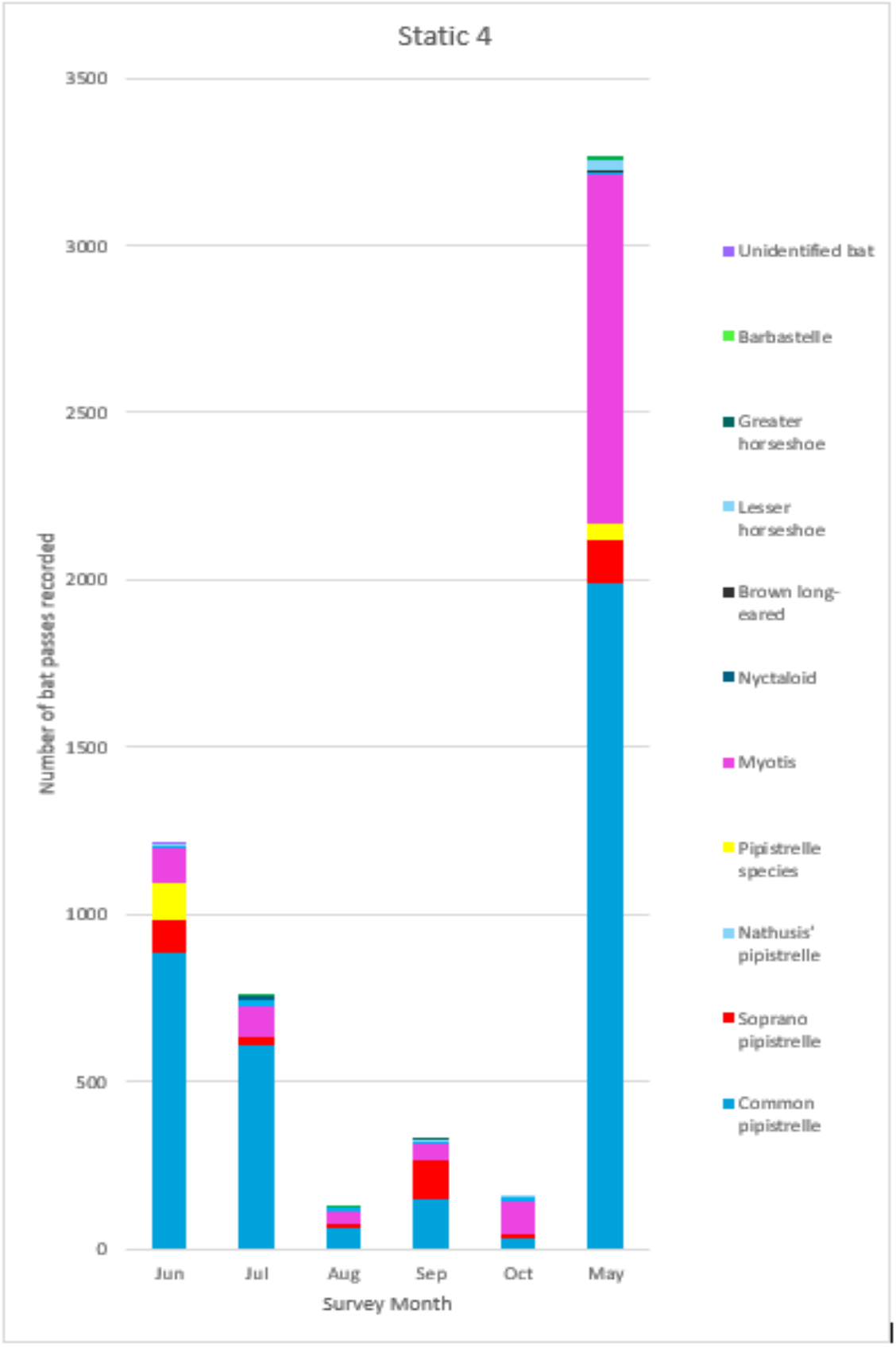


Figure 3-4 - Graphs to Show Static 3 and 4 Survey Results (associated with Transect 2)

3.7. Transect Survey 4

Transect Surveys

3.7.1. A total of at least nine bat species or species groups (common pipistrelle, soprano pipistrelle, ***Myotis*** species, noctule, Leisler's, brown long-eared, lesser horseshoe, serotine and barbastelle bat) were recorded during the six surveys that were undertaken. These results can be seen on Figure 3-5.

3.7.2. Pipistrelle bats comprised of 155 common pipistrelle bats and 22 soprano pipistrelle bat passes. A peak count of 45 common pipistrelle passes were recorded in May 2020, with only two passes in October 2019. The remaining months had between 14 and 39 bat passes on each transect. For soprano pipistrelle, there were no passes in October 2019, and between one and eight passes on all other transects, with the maximum being eight passes recorded in August 2019. Passes for pipistrelle were recorded along all off the PCs, with the majority of passes being picked up towards the M5 (i.e., fewer bats were recorded at PCs 5, 6 and C).

3.7.3. ***Myotis*** species' passes were recorded a total of 38 times over all of the surveys, with between four and nine passes on each survey, with the exception of the July transect, where there was only one pass of a ***Myotis*** species bat. ***Myotis*** species bat passes were recorded throughout the transect route and not in one area in particular.

3.7.4. Noctule bat passes a total of 22 times over all of the transects, between one (June 2019) and five passes (July, August dusk/ dawn and May 2020) during each survey. The passes were recorded throughout the transect, not focused in any area. Leisler's bat passed this location four times on the transect route. All four Leislers' passes were recorded while surveyors were walking along vegetation parallel to the M5 and not along any other PCs on this transect. In June 2019 one pass was along PC 3 to 7, in August 2019 a single pass at PC F was recorded, and there were two passes in September 2019, one was at PC 2 to 3 and one was PC 3 to F, all along the M5 vegetation. A single serotine bat pass was recorded at the south of the transect, at PC 8, adjacent to the vegetation of the M5, recorded in September 2019. A further six passes of Nyctaloid were recorded during the transect surveys, In June 2019 (one pass), August 2019 (one pass), September 2019 (two passes) and October (two passes). Passes were scattered through the study area.

3.7.5. There was one brown long-eared bat pass in August 2019 at the southern end of the study area (PC 8 to E).

3.7.6. Two lesser horseshoe bat passes were recorded in August 2019 (PC D to 7, along a hedgerow perpendicular to the M5) and also in September 2019 (PC A to 1, which is just north of where a bat passed in August, along hedgerows to the west of the M5).

3.7.7. A single barbastelle bat pass was recorded in June 2019, at PC 2 to 3, running parallel with the vegetation to the M5.

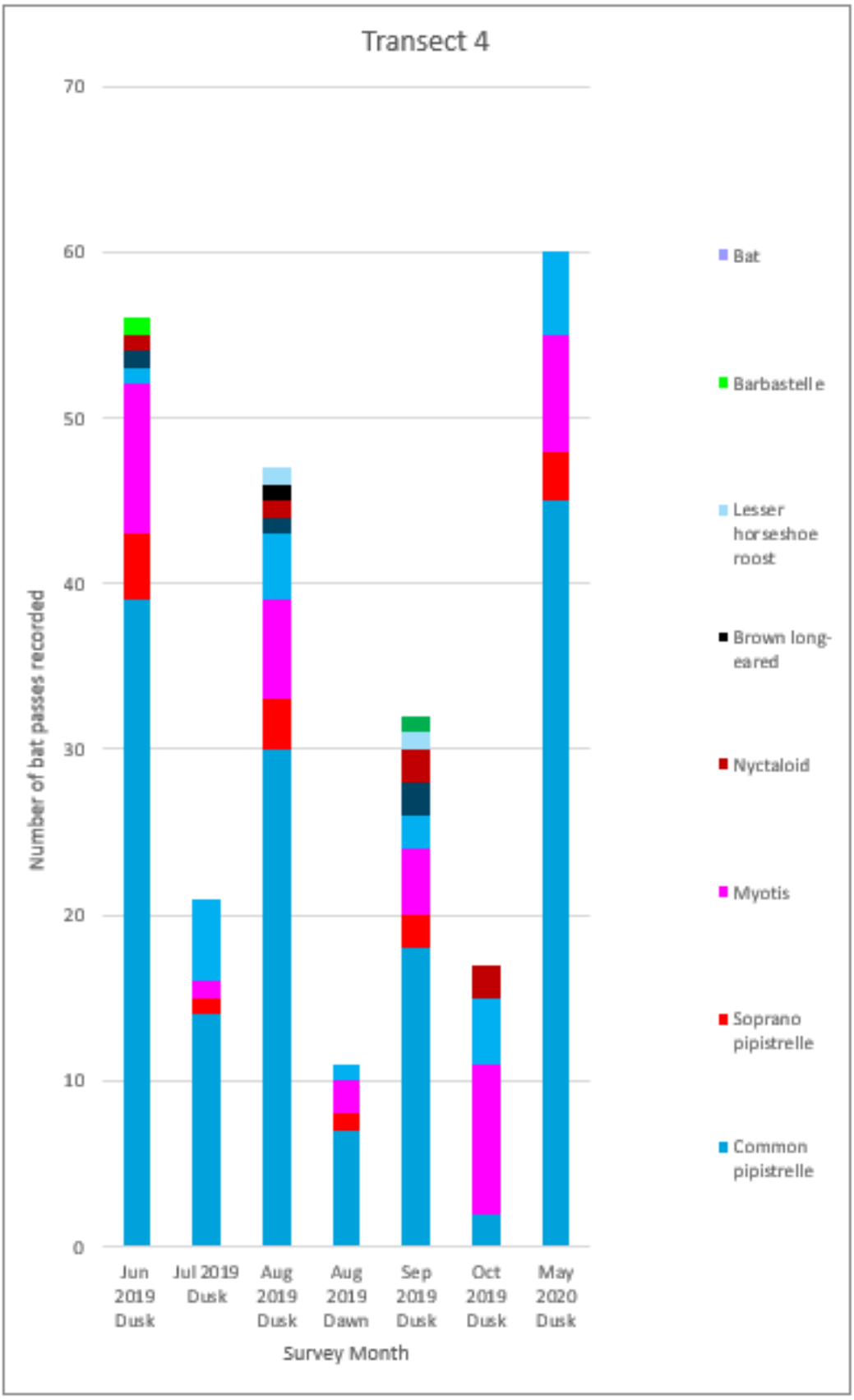


Figure 3-5 - Graph to Show Transect 4 Overview of Results

Automated Surveys

3.7.8. At least eleven bat species or specie groups were recorded between static 7 (in vegetation adjacent to the M5, close to the farm properties) and static 8 (along the M5 close to the un-named road leading to Hardwicke) during the automated bat surveys; common pipistrelle, soprano pipistrelle, Nathusius' pipistrelle, ***Myotis***., noctule, Leisler's, brown long-eared, lesser horseshoe, greater horseshoe, serotine, barbastelle and unidentified bats). Full survey results are provided within Table 4-60 and summarised in Figure 3-6.

3.7.9. Static 7 and 8 were deemed to be similar with bat activity, with 7459 bat passes at static 7 and 9393 passes at static 8. Bat activity at both static 7 and 8 locations was highest in May (43% of all the passes), however there was also a large number of passes in June at static 7 also.

3.7.10. As with the manual transect surveys, common pipistrelle passes were most frequently recorded across the two static locations. Nathusius' pipistrelle bat was recorded with 22 passes at static 7 (all passes were in June), and one pass at static 8, in May. This suggests a maternity colony may be close by, based on the time of the year of these calls.

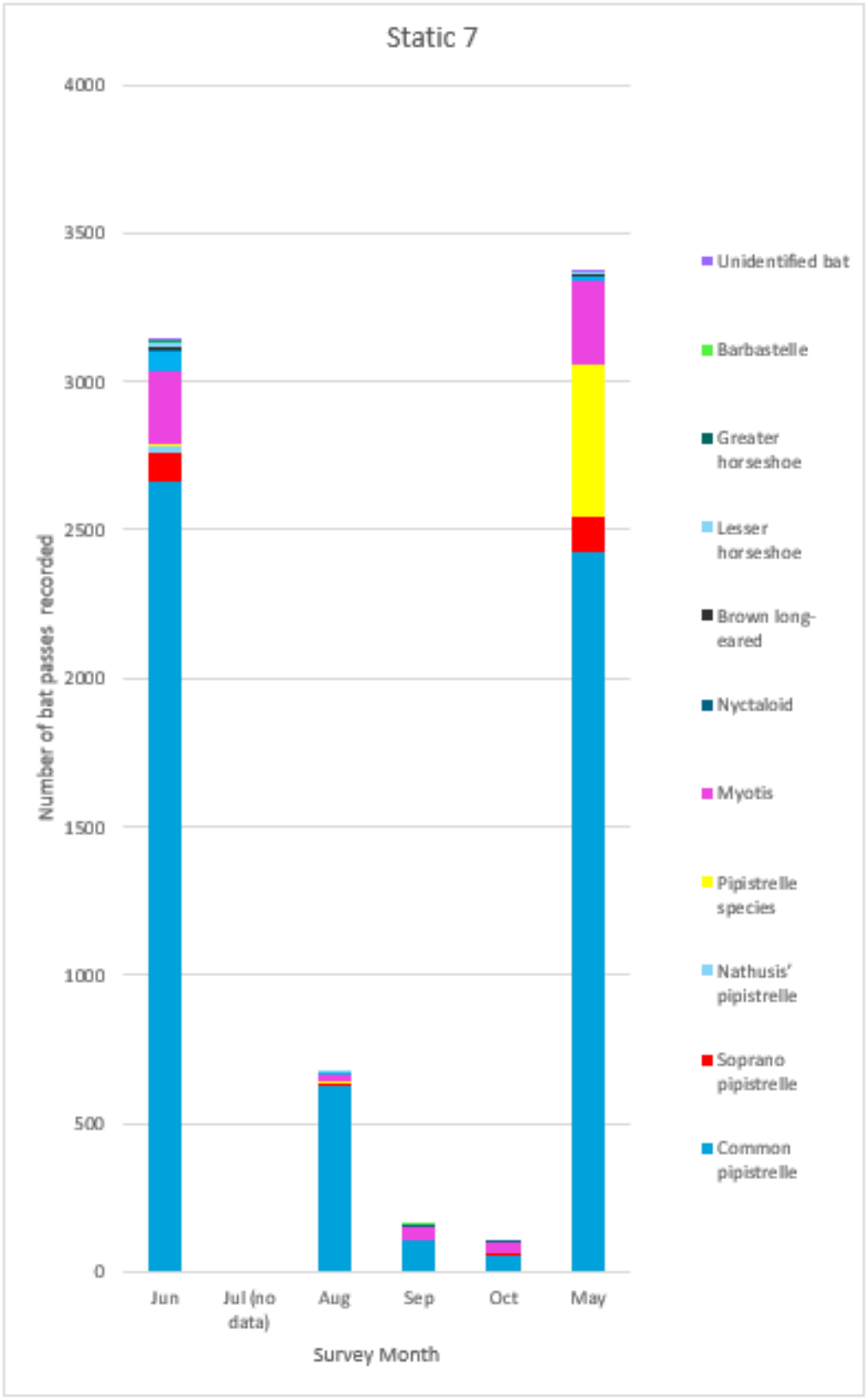
3.7.11. ***Myotis*** were recorded at both static 7 (640 passes) and 8 (320 passes).

3.7.12. Brown long-eared bat passes were recorded 12 times at static 7, and only twice at static 8. All brown long eared passes were in May, June and September.

3.7.13. Annex II bat species at these locations included lesser horseshoe, greater horseshoe and barbastelle. Lesser horseshoe bat had 34 passes at static 7 and 26 passes at static 8. Greater horseshoe bat were recorded with one pass in September at static 8. Barbastelle bat passes comprised of seven and 16 passes respectively at static 7 and 8.

3.7.14. Five and seven serotine bat passes were recorded respectively at static 7 and 8.

3.7.15. Noctule, Leisler's and Nyctaloid bat passes were recorded at both locations. At static 7 this included 99 passes and 204 passes at static 8.


Static 7
4000
3500
3000
2500
2000
1500
1000
500
0
Number of bat passes recorded
Jun
Jul (no data)
Aug
Sep
Oct
May
Survey Month
Unidentified bat
Barbastelle
Greater horseshoe
Lesser horseshoe
Brown long-eared
Nyctaloid
Myotis
Pipistrelle species
Nathusis' pipistrelle
Soprano pipistrelle
Common pipistrelle

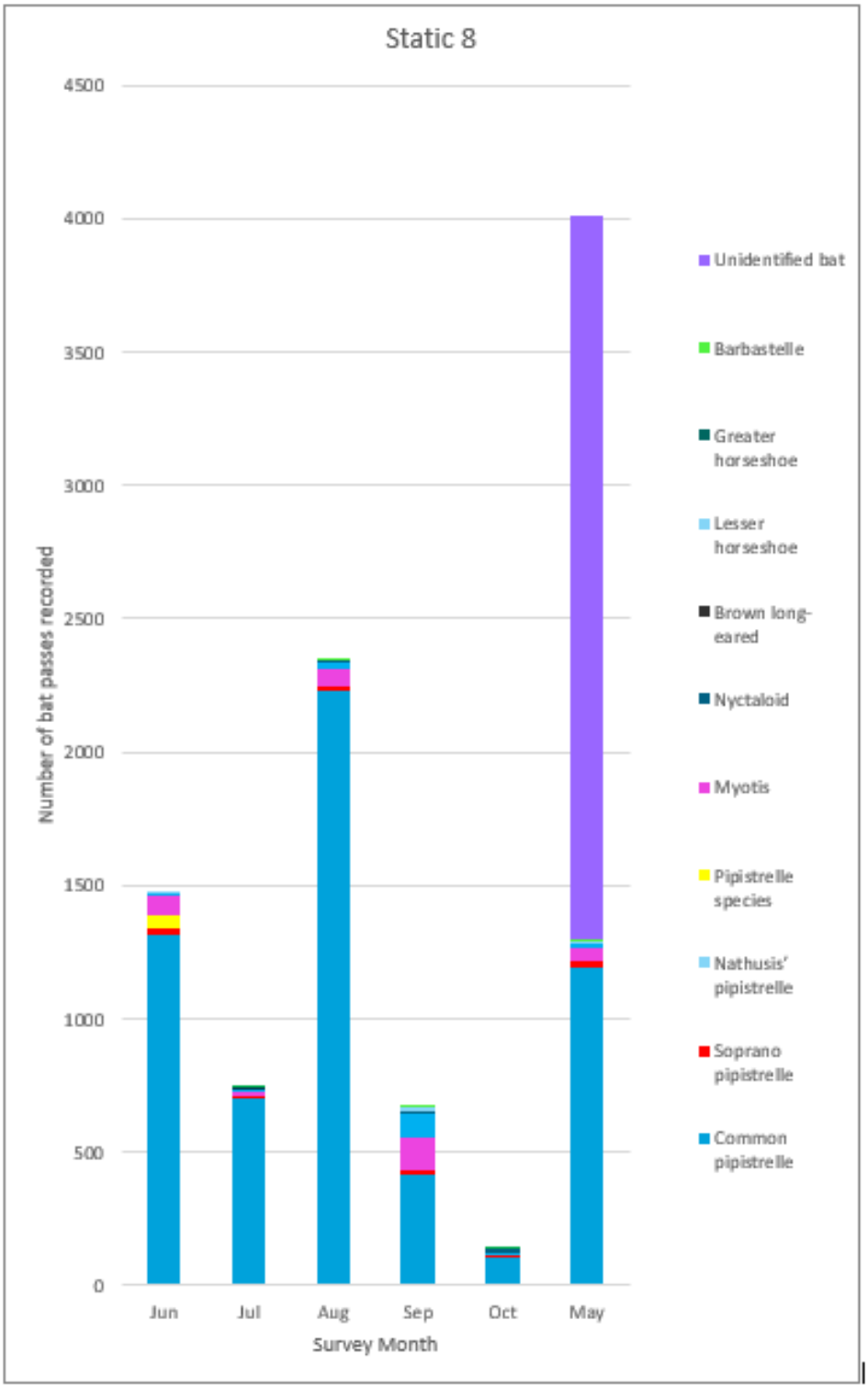


Figure 3-6 - Graph to Show Static 7 and 8 Survey Results (Associated with Transect 4)

3.8. Transect Survey 5

Transect Surveys

3.8.1. A total of at least six bat species or species groups (common pipistrelle, soprano pipistrelle, pipistrelle species, ***Myotis*** species, noctule, brown long-eared, lesser

horseshoe and unidentified bats) were recorded during the six surveys that were undertaken. Transect 5 was the quietest transect based on total number of bat passes from each transect completed (seven locations in total). These results can be seen on Figure 3-7.

3.8.2. Pipistrelle bat comprised of 59 common pipistrelle bats, 21 soprano pipistrelle bat passes and one pipistrelle bat species pass. A max count of 15 common pipistrelle passes were recorded during the August dusk/ dawn, with only three passes in October 2019. The remaining months had between eight and 13 bat passes on each transect. For soprano pipistrelle, there were no passes in July 2019, and between one and 11 passes on all other transects, with the maximum being 11 passes recorded during the dusk/ dawn in August 2019. Passes of pipistrelle were recorded along all off the PCs, with the majority being picked up around PCs 7, C and 6 (along the River Chelt), with the exception of the May 2020 survey where most of the passes were focused towards to the north and east of the transect (PCs 4, A, 5 and B). Only a few of the bat passes were at PC A, or on route to or from A, which is where the new Link Road will pass through a hedgerow directly (the location of CP3).

3.8.3. ***Myotis*** were recorded a total of 27 times over all of the surveys, with passes between two (July 2019) and ten times (August 2019 dusk/ dawn survey) on each survey. Passes of ***Myotis*** were primarily within the centre and at the south of the transect route, along the River Chelt (PC C, A, 3 and 6).

3.8.4. Noctule passes were recorded a total of nine times over all of the transects, once in August 2019 and two times on all other surveys (June, July, September 2019 and May 2020) with the exception of October 2020, where there were no passes. The passes were recorded throughout the transect with the exception of the north eastern end of the transect, i.e., not around PCs 5 or B.

3.8.5. Two brown long-eared bat passes were recorded in October 2019, both at PC 3, located along the hedgerow in the centre of the transect.

3.8.6. One lesser horseshoe bat pass was recorded in October 2019 at PC 4, located along a hedgerow along Withybridge Lane.

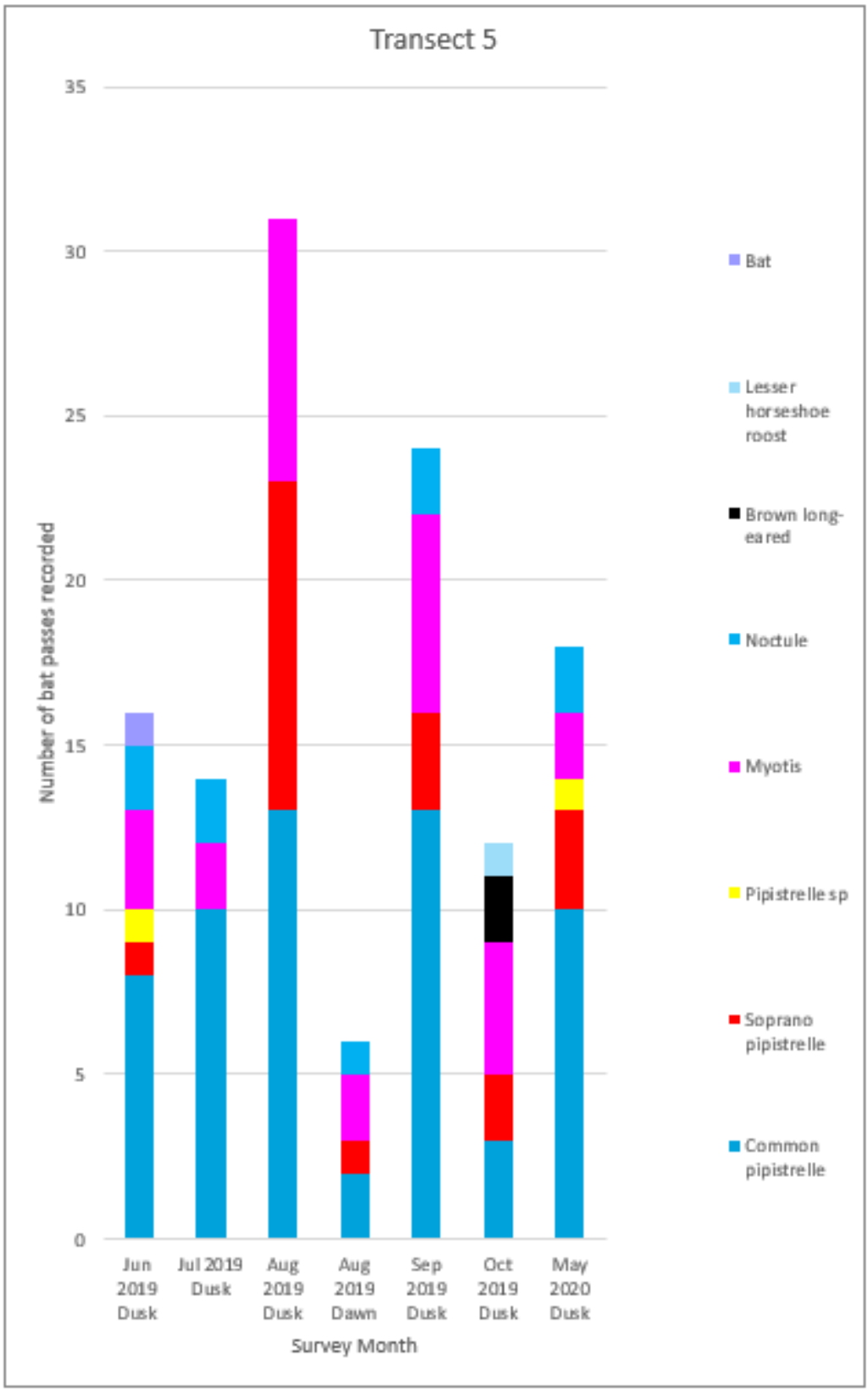


Figure 3-7 - Graph to Show Transect 5 Overview of Results

Automated Surveys

At least eleven species or species groups of bat were recorded at static 9 (where three hedgerows meet between pasture and arable fields) and static 10 (along the River Chelt) during the automated bat surveys; common pipistrelle, soprano pipistrelle, Nathusius' pipistrelle, Myotis species, noctule, Leisler's, brown long-eared, lesser horseshoe, greater horseshoe, serotine, barbastelle and unidentified bats). Full survey results are provided within Table 4-60 and summarised in

3.8.7. Figure 3-8.

3.8.8. Comparing static 9 and 10, static 9 accounted for 62% (7534 passes) of the total passes compared to static 10 (4543 passes, 38%). Bat activity at static 9 was highest in May (46%), however, at static 10 bat activity was highest in July (37% of static 10 bat passes).

3.8.9. As with the manual transect surveys, common pipistrelle had the most frequently recorded passes across the two static locations. Nathusius' pipistrelle bats only passed once at static 10 in May 2020, and not at static 9 at all.

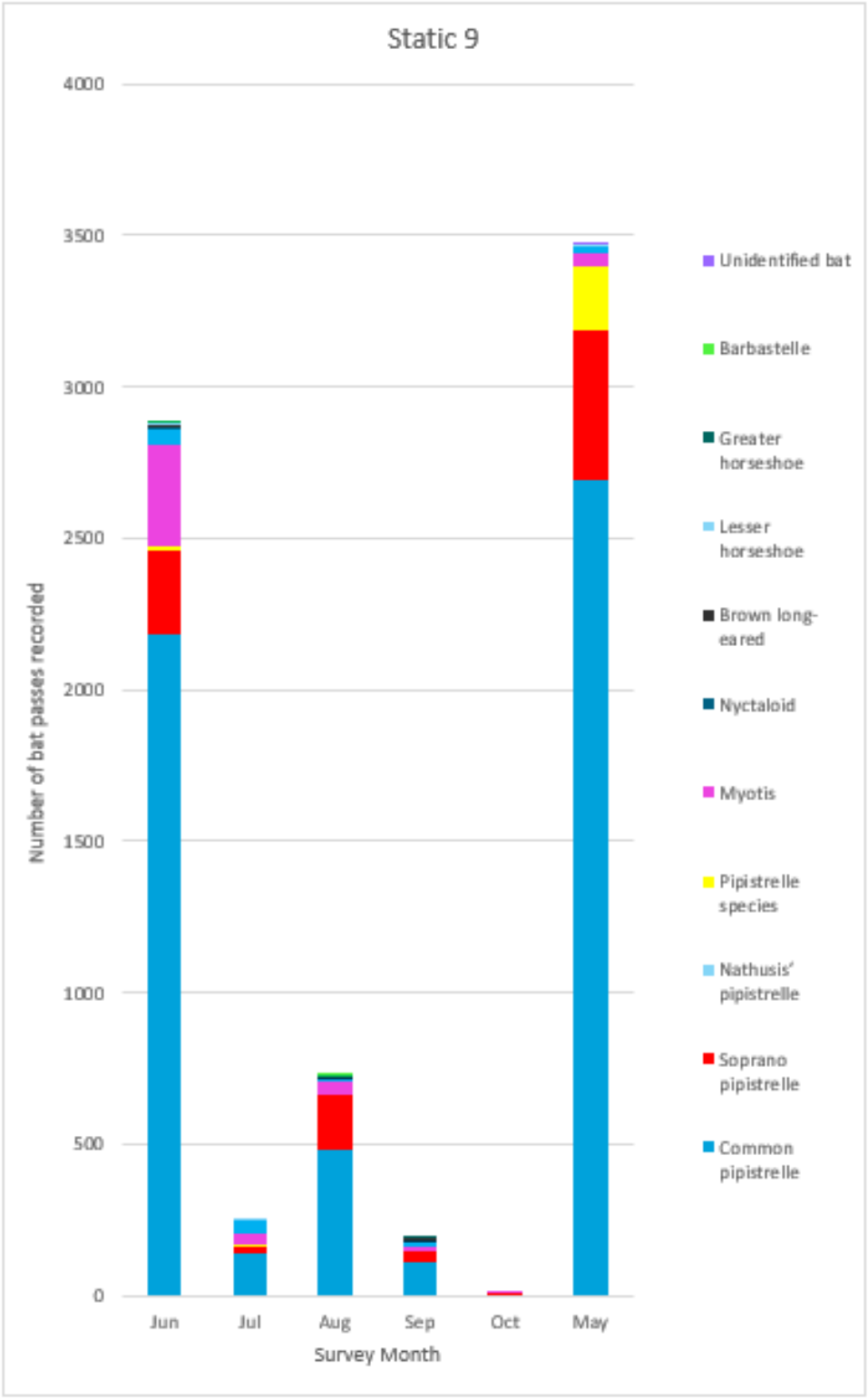
3.8.10. ***Myotis*** species passes were both static 9 (491 passes) and 8 (836 passes).

3.8.11. Brown long-eared bat was recorded with 11 passes at static 9, and 18 passes at static 10.

3.8.12. Annex II bat species at these locations include lesser horseshoe, greater horseshoe and barbastelle. There were 15 passes of lesser horseshoe at static 9 and nine passes at static 10. One greater horseshoe pass was recorded in September at static 9 only. There was once barbastelle pass recorded at static 9 and 13 passes at static 10.

3.8.13. Serotine were recorded with five and ten passes respectively at static 9 and 10.

3.8.14. Noctule, Leisler's and Nyctaloid bats were recorded at both locations. At static 9 these included 154 passes and 224 passes at static 10.


Static 9
4000
3500
3000
2500
2000
1500
1000
500
0
Number of bat passes recorded
Jun
Jul
Aug
Sep
Oct
May
Survey Month
Unidentified bat
Barbastelle
Greater horseshoe
Lesser horseshoe
Brown long-eared
Nyctaloid
Myotis
Pipistrelle species
Nathusis' pipistrelle
Soprano pipistrelle
Common pipistrelle

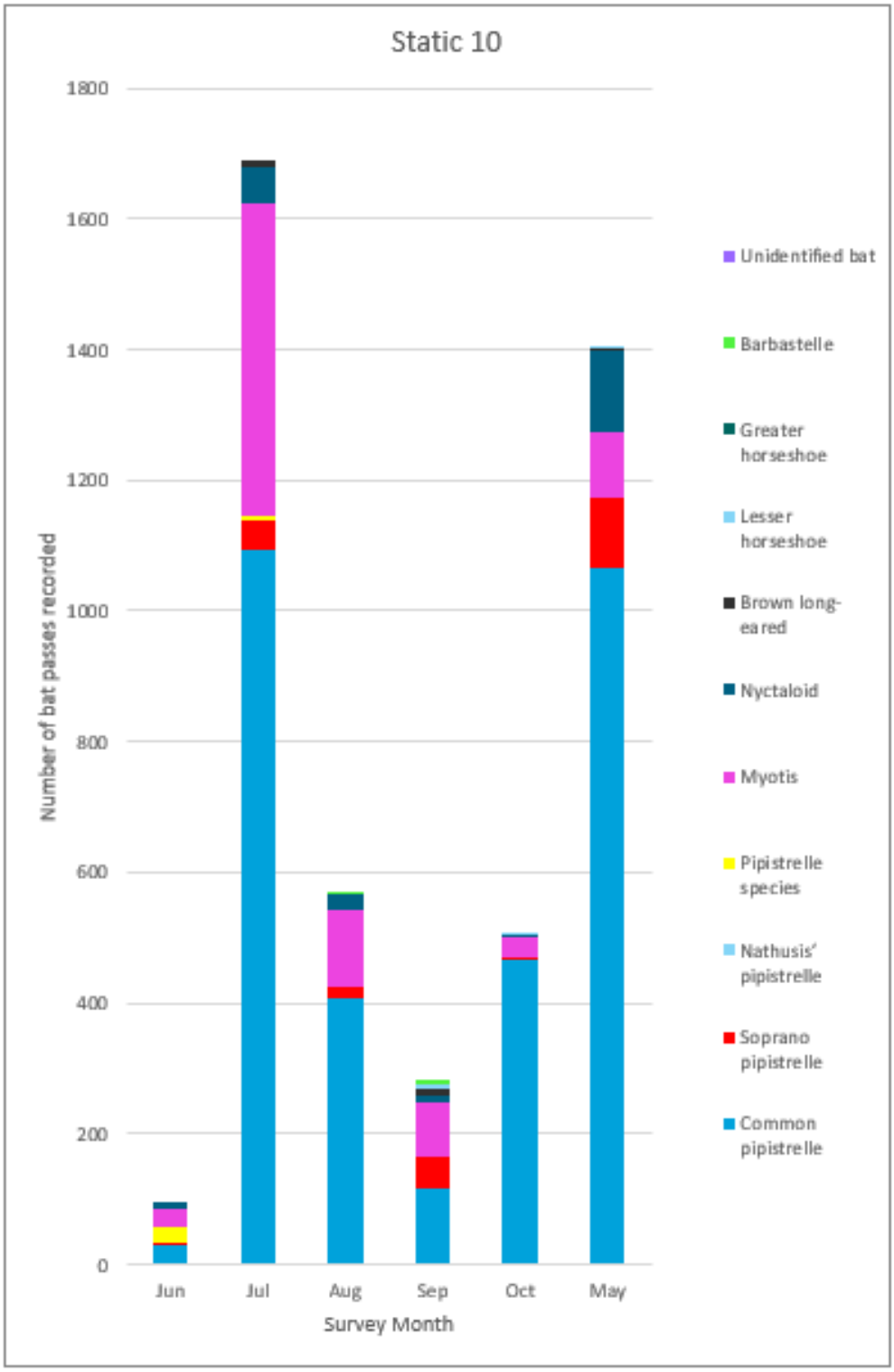


Figure 3-8 - Graph to Show Static 9 and 10 Survey Results (within Transect 5 Location)

3.9. Transect Survey 7

Transect Surveys

3.9.1. A total of at least eight bat species or species groups (common pipistrelle, soprano pipistrelle, pipistrelle species, ***Myotis*** species, noctule, Leisler's, brown long-eared, lesser horseshoe and serotine bats) were recorded during the survey. These results can be seen on Figure 3-9.

3.9.2. Pipistrelle species bat calls comprised of 128 common pipistrelle bats, 14 soprano pipistrelle bat passes and two pipistrelle species (during the August 2019 dawn). A max count of 39 common pipistrelle passes were recorded during the August dusk/ dawn 2020, with only one pass in October 2019. The remaining months had between 11 and 37 bat passes on each transect. For soprano pipistrelle, there were no passes in October 2019, and between one and five passes on all other transects, with the peak of five passes in May 2020. Pipistrelle passes were recorded along all off the PCs, with no particular 'hotspots'.

3.9.3. There were 37 passes of ***Myotis*** species over all of the surveys, comprising of between one and eight passes on each survey, with the exception of the June 2019 survey, where there were no ***Myotis*** species passes. Records of ***Myotis*** species were throughout the transect route and not in one area in particular.

3.9.4. Noctule was recorded, with a total of nine passes over all of the transects, between one (June, July, and August 2019) and four (September 2019) passes during each survey, with the exception of October, where no noctule passes were recorded. The passes were primarily at the northern end of the transect route (PCs 4,5 and 6), with one pass to the south (PC B).

3.9.5. There was one Leisler's pass recorded on the transect route in July 2019 at PC 2, located at the north west of the transect, close to Withybridge Lane.

3.9.6. One brown long-eared bat pass in May 2020 was recorded at PC 1 to C. which is located at the south western corner of the transect, at the rear of the 'House in the Tree' public house (on the corner of Withybridge Lane and Old Gloucester Road).

3.9.7. One lesser horseshoe bat pass in September 2019 (PC 7 to B) was recorded along Old Gloucester Road's bordering hedgerow.

3.9.8. Four serotine bat passes were recorded altogether. Three in July 2019, two at PC 2 to 1 (along Withybridge Lane) and one at PC 4 to 3 along a hedgerow running parallel to Withybridge Lane) . The other pass was in September 2019 at PC C to 1, which is located at the south western corner of the transect, at the rear of the 'House in the Tree' public house.

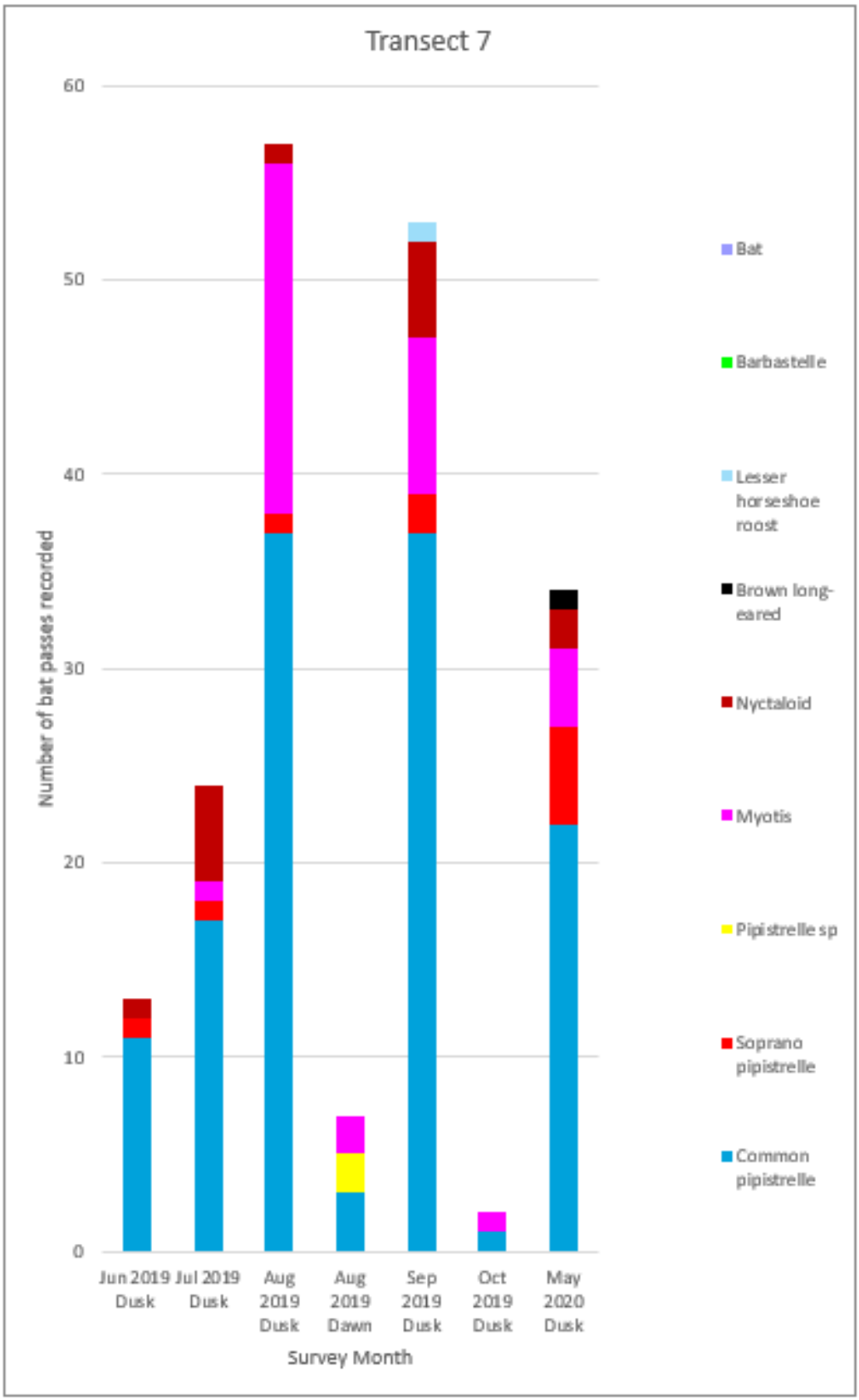


Figure 3-9 - Graph to Show Transect 7 Overview of Results

Automated Surveys

3.9.9. At least ten species or species groups of bat were recorded at between static 11 (along the hedgerow on Old Gloucester Road, where the new Link Road is proposed to intersect) and static 12 (along a hedgerow between an arable and pasture field) during the automated bat surveys; common pipistrelle, soprano pipistrelle, pipistrelle species, ***Myotis*** species, noctule, Leisler's, brown long-eared, lesser horseshoe, greater horseshoe, serotine and barbastelle bats). No nathusius pipistrelle bat passes were recorded within this area during these automated surveys. Full survey results are provided within Table 4-60 and summarised in Figure 3-10.

3.9.10. Comparing static 12 and 11, static 12 (70%) was more than twice as busy as static 11 (30%). May 2020 was the busiest month for static 12 (32% of static 12 passes). For static 11, August was the busiest month (29% of static 11 passes).

3.9.11. As with the manual transect surveys, passes from common pipistrelle bat were the most frequent species across the two static locations.

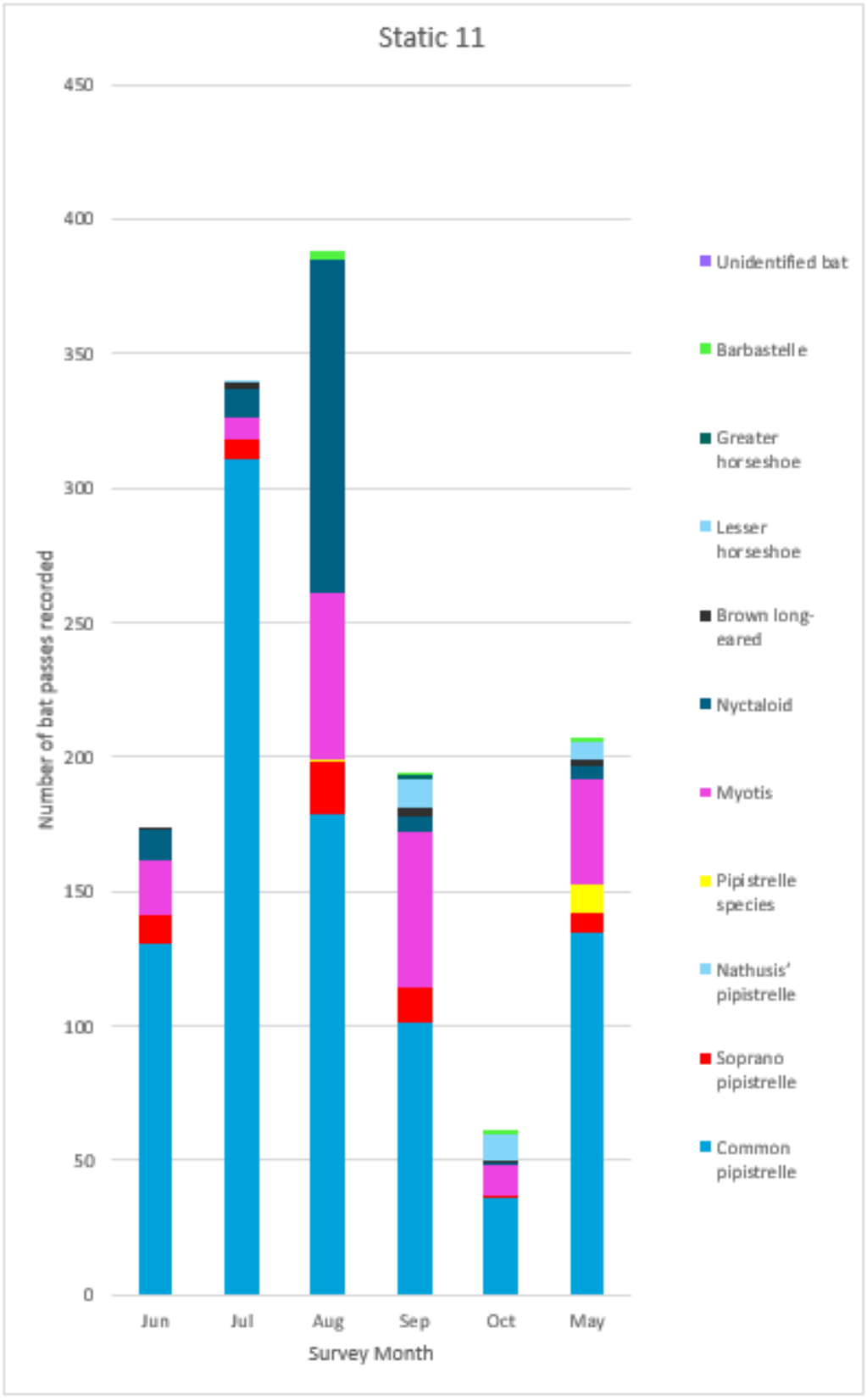
3.9.12. ***Myotis*** bat species passes were recorded frequently at both static 11 (199 passes) and 12 (411 passes), showing ***Myotis*** species were recorded more often close to Old Gloucester Road, rather than within the arable landscape (static 12).

3.9.13. Brown long-eared was recorded with nine passes at static 11 (in all months except August 2019), and only one pass at static 12 (August 2020).

3.9.14. Annex II bat species at these locations included lesser horseshoe, greater horseshoe and barbastelle. Lesser horseshoe were recorded 29 times at static 11 and 23 times at static 12. There was one greater horseshoe pass in September at static 11 and one pass in May 2020 at static 12. Barbastelle passes comprised of six and three passes respectively at static 11 and 12.

3.9.15. Nine and three serotine passes were recorded at static 11 and 12 respectively.

3.9.16. Noctule, Leisler's and Nyctaloid bats were recorded at both locations, with 151 passes at static 11 and 98 passes at static 12. This shows large bats were recorded more often further north than Old Gloucester Road, at static 12.


Static 11
450
400
350
300
250
200
150
100
50
0
Number of bat passes recorded
Jun
Jul
Aug
Sep
Oct
May
Survey Month
Unidentified bat
Barbastelle
Greater horseshoe
Lesser horseshoe
Brown long-eared
Nyctaloid
Myotis
Pipistrelle species
Nathusis' pipistrelle
Soprano pipistrelle
Common pipistrelle

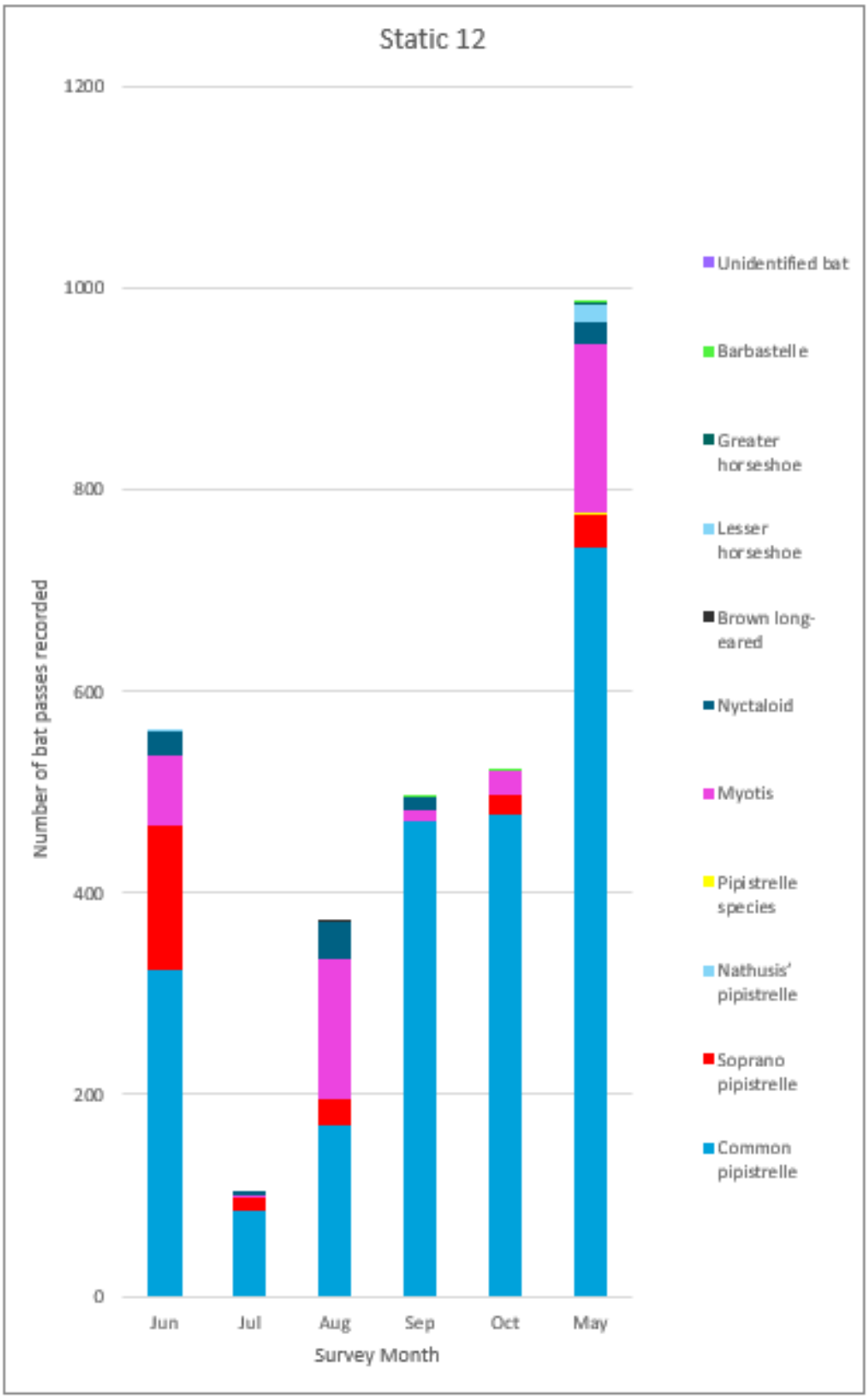


Figure 3-10 - Graph to Show Static 11 and 12 Survey Results (within Transect 7 Location)

3.10. Transect Survey 8

Transect Surveys

3.10.1. A total of at least eight bat species or species groups (common pipistrelle, soprano pipistrelle, ***Myotis***, noctule, Nyctaloid, brown long-eared, lesser horseshoe, serotine, barbastelle and an un-identified bat) were recorded during the surveys. Passes focused along the River Chelt, including where the River Chelt meets Withybridge Lane (with adjacent farm structures). These results can be seen on Figure 3-11.

3.10.2. Pipistrelle bats comprised of 130 common pipistrelle bats and 14 soprano pipistrelle bat passes. There were a max count of 36 common pipistrelle passes during July 2019, with only five passes in October 2019. The remaining months had between nine (June 2019) and 35 (August 2019 dusk/ dawn) bat passes on each transect. For soprano pipistrelle, there were no passes in June 2019 or September 2019, and between one and five passes on all other transects, with the maximum being five passes in July 2019. Pipistrelle passes were along all of the PCs, with no particular 'hotspots' recorded.

3.10.3. ***Myotis*** bat were recorded a total of 22 times over all of the surveys, being recorded between two (August and October 2019) and ten times (September 2019) on each survey. Records of ***Myotis*** were throughout the transect route, particularly along Withybridge Lane, the southern hedgerow (PC 4 and 5) along River Chelt (PC D and 6).

3.10.4. Noctule were recorded a total of six times over all of the transects, with most months only having one pass, with the exception of no passes in June and October 2019 and two passes during the August 2019 dusk/ dawn survey. The passes were recorded primarily at the south of the transect along the hedgerow and along Withybridge Lane, with the exception of two passes at the east and along the River Chelt. Two serotine bat passes were recorded altogether. One in August 2019 (PC 1 to A) close the River Chelt and the residential properties and farm structures off Withybridge Lane. The other record was from May 2020, PC D to A, also along the River Chelt, close to farm structures off Withybridge Lane. In addition, there were four Nyctaloid passes over all of the transects. One pass in June 2019 was at PC 1 near the farm structures, and in August 2019 all three passes were along Withybridge Lane (PC A to 1), close to the River Chelt.

3.10.5. One brown long-eared bat pass was recorded in October 2019 at PC 5, which is located at the south eastern corner of the transect, along a hedgerow perpendicular at the south to the River Chelt.

3.10.6. Two lesser horseshoe bat passes were recorded in total. One pass was in October 2019 (PC D to 1), close the River Chelt and the residential properties and farm structures off Withybridge Lane. The other record was in May 2020 from PC D, along the River Chelt.

3.10.7. Two barbastelle bat passes were recorded. One in June 2019, at PC 6 to 2 along the River Chelt, and the other In October 2019 at PC 6, also along the River Chelt.

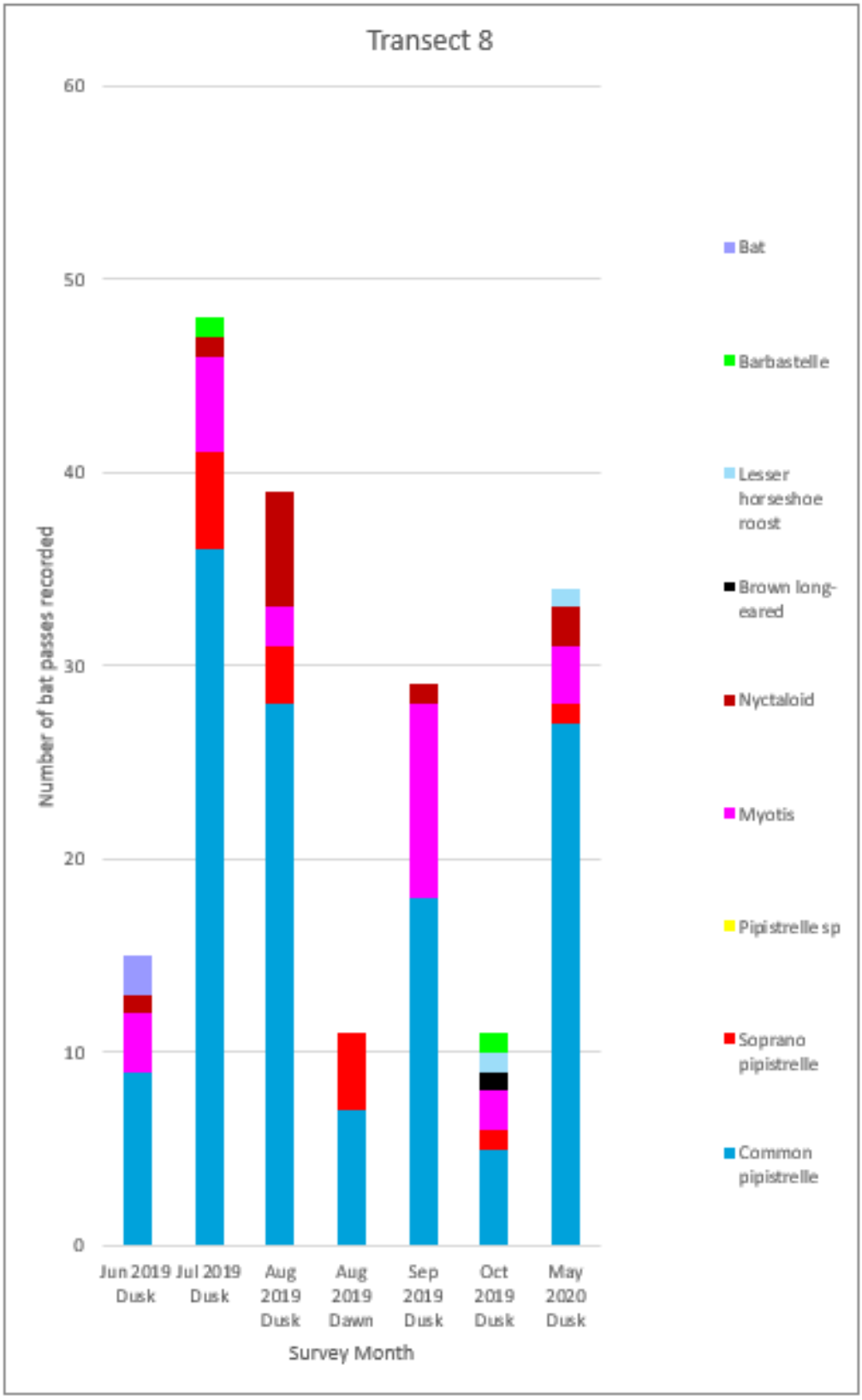


Figure 3-11 - Graph to Show Transect 8 Overview of Results

Automated Surveys

3.10.8. At least eleven species or species groups of bat were recorded at static 14 (along a hedgerow bordered by arable fields on both sides, located 175m from the River Chelt) and static 36 (along the River Chelt) during the automated bat surveys; common pipistrelle, soprano pipistrelle, Nathusius' pipistrelle, ***Myotis*** species, noctule, Leisler's, brown long-eared, lesser horseshoe, greater horseshoe, serotine, barbastelle and unidentified bats). Full survey results are provided within Table 4-60 and summarised in Figure 3-12.

3.10.9. Comparing static 36 and static 14, static 36 (80% of overall passes) was significantly more busy than static 14 (20% of overall passes). May 2020 was the busiest month for static 14 (50% of static 14 passes). For static 36, June was the busiest month (41% of static 36 passes), slowly decreasing in activity each month until October.

3.10.10. As with the manual transect surveys, common pipistrelle passes were the most frequent species across the two static locations.

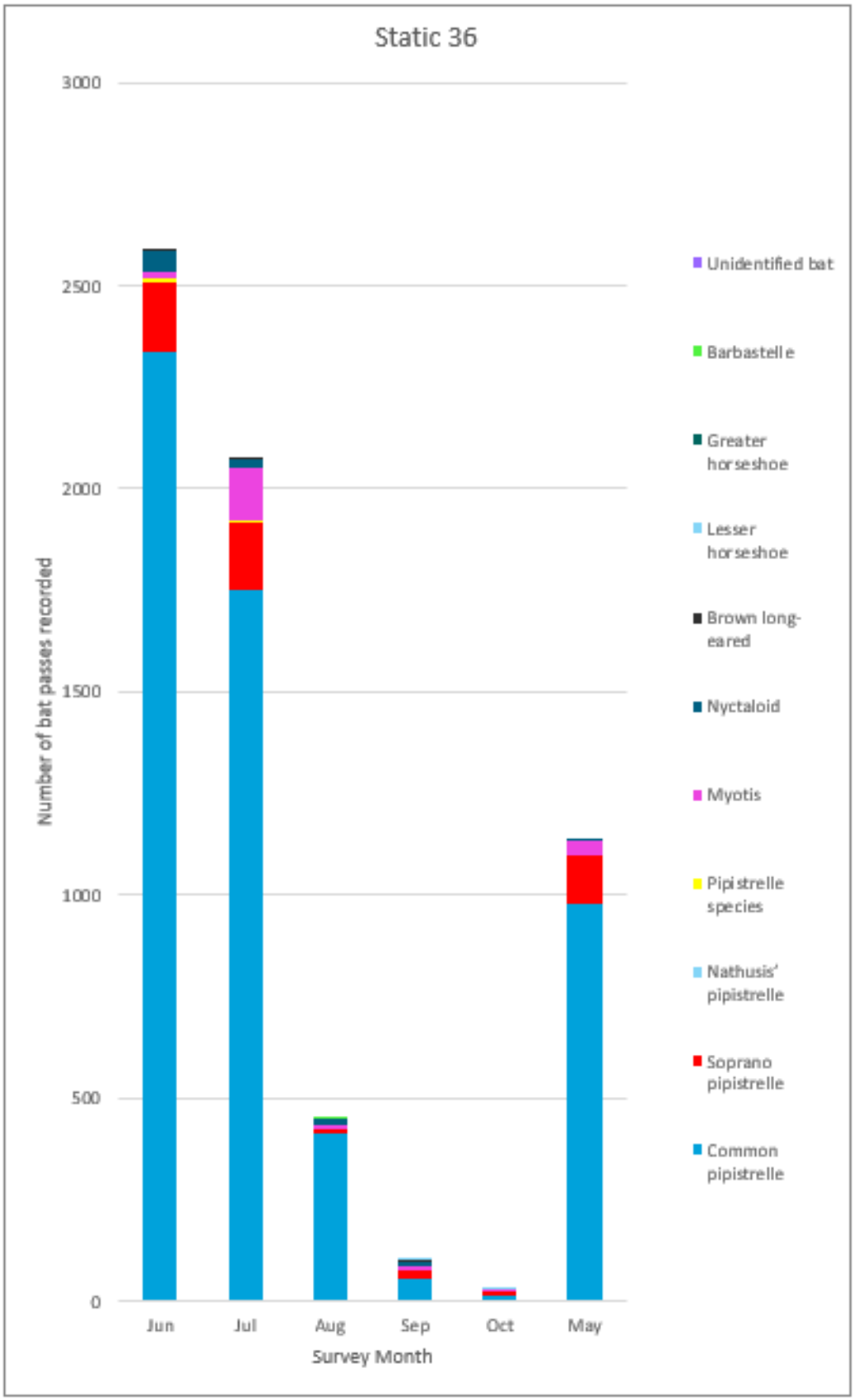
3.10.11. A Nathusius' pipistrelle bat pass was recorded once on static 14, and three passes on static 36, all in June 2019.

3.10.12. ***Myotis*** bat species' passes were recorded at both static 14 (94 passes) and 36 (210 passes), showing ***Myotis*** were more often closer to the River Chelt corridor.

3.10.13. Four brown long-eared bat passes were recorded at static 14, and eight times at static 36.

3.10.14. Annex II bat species at these locations include lesser horseshoe, greater horseshoe and barbastelle. Six lesser horseshoe bat passes were recorded at static 14 and five passes at static 36. There was one greater horseshoe pass in May 2020 at static 14 and two passes in August 2019 at static 36. Barbastelle passes included 13 at static 14, and only two passes in August 2019 at static 36.

3.10.15. Serotine, noctule and Leisler's were recorded at both locations. At static 14 these included 192 passes, and at static 36 there were 100 passes. This shows large bats were recorded more often further from the River Chelt than along the corridor itself. Static 36 had more Leisler's passes than the other static locations, with 94 Leisler's passes in September 2019 alone (between 4th to 8th September 2019), suggesting that this location may be important for Leisler's in the late summer months for foraging.


Static 36
3000
2500
2000
1500
1000
500
0
Number of bat passes recorded
Jun
Jul
Aug
Sep
Oct
May
Survey Month
Unidentified bat
Barbastelle
Greater horseshoe
Lesser horseshoe
Brown long-eared
Nyctaloid
Myotis
Pipistrelle species
Nathusis' pipistrelle
Soprano pipistrelle
Common pipistrelle

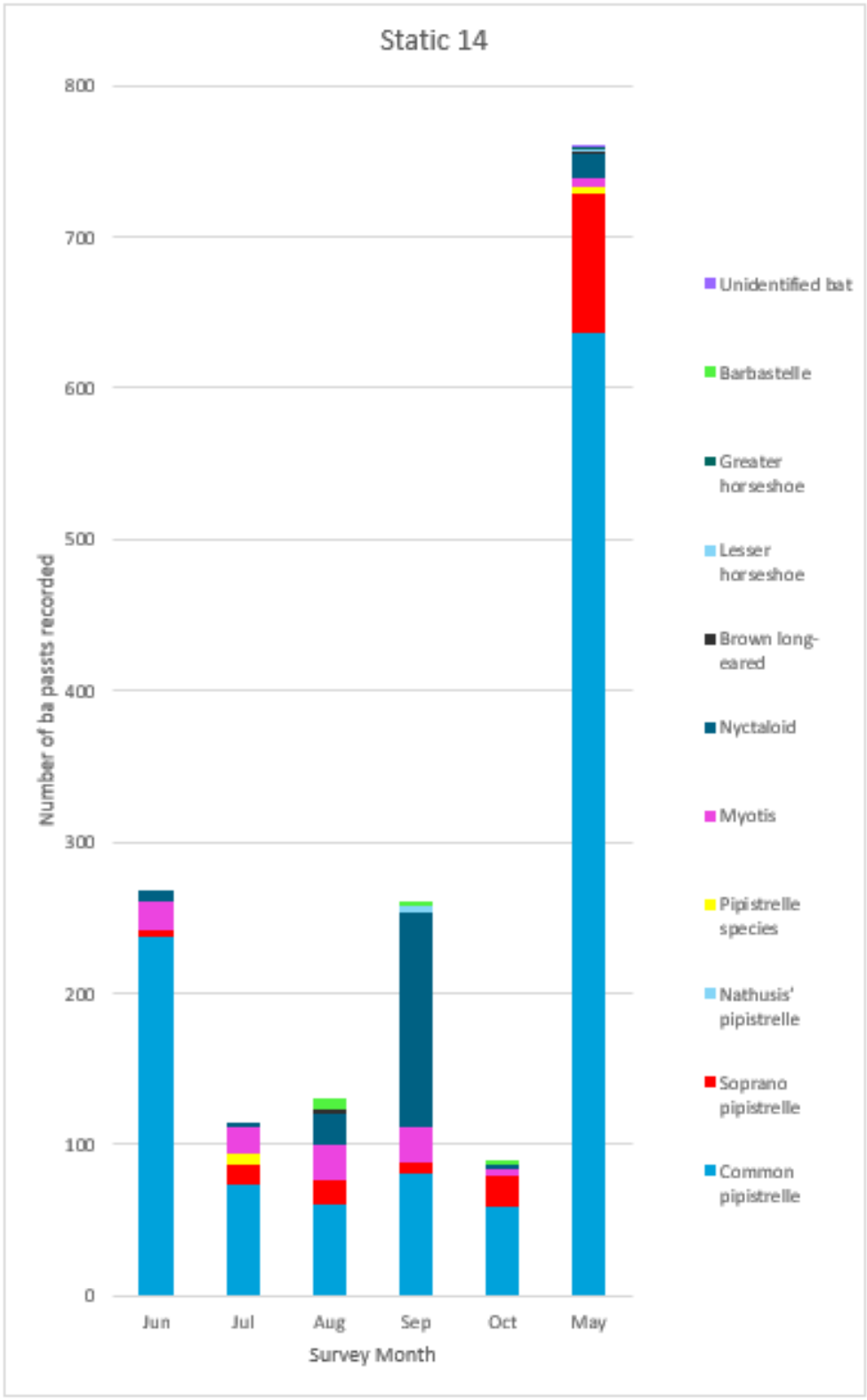


Figure 3-12 - Graph to Show Static 14 and 36 Survey Results (Associated with Transect 8)

3.11. Transect Survey 9

Transect Surveys

3.11.1. Based on total bat passes, this was the busiest transect of all the locations surveyed (seven in total). A total of at least eight bat species or species groups (common pipistrelle, soprano pipistrelle, pipistrelle species, ***Myotis*** species, noctule, Nyctaloid, lesser horseshoe and barbastelle) were recorded during the surveys. These results can be seen on Figure 3-13.

3.11.2. Pipistrelle bat species comprised of 134 common pipistrelle bats and 93 soprano pipistrelle bat passes. A max count of 33 common pipistrelle passes were recorded during July 2019, with only 13 passes in October 2019. The remaining months had between 20 (June and August (dusk/ dawn) 2019) and 33 (July 2019) bat passes on each transect. For soprano pipistrelle, the number of passes in total is approximately double the passes compared to other surveys. There were 30 bat passes in July 2019, suggesting a potential maternity colony close by, due to the increase in soprano bat passes compared to other months. Between two (June 2019) and 19 passes (August dusk/ dawn and September 2019) on all other transects. Pipistrelle passes were recorded along all off the PCs, with no particular 'hotspots'.

3.11.3. ***Myotis*** species passes were recorded a total of 25 times over all of the surveys, with two passes (July 2019) and eight passes (May 2020) on each survey, with the exception of no passes in September 2019. Passes from ***Myotis*** were throughout the transect route.

3.11.4. 23 noctule passes were recorded over all of the transects, with a peak of eight passes in May 2020, and a minimum of two passes in July 2019, with no passes in October 2019. The passes were throughout the study area. In addition, Nyctaloid were recorded a total of three times over all of the transects. Twice in May 2020 close to the M5, along a tree lined hedgerow, and once in September 2019 t PC A to 3 which is along the tree lined hedgerow running parallel with the River Chelt.

3.11.5. One lesser horseshoe bat was recorded in May2020 at PC A, which is located adjacent to the M5 vegetation, approximately 100m north of the River Chelt.

3.11.6. One barbastelle bat pass was recorded in July 2019, at PC 1 to 7 located at the west of the transect route.

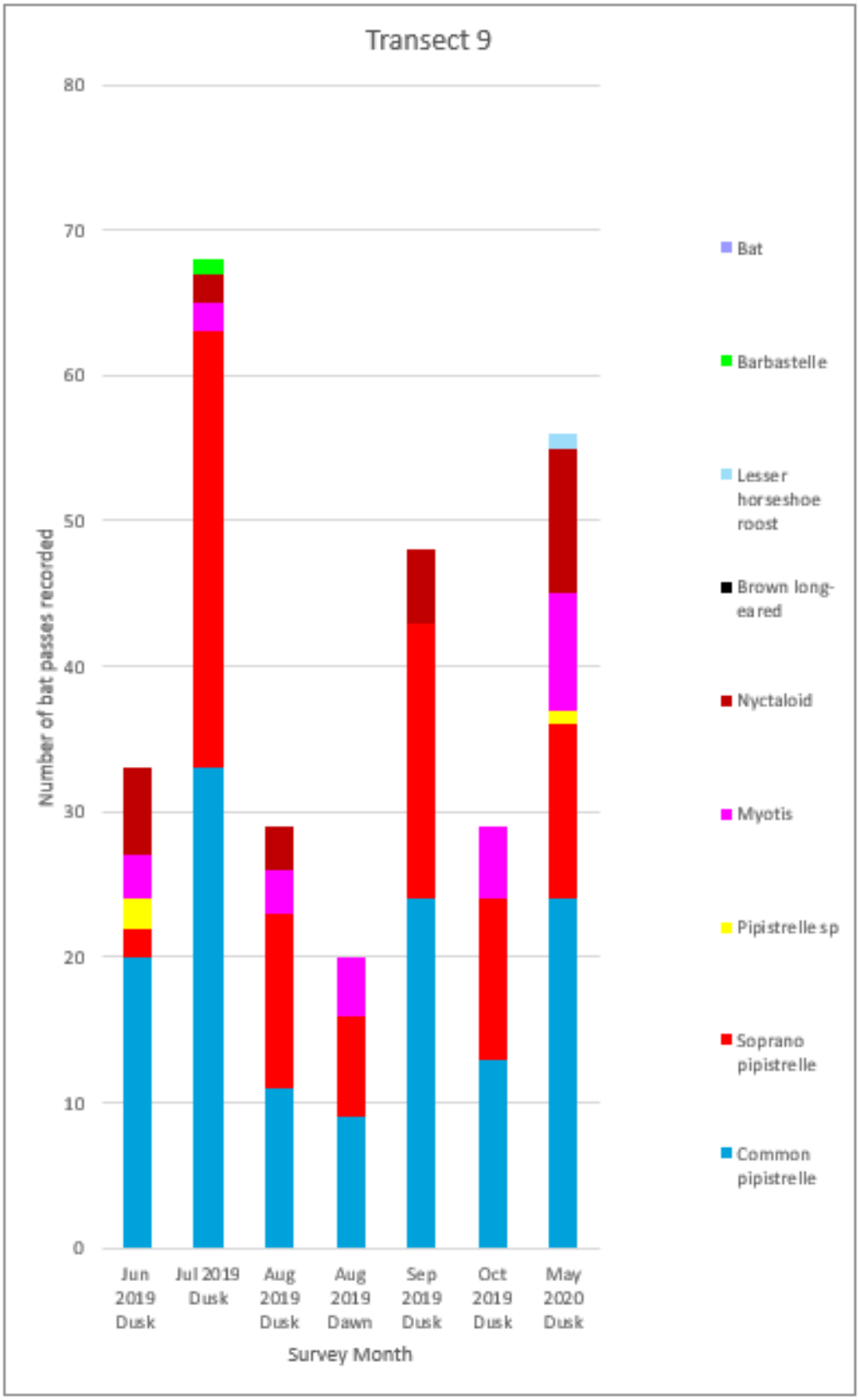


Figure 3-13 - Graph to Show Transect 9 Overview of Results

Automated Surveys

3.11.7. At least ten species or species groups of bats were recorded at static 15 (by the M5 River Chelt culvert) and static 16 (within the western quadrant of the study area, located directly south east of the junction) during the automated bat surveys; common pipistrelle, soprano pipistrelle, Nathusius' pipistrelle, ***Myotis species***, noctule, Leisler's, brown long-eared, lesser horseshoe, serotine, barbastelle, and unidentified bats). Full survey results are provided within Table 4-60 and summarised in Figure 3-14. See survey limitation regarding no survey data for September.

3.11.8. Comparing static 15 and static 16, static 15 (59% of overall passes) was slightly more busy than static 16 (41% of overall passes). Static 15 was also the second most busy static across all of the surveys, likely to be due the River Chelt corridor. May 2020 was the busiest month for static 15 (35% of static 15 passes) and static 16 (60% of static 16 passes).

3.11.9. As with the manual transect surveys, common pipistrelle passes were the most frequently recorded species across the two static locations.

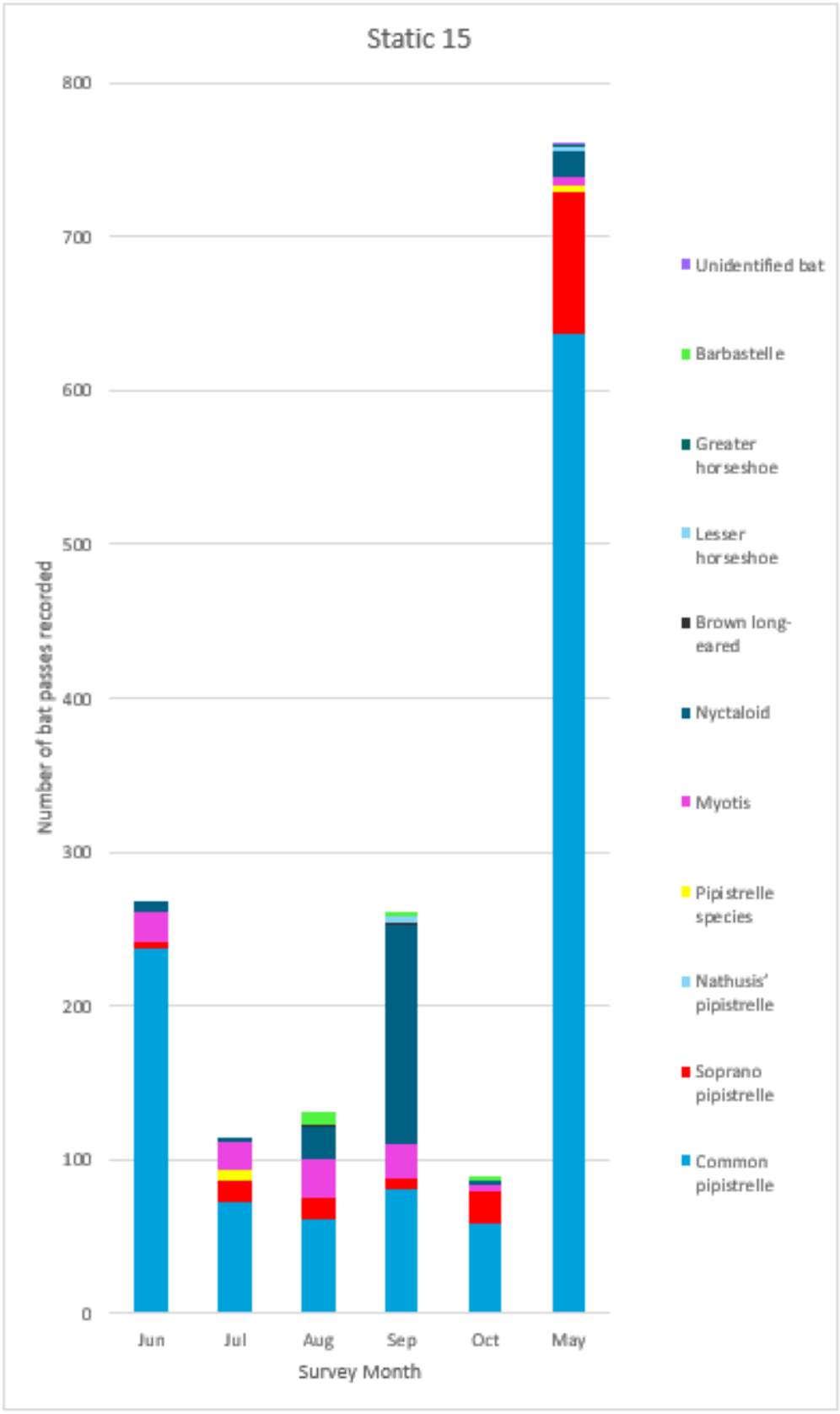
3.11.10. Nathusius' pipistrelle was recorded once in June 2019 at static 15 only.

3.11.11. ***Myotis*** bat species were recorded frequently at both static 15 (619 passes) and 16 (3797 passes), showing ***Myotis*** passes were more often closer to the M5 junction 10 than along the River Chelt corridor.

3.11.12. 23 brown long-eared bats passes were at static 15, and 16 passes at static 16.

3.11.13. Annex II bat species at these locations include lesser horseshoe and barbastelle. Greater horseshoe were not recorded at these locations. 30 passes from lesser horseshoe were at static 15 and 15 passes at static 16. Three passes from barbastelle were at static 15 only in May and August.

3.11.14. Noctule, Leisler's and serotine bats were recorded at both locations. At static 15 these included 602 passes, and at static 16 there were 173 passes. This shows large bats were recorded more often further from the River Chelt, rather than along the corridor itself, and instead closer to the A4019.


Static 15
800
700
600
500
400
300
200
100
0
Number of bat passes recorded
Jun
Jul
Aug
Sep
Oct
May
Survey Month
Unidentified bat
Barbastelle
Greater horseshoe
Lesser horseshoe
Brown long-eared
Nyctaloid
Myotis
Pipistrelle species
Nathusis' pipistrelle
Soprano pipistrelle
Common pipistrelle

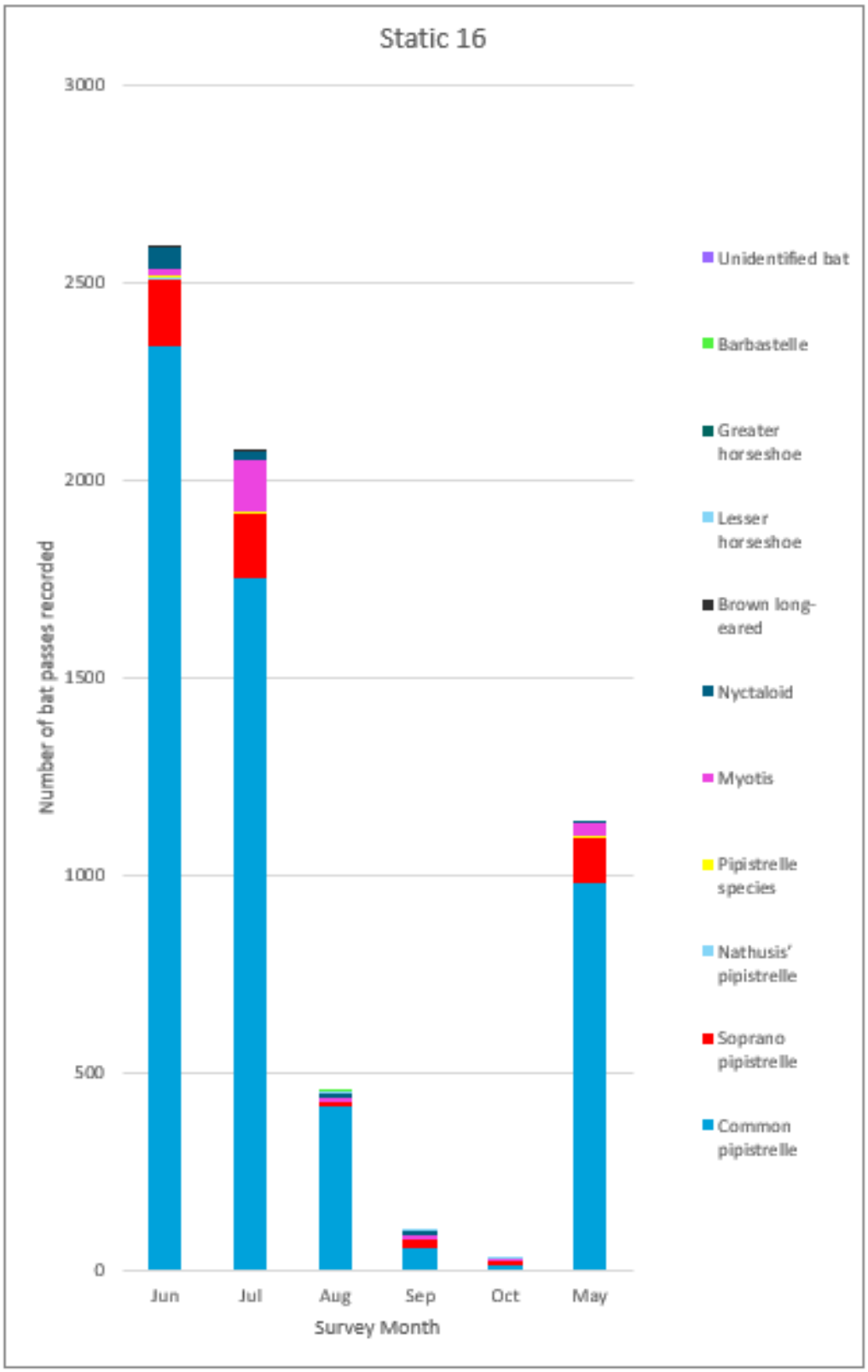


Figure 3-14 - Graph to Show Statics 15 and 16 Survey Results (Associated with Transect 9)

3.12. Transect Survey 10

Transect Surveys

3.12.1. A total of at least seven bat species or species groups (common pipistrelle, soprano pipistrelle, pipistrelle species, ***Myotis species***, noctule, Leisler's, lesser horseshoe and serotine) were recorded during the five surveys that were carried out. It must be noted that the July 2019 survey was not completed due to access restrictions, therefore this survey data has been omitted. This has led to a smaller total number of bats being recorded along this transect, compared to the other transect routes. These results can be seen on Figure 3-15.

3.12.2. Pipistrelle bats comprised of 80 common pipistrelle bats and 32 soprano pipistrelle bat passes. A max count of 35 common pipistrelle passes were recorded during August 2019, with only three passes in October 2019. The remaining months had between ten (May 2020) and 17 (June 2019) bat passes on each transect. For soprano pipistrelle, there were between nine bat passes (September 2019 and May 2020) and two bat passes (October 2019) on all the transects. Passes for pipistrelle were recorded along all off the PCs, with no particular 'hotspots'.

3.12.3. ***35 Myotis species passes*** were recorded over all of the surveys, with between three (July and October 2019) and 14 passes (August dusk/ dawn 2019). Passes from ***Myotis*** were throughout the transect route.

3.12.4. 21 noctule passes were recorded over all of the transects, with a maximum of five passes (August dusk and September 2019), and a minimum of three passes in September 2019. The passes were throughout the study area. One serotine bat pass was recorded in August 2019, at PC 1 to 7 located at the west of the transect route. Leisler's passes were recorded a total of three passes in August 2019, two passes at PC 5 to D (along a tree lined hedgerow) and one pass at PC 3 to C at the west of the study area, along the field margin. In addition, one Nyctaloid pass in September 2019 was at PC 5 to 6 within the centre of the transect.

3.12.5. Two lesser horseshoe bat passes were recorded in September 2019 at PC 4 to C (a hedgerow parallel to the A4019, approximately 50m south) and once in May 2020 at PC 3 to 4, which is located at the far western side of the transect.

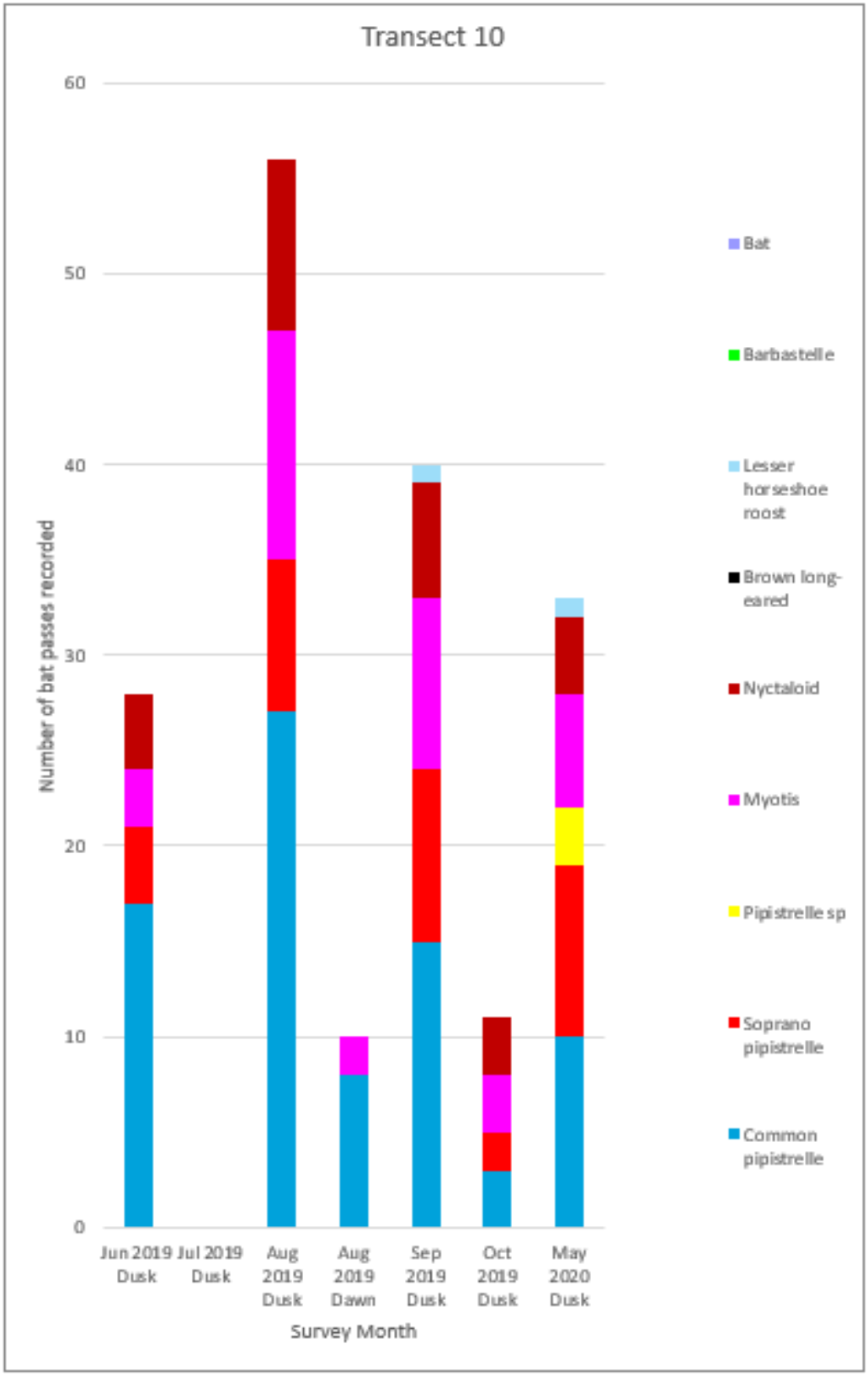


Figure 3-15 - Graph to Show Transect 10 Overview of Results

Automated Surveys

3.12.6. At least eleven species of bat or species groups were recorded between static 17 (within the norther quadrant of the study area, located north west of the junction) and static 18 (located to the west of the M5 adjacent to the hedgerow, 200 m south of Leigh Brook) during the automated bat surveys; common pipistrelle, soprano pipistrelle, Nathusius' pipistrelle, ***Myotis*** species, noctule, Leisler's, brown long-eared, lesser horseshoe, greater horseshoe, serotine, barbastelle and unidentified bats). Full survey results are provided within Table 4-60 and summarised in Figure 3-16.

3.12.7. Static 17 (60% of overall passes) was slightly more busy than static 17 (40% of overall passes). Statics 17 and 18 were 9th and 7th quietest statics respectively, when assessing all of the static data sets (20 statics in total) see Figure 3-1. For static 17 August was the busiest month (32% of static 17 passes). May 2020 was the busiest month for static 18 (30% of static 18 passes).

3.12.8. Common pipistrelle included 2114 and 439 passes respectively at statics 17 and 18, suggesting that common pipistrelles are significantly more likely to be present closer to the junction (static 17).

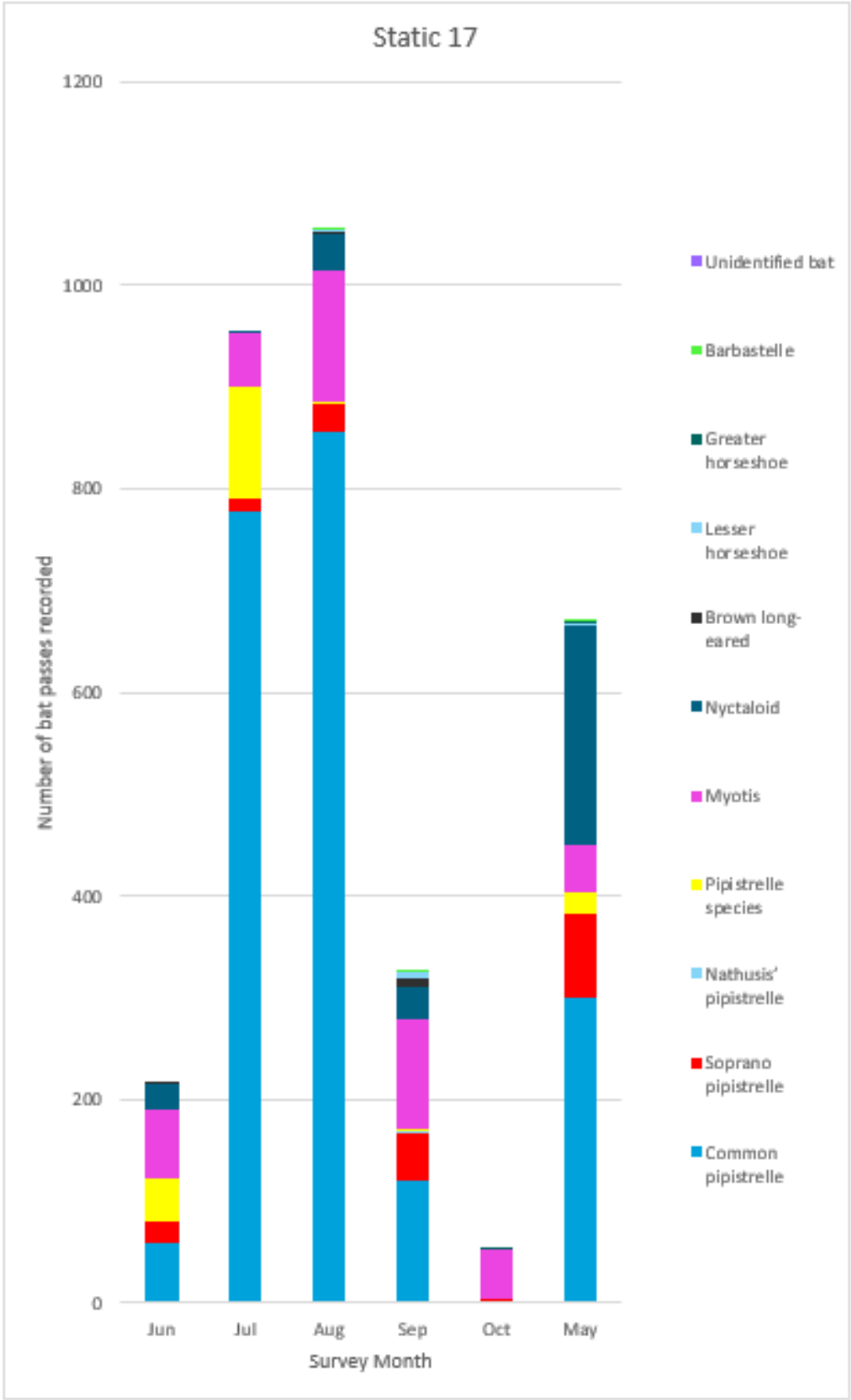
3.12.9. One Nathusius' pipistrelle pass was recorded in September 2020 at static 17 only.

3.12.10. ***Myotis*** species passed both static 17 (453 passes) and static 18 (301 passes), showing ***Myotis*** passed closer to the junction more frequently.

3.12.11. 13 and 18 brown long-eared bat passes were recorded at static 17, and 18 respectively.

3.12.12. Annex II bat species at these locations included lesser horseshoe, greater horseshoe and barbastelle. 10 lesser horseshoe bat passes at static 17 and 13 passes at static 18. Two passes from greater horseshoe bat were recorded at static 17 (May and October) and one pass in May 2020 at static 18. Four and five barbastelle passes were recorded respectively at static 17 and static 18.

3.12.13. Noctule, Leisler's and serotine bats were recorded at both locations. At static 17 these included 308 passes, and at static 18 there were 1267 passes. This shows large bats were recorded more often further from the junction, being closer to the A4019. Most large bat passes were in May 2020 at both static locations, followed by August 2019large bat passes were in May 2020 at both static locations, followed by August 2019.


Static 17
1200
1000
800
600
400
200
0
Number of bat passes recorded
Jun
Jul
Aug
Sep
Oct
May
Survey Month
Unidentified bat
Barbastelle
Greater horseshoe
Lesser horseshoe
Brown long-eared
Nyctaloid
Myotis
Pipistrelle species
Nathusis' pipistrelle
Soprano pipistrelle
Common pipistrelle

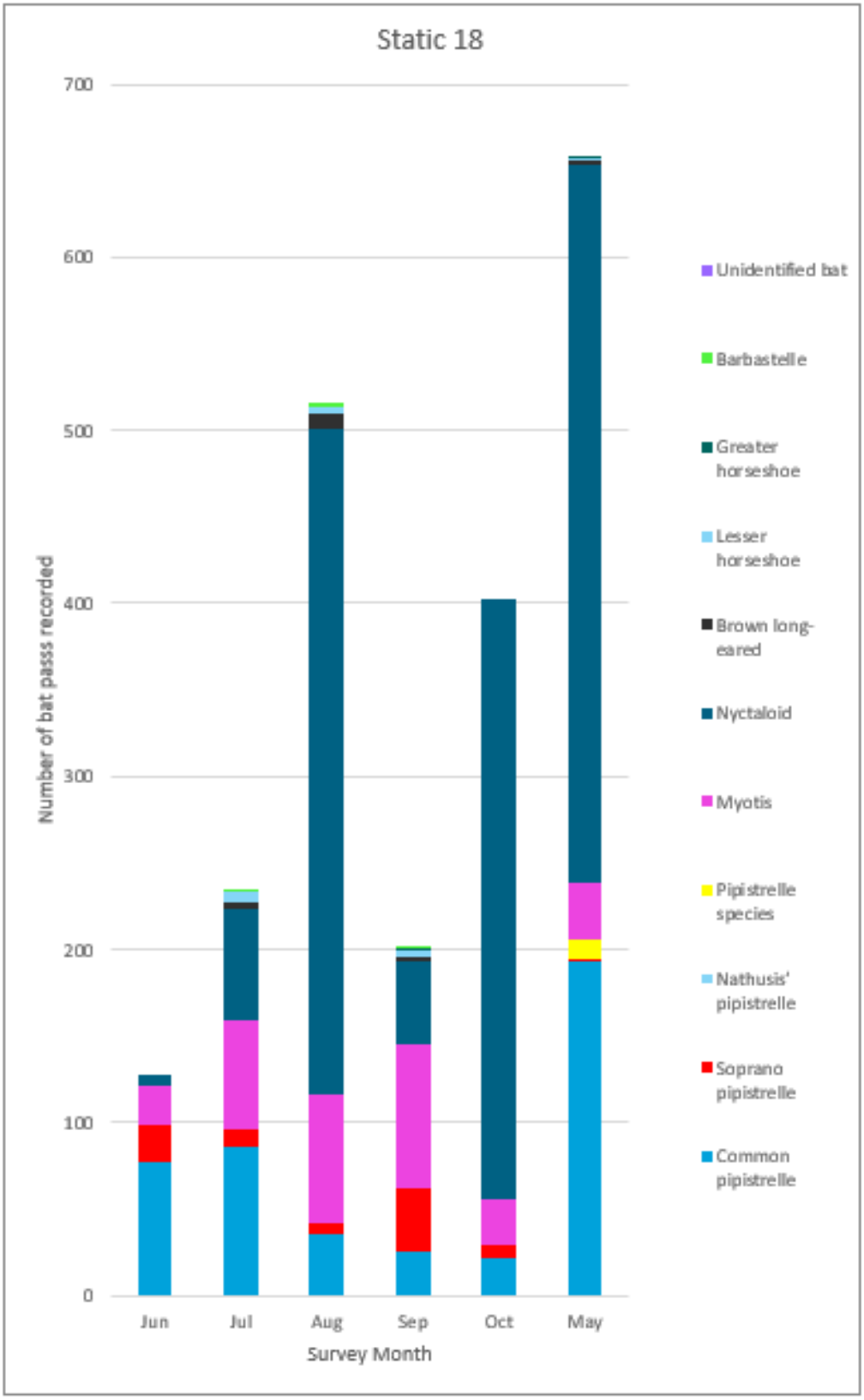


Figure 3-16 - Graph to Show Static 17 and 18 Survey Results (within Transect 10 Location)

3.13. Transect Survey 11

Transect Surveys

3.13.1. No transects were carried out in 2019/ 2020, due to a scope change in early 2021.

Automated Surveys

3.13.2. At least nine species of bat or species groups were recorded on static 39 (north of the A4019 east of Moat Lane) during the automated bat surveys; common pipistrelle, soprano pipistrelle, Nathusius' pipistrelle, ***Myotis*** species, noctule, Leisler's, Nyctaloid, brown long-eared, lesser horseshoe and barbastelle bats). Serotine and greater horseshoe were not recorded at this location. Survey results are summarised in Figure 3-17.

3.13.3. Static 39 was the 3rd quietist static location for bat passes when assessing all of the static data sets (20 statics in total). September 2019 was the busiest month (37% of passes).

3.13.4. There were 247 common pipistrelle bat passes at this static location, with a peak count in September 2020.

3.13.5. A single Nathusius' pipistrelle pass was recorded once in September 2020.

3.13.6. Passes from ***Myotis*** species were recorded 49 times, with over half (26 passes) of these passes being in September 2020.

3.13.7. There were nine brown long-eared bat passes recorded at this location.

3.13.8. Annex II bat species at this location included lesser horseshoe and barbastelle. Nine lesser horseshoe bat passes were recorded, and eight barbastelle passes were recorded.

3.13.9. Noctule, Leisler's and Nyctaloid bats were recorded 116 times.

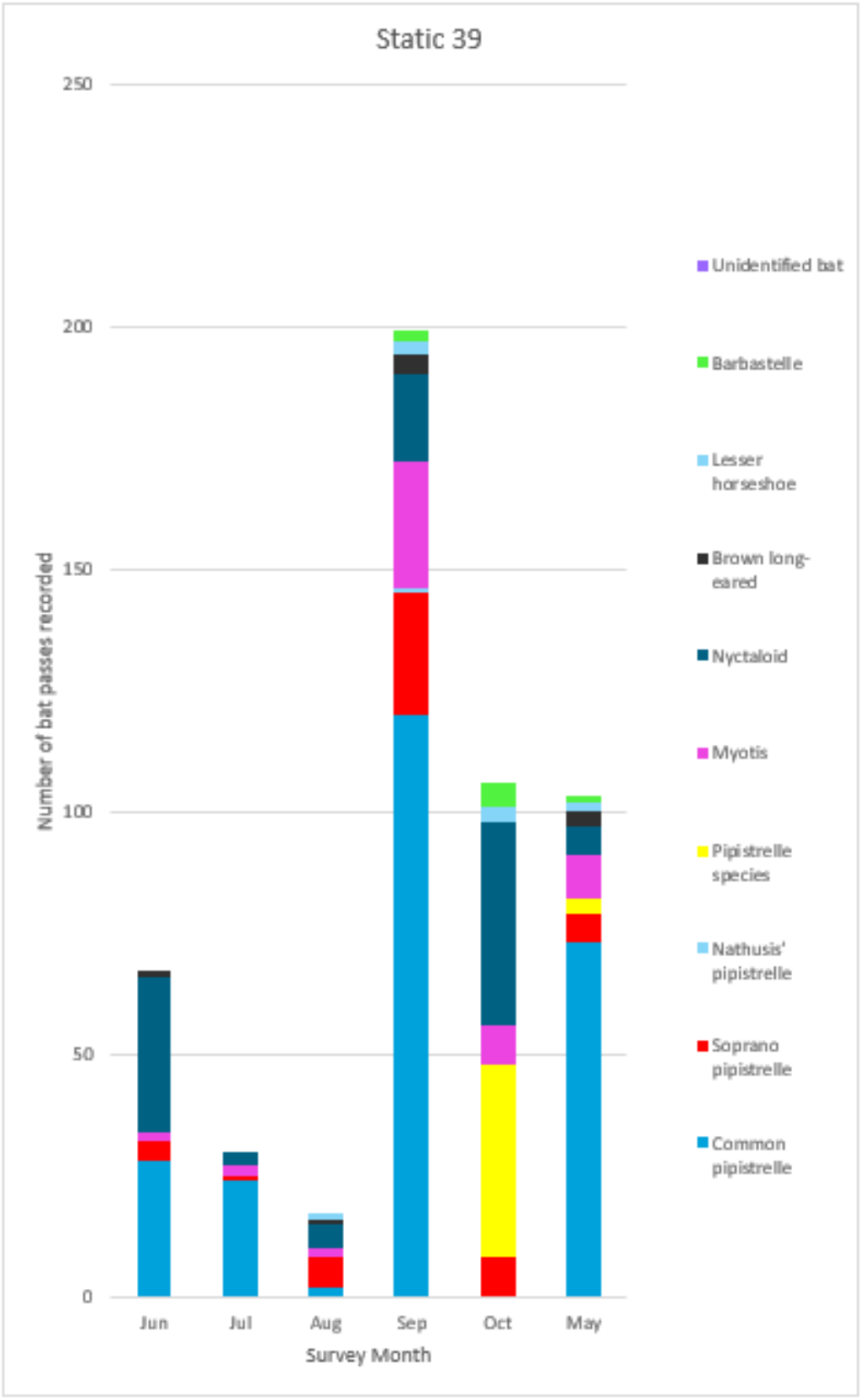


Figure 3-17 - Graph to Show Static 39 Results (within Transect 11 Location)

3.14. Transect Survey 12

Transect Surveys

3.14.1. No transects were carried out in 2019/ 2020, due to a scope change in early 2021.

Automated Surveys

3.14.2. At least eight species of bat or species groups were recorded on static 33 (north of the A4019 east of Moat Lane) during the automated bat surveys; common pipistrelle, soprano pipistrelle, pipistrelle species, ***Myotis*** species, noctule, Leisler's, Nyctaloid, brown long-eared, lesser horseshoe and barbastelle bats). Nathusius', serotine and greater horseshoe were not recorded at this location. Full survey results are summarised in Figure 3-18.

3.14.3. Static 33 was the 4th quietist static location for bat passes when assessing all of the static data sets (20 statics in total). May 2020 was the busiest month (34% of passes).

3.14.4. 177 common pipistrelle passes were recorded, with a peak count in June 2019.

3.14.5. ***Myotis*** species passes were recorded 71 times, with 33 passes in October 2019.

3.14.6. Brown long-eared bat were recorded with three passes.

3.14.7. Annex II bat species at this location included lesser horseshoe and barbastelle. Lesser horseshoe bat passes were recorded three times and two barbastelle passes were recorded.

3.14.8. Noctule, Leisler's and Nyctaloid bats were recorded 438 times, primarily in May and July.

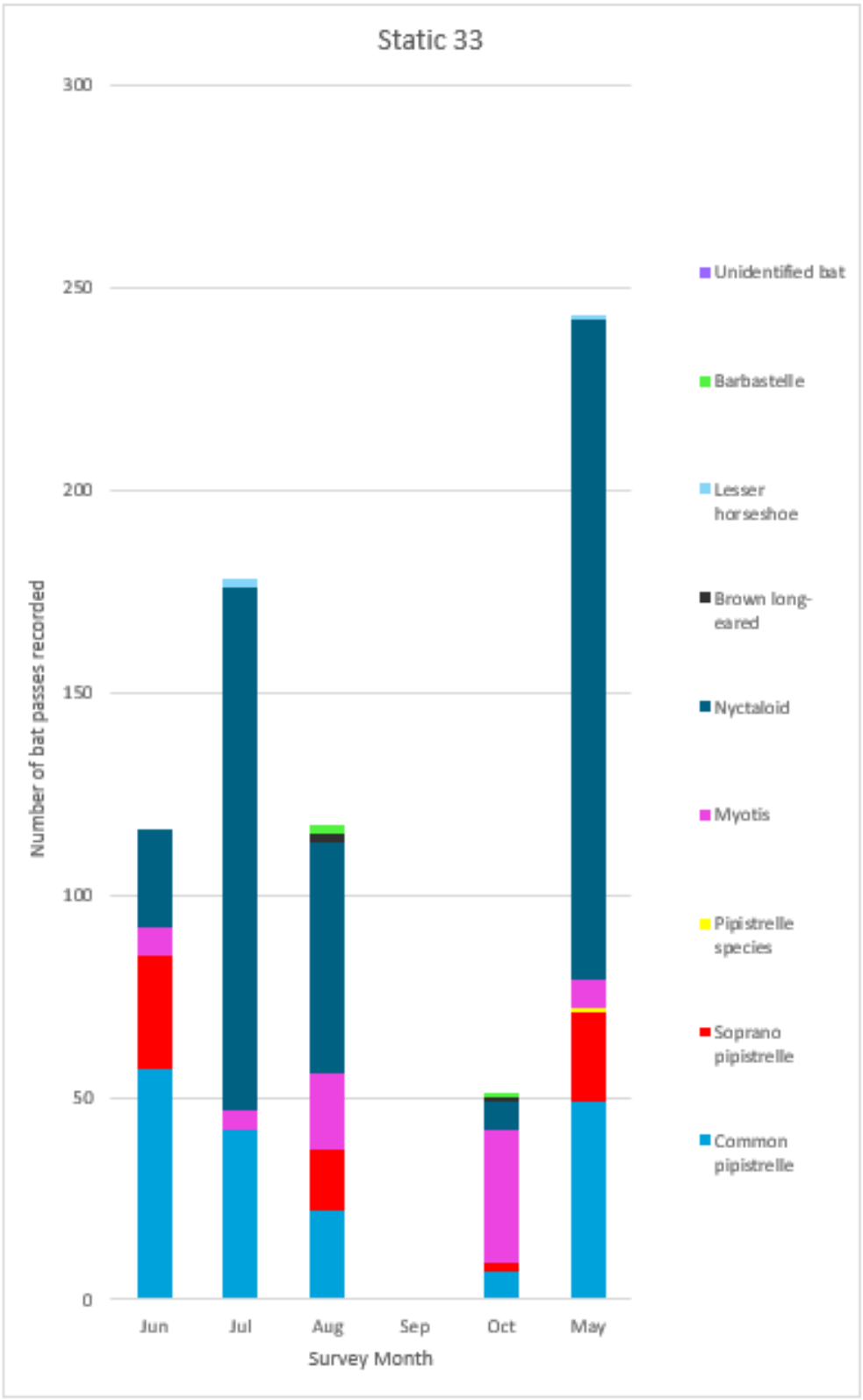


Figure 3-18 - Graph to Show Static 33 Results (within Transect 12 Location)

3.15. Highways Land

Transect Surveys

3.15.1. No specific transects were carried out in these locations.

Automated Surveys

3.15.2. At least eight species of bat or bat species groups were recorded between static 22 (in the eastern quadrant located directly north east of the junction) and static 23 (located western quadrant located directly south west of the junction) during the automated bat surveys; common pipistrelle, soprano pipistrelle, ***Myotis*** species, noctule, Leisler's, brown long-eared, lesser horseshoe and serotine). Full survey results are provided within Table 4-60 and summarised in Figure 3-19.

3.15.3. Static 22 and 23 had the fewest bat passes when assessing all of the static data sets (20 statics in total). For static 22, September 2019 was month with the most bat passes and for static 23 it was June 2019.

3.15.4. No common pipistrelle bat passes were recorded at static 22. For static 23 only two pipistrelle bat passes were recorded. No Nathusius' pipistrelle bat passes were recorded at these locations.

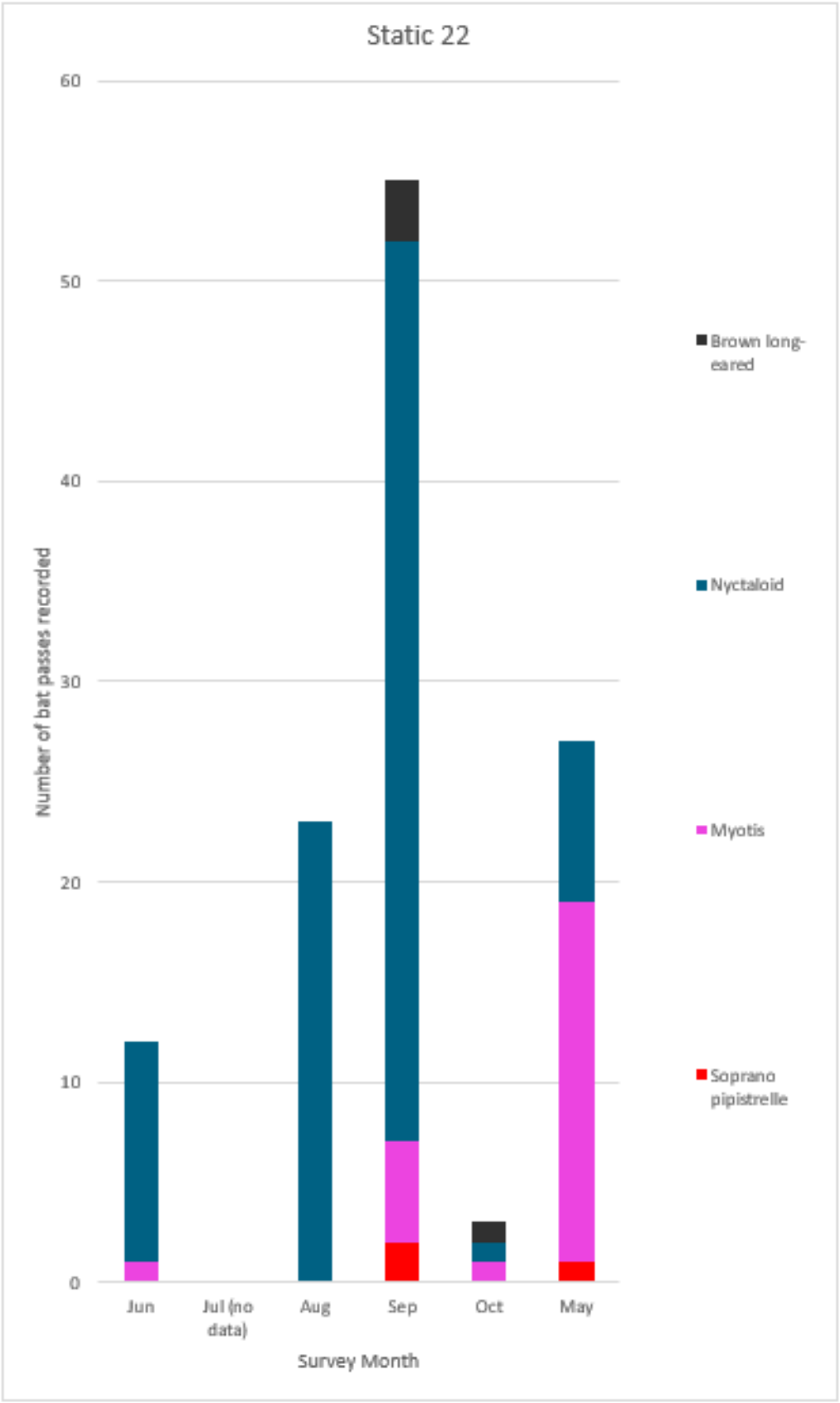
3.15.5. ***Myotis*** species were recorded at both static 22 (25 passes) and 23 (eight passes), showing ***Myotis*** species were recorded slightly more within the western quadrant.

3.15.6. Brown long-eared bat was recorded with four passes at static 22 only.

3.15.7. Annex II bat species at these locations include lesser horseshoe only. 23 lesser horseshoe passes were recorded at static 23 only, in September 2020. Greater horseshoe and barbastelle were not recorded (no bat passes).

3.15.8. Serotine were recorded with one bat pass at static 23 in August 2019.

3.15.9. Noctule and Nyctaloid bats were recorded at both locations; Leisler's bat passes were at static 23 only. At static 22 were 88 passes, and at static 23 there were 27 passes.


Static 22
60
50
40
30
20
10
0
Number of bat passes recorded
Jun
Jul (no data)
Aug
Sep
Oct
May
Survey Month
Brown long-eared
Nyctaloid
Myotis
Soprano pipistrelle

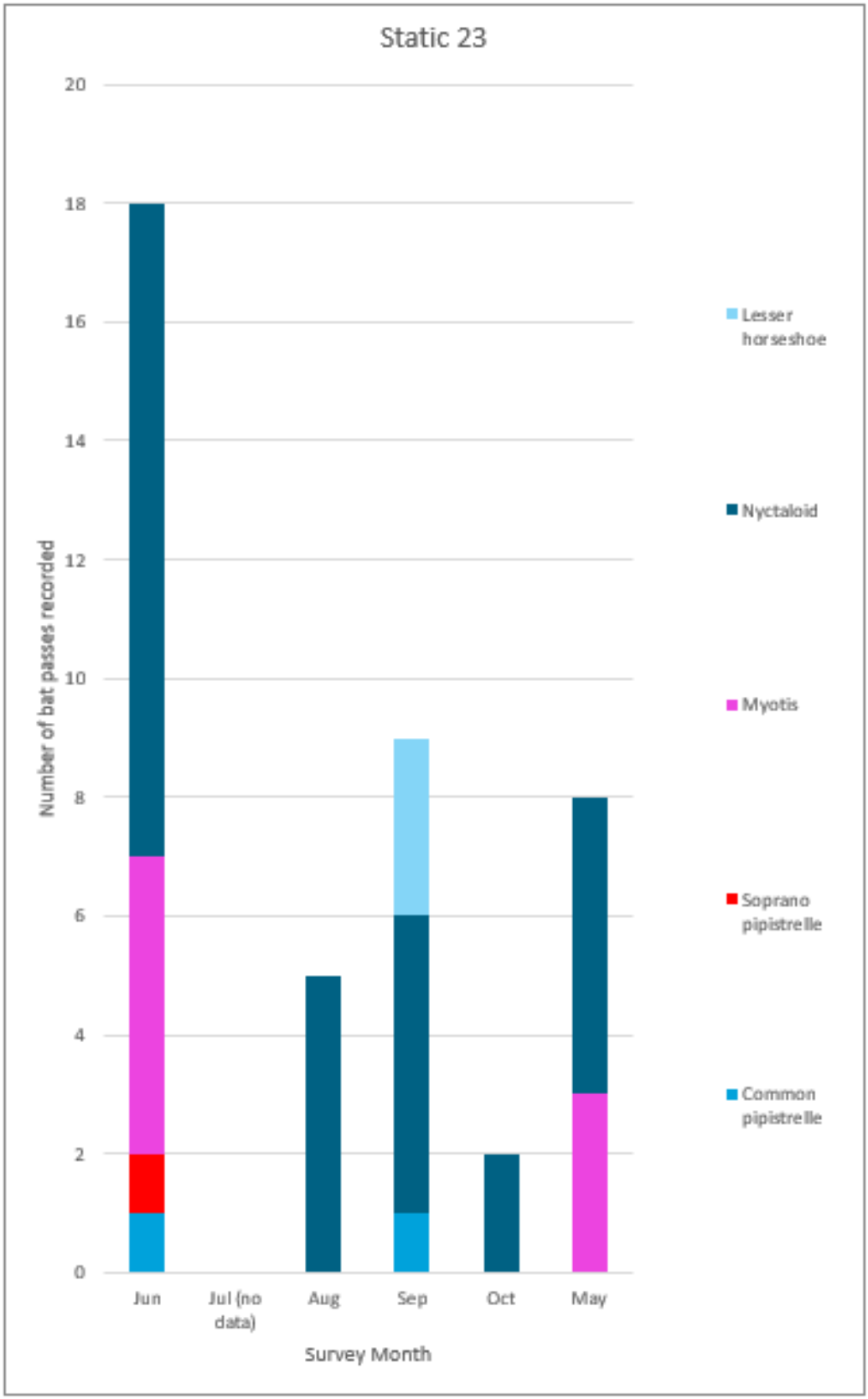


Figure 3-19 - Graph to Show Static 22 and 23 Survey Results (within Highway England land)

3.16. Southern Quadrant Study Area

Transect Surveys

3.16.1. No specific transects were carried out in these locations due to health and safety issues.

Automated Surveys

3.16.2. At least eleven species of bat or species groups were recorded between static 21 (in the southern quadrant located directly south east of the junction) and static 35 (located at the east of M5) during the automated bat surveys; common pipistrelle, soprano pipistrelle, Nathusius' pipistrelle, ***Myotis*** species, noctule, Leisler's, brown long-eared, lesser horseshoe, greater horseshoe, barbastelle, serotine and unidentified bats). Full survey results are provided within Table 4-60 and summarised in Figure 3-20.

3.16.3. Static 21 had the 4th highest number of bat passes, and 35 was the 9th highest when assessing all of the static data sets (20 statics in total), despite no data being gathered for July and October. For both static 21 and 35, May had the highest number of passes, although no data was gathered for July and October.

3.16.4. As with the manual transect surveys, common pipistrelle passes were the most frequently recorded species across the two static locations.

3.16.5. One Nathusius' pipistrelle pass was recorded in May 2020 at static 21, and one pass in June 2019 at static 35.

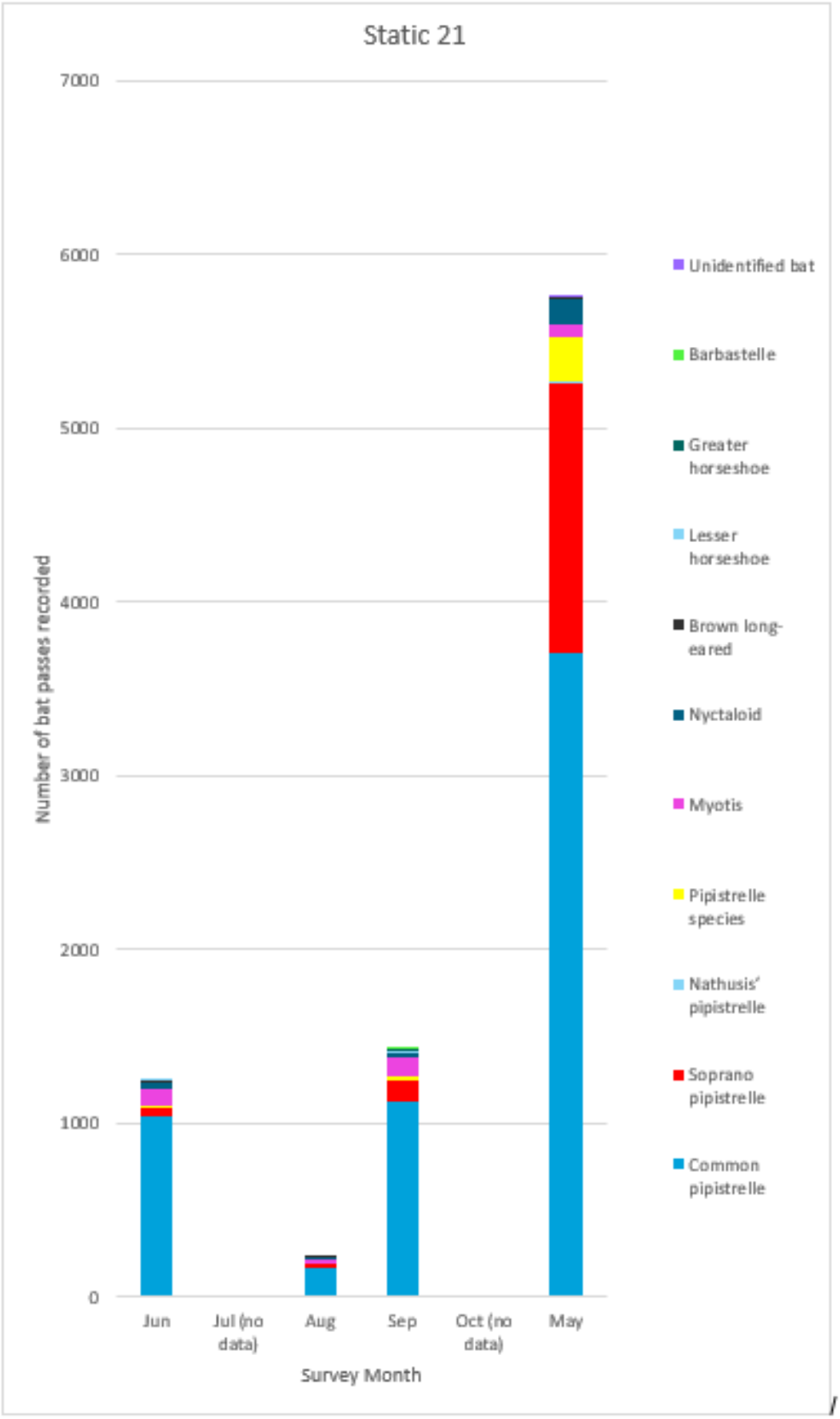
3.16.6. ***Myotis*** species were recorded at both static 21 (299 passes) and 35 (521 passes), showing ***Myotis*** species were recorded more frequently further from the junction.

3.16.7. Brown long-eared bat passes were recorded 21 and 19 times respectively at static 21 and 35.

3.16.8. Annex II bat species at these locations included lesser horseshoe, greater horseshoe and barbastelle. Passes from lesser horseshoe were recorded at both static locations, with 16 passes at static 21 and ten passes at static 35. Greater horseshoe passes were recorded seven times at static 21, only in September 2019. Barbastelle passes were recorded 19 times at static 21, and six times at static 35.

3.16.9. Passes from serotine were recorded, with five and two passes respectively at static 21 and 35.

3.16.10. Noctule, Leisler's and Nyctaloid bats were recorded at both locations; at static 21 were 214 passes, and at static 35 there were 89 passes.


Static 21
7000
6000
5000
4000
3000
2000
1000
0
Number of bat passes recorded
Jun
Jul (no data)
Aug
Sep
Oct (no data)
May
Survey Month
Unidentified bat
Barbastelle
Greater horseshoe
Lesser horseshoe
Brown long-eared
Nyctaloid
Myotis
Pipistrelle species
Nathusis' pipistrelle
Soprano pipistrelle
Common pipistrelle

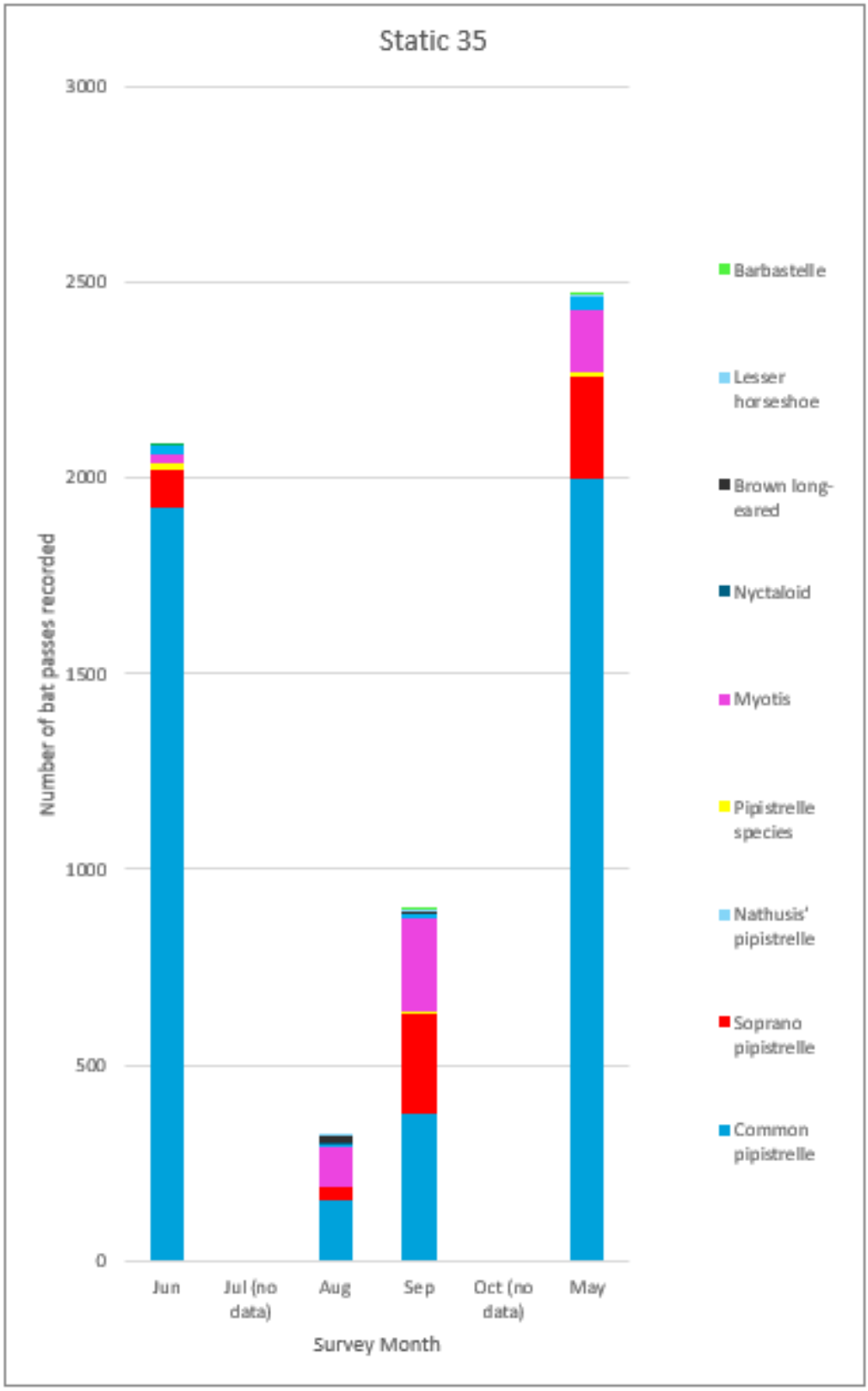


Figure 3-20 - Graph to Show Static 21 and 35 Survey Results (within the southern quadrant, directly south east of the junction)

3.17. Crossing Point Surveys

Overview

3.17.1. A summary of the bat species and peak counts over all months at each crossing point location are provided between Table 4-62 and Table 4-66. A figure showing all the activity across the different crossing point locations is provided on Figure 3-21.

3.17.2. On the basis of the methodology set out in Table 2-3, location 3 is not deemed to be a bat 'crossing point' as after the initial two survey visits only six common pipistrelle bats were recorded crossing at this location (using Features B and C only).

3.17.3. CP1, CP2, CP4 and CP5 were all deemed to be bat crossing points.

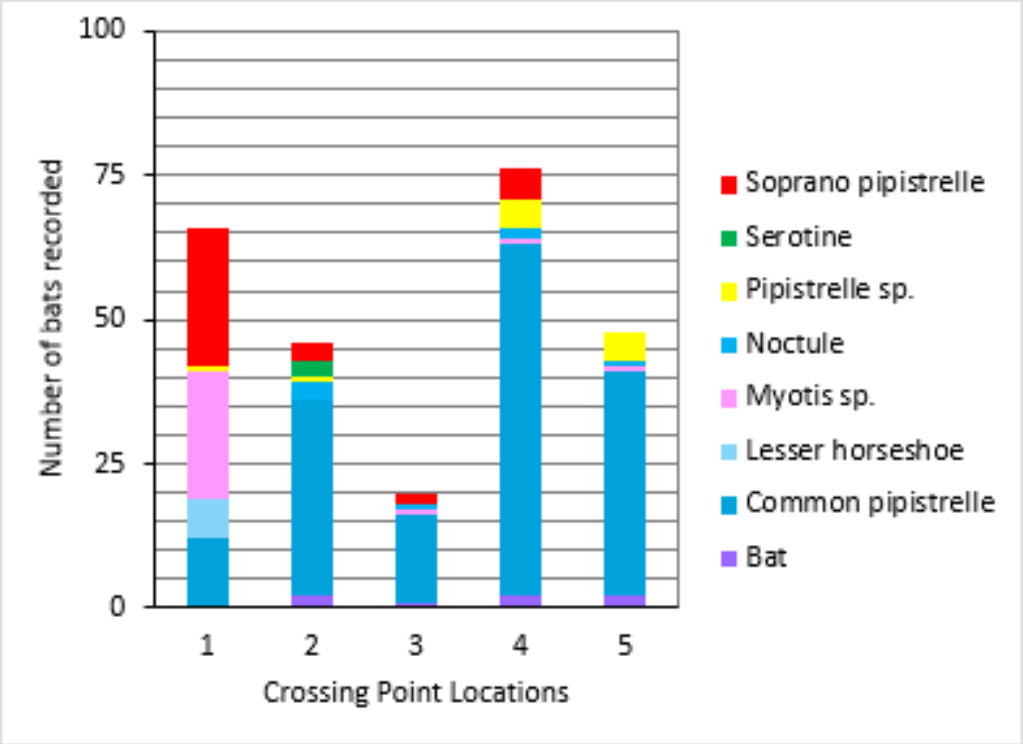


Figure 3-21 - Graph to Show Overview of all Crossing Point Location Data (Across all Six Surveys)

CP1

3.17.4. CP1 was deemed to be a bat crossing point. At least four bat species, or species groups, commuting through the M5 River Chelt culvert under the M5 motorway (common pipistrelle, soprano pipistrelle, pipistrelle species, ***Myotis*** species and lesser horseshoe bat).

3.17.5. On average 13 or fewer bats crossed during each survey, with the exception of the 3rd survey (July 2020), where 18 bats were recorded commuting through the M5 River Chelt culvert. Soprano pipistrelle were the most common bat species recorded using the M5 River Chelt culvert to cross the M5.

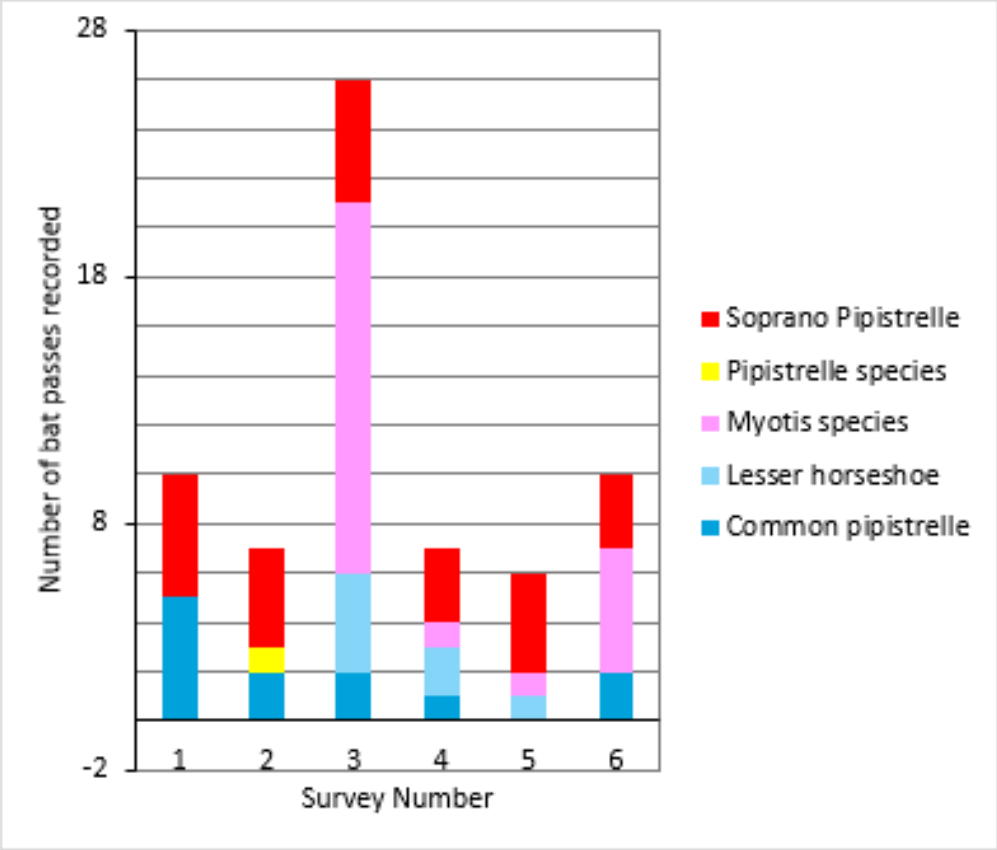


Figure 3-22 - Graph to Show CP1 Survey Data (Six Survey Visits)

CP2

3.17.6. CP2 was deemed to be a bat crossing point. At least four bat species, or species groups, were record at this location crossing the road, or using the adjacent hedgerows to commute/ forage along (common pipistrelle, soprano pipistrelle, pipistrelle species, noctule, serotine and an unidentified bat).

3.17.7. Common pipistrelle were the most common bat species recorded. Three serotine bats were recorded crossing the road below 5 m at this location in August 2020, as well as one serotine bat being recorded over 5 m. Serotine bat were not recorded during any other month.

3.17.8. Noctule were recorded in June, July and August (2020), with a maximum of one bat per survey below 5 m.

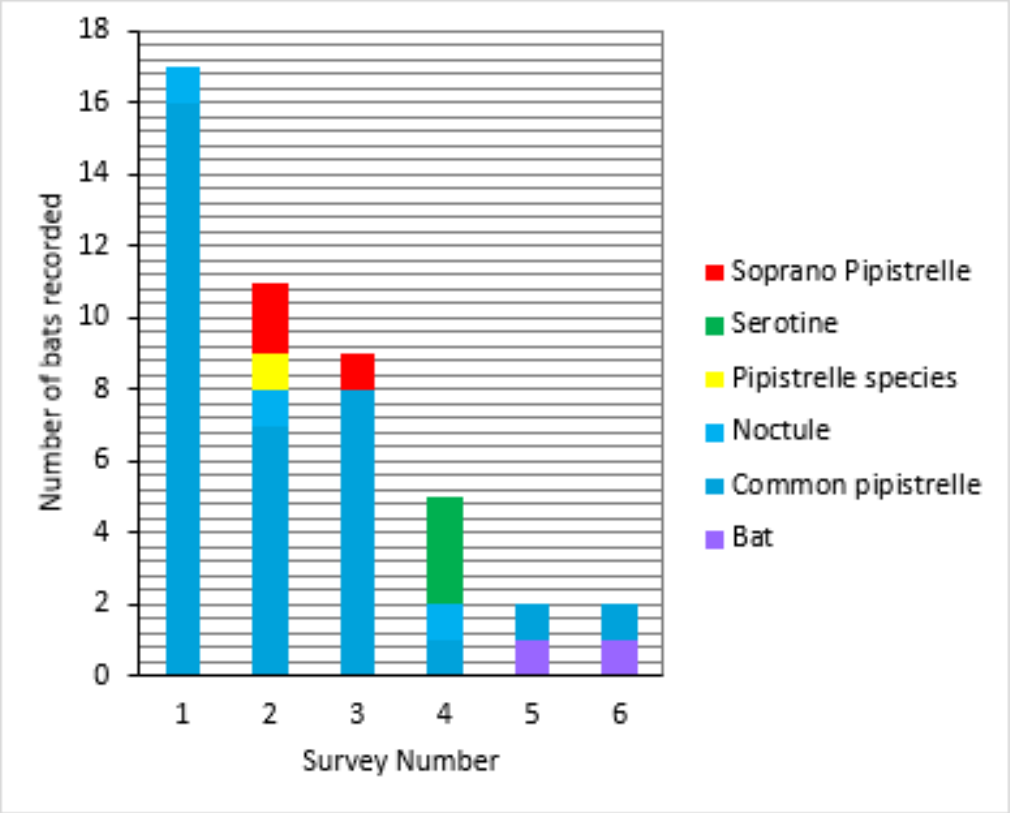


Figure 3-23 - Graph to Show CP2 Survey Data (Six Survey Visits)

CP3

3.17.9. CP3 was not deemed to be a bat crossing point due to the low numbers of bats crossing during the initial two survey visits.

3.17.10. CP3 recorded at least four bat species or species groups commuting at this location (common pipistrelle, soprano pipistrelle, ***Myotis***, noctule and an unidentified bat). A maximum of seven bats (September) were recorded during each survey visit.

3.17.11. Common pipistrelle were the most common bat species recorded. Noctule were recorded once in September 2020, below 5 m, however noctule were recorded regularly over 5 m from the features. ***Myotis*** were recorded once in September 2020.

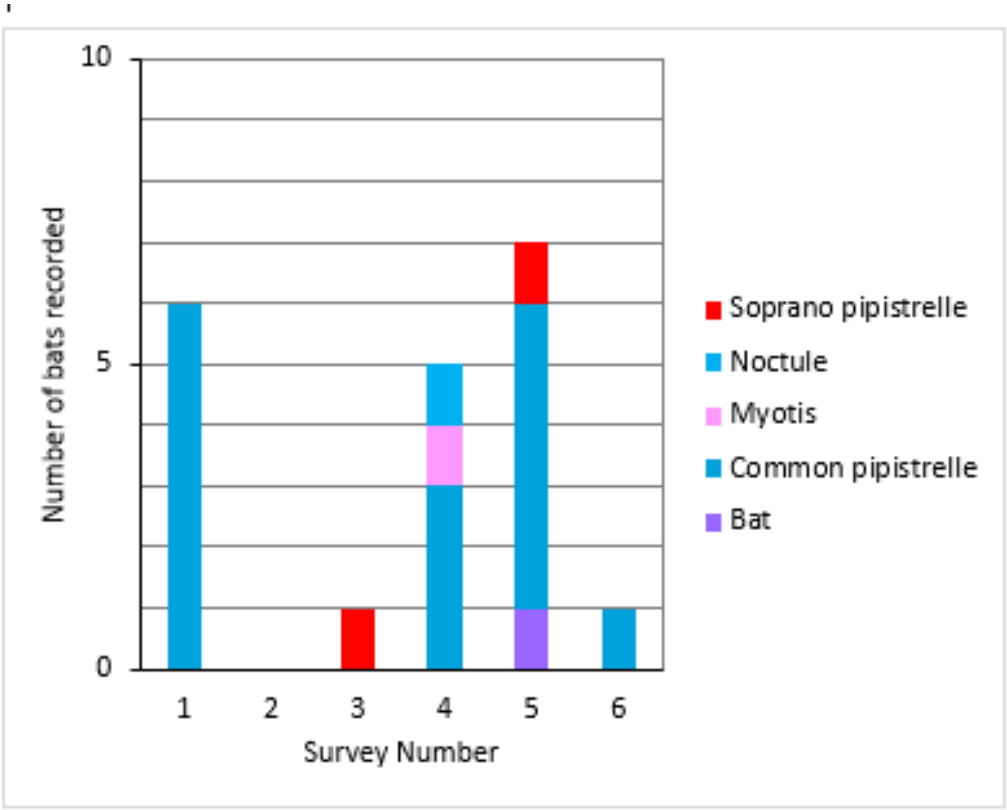


Figure 3-24 - Graph to Show CP3 Survey Data (Six Survey Visits)

CP4

3.17.12. CP4 was deemed to be a bat crossing point.

3.17.13. CP4 recorded at least four bat species or species groups commuting along the River Chelt (common pipistrelle, soprano pipistrelle, pipistrelle species, ***Myotis***, noctule and an unidentified bat). A minimum of ten bats were recorded during each the of survey visits.

3.17.14. Common pipistrelle were the most common bat species recorded using the River Chelt. Noctule were recorded twice in July 2020, below 5 m, however, noctule were recorded on every survey over 5 m from the River Chelt. A ***Myotis*** species bat was recorded once in August 2020 below 5 m.

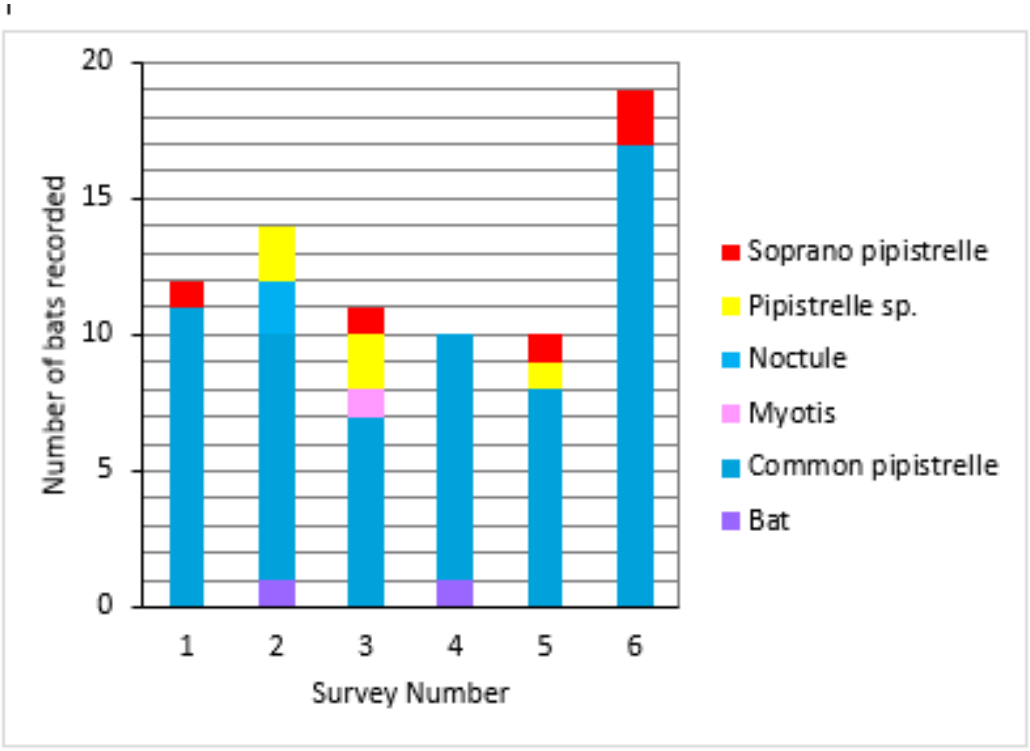


Figure 3-25 - Graph to Show CP4 Survey Data (Six Survey Visits)

CP5

3.17.15. CP5 was deemed to be a bat crossing point.

3.17.16. CP5 recorded at least three bat species or species groups commuting at this location (common pipistrelle, pipistrelle species, ***Myotis***, noctule and an unidentified bat). A minimum of ten bats were recorded during each of the surveys below 5 m.

3.17.17. Common pipistrelle were the most common bat species recorded using these features. Noctule bat were recorded once in September 2020 below 5 m, however, a noctule bat was recorded on three other occasions over 5 m. A ***Myotis*** species bat was recorded once in August 2020 below 5 m.

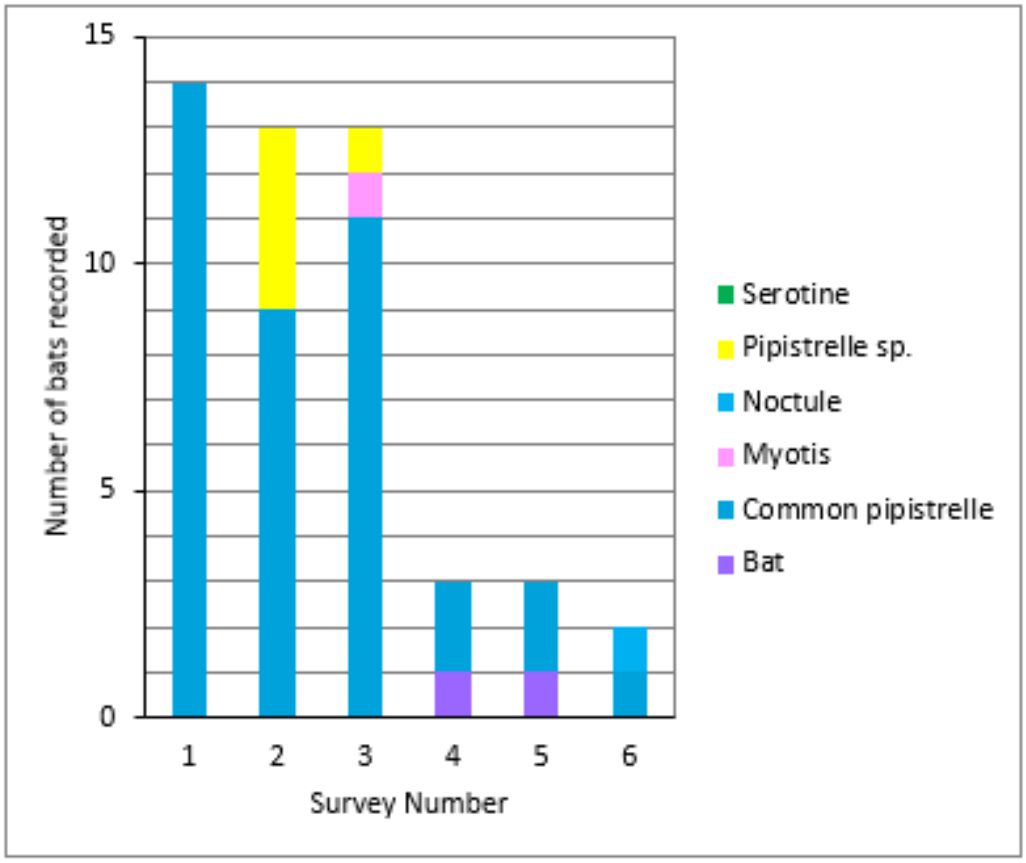


Figure 3-26 - Graph to Show CP4 Survey Data (Six Survey Visits)

4. Evaluation

4.1. Evaluation of Bats

4.1.1. Based on the information that is currently available concerning the distribution and abundance of confirmed and potential bat roosts within the study area, the availability of suitable foraging and commuting habitats and the assemblage of species already recorded, bats have been ascribed the values set out in Table 4-1. These will be refined following further surveys in 2021/ 2022.

4.1.2. Please note the following significant limitations at this stage of the evaluation process and therefore the following evaluation (and subsequent evaluation/ mitigation) will need to be updated as further survey results are received:

- No transects have been completed to date along transect routes 11 and 12;
- No crossing point surveys have been completed along the A4019 (CP6-CP9), therefore these locations must be assumed as crossing points until proved otherwise;
- No advanced licence bat survey techniques (ALBST)[22] have been completed to determine how Bechstein's bats (a difficult to distinguish rare, Annex II bat species) are using the survey area (i.e. activity surveys and crossing point surveys don't distinguish between ***Myotis*** bat calls, therefore in the absence of additional data, all locations where ***Myotis*** have been recorded must assume Bechstein's as present);
- 148 structures have not had a PRA completed yet (including Barn Farm culvert, Leigh Brook), due to either a lack of access or surveys are still outstanding. Therefore, additional bat roosts may be located in these structures;
- 200 structures have no hibernation survey data and access has not been granted, as well as hibernation surveys of 19 structures are still outstanding for winter 2021/ 2022;
- Emergence surveys of structures are still ongoing and further roosts may be identified;
- In areas where no access has been permitted to date, additional trees may be present that have not been accounted for within the tree totals described in this report;
- 13 tree hibernation surveys are yet to be completed (scheduled for winter 2021/ 2022); and
- Emergence/ aerial tree climb surveys of trees are still ongoing and further roosts may be identified.

[22] See further recommended surveys for more detail.

Table 4-1 - Bat Resource Importance

Resource Importance	
Regional Importance	
Natterer's roost (maternity) BU_752 and BU_854	• Natterer's bats are part of the ***Myotis*** genus that has been recorded frequently within the activity surveys across the study area. Natterer's bats are determined to be a 'rarer' bat species in England (Wray et al., (2010))[23]; and • Based on the criteria provided in Wray et al., (2010), maternity sites of 'rarer' bats are of **regional value**.
New Link Road (habitats in the vicinity of) • Transect 5 (statics 9 and 10); • Transect 7 (statics 11 and 12); • Transect 8 (statics 11 and 12); and • CP3, CP5 and CP4.	At least nine bat species or species groups (common pipistrelle, soprano pipistrelle, pipistrelle species, ***Myotis***, noctule, Leisler's, brown long-eared, lesser horseshoe, serotine, barbastelle and an unidentified bat) were recorded among the three transect survey locations. Only two barbastelle (determined to be a 'rarest' bat) passes were recorded along transect 8 in June 2019 (along the River Chelt), and the other in October 2019 along the River Chelt. At least eleven species of bat were recorded within the statics at these locations during the automated bat surveys; common pipistrelle, soprano pipistrelle, Nathusius' pipistrelle, pipistrelle species, ***Myotis***, noctule, Leisler's, Nyctaloid, brown long-eared bat, lesser horseshoe, greater horseshoe, serotine, barbastelle and unidentified bat. CP3 was not deemed to be a bat crossing point due to so few bats being recorded at this location. CP4 and CP5 recorded at least four bat species or species groups commuting at these locations combined (common pipistrelle, soprano pipistrelle, pipistrelle species, ***Myotis*** species, noctule and an unidentified bat), and both were deemed to be bat crossing points. Based on Wray et al., (2010), the foraging and commuting habitat in this location would be based on the highest scoring bat species, barbastelle: • 20 points for being one of the 'rarest' species[24]; • 5 points for being only 'individual bats'; • 3 points for a 'small number' of roosts being nearby (Tree 496, located 560 m from the top of Withybridge Lane); • 5 points for habitat based on the location being deemed as 'complex network of mature well-established hedgerows, small fields and rivers/streams' Total = 33 points deemed as **regional value** (total points between 31 and 40) NB: This calculation could also be completed for Bechstein's bats (or greater horseshoe bats). One transitional Bechstein's roost (Tree 172) has been recorded, with one individual on all survey occasions. It was recorded 110 m from this location. On a precautionary basis it could be assumed that small numbers of bats use this area, combined with a small number of bats roosting nearby. With this data, the total score comes out at 38, and would still be deemed as regional value. It is currently deemed unlikely that large numbers of Bechstein's roosts would be in the vicinity (based on current data)

[23] Wray ***et al.,*** Valuing Bats in Ecological Impact Assessment (provided within CIEEM (2010) In Practice Number 70)
[24] This would also include greater horseshoe or Bechstein's

Resource Importance	
	therefore it is not deemed appropriate to assume national value at this stage on a precautionary basis.
A4019 Improvements (habitats in the vicinity of) • Transect 11 (static 39); • Transect 12 (static 33); • CP2; and • CP6, CP7 and CP8 (no survey data to date at these locations)	No transects have been completed at this location to date (proposed for 2021). At least nine bat species or species groups (common pipistrelle, soprano pipistrelle, Nathusius' pipistrelle, pipistrelle species, ***Myotis*** species, noctule, Leisler's, Nyctaloid, brown long-eared bat, lesser horseshoe and barbastelle bat) were recorded among the two automated survey locations. Barbastelle bat were recorded eight times at static 39, and twice at static 33. CP2 recorded at least four bat species or species groups commuting over the road at this location (common pipistrelle, soprano pipistrelle, pipistrelle species, noctule, serotine and an unidentified bat). CP data for CP6, CP7 and CP8 is not currently available until after the 2021 surveys are complete, therefore these must be assumed as bat crossing points on a precautionary basis. Based on Wray ***et al***., (2010), the foraging and commuting habitat in this location would be based on the highest scoring bat species present (barbastelle): • 20 points for being the 'rarest' species; • 5 points for being only 'individual bats'; • 3 points for a 'small number' of roosts being nearby (Tree 496, located 230 m from the A4019); • 3 points for habitat based on the location being deemed as 'suburban areas or intensive arable land' Total = 31 points deemed as **regional value** (total points between 31 and 40) NB: As detailed above, on a precautionary basis it is not deemed appropriate to assume national value at this stage.
Junction Improvements (habitats in the vicinity of) • Transect 2 (statics 3 and 4); • Transect 4 (statics 7 and 8); • Transect 9 (statics 15 and 16); • Transect 10 (statics 17 and 18); • Southern quadrant directly south east of the junction (no transect survey at	This location included the three transect routes with the highest number of bat passes throughout the study area (transects 2, 4 and 9, see Figure 3-1). Between all the transects at least nine bat species or species groups were recorded (common pipistrelle, soprano pipistrelle, pipistrelle species, ***Myotis*** species, noctule, Leisler's, brown long-eared, lesser horseshoe, serotine, barbastelle and an unidentified bat). At least eleven species of bat were recorded during the automated bat surveys at these locations (common pipistrelle, soprano pipistrelle, Nathusius' pipistrelle, pipistrelle species, ***Myotis*** species, noctule, Leisler's, Nyctaloid, brown long-eared bat, lesser horseshoe, greater horseshoe, serotine, barbastelle and an unidentified bat). CP1 recorded at least four bat species or species groups commuting at these locations combined (common pipistrelle, soprano pipistrelle, pipistrelle species, ***Myotis*** and lesser horseshoe bat). Based on Wray ***et al.,*** (2010), the foraging and commuting habitat in this location would be based on the highest scoring bat species (barbastelle): • 20 points for being the 'rarest' species;

Resource Importance	
this location[25]) (statics 21 and 35); • Highways England land (statics 22 and 23); • CP9 (no survey data to date)	• 5 points for being only 'individual bats'; • 3 points for a 'small number' of roosts being nearby (Tree 496, due to be felled by the Scheme at this location); • 5 points for habitat based on the location being deemed as 'complex network of mature well-established hedgerows, small fields and rivers/streams' Total = 33 points deemed as **regional value** (total points between 31 and 40) NB: As detailed above, on a precautionary basis it is not deemed appropriate to assume national value at this stage.
County Importance	
Common pipistrelle roosts (maternity BU_757, BU_854, BU_993, BU_1030 and BU_981) (hibernation, BU_638)	• Common pipistrelles are common in the area, as indicated by the local records and the records from the activity surveys completed. They are listed as 'common' in England (Wray ***et al***., (2010)); • 'Pipistrelle' are considered to be of conservation importance within the Gloucestershire Biodiversity Action Plan (BAP); and • Based on the criteria provided in Wray ***et al.,*** (2010), maternity sites and small numbers of hibernating sites of 'common' bats are of **county value.**
Lesser horseshoe roosts (day, night, feeding and transitional) BU_747, BU_752, BU_757, BU_364, BU_574, BU_993, BU_638, BU_507, BU_611, BU_709, BU_507, BU_611 and BU_819	• Lesser horseshoe bat is an Annex II species that have been recorded within the activity surveys across the study area, however lesser horseshoe are determined to be a 'rarer' bat species in England (Wray et al., (2010)). • Lesser horseshoe bat is considered to be of conservation importance within the Gloucestershire BAP; • Lesser horseshoe bat is also listed as a priority species on the UK BAP; and • Based on the criteria provided in Wray ***et al***., (2010), small numbers of non-breeding or individual 'rarer' bats are of **county value**.
Noctule roosts (day and transitional) BU_610, Tree 576, Tree 578 and Tree 627	• Noctule bat is common in the area, as indicated by the local records and the records from the activity surveys completed within the study area, however, noctule are determined to be a 'rarer' bat species in England (Wray ***et al.,*** (2010)); • Noctule bat is listed as a priority species on the UK BAP; and • Based on the criteria provided in Wray ***et al***., (2010), small numbers of non-breeding or individual 'rarer' bats are of **county value**.
Barbastelle roost (transitional, Tree 496)	• Barbastelle bat is an Annex II species that have been recorded infrequently within the activity surveys across the study area, and are determined to be one of the 'rarest' bat species in England (Wray ***et al.,*** (2010)); • Barbastelle bat is considered to be of conservation importance within Gloucestershire BAP;

[25] No survey at this location possible due to health and safety as detailed in Table 2-1

Resource Importance	
	• Barbastelle bat is also is listed as a priority species on the UK BAP; and • Based on the criteria provided in Wray ***et al***., (2010), small numbers of non-breeding 'rarest' bats are of **county value**.
Natterer's roosts (day, night, transitional, feeding, mating and feeding) BU_723, BU_379, BU_752, BU_854, BU_752, BU_853, BU_752, BU_766, BU_857, BU_761, BU_763, BU_854, BU_766, BU_857 and BU_854	• Natterer's bat is part of the ***Myotis*** genus that has been recorded within the activity surveys across the study area; • Natterer's bat is determined to be a 'rarer' bat species in England (Wray ***et al***., (2010)); • Based on the criteria provided in Wray ***et al.,*** (2010), small numbers of non-breeding or individual 'rarer' bats are of **county value**.
Whiskered roosts (day, night, feeding and transitional) BU_857 and BU_992	• Whiskered bat is part of the ***Myotis*** genus that has been recorded within the activity surveys across the study area; • Whiskered bat is determined to be a 'rarer' bat species in England (Wray et al., (2010)); and • Based on the criteria provided in Wray ***et al.,*** (2010), small numbers of non-breeding or individual 'rarer' bats are of **county value**.
Local Importance	
Common pipistrelle roosts (transitional, occasional, day, night, feeding and mating)	• Common pipistrelle bat is common in the area, as indicated by the activity surveys completed within the study area, and as listed as 'common' in England (Wray ***et al***., (2010); • 'Pipistrelle' are however considered to be of conservation importance within the Gloucestershire BAP; • Based on the criteria provided in Wray ***et al.,*** (2010), small numbers of non-breeding or individual 'common' bats are of **local value.**
Soprano pipistrelle roosts (transitional, occasional, day, night and feeding)	• Soprano pipistrelle bat is common in the area, as indicated by the activity surveys completed within the study area, and as listed as 'common' in England (Wray ***et al***., (2010); • 'Pipistrelle' are, however, considered to be of conservation importance within the Gloucestershire BAP; • Soprano pipistrelle bat is also listed as a priority species on the UK BAP; and • Based on the criteria provided in Wray ***et al***., (2010), small numbers of non-breeding or individual 'common' bats are of **local value.**
Brown long-eared (day, night transitional and feeding)	• Brown long-eared bat listed as 'common' in England (Wray ***et a***l., (2010)); • Brown long-eared bat is however considered to be of conservation importance within the Gloucestershire BAP; • Brown long-eared are also listed as a priority species on the UK BAP; and

Resource Importance	
	• Based on the criteria provided in Wray ***et al.,*** (2010), small numbers of non-breeding or individual 'common' bats are of **local value.**
Unknown roost	• In the absence of additional data an unknown bat roost has been ascribed local value until further details can be provided.

Appendices to Appendix 7.3

- Appendix A
- Appendix B
- Appendix C
- Appendix D
- Appendix E
- Appendix F

Appendix A.

A.1. Structure Survey Results

A.1.1. Potential Roost Assessment (PRA), Emergence and Hibernation Survey Data and Results

Table 4-2 - Potential Roost Assessment (PRA), Emergence and Hibernation Survey Data and Results

Number[26]	Feature	Access Permitted	Impact from the Scheme	PRA Results	PRA Survey Date	Hibernation suitability	Hibernation survey 2021	Roost Survey 1	Roost Survey 2	Roost Survey 3	Survey Limitations (if applicable)
1	BU_01	No	Within 50 m A4019 south				Unknown				No land access details
2	BU_04	No	Within 50 m A4019 south				Unknown				No land access details
3	BU_06	No	Within 50 m A4019 south				Unknown				No land access details
4	BU_08	No	Within 50 m A4019 south				Unknown				No land access details
5	BU_1000	No	Major			Unknown					Access refused
6	BU_1001	Yes	Demolished			Unknown					Only external survey was possible due to Covid-19 restrictions
7	BU_1002	Access retracted	Demolished	Low	01/08/2019	No	N/A		N/A	N/A	Only a daytime external assessment was possible before access was retracted
8	BU_1005	Yes	Demolished	Moderate	27/10/2020	Yes	Completed – no bat evidence	Bio[27] - du[28] 19/5/21	Bio - da[29] 24/06/21	N/A	
9	BU_1006	Access retracted	Demolished	Moderate	14/12/2020	Yes	N/A - no survey possible as no roof void			N/A	Hibernation survey deemed unsuitable
10	BU_1006a	Yes	Demolished	Negligible	14/12/2020	No	N/A	N/A	N/A	N/A	
11	BU_1007	Yes	Demolished	Low	24/07/2019	No	N/A	Bio - du 06/08/19	N/A	N/A	
12	BU_1008	Yes	Demolished	Low	24/07/2019	No	N/A	Bio - du 06/08/19	N/A	N/A	
13	BU_1008a	Yes	Demolished	Negligible	24/07/2019	No	N/A	N/A	N/A	N/A	
14	BU_1008b	Yes	Demolished	Negligible	24/07/2019	No	N/A	N/A	N/A	N/A	
15	BU_1008c	Yes	Demolished	Negligible	24/07/2019	No	N/A	N/A	N/A	N/A	
16	BU_1010	Yes	Demolished	Negligible	28/10/2020	No	N/A	N/A	N/A	N/A	
17	BU_1010a	Yes	Demolished	Negligible	28/10/2020	No	N/A	N/A	N/A	N/A	

[26] Red in table = survey access refused. Amber in table = surveys outstanding
27 Bio = Survey completed by Biocensus
28 Du = dusk survey

Number[26]	Feature	Access Permitted	Impact from the Scheme	PRA Results	PRA Survey Date	Hibernation suitability	Hibernation survey 2021	Roost Survey 1	Roost Survey 2	Roost Survey 3	Survey Limitations (if applicable)
18	BU_1011	Yes	Demolished	Low	03/12/2020	No	N/A	Bio - du 23/6/21	N/A		
19	BU_1012	Yes	Within 50 m	Low	14/12/2020	Yes		Bio - du 20/7/21	N/A	N/A	Landowner refused access winter 2019-2020
20	BU_1012a	Yes	Within 50 m	Negligible	14/12/2020	No	N/A	N/A	N/A	N/A	
21	BU_1012b	Yes	Within 50 m	Low	14/12/2020	Yes	N/A - no survey possible as no roof void		N/A	N/A	Hibernation survey deemed unsuitable
22	BU_1013	No	Within 50 m			Unknown					Access has been requested three times between Aug 2020 and July 2021 – with no response
23	BU_1014	No	Within 50 m			Unknown					Access has been requested three times between Aug 2020 and July 2021 – with no response
24	BU_1023	Access retracted	Demolished			Unknown					Access has been refused since August 2020
25	BU_1023a	Access retracted	Demolished	Negligible	01/08/2019	No	N/A	N/A	N/A	N/A	All surveys complete before access was retracted
26	BU_1024	Access retracted	Demolished			Unknown					Access has been refused since August 2020
27	BU_1025	Yes	Demolished	Low	31/07/2019	No	N/A		N/A	N/A	
28	BU_1025a	Yes	Demolished	Negligible	31/07/2019	No	N/A	N/A	N/A	N/A	
29	BU_1026	Access retracted	Demolished			Unknown					Access has been refused since August 2020
30	BU_1027	Access retracted	Demolished	Moderate	21/08/2019	Yes				N/A	Access has been refused since Feb 2020
31	BU_1028	Access retracted	Demolished			Unknown					Access has been refused since July 2020
32	BU_1029	No	Demolished			Unknown					All access refused
33	BU_1030	Yes	Demolished	Confirmed	31/07/2019	Yes	N/A - no survey possible as no roof void	Bio - du 28/08/20	Bio - da 30/07/21	Key - du 9/8/21	Hibernation survey deemed unsuitable
34	BU_1033	Yes	Demolished	High	31/07/2019	Yes	N/A - no survey possible as little roof void and elderly resident	Bio - du 20/08/19	Bio-du 27/05/21	Bio-da 23/7/21	Hibernation survey deemed unsuitable

Number[26]	Feature	Access Permitted	Impact from the Scheme	PRA Results	PRA Survey Date	Hibernation suitability	Hibernation survey 2021	Roost Survey 1	Roost Survey 2	Roost Survey 3	Survey Limitations (if applicable)
35	BU_1033a	Yes	Demolished	Negligible	31/07/2019	No	N/A	N/A	N/A	N/A	
36	BU_1033b	Yes	Demolished	Negligible	31/07/2019	No	N/A	N/A	N/A	N/A	
37	BU_1033c	Yes	Demolished	Negligible	31/07/2019	No	N/A	N/A	N/A	N/A	
38	BU_1034	Access retracted	Demolished	Confirmed	01/08/2019	Yes		Bio – du 13/08/19			Access has been refused since August 2020
39	BU_1034a	Access retracted	Demolished	Confirmed	01/08/2019	Yes				N/A	Access has been refused since August 2020
40	BU_1035		Demolished			Unknown					Access has been refused since June 2021
41	BU_1036	Yes	Demolished	Negligible	24/07/2019	No	N/A	N/A	N/A	N/A	
42	BU_1037	Yes	Demolished	Negligible	31/07/2019	No	N/A	N/A	N/A	N/A	
43	BU_1038	Access retracted	Demolished			Unknown					Access has been refused since Feb 2020
44	BU_1039	Access retracted	Demolished	Moderate	01/08/2019	Yes	N/A - no survey possible as no roof void			N/A	Hibernation survey deemed unsuitable. Access has been refused since August 2020
45	BU_1040	Yes	Demolished	Negligible	31/07/2019	No	N/A	N/A	N/A	N/A	
46	BU_1041	Yes	Demolished	Moderate	31/07/2019	Yes				N/A	Access refused since Sep 2019
47	BU_1041a	Yes	Demolished	Negligible	31/07/2019	No	N/A	N/A	N/A	N/A	Access refused since Sep 2019
48	BU_1041b	Yes	Demolished	Low	31/07/2019	No	N/A		N/A	N/A	Access refused since Sep 2019
49	BU_1042	Yes	Demolished	Moderate	31/07/2019	Yes		Bio - du 18/08/20	Bio-da 22/7/21	N/A	
50	BU_1043	Yes	Demolished	Low	31/07/2019	Yes	N/A - no survey possible as no roof void		N/A	N/A	Hibernation survey deemed unsuitable. Access refused since Aug 2020
51	BU_1044	No	Within 50 m	Low	18/11/2020	No	N/A		N/A	N/A	
52	BU_1045	No	Within 50 m			Unknown					Access has been requested three times between Aug 2020 and July 2021 – with no response
53	BU_1046	Yes	Within 50 m	Low	27/10/2020	No	N/A	Bio - da 21/7/21	N/A	N/A	
54	BU_1047	Yes	Within 50 m	Moderate	27/10/2020	Yes		Bio - da 21/7/21	Bio-du 6/8/21	N/A	Landowner refused hibernation survey due to Covid-19
55	BU_1047a	Yes	Within 50 m	Negligible	27/10/2020	No	N/A	N/A	N/A	N/A	

Number[26]	Feature	Access Permitted	Impact from the Scheme	PRA Results	PRA Survey Date	Hibernation suitability	Hibernation survey 2021	Roost Survey 1	Roost Survey 2	Roost Survey 3	Survey Limitations (if applicable)
56	BU_1047b	Yes	Within 50 m	Negligible	27/10/2020	No	N/A	N/A	N/A	N/A	
57	BU_1091	No	Within 50 m			Unknown					Access has been requested three times between Aug 2020 and July 2021 – with no response
58	BU_1092	Yes	Within 50 m	Low	27/10/2020	Yes		Bio - du 29/6/21	N/A	N/A	Landowner refused access winter 2019-2020
59	BU_1092a	Yes	Within 50 m	Low	27/10/2020	Yes		Bio - du 29/6/21	n/a		Landowner refused access winter 2019-2020
60	BU_1093	No	Within 50 m			Unknown					Access has been requested three times between Aug 2020 and July 2021 – with no response
61	BU_1094	No	Within 50 m			Unknown					Access has been requested three times between Aug 2020 and July 2021 – with no response
62	BU_11	Yes	Within 50 m A4019 South			Unknown					
63	BU_12	No	Within 50 m A4019 South			Unknown					No access
64	BU_1395	No	Within 100 m			Unknown					No access
65	BU_1396	No	Within 100 m			Unknown					No access
66	BU_1397	No	Within 100 m			Unknown					No access
67	BU_1398	No	Within 100 m			Unknown					No access
68	BU_1399	No	Within 100 m			Unknown					No access
69	BU_14	No	Within 50 m A4019 south	Unknown			Unknown				No land access details
70	BU_1400	No	Within 100 m			Unknown					No access
71	BU_1401	No	Minor			Unknown					No access
72	BU_1402	No	Within 100 m			Unknown					No access
73	BU_1403	No	Within 100 m			Unknown					No access
74	BU_1404	No	Within 100 m			Unknown					No access
75	BU_1405	No	Minor			Unknown					No access
76	BU_1408 / 768	Access retracted	Fragmented	High	22/08/2019	Yes		Bio -du 24/09/19			Access retracted since June 21
77	BU_1468	Yes	Within 50 m	Moderate	30/06/2021	Yes, confirm with internal				N/a	
78	BU_1490	Yes	Within 50 m	Negligible	30/06/2021	No	N/A	N/A	N/A	N/A	

Number[26]	Feature	Access Permitted	Impact from the Scheme	PRA Results	PRA Survey Date	Hibernation suitability	Hibernation survey 2021	Roost Survey 1	Roost Survey 2	Roost Survey 3	Survey Limitations (if applicable)
79	BU_1492	Yes	Within 50 m	Moderate	30/06/2021	Yes, confirm with internal		Bio -du 10/8/21		N/A	
80	BU_1495	Yes	Within 50 m	Low	30/06/2021	Yes, confirm with internal		Bio-du 9/8/21	N/a	N/a	
81	BU_1495a	Yes	Within 50 m	Low	30/06/2021	Yes, confirm with internal		Bio-du 9/8/21	N/a	N/a	
82	BU_16	Yes	Within 50 m A4019 South			Unknown					No access
83	BU_17	Yes	Within 50 m A4019 South			Unknown					
84	BU_18	Yes	Within 50 m A4019 South			Unknown					No access
85	BU_19	Yes	Within 50 m			Unknown					Access not granted due to Covid-19
86	BU_20	Yes	Minor	Low	30/06/21	No	N/A		N/A	N/A	
87	BU_25	Yes	Within 50 m			Unknown					Access not granted due to Covid-19
88	BU_269	Yes	Within 50 m A4019 south			Unknown					No land access details
89	BU_28	No	Within 50 m A4019 south			Unknown					No land access details
90	BU_286	No	Within 50 m A4019 south			Unknown					No land access details
91	BU_29	No	Within 50 m A4019			Unknown					No land access details
92	BU_30	No	Within 50 m A4019 south			Unknown					No land access details
93	BU_33	No	Within 50 m A4019 south			Unknown					No land access details
94	BU_351	Yes	Within 100 m	Low	17/07/2019	No	N/A	Bio - da 23/07/19	N/A	N/A	
95	BU_352	Yes	Within 100 m	Low	17/07/2019	No	N/A	Bio - da 10/06/21	N/A	N/A	
96	BU_353	Yes	Within 100 m	Negligible	17/07/2019	No	N/A	N/A	N/A	N/A	
97	BU_356	Yes	Within 50 m	Moderate	17/07/2019	No	N/A	Bio - du 22/07/2019	Mid - da 02/07/21	N/A	
98	BU_357	Access retracted	Fragmented	Confirmed	22/08/2019	No	N/A	Atk[30] - du 06/08/2020	Atk - du 02/09/2020		Access refused since April 2021
99	BU_359	No	Minor			Unknown					Access was attempted in July 2021 with no success
100	BU_360	Access retracted	Fragmented	High	05/09/2019	Yes	N/A No survey possible as no roof void				Hibernation survey deemed unsuitable. Access refused since April 2021
101	BU_362	Yes	Within 100 m	Moderate	24/09/2019	Yes		Bio - du 15/07/21	Bio-du 30/7/21	N/A	

[30] Atk = Survey complete by Atkins

Number[26]	Feature	Access Permitted	Impact from the Scheme	PRA Results	PRA Survey Date	Hibernation suitability	Hibernation survey 2021	Roost Survey 1	Roost Survey 2	Roost Survey 3	Survey Limitations (if applicable)
102	BU_363	No	Minor			Unknown					Access was attempted in July 2021 with no success
103	BU_364	Access retracted	Fragmented	Confirmed	22/08/2019	No	N/A	Bio - du 12/09/19	Atk - du 03/08/2020		Access refused since April 2021
104	BU_365	No	Minor			Unknown					Access was attempted in July 2021 with no success
105	BU_366	Yes	Fragmented	Low	22/08/2019	No	N/A	Atk - du 06/08/20	N/A	N/A	Access refused since April 2021
106	BU_367	No	Major	High	24/10/2019	Yes		Bio - da 27/09/19			Access refused since October 2019
107	BU_368	Yes	Within 100 m	Moderate	17/07/2019	No	N/A	Bio - da 23/07/19	Mid[31] - du 16/06/21	N/A	
108	BU_370	No	Major	Confirmed	24/10/2019	Yes					Access refused since October 2019
109	BU_371	Yes	Within 100 m	Low	17/07/2019	No	N/A	Mid - du 16/06/21	N/A	N/A	
110	BU_374a	No	Within 100 m	Negligible	24/09/2019	No	N/A	N/A	N/A	N/A	
111	BU_374b	No	Within 100 m	Negligible	24/09/2019	No	N/A	N/A	N/A	N/A	
112	BU_376	Yes	Within 50 m	Confirmed	17/07/2019	Yes	Completed – no bat evidence	Atk - du 17/07/2019	Bio - da 30/09/2020	Bio - du 23/6/21	
113	BU_377	Yes	Within 10 0m	Low	17/07/2019	No	N/A	Key-du 15/7/21	N/A	N/A	
114	BU_378	Yes	Within 50 m	Confirmed	17/07/2019	No	N/A	Bio - du 22/07/2019	Bio - du 16/09/2020	Mid - da 02/07/21	
115	BU_379	Yes	Within 100 m	Confirmed	17/07/2019	No	N/A	Bio - du 23/07/2019	Bio-da 10/06/21	Key-du 15/7/21	
116	BU_40	Yes	Within 50 m A4019	Negligible	25/09/2020	No	N/A	N/A	N/A	N/A	
117	BU_45	Yes	Demolished			Unknown		Mi - du 8/7/21			No access granted to tenant property
118	BU_48	Yes	Within 50 m			Unknown					Access not granted due to Covid-19
119	BU_493	No	Within 50 m A4019 south			Unknown					No land access details
120	BU_496	No	Within 50m A4019 south			Unknown					Land access refused
121	BU_497	No	Within 50 m A4019 south			Unknown					No land access details
122	BU_499	No	Within 50 m A4019 south			Unknown					No land access details
123	BU_50	No	Within 50 m A4019 south			Unknown					No land access details

[31] Mid = Survey completed by Middlemarch

Number[26]	Feature	Access Permitted	Impact from the Scheme	PRA Results	PRA Survey Date	Hibernation suitability	Hibernation survey 2021	Roost Survey 1	Roost Survey 2	Roost Survey 3	Survey Limitations (if applicable)
124	BU_500	No	Within 50 m A4019 south			Unknown					No land access details
125	BU_501	No	Within 50 m A4019 south			Unknown					No land access details
126	BU_503	Yes	Within 50 m A4019 south			Unknown					
127	BU_507	Yes	Demolished	Confirmed	25/09/2020	Yes		Bio-da 09/06/21	Mid-du 07/07/21	Mid-da 22/7/21	
128	BU_521	No	Within 50 m A4019 south			Unknown					No land access details
129	BU_524	Yes	Within 50 m A4019 south			Unknown					
130	BU_525	No	Within 50 m A4019 south			Unknown					No land access details
131	BU_53	No	Within 50 m A4019 south			Unknown					No land access details
132	BU_536	Yes	Within 50 m A4019 south			Unknown					
133	BU_54	Yes	Demolished	Moderate	03/02/2021	Yes				N/A	Access refused since Feb 2021
134	BU_541	Yes	Within 50 m			Unknown					Access not granted due to Covid-19
135	BU_550	Yes	Within 50 m A4019 south			Unknown					
136	BU_558	Yes	Within 50 m	Low	03/12/2020	No	N/A		N/A	N/A	
137	BU_559	No	Within 100 m			Unknown					Land access refused
138	BU_56	No	Within 50 m A4019 south			Unknown					No land access details
139	BU_560	No	Within 100 m			Unknown					Land access refused
140	BU_561	No	Within 100 m			Unknown					Land access refused
141	BU_565	Yes	Within 50 m	Low	25/08/2020	No	N/A	Bio-du 28/6/21	N/A	N/A	
142	BU_567	Yes	Within 50 m	High	03/12/2020	Yes	Completed – no bat evidence				
143	BU_569	Yes	Demolished	Low	25/08/2020	No	N/A		N/A	N/A	
144	BU_572	Yes	Demolished	Negligible	25/08/2020	No	N/A	N/A	N/A	N/A	
145	BU_573	Yes	Within 50 m	Low	25/08/2020	No	N/A	Bio-du 27/7/21	N/A	N/A	
146	BU_573a	Yes	Within 50 m	Negligible	25/08/2020	No	N/A	N/A	N/A	N/A	
147	BU_574	Yes	Within 100 m	Confirmed	03/12/2020	Yes	Completed – no bat evidence	Bio-du 25/05/21	Mid-da 02/07/21	Key - du 20/7/21	
148	BU_577	Yes	Within 50 m			Unknown					Access not granted due to Covid-19

Number[26]	Feature	Access Permitted	Impact from the Scheme	PRA Results	PRA Survey Date	Hibernation suitability	Hibernation survey 2021	Roost Survey 1	Roost Survey 2	Roost Survey 3	Survey Limitations (if applicable)
149	BU_578	Yes	Within 50 m			Unknown					Access not granted due to Covid-19
150	BU_585	Yes	Demolished			Unknown					Access not granted due to Covid-19
151	BU_589	Yes	Within 50 m			Unknown					Access not granted due to Covid-19
152	BU_594	No	Within 50 m			Unknown					Access refused
153	BU_595	No	Within 50 m			Unknown					No land access details
154	BU_596	No	Within 50 m			Unknown					No land access details
155	BU_599	No	Within 50 m			Unknown					Access refused
156	BU_600	No	Within 50 m A4019 south			Unknown					Access refused
157	BU_602	No	Within 50 m A4019 south			Unknown					No land access details
158	BU_609	No	Within 50 m A4019 south			Unknown					No land access details
159	BU_610	Yes	Demolished	Confirmed	25/09/2020	Yes		Bio - du - 22/06/21	Key-du 15/7/21	Key - da 04/8/21	
160	BU_611	Yes	Demolished	Confirmed	25/09/2020	Yes		Key - du 15/07/21	Key-da 04/08/21	Bio - du - 22/6/21	
161	BU_612	No	Within 50 m A4019 south			Unknown					No land access details
162	BU_613	Yes	Within 50 m A4019 south			Unknown					
163	BU_614	Yes	Within 50 m A4019 south			Unknown					
164	BU_615	No	Within 50 m A4019 south			Unknown					No land access details
165	BU_629	Yes	Demolished	Moderate	25/09/2020	Yes		Bio - da 09/06/21	Mid-du 07/07/21	N/A	
166	BU_630	Yes	Minor	Negligible	30/06/2021	No	N/A	N/A	N/A	N/A	
167	BU_638	Yes	Within 50 m	Confirmed	14/12/2020	Yes	Completed	Bio - du 17/05/21	Key-du 08/07/21	Bio-da 12/8/21	
168	BU_641	No	Minor			Unknown					No land access details
169	BU_643	No	Within 50 m			Unknown					No land access details
170	BU_644	No	Within 50 m			Unknown					Access refused
171	BU_645	Access retracted	Within 50 m	High	03/02/2021	Yes					Access refused since Feb 2021
172	BU_645a	Access retracted	Within 50 m	Negligible	03/02/2021	No	N/A	N/A	N/A	N/A	Access refused since Feb 2021
173	BU_646	Yes	Within 50 m	Low	14/12/2020	No	N/A	Key-du 26/07/21	N/A	N/A	

Number[26]	Feature	Access Permitted	Impact from the Scheme	PRA Results	PRA Survey Date	Hibernation suitability	Hibernation survey 2021	Roost Survey 1	Roost Survey 2	Roost Survey 3	Survey Limitations (if applicable)
174	BU_652	Yes	Within 50 m	Low	14/12/2020	Yes		Bio - du 14/6/21	N/A	N/A	Hibernation survey not completed due to landowner refusal
175	BU_642	Yes	Within 100 m	Confirmed	28/10/2020	No	N/A				
176	BU_654	No	Demolished	Low	27/10/2020	Yes		N/A	N/A	Access refused	Hibernation survey not completed due to landowner refusal
177	BU_655	No	Within 100 m			Unknown					
178	BU_656	Yes	Within 50 m	Negligible	14/12/2020	No	N/A	N/A	N/A	N/A	
179	BU_656a	Yes	Within 50 m	Negligible	14/12/2020	No	N/A	N/A	N/A	N/A	
180	BU_657	No	Within 50 m			Unknown					No land access details
181	BU_659	Yes	Demolished	Low	25/08/2020	No	N/A	Bio-du 19/7/21	N/A	N/A	
182	BU_660	Yes	Within 50 m	High	14/12/2020	No	N/A	Bio - du 18/5/21	Mid – du 28/7/21	Mid - da 12/8/21	
183	BU_661	Yes	Within 50 m	Moderate	14/12/2020	No	N/A	Mid-du 1/7/21	Key-du 13/09/21	N/A	
184	BU_662	Yes	Within 50 m	Moderate	27/10/2020	Yes	N/A No survey as no roof void	Mid - da 13/08/21	Bio - du 31/8/21	N/A	Hibernation survey deemed unsuitable.
185	BU_663	Yes	Within 50 m	Low	25/08/2020	No	N/A	Bio-du 29/7/21	N/A	N/A	
186	BU_666	No	Within 50 m			Unknown					Access refused
187	BU_667	Yes	Demolished	Moderate	25/08/2020	Yes				N/A	
188	BU_668	Yes	Within 50 m			Unknown					
189	BU_687	Yes	Within 50 m	Negligible	25/08/2020	No	N/A	N/A	N/A	N/A	
190	BU_688	Yes	Within 50 m	Negligible	03/02/2021	No	N/A	N/A	N/A	N/A	
191	BU_691	Yes	Within 50 m	Negligible	25/08/2020	No	N/A	N/A	N/A	N/A	
192	BU_693	No	Minor			Unknown					No land access details
193	BU_695	Yes	Within 50 m	Negligible	14/12/2020	No	N/A	N/A	N/A	N/A	
194	BU_701	Yes	Within 50 m	High	14/12/2020	Yes	N/A – no survey as no roof void	Bio -du 11/5/2021	Key-du 26/07/21	Bio-da 13/8/21	Hibernation survey deemed unsuitable.
195	BU_703	Yes	Within 50 m	Negligible	03/12/2020	No	N/A	N/A	N/A	N/A	
196	BU_705	Yes	Within 50 m	Low	27/10/2020	Yes	Completed – no bat evidence	Bio - du 16/06/21	n/a	n/a	

Number[26]	Feature	Access Permitted	Impact from the Scheme	PRA Results	PRA Survey Date	Hibernation suitability	Hibernation survey 2021	Roost Survey 1	Roost Survey 2	Roost Survey 3	Survey Limitations (if applicable)
197	BU_653	Yes	Demolished	Confirmed	27/10/2020	Yes		Mid - du 17/06/21	Bio-da 29/7/21	Required	
198	BU_709a	Yes	Demolished	Negligible	25/09/2020	No	N/A	N/A	N/A	N/A	
199	BU_710	Yes	Within 50 m			Unknown					GCC unable to grant access to tenants property
200	BU_711	Yes	Demolished	Low	03/12/2020	Yes		Bio - da - 15/6/21	N/A	N/A	Hibernation survey not complete due to landowner refusal.
201	BU_714	No	Within 50 m			Unknown					GCC unable to grant access to tenants property
202	BU_716	No	Within 50 m			Unknown					No land access details
203	BU_718	Yes	Demolished	Low	25/08/2020	No	N/A		N/A	N/A	
204	BU_722	Yes	Within 50 m	Low	28/10/2020	Yes		Bio - du - 14/6/21	N/A	N/A	Hibernation survey not complete due to landowner refusal.
205	BU_722a	Yes	Within 50 m	Negligible	28/10/2020	No	N/A	N/A	N/A	N/A	
206	BU_722b	Yes	Within 50 m	Negligible	28/10/2020	No	N/A	N/A	N/A	N/A	
207	BU_709	Yes	Demolished	Confirmed	25/09/2020	Yes		Bio-Da 9/7/21	Mid-du 24/06/21		
208	BU_725	No	Within 50 m			Unknown					No land access details
209	BU_726	No	Minor			Unknown					No land access details
210	BU_728	Yes	Minor	Low	03/02/2021	Yes, confirm with internal survey		Bio-du10/05/2021	N/A	N/A	
211	BU_728a	Yes	Minor	Negligible	03/02/2021	No	N/A	N/A	N/A	N/A	
212	BU_732	Yes	Minor	Low	03/02/2021	Yes, likely		Mid - da 1/7/21	N/A	N/A	
213	BU_735	Yes	Within 50 m	High	27/10/2020	Yes	Completed – no bat evidence	Bio-du 11/05/2021	Key-du 26/07/21	Key-da 20/09/21	
214	BU_736	Yes	Within 50 m	Low	03/02/2021	No	N/A	Bio - du 12/07/21	N/A	N/A	
215	BU_737	Yes	Within 50 m	High	03/02/2021	Yes		Bio-du 12/7/21	Bio-da 05/08/21		
216	BU_738	Yes	Within 50 m			Unknown					GCC unable to grant access to tenants property
217	BU_740	No	Within 100 m			Unknown					
218	BU_741	No	Within 100 m			Unknown					Access refused
219	BU_742	No	Within 50 m			Unknown					Access refused

Number[26]	Feature	Access Permitted	Impact from the Scheme	PRA Results	PRA Survey Date	Hibernation suitability	Hibernation survey 2021	Roost Survey 1	Roost Survey 2	Roost Survey 3	Survey Limitations (if applicable)
220	BU_743	No	Within 50 m			Unknown					Access refused
221	BU_744	Access retracted	Fragmented			Unknown					Access since June 2021 was refused
222	BU_746	Access retracted	Fragmented			Unknown					Access since June 2021 was refused
223	BU_723	Yes	Within 50 m	Confirmed	29/07/2021	No	N/A	Mid - du 5/8/21	Mid - da 23/8/21		
224	BU_748 (now part of BU_850)	Access retracted	Fragmented			Unknown					Access since June 2021 was refused
225	BU_749	Access retracted	Fragmented			Unknown					Access since June 2021 was refused
226	BU_750	Access retracted	Fragmented	Low	18/07/2019	No	N/A	Atk - du 25/06/2019	N/A	N/A	Access since June 2021 was refused, after all surveys completed
227	BU_747	Access retracted	Fragmented	Confirmed	18/07/2019	No	N/A	Bio - du 05/09/2019			Access since June 2021 was refused
228	BU_751	Access retracted	Fragmented	Confirmed	18/07/2019	Yes		Bio - du 29/07/2019	Bio - du 09/09/2020		Access since June 2021 was refused
229	BU_752a	Access retracted	Fragmented	Low	22/08/2019	No	N/A	Bio - du 19/08/2019	Bio - du 24/09/2020	N/A	Access since June 2021 was refused
230	BU_752	Access retracted	Fragmented	Confirmed	18/07/2019	Yes		Bio - du 19/08/2019	Bio - du 24/09/2020		Access since June 2021 was refused. Emergence survey 2 had some moderate rain at the end of the survey, bats passes were recorded, but not foraging as they had been on the previous survey.
231	BU_754	No	Fragmented			Unknown					No land access details
232	BU_755	Yes	Fragmented	Moderate	22/08/2019	No	N/A	ATK - du 05/08/2020	ATK - du 29/09/2020	N/A	
233	BU_756	Access retracted	Fragmented			Unknown					
234	BU_753	Access retracted	Fragmented	Confirmed	05/09/2019	Yes	Completed – no bat evidence	Bio - du 11/09/2019	ATK - du 27/07/2020		Access since June 2021 was refused
235	BU_758	Access retracted	Fragmented	Low	18/07/2019	No	N/A		N/A	N/A	
236	BU_759	Access retracted	Fragmented			Unknown					
237	BU_760	Access retracted	Fragmented			Unknown					

Number[26]	Feature	Access Permitted	Impact from the Scheme	PRA Results	PRA Survey Date	Hibernation suitability	Hibernation survey 2021	Roost Survey 1	Roost Survey 2	Roost Survey 3	Survey Limitations (if applicable)
238	BU_757	Access retracted	Fragmented	Confirmed	18/07/2019	Yes		Bio - du 05/09/2019	Bio - du 29/09/2020		
239	BU_761	Access retracted	Fragmented	Confirmed	18/07/2019	No	N/A	ATK - du 29/09/2020			
240	BU_762	Access retracted	Fragmented			Unknown					
241	BU_762	Access retracted	Fragmented	Confirmed	22/08/2019	Yes		Bio - da 06/09/2019	Atk - du 17/09/2020		
242	BU_763	Access retracted	Fragmented	Confirmed	18/07/2019	Yes		Bio - du 19/08/2019	Bio - du 09/09/2020		
243	BU_765	Access retracted	Fragmented	Confirmed	18/07/2019	No	N/A	Bio - da 20/08/2019	Bio - du 15/09/2020		
244	BU_768	Access retracted	Fragmented	Low	22/08/2019	Yes			N/A	N/A	
245	BU_768b	Access retracted	Fragmented	Negligible	22/08/2019	No	N/A	N/A	N/A	N/A	
246	BU_770	Yes	Fragmented	Low	05/09/2019	No	N/A		N/A	N/A	
247	BU_766	Access retracted	Fragmented	Confirmed	18/07/2019	No	N/A	Bio - du 05/09/2019			
248	BU_772	Yes	Fragmented	Low	22/08/2019	No	N/A	ATK -du 05/08/2020	N/A	N/A	N/A
249	BU_775	No	Fragmented			Unknown					
250	BU_776	No	Fragmented			Unknown					No land access details
251	BU_779	Yes	Fragmented			Unknown					
252	BU_786	Yes	Within 50 m	Negligible	03/12/2020	No	N/A	N/A	N/A	N/A	
253	BU_792	No	Within 50 m			Unknown					
254	BU_797	No	Within 50 m			Unknown					No land access details
255	BU_800	No	Within 50 m			Unknown					No land access details
256	BU_803	Yes	Demolition	Moderate	25/09/2020	Yes		Bio-du 09/06/21	Bio-da 15/07/21	N/A	
257	BU_813	Yes	Within 100 m	Negligible	17/07/2019	No	N/A	N/A	N/A	N/A	
258	BU_817	Yes	Within 50 m	Negligible	17/07/2019	No	N/A	N/A	N/A	N/A	
259	BU_771	Yes	Fragmented	Confirmed	22/08/2019	Yes		Bio - da 29/08/2019	Bio - du 14/09/2020		
260	BU_820	No	Within 50 m			Unknown					No land access details
261	BU_824	Yes	Minor	Moderate	01/08/2019	Yes		Bio-da 08/07/21		N/A	Hibernation survey not completed due to landowner refusal

Number[26]	Feature	Access Permitted	Impact from the Scheme	PRA Results	PRA Survey Date	Hibernation suitability	Hibernation survey 2021	Roost Survey 1	Roost Survey 2	Roost Survey 3	Survey Limitations (if applicable)
262	BU_826	Yes	Within 50 m	Low	21/08/2019	No	N/A	Atk - du 22/07/2020	N/A	N/A	
263	BU_819	Yes	Demolition	Confirmed	25/09/2020	Yes		Mid-du 08/07/21	Mid-da 22/7/21	Key-du 09/8/21	
264	BU_835	No	Within 50 m			Unknown					No land access details
265	BU_836	No	Minor			Unknown					No land access details
266	BU_837	No	Minor			Unknown					No land access
267	BU_839	Yes	Within 50 m	Low	17/07/2019	Yes	Completed – no bat evidence	Bio - du 23/07/2019	N/A	N/A	
268	BU_840	Yes	Major	Negligible	24/10/2019	No	N/A	N/A	N/A	N/A	
269	BU_841	Yes	Minor	Moderate	01/08/2019	Yes	Required	Mid-du 23/06/21	Mid-du 15/07/2021	N/A	Hibernation survey not completed due to owner refusal.
270	BU_848	Access retracted	Fragmented			Unknown					Access refused since June 2021
271	BU_849	Access retracted	Fragmented			Unknown					Access refused since June 2021
272	BU_834	Yes	Within 50 m	Confirmed	17/07/2019	Yes	N/A No survey as no roof void	Bio - du 22/07/2019	Bio - du 16/09/2020	Mid - da 02/07/21	Hibernation survey deemed unsuitable.
273	BU_851	Access retracted	Fragmented			Unknown					Access refused since June 2021
274	BU_852	Access retracted	Fragmented			Unknown					Access refused since June 2021
275	BU_850	Access retracted	Fragmented	Confirmed	18/07/2019	Yes		Bio - Du 05/09/2019			Access refused since June 2021
276	BU_853	Access retracted	Fragmented	Confirmed	18/07/2019	No	N/A	Atk - du 27/06/2019	Bio - du 29/07/2019		Access refused since June 2021
277	BU_854	Access retracted	Fragmented	Confirmed	18/07/2019	Yes		Atk - du 24/06/2019	Bio - da 30/07/2019	Bio-du 26/05/21	Access refused since June 2021
278	BU_856	Access retracted	Fragmented			Unknown					Access refused since June 2021
279	BU_855	Access retracted	Fragmented	Confirmed	18/07/2019	Yes		Bio - du 05/09/2019	Mid-du 27/05201		Access refused since June 2021
280	BU_858	Access retracted	Fragmented	Low	18/07/2019	No	N/A		N/A	N/A	Access refused since June 2021
281	BU_859	Access retracted	Fragmented	Low	18/07/2019	No	N/A		N/A	N/A	Access refused since June 2021
282	BU_857	Access retracted	Fragmented	Confirmed	18/07/2019	No	N/A	Bio - da 20/08/2019	Bio - du 15/09/2020		Access refused since June 2021

Number[26]	Feature	Access Permitted	Impact from the Scheme	PRA Results	PRA Survey Date	Hibernation suitability	Hibernation survey 2021	Roost Survey 1	Roost Survey 2	Roost Survey 3	Survey Limitations (if applicable)
283	BU_862a	Yes	Within 100 m	Low	21/08/2019	No	N/A	Atk -du 22/07/2020	N/A	N/A	
284	BU_864	No	Within 100 m			Unknown					No land access details
285	BU_890	Yes	Within 50 m	Low	30/06/2021	Yes		Bio-du 12/08/21	N/A	N/A	
286	BU_892	No	Within 50 m			Unknown					No land access details
287	BU_893	No	Within 50 m			Unknown					No land access details
288	BU_894	Yes	Within 50 m			Unknown					
289	BU_903	No	Within 50 m			Unknown					No land access details
290	BU_908	No	Within 50 m			Unknown					No land access details
291	BU_909	Yes	Minor	Low	30/06/2021	Yes	N/A	Bio-du 02/08/21	N/A	N/A	No internal access to roof void possible.
292	BU_910	No	Within 50 m			Unknown					No land access details
293	BU_912	No	Within 50 m			Unknown					No land access details
294	BU_923	Yes	Within 50 m	Negligible	25/09/2020	No	N/A	N/A	N/A	N/A	
295	BU_924	No	Within 50 m			Unknown					No land access details
296	BU_926	No	Within 50 m			Unknown					No land access details
297	BU_927	No	Within 50 m			Unknown					No land access details
298	BU_960	No	Major			Unknown					Access refused
299	BU_961	No	Major			Unknown					Access refused
300	BU_962	Yes	Demolished	Negligible	24/07/2019	No	N/A	N/A	N/A	N/A	
301	BU_862	Yes	Within 50 m	Confirmed	21/08/2019	Yes	Completed – no bat evidence	Atk -du 20/07/2020	Bio - du 21/09/2020	Key-du 2/8/21	
302	BU_964	Access retracted	Demolished	Low	03/12/2020	Yes	Completed – no bat evidence		N/A	N/A	Access refused since Jan 2021
303	BU_965	Access retracted	Demolished	Moderate	31/07/2019	Yes	Completed – no bat evidence	Bio - du 07/09/2020	Bio-du 26/7/21	N/A	
304	BU_965a	Access retracted	Demolished	Negligible	31/07/2019	No	N/A	N/A	N/A	N/A	Access refused since Jan 2021
305	BU_965b	Access retracted	Demolished	Negligible	31/07/2019	No	N/A	N/A	N/A	N/A	Access refused since Jan 2021
306	BU_965c	Access retracted	Demolished	Negligible	31/07/2019	No	N/A	N/A	N/A	N/A	Access refused since Jan 2021

Number[26]	Feature	Access Permitted	Impact from the Scheme	PRA Results	PRA Survey Date	Hibernation suitability	Hibernation survey 2021	Roost Survey 1	Roost Survey 2	Roost Survey 3	Survey Limitations (if applicable)
307	BU_965d	Access retracted	Demolished	Negligible	31/07/2019	No	N/A	N/A	N/A	N/A	Access refused since Jan 2021
308	BU_965e	Access retracted	Demolished	Negligible	31/07/2019	No	N/A	N/A	N/A	N/A	Access refused since Jan 2021
309	BU_965f	Access retracted	Demolished	Negligible	31/07/2019	No	N/A	N/A	N/A	N/A	Access refused since Jan 2021
310	BU_966	Access retracted	Demolished	Moderate	24/07/2019	Yes				N/A	Access refused since Sep 2020
311	BU_967	Yes	Demolished	Negligible	01/08/2019	No	N/A	N/A	N/A	N/A	
312	BU_968	Access retracted	Demolished	Moderate	01/08/2019	Yes	N/A – no survey as there is no roof void			N/A	Hibernation survey deemed unsuitable.
313	BU_969	Yes	Demolished	Low	24/07/2019	No	N/A	Bio - da 03/09/2020	N/A	N/A	
314	BU_969a	Yes	Demolished	Low	24/07/2019	No	N/A	Bio - da 03/09/2020	N/A	N/A	
315	BU_970	Yes	Demolished	Low	24/07/2019	No	N/A	Bio - da 07/08/2019	N/A	N/A	
316	BU_971	Access retracted	Demolished	Moderate	01/08/2019	Yes	N/A – no accessible roof void			N/A	Hibernation survey deemed unsuitable. Access refused since Aug 2020
317	BU_971a	Access retracted	Demolished	Negligible	01/08/2019	No	N/A	N/A	N/A	N/A	Access refused since Aug 2020
318	BU_972	Access retracted	Demolished	Moderate	01/08/2019	Yes	N/A - no survey as no roof void			N/A	Hibernation survey deemed unsuitable. Access refused since Aug 2020
319	BU_973	Access retracted	Demolished	Negligible	01/08/2019	No	N/A		N/A	N/A	Access refused since Aug 2020
320	BU_974	Yes	Demolished	Negligible	31/07/2019	No	N/A	N/A	N/A	N/A	
321	BU_975	Yes	Demolished	Negligible	24/07/2019	No	N/A	N/A	N/A	N/A	
322	BU_975a	Yes	Demolished	Negligible	24/07/2019	No	N/A	N/A	N/A	N/A	
323	BU_976	No	Major			Unknown					Access refused
324	BU_978	Access retracted	Demolished	Low	03/12/2020	No	N/A		N/A	N/A	Access refused
325	BU_978a	Yes	Demolished	Negligible	03/12/2020	No	N/A	N/A	N/A	N/A	
326	BU_978b	Yes	Demolished	Negligible	03/12/2020	No	N/A	N/A	N/A	N/A	
327	BU_979	Access retracted	Within 50 m			Unknown					Access refused since June 2021
328	BU_980	Yes	Demolished	Negligible	01/08/2019	No	N/A	N/A	N/A	N/A	

Number[26]	Feature	Access Permitted	Impact from the Scheme	PRA Results	PRA Survey Date	Hibernation suitability	Hibernation survey 2021	Roost Survey 1	Roost Survey 2	Roost Survey 3	Survey Limitations (if applicable)
329	BU_963	Yes	Demolished	Confirmed	01/08/2019	Yes		ATK - du 03/07/2019	Bio - da 21/08/2019	Bio-du 07/07/21	Landowner refused hibernation static due to Covid-19
330	BU_982	Yes	Demolished	Low	24/07/2019	Yes	N/A - roof void inaccessible	Bio - Du 20/08/2020	N/A	N/A	Hibernation survey deemed unsuitable.
331	BU_983	Access retracted	Demolished	Moderate	31/07/2019	Yes				N/A	Access refused since July 2020
332	BU_984	No	Major			Unknown					Access refused
333	BU_985	Yes	Demolished	Low	31/07/2019	Yes	N/A – no survey as inaccessible small roof void	Bio - du 16/6/21	N/A	N/A	Hibernation survey deemed unsuitable.
334	BU_985b	Yes	Demolished	Negligible	31/07/2019	No	N/A	N/A	N/A	N/A	
335	BU_985c	Yes	Demolished	Negligible	31/07/2019	No	N/A	N/A	N/A	N/A	
336	BU_981	Yes	Demolished	Confirmed	03/12/2020	Yes	Completed – no bat evidence	Bio - du 15/06/21	Bio - du 08/07/21	Key- du 4/8/21	
337	BU_987a	Yes	Demolished	Negligible	24/07/2019	No	N/A	N/A	N/A	N/A	
338	BU_987b	Yes	Demolished	Negligible	24/07/2019	No	N/A	N/A	N/A	N/A	
339	BU_987c	Yes	Demolished	Negligible	24/07/2019	No	N/A	N/A	N/A	N/A	
340	BU_987d	Yes	Demolished	Negligible	24/07/2019	No	N/A	N/A	N/A	N/A	
341	BU_988	Yes	Demolished	moderate	21/08/2019	Yes	Completed – no bat evidence	Bio - du 03/09/2020	Bio- da 14/05/2021	N/A	
342	BU_988a	Yes	Demolished	Moderate	21/08/2019	No	N/A	Mid - da 11/06/21	Bio - du 28/6/21	N/A	
343	BU_988b	Yes	Demolished	Negligible	21/08/2019	No	N/A	N/A	N/A	N/A	
344	BU_989	No	Major			Unknown					Access refused
345	BU_987	Yes	Demolished				N/A - no roof void. Roof converted	Bio - du 01/09/2020	Bio - du 03/08/21		
346	BU_991	Access retracted	Within 50 m			Unknown					Access refused since June 2021
347	BU_990	Access retracted	Within 50 m	Confirmed	31/07/2019	No	N/A	Atk - du 24/07/2019	Bio - da 13/08/2019	Atk - du 29/07/2020	Access refused since June 2021
348	BU_992	Access retracted	Within 50 m	Confirmed	31/07/2019	Yes	N/A – no survey as small roof void, if any	Atk - du 31/07/2019	Bio - du 12/08/2019	Atk -du 14/07/2020	Hibernation survey deemed unsuitable. Access refused since June 2021

Number[26]	Feature	Access Permitted	Impact from the Scheme	PRA Results	PRA Survey Date	Hibernation suitability	Hibernation survey 2021	Roost Survey 1	Roost Survey 2	Roost Survey 3	Survey Limitations (if applicable)
349	BU_994	Access retracted	Within 50 m			Unknown					Access refused since June 2021
350	BU_995	Yes	Demolished	Low	14/12/2020	No	N/A Skylight and likely small roof void, if at all	Bio-du 09/08/21	N/A	N/A	Hibernation survey deemed unsuitable
351	BU_996	Yes	Demolished	Negligible	31/07/2019	No	N/A	N/A	N/A	N/A	
352	BU_998	No	Major			Unknown					Access refused
353	M5 River Chelt culvert	Yes	Extended	Moderate	22/08/2019	No	N/A	Bio-du 04/08/21	Required - dawn	N/A	
354	Junction bridge	Yes	Demolished	Moderate	27/07/2021	Yes	N/A no survey possible as feature cannot be inspected or a static left	Key - du 5/7/21	Key-du 19/7/21	N/A	Hibernation survey deemed unsuitable
355	Piffs Elm Culvert	Partial	Extended	Moderate	27/07/2021	No	N/A	Bio-du 02/08/21	N/A	N/A	Surveyors can only access one side of the culvert, and views of the entrance are only possible from the top of a bank, where vegetation obscures the tunnel entrance's view
356	Barn Farm culvert (Leigh Brook)	Partial	Extended								
357	BU_342	No	Within 50 m								GCC unable to grant access to tenants property
358	BU_522	Yes	Demolished	Negligible	25/09/2020	No	N/A	N/A	N/A	N/A	
359	BU_641	Yes	Minor	Moderate	27/07/2021	Yes					
360	BU_641a	Yes	Minor	Negligible	27/07/2021	No	N/A	N/A	N/A	N/A	
361	BU_993	Access retracted	Within 50 m	Confirmed	31/07/2019	No	N/A	Bio - da 13/08/2019	ATK - du 29/07/2020	Bio - du 3/8/21	Access refused since June 2021
362	BU_694	Yes	Demolished	Moderate	25/09/2020	Yes		Mid-du 24/06/21	Bio-da 9/7/21	Bio - Du 17/8/21	
363	BU_694a	Yes	Demolished	Negligible	25/09/2020	No	N/A	N/A	N/A	N/A	
364	BU_787	No	Within 50 m A4019 south	Unknown							No land access details
365	BU_641b	Yes	Minor	Negligible	27/07/2021	No	N/A	N/A	N/A	N/A	
366	BU_641c	yes	Minor	Low	27/07/2021	No	N/A		N/A	N/A	
367	BU_1477	yes	Minor	Moderate	27/07/2021	Yes	N/A - features unsuitable			N/A	Hibernation survey deemed unsuitable.

Number[26]	Feature	Access Permitted	Impact from the Scheme	PRA Results	PRA Survey Date	Hibernation suitability	Hibernation survey 2021	Roost Survey 1	Roost Survey 2	Roost Survey 3	Survey Limitations (if applicable)
							for full hibernation survey				

A.2. Confirmed Bat Roost Assessment

Some data from 2021 is included within these tables, however, these details are not included in this assessment as full 2021 data is not available.

Table 4-3 - Survey Results BU_1034a

Date of Survey	Start and End Times and Time of Sunset	Structure Reference	Equipment Used (include make of bat detectors and logging equipment)	Weather (include start and end temps, precipitation, Beaufort wind scale etc)
01/08/2019	Daytime inspection (external only)	BU_1034a	N/A	Air temp: 20 (˚C), no rain, cloud cover 8, wind speed 2
Comments[32]: Atkins: SK and RM				
Visual inspection results (roost type, roost location, access points and dimensions of roost or explanation where the roost is): Folly in garden. Single storey, hexagonal red brick structure with a multi hipped roof. Some lifted tiles. Loose lead flashing around the protruding log flue.				
Access refused for hibernation survey	Hibernation static deployment	N/A	N/A	N/A
13/08/2019	20:22 to 22:07 (sunset = 20:37)	BU_1034a	Batlogger and EMT 2 x 3	Air temp: 16.5 down to 14 (˚C), no rain, cloud cover 8, wind speed 0
Comments: Biocensus: GW, AB, AM and JS				
Roost survey results: (species and numbers, roost location, access points (include number of them) and dimensions where appropriate: Foraging activity throughout survey by common and soprano pips. Also several passes by noctule over site and a couple of ***Myotis*** passes. Owner had found a dead common pipistrelle bat in the 'folly' structure in the garden.				
Survey 2 – Access				
Survey 3 – Access				

[32] Class licence numbers can be provided upon request

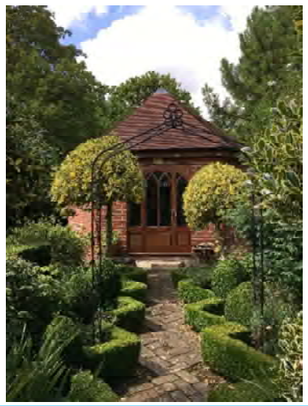
Date of Survey	Start and End Times and Time of Sunset	Structure Reference	Equipment Used (include make of bat detectors and logging equipment)	Weather (include start and end temps, precipitation, Beaufort wind scale etc)
Photos/ diagrams:  				

Table 4-4 - Survey Results BU_638

Date of Survey	Start and End Times and Time of Sunset	Structure Reference	Equipment Used (include make of bat detectors and logging equipment)	Weather (include start and end temps, precipitation, Beaufort wind scale etc)
14/12/2020	Daytime inspection (external only)	BU_638	N/A	Air temp: 10 (˚C), no rain, cloud cover 3, wind speed 1
Comments: Atkins: SK and RM				
Visual inspection results (roost type, roost location, access points and dimensions of roost or explanation where the roost is): Large two-storey house with several roof aspects. Cross-gabled roof with rear mono-pitched two-storey extension. Clay roof tiles and ridge. Two red brick chimneys, one recently repaired. Further red brick chimney on southern gable end. Lead flashing present on extension. Bargeboards with soffit box present. Windows have timber frames. Gable end/ dormer on east elevation where entrance is. Window dormer on southern elevation. Vent on southern gable end at apex of elevation. Possible roosting features include: Lifted lead flashing in between roof tiles. Slipped and uneven tiles. Gaps under ridge tiles. Gaps in mortar at base of repaired chimney. Gap next to guttering where single storey extension meets two storey extension. Open timber vent on southern gable end.				
17/01/2021 – 31/03/2021	Hibernation static deployment	BU_638	Swift and EasyLog USB - Lascar temperature and humidity data logger	Between -1.5 and 20.5 (˚C)
Comments: Atkins: RM, TS, however, deployed internally by landowner				
Hibernation results: A static bat detector was deployed by the landowner into the roof space as no internal access was possible due to Covid-19. Common pipistrelle was recorded on the 21st, 22nd, 24th of February and 15th, 17th, 21st and 31st March. During the February recording of bats the temperature within the roof space was recorded to be around 17oC, just after a cooler period. In the absence of further information, it has been assumed that the pipistrelle(s) were hibernating somewhere within the property.				
17/05/2021	20:34 to 22:19 (sunset = 20:49)	BU_638	EMT 2 and Samsung Tablet	TBC
Comments: Biocensus: AR and LM				
Roost survey results: (species and numbers, roost location, access points (include number of them) and dimensions where appropriate: No roosting activity noted. Foraging was noted in the grounds of the property throughout.				
08/07/2021	21:22 to 23:27	BU_638	SM4/ Duet x 4 and one thermal camera	TBC
Comments: Keystone: RT, ES, JM and BB				
Roost survey results: (species and numbers, roost location, access points (include number of them) and dimensions where appropriate: One common pipistrelle emerged from the northern elevation of the structure. A second common pipistrelle is likely to have emerged from the eastern side (review of thermal footage will assist with this being confirmed).				
Survey 3 – 31/08/2021				
Photos/ diagrams:  				

Table 4-5 - Survey Results BU_364

Date of Survey	Start and End Times and Time of Sunset	Structure Reference	Equipment Used (include make of bat detectors and logging equipment)	Weather (include start and end temps, precipitation, Beaufort wind scale etc)
22/08/2019	Daytime inspection (external only)	BU_364	N/A	Air temp: 19 (˚C), very light rain, cloud cover 8, wind speed 1
Comments: Atkins: SK and RM				
Visual inspection results (roost type, roost location, access points and dimensions of roost or explanation where the roost is): Dutch barn consisting of two duo pitched barns attached to each other, open on all sides except southern elevation where partition made of corrugated metal is present. Southern section only open on eastern side. Barn constructed from steel beams and trusses with asbestos roof. Walls in southern section clad with corrugated metal and breeze blocks. One gable end clad with timber boards. Internally exposed beams are present. No obvious roosting locations recorded. Likely pipistrelle droppings scattered throughout open barn area mostly small sized including on cars in open section of the barn (see DNA below). Additionally, a collection of yellow underwing moth wings were recorded, likely from brown long-eared bats, along with two droppings (1 small & 1 medium sized).				
DNA: date collected 22/08/2019 (south) – Soprano pipistrelle bat (brown long-eared suspected)				
No hibernation suitability.				
12/09/2019	19:17 to 21:02 (sunset = 19:32)	BU_364	Walkabout, EMT 2 x 2 and Scout	Air temp: 18.9 down to 17.1 (˚C), no rain, cloud cover 7, wind speed 5
Comments: Biocensus: CB, HB, AM and FT				
Roost survey results: (species and numbers, roost location, access points (include number of them) and dimensions where appropriate: Very little bat activity, several ***Myotis*** passes, one common pipistrelle and a noctule recorded. No bats seen to emerge.				
03/08/2020	20:38 to 22:23 (sunset = 20:53)	BU_364	Walkabout x 4	Air temp: 20 down to 16 (˚C), no rain, cloud cover 6, wind speed 0
Comments: Atkins: RM, EH, TS and EE				
Roost survey results: (species and numbers, roost location, access points (include number of them) and dimensions where appropriate: Records of common pipistrelle and soprano pipistrelle foraging. Also passes by noctule and ***Myotis***. No bats seen to emerge.				
Survey 3 – Access				
Photos/ diagrams:   				

Table 4-6 - Survey Results BU_771

Date of Survey	Start and End Times and Time of Sunset	Structure Reference	Equipment Used (include make of bat detectors and logging equipment)	Weather (include start and end temps, precipitation, Beaufort wind scale etc)
22/08/2019	Daytime inspection (external only)	BU_771	N/A	Air temp: 19 (˚C), very light rain, cloud cover 8, wind speed 1
Comments: Atkins: SK and IH				
Visual inspection results (roost type, roost location, access points and dimensions of roost or explanation where the roost is): Cross gabled roof laid with plain clay tiles and clay ridge tiles. Brick walls and extensive wooden cladding along most of main walls. Decorative timber eaves (undersides). Timber bargeboards on gable ends clad with timber boarding. No bargeboard present on gable end without cladding. Many gaps under wooden cladding on walls, gaps around door frames and windows, lead flashing over window on west roof with gaps underneath. Gaps around beam ends on west and east walls and gaps at top of gable end. Gaps under tiles. No specific evidence of bat usage during daytime visit.				
Access refused for hibernation survey	Hibernation static deployment	N/A	N/A	N/A
Comments (to include number of surveyors used for each visit, including Class Licence registration number if applicable):				
Hibernation results:				
06/09/2019	04:58 to 06:43 (sunrise = 06:28)	BU_762 (incidental sighting)	Walkabout and EMT 2 x 3	Air temp: 13.1 up to 13.6 (˚C), no rain, cloud cover 100%, wind speed 1/ 2
Comments: Biocensus: CB, AB, AM and JS				
Roost survey results: (species and numbers, roost location, access points (include number of them) and dimensions where appropriate: Very little bat activity, all but one bat (soprano pipistrelle) were common pipistrelles and one brown long-eared bat, recorded foraging and commuting. A common pipistrelle was seen at 06:17 (26 minutes before sunrise) that was assumed to return to the roost in BU_771 but exact location unknown as obscured from surveyor position.				
29/08/2019	04:45 to 06:28 (sunrise = 06:13)	BU_771	Walkabout and EMT 2 x 3	Air temp: 9 up to 5.6 (˚C), no rain (but had been heavy rain earlier in the night, cloud cover 0, wind speed 0
Comments: Biocensus: SB, JS, HB and AM				
Roost survey results: (species and numbers, roost location, access points (include number of them) and dimensions where appropriate: Very little bat activity, with passes from soprano pipistrelle, common pipistrelle, and two noctule passes. No bats seen to re-enter a roost.				
14/09/2020	19:09 to 20:55 (sunset = 19:24)	BU_771	Scout x 2 and EMT 2 x 2	Air temp: 22 (˚C), no rain, wind speed 0, cloud cover 0
Comments: Biocensus: JC, AB, CM and LS				
Roost survey results: (species and numbers, roost location, access points (include number of them) and dimensions where appropriate: Few noctule passes and constant common pipistrelle and some soprano pipistrelle foraging behind the barn, some social calls were also recorded. One common pipistrelle emerged from the lower, left gable end at 19:52 (28 minutes after sunset) and flew north.				
Survey 3 – access refused				

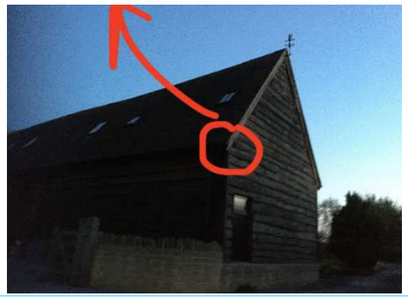
Date of Survey	Start and End Times and Time of Sunset	Structure Reference	Equipment Used (include make of bat detectors and logging equipment)	Weather (include start and end temps, precipitation, Beaufort wind scale etc)
Photos/ diagrams:				

Table 4-7 - Survey Results BU_762

Date of Survey	Start and End Times and Time of Sunset	Structure Reference	Equipment Used (include make of bat detectors and logging equipment)	Weather (include start and end temps, precipitation, Beaufort wind scale etc)
22/08/2019	Daytime inspection (external only)	BU_762	N/A	Air temp: 19 (˚C), very light rain, cloud cover 8, wind speed 1
Comments: Atkins: SK and IH				
Visual inspection results (roost type, roost location, access points and dimensions of roost or explanation where the roost is): Long barn half of which has been converted into a residential structure with other half type of car port. Car port ceiling has been boarded with timber panelling. Two timber trusses without central post present. Roof duo pitched, laid with simple plain clay tiles and clay ridge. Walls brick. Some old timber beams present. Timber fascia present. Droppings likely from pipistrelle were recorded inside car port, on top of wood pile at eastern end of barn. Potential roosting locations include gaps between internal timber panels and wall.				
Access refused for hibernation survey	Hibernation static deployment	N/A	N/A	N/A
06/09/2019	04:58 to 06:43 (sunrise = 06:28)	BU_762	Walkabout and EMT 2 x 3	Air temp: 13.1 up to 13.6 (˚C), no rain, cloud cover 100%, wind speed 1/ 2
Comments: Biocensus: CB, AB, AM and JS				
Roost survey results: (species and numbers, roost location, access points (include number of them) and dimensions where appropriate: Very little bat activity, all but one bat (soprano pipistrelle) were common pipistrelles and one brown long-eared bat, recorded foraging and commuting. A common pipistrelle was seen at 06:17 (26 minutes before sunrise) that was assumed to return to the roost in BU_771.				
17/09/2020	19:02 to 20:47 (sunset = 19:17)	BU_762	Walkabout x 4	Air temp: 21.3 down to 18.1 (˚C), no rain, cloud cover 0, wind speed 1
Comments: Atkins: SK, EH, JH and HM				
Roost survey results: (species and numbers, roost location, access points (include number of them) and dimensions where appropriate: At 19:35 a common pipistrelle bat was seen to emerge from the southern elevation although the exact location was unknown. A further common pipistrelle emerged from under the apex ridge tile and headed south at 19:40 (23 minutes after sunset). Other bats included soprano pipistrelle and ***Myotis***.				
Survey 3 – access				
Photos/ diagrams:  				

Table 4-8 - Survey Results BU_376

Date of Survey	Start and End Times and Time of Sunset	Structure Reference	Equipment Used (include make of bat detectors and logging equipment)	Weather (include start and end temps, precipitation, Beaufort wind scale etc)
17/07/2019	Daytime inspection (external only)	BU_376	N/A	Air temp: 23 (˚C), no rain, cloud cover 7, wind speed 1
Comments: Atkins: SK and IM				
Visual inspection results (roost type, roost location, access points and dimensions of roost or explanation where the roost is): Brick constructed structure with cross gabled roof laid with double Roman concrete tiles. Concrete ridge tiles. Brick chimney. Double glazed windows in timber surrounds. Closed soffits throughout (plastic and boarding). Likely pipistrelle droppings on window below soffit under gable, although this was not sent for DNA analysis.				
02/03/2021 – 25/03/2021	Hibernation static deployment	BU_638	Swift and EasyLog USB - Lascar temperature and humidity data logger	Between -3.5 and 22 (˚C)
Comments: Atkins: RM and TS, however deployed internally by landowner				
Hibernation results: No bat activity was recorded				
17/07/2019	21:04 to 22:49 (sunset = 21:19)	BU_376	Walkabout x 3	Air temp: 19 down to 18 (˚C), no rain, cloud cover 7, wind speed 1
Comments: Atkins: SK, IH, and HY				
Roost survey results: (species and numbers, roost location, access points (include number of them) and dimensions where appropriate: Several passes by common pipistrelle, some very early on however detector did not register the calls. Common pipistrelle appeared at 21:47 (28 minutes after sunset) and the exact roost location could not be determined, but the roost is likely in a structure nearby.				
16/09/2020	05:09 to 07:24 (sunrise = 07:09)	BU_376	Walkabout x 2, Scout x 2 and Batlogger	Air temp: 10 (˚C), no rain, cloud cover 6, wind speed 1
Comments: Biocensus: JC, AB, LS and FT				
Roost survey results: (species and numbers, roost location, access points (include number of them) and dimensions where appropriate: Few records of common pipistrelle, ***Myotis*** and brown long-eared bats. No bats seen to emerge.				
23/6/2021	21:15 to 23:10 (sunset = 21:32)	BU_376	Walkabout x 3	Air temp: 19.6 to 19.9 (˚C), no rain, cloud cover 5/6, wind speed 1
Comments: Biocensus: OG, PC, DT and WT				
Roost survey results: (species and numbers, roost location, access points (include number of them) and dimensions where appropriate: Two pipistrelle emergences from soffit on east and south elevations (view obscured by pergola) at 21:59 and 22:17 (27 and 45 minutes after sunset). A further common pipistrelle was seen to emerge (the exact location was not determined despite using an infra-red camera) at 22:09 (37 minutes after sunset). Garage structure next door also surveyed - no emergences from there. Very quiet otherwise. Some pipistrelle foraging activity later on in the evening and ***Myotis*** pass				
Photos/ diagrams:  				

Table 4-9 - Survey Results BU_378

Date of Survey	Start and End Times and Time of Sunset	Structure Reference	Equipment Used (include make of bat detectors and logging equipment)	Weather (include start and end temps, precipitation, Beaufort wind scale etc)
17/07/2019	Daytime inspection (external only)	BU_378	N/A	Air temp: 23 (˚C), no rain, cloud cover 7, wind speed 1
Comments: Atkins: DK and IH				
Visual inspection results (roost type, roost location, access points and dimensions of roost or explanation where the roost is): Lean-to attached to BU_356 constructed from breeze block with corrugated asbestos sheets as roof covering. South elevation is open leading into one section of the structure used as garage and for storage. The rest of the structure is compartmentalised. Large timber barn doors are present on the west elevation. The windows present on this elevation have been boarded up from inside. Corrugated asbestos sheets sit directly on top of timber cut offs which are fixed to the wall plate. Bat droppings (likely pipistrelle) on top of car.				
DNA: date collected 17/07/2019 – Common pipistrelle				
No hibernation suitability				
22/07/2019	20:58 to 23:13 (sunset = 21:13)	BU_834/ BU_378/	Walkabout x 1 and EMT 2 x 3	Air temp: 19.8 down to 16.9 (˚C), no rain, cloud cover 6, wind speed 0
Comments: Biocensus: CB, AM, AB and VB				
Roost survey results: (species and numbers, roost location, access points (include number of them) and dimensions where appropriate: One common pipistrelle emerged from east facing roof pitch of a different structure BU_834. Majority of bat activity was attributed to commuting and to a lesser extent foraging common pipistrelles. One soprano pipistrelle and one noctule pass recorded, with a couple of ***Myotis*** passes also.				
16/09/2020	19:05 to 20:50 (sunset = 19:20)	BU_834/ BU_378/ BU_356	Walkabout, Batlogger M, EMT 2 and Scout	Air temp: 19 down to 17 (˚C), no rain, cloud cover 8, wind speed 3/ 5
Comments: Biocensus: JC, CM, AB and VB				
Roost survey results: (species and numbers, roost location, access points (include number of them) and dimensions where appropriate: Records of common pipistrelle and soprano pipistrelle, and noctule. No bats seen to emerge.				
02/07/2021	02:00 to 06:00 (sunrise TBC)	BU_378	TBC	TBC
Comments: Middlemarch: HS and RD				
Roost survey results: (species and numbers, roost location, access points (include number of them) and dimensions where appropriate: No emergence recorded, pipistrelle, brown long-eared and ***Myotis*** activity recorded.				
Photos/ diagrams:   				

Table 4-10 - Survey Results BU_379

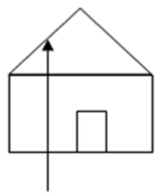
Date of Survey	Start and End Times and Time of Sunset	Structure Reference	Equipment Used (include make of bat detectors and logging equipment)	Weather (include start and end temps, precipitation, Beaufort wind scale etc)
17/07/2019	Daytime inspection (external only)	BU_379	N/A	Air temp: 23 (˚C), no rain, cloud cover 7, wind speed 1
Comments: Atkins: SK and IH				
Visual inspection results (roost type, roost location, access points and dimensions of roost or explanation where the roost is): Barn/ shed with timber clad walls and corrugated asbestos roof with metal ridge; timber bargeboards with soffit box present on gable ends; windows boarded up; expanding foam appears to have been utilised on the interior to seal/ insulate structure. No evidence recorded of bats, some gaps under corrugated asbestos.				
No hibernation suitability				
23/07/2019	03:17 to 05:32 (sunset = 05:17)	BU_368 and BU_351 (incidental sighting)	Walkabout x 1 and EMT 2 x 3	Air temp: 17.6 down to 11.5 (˚C), no rain, cloud cover 2, wind speed 0
Comments: Biocensus: CB, AM, AB and JS				
Roost survey results: (species and numbers, roost location, access points (include number of them) and dimensions where appropriate: Observed a ***Myotis*** bat (considered likely to be Natterer's based on call analysis) enter the south facing gable end verge between the soffit and the barge board. Other bats recorded were common pipistrelle and brown long-eared.				
23/07/2019	20:57 to 22:42 (sunset = 21:12)	BU_379	Walkabout x 1 and EMT 2 x 3	Air temp: 25.3 down to 25.1 (˚C), no rain, cloud cover 2, wind speed 0
Comments: Biocensus: CB, AM, AB and JS				
Roost survey results: (species and numbers, roost location, access points (include number of them) and dimensions where appropriate: Bat activity attributed mainly to common pipistrelles commuting, three noctule passes and three ***Myotis*** passes. No bats emerged.				
10/06/2021	03:20 to 05:05 (sunrise = 04:50)	BU_379	EMT 2 x 2	Air temp: 15 (˚C), no rain, cloud cover 8/ 6, wind speed 4/ 2
Comments: Biocensus: RS and CT				
Roost survey results: (species and numbers, roost location, access points (include number of them) and dimensions where appropriate: High pipistrelle activity around BU_379, including a soprano pipistrelle bat re-entering the roost in the structure at 4:11 (49 minutes before sunrise).				
15/07/2021	20:50 to 23:30 (sunset = TBC)	BU_379	TBC	TBC
Comments: Biocensus: TA and MM				
Roost survey results: (species and numbers, roost location, access points (include number of them) and dimensions where appropriate: No emergences recorded				
Photos/ diagrams:   BAT ROOST – SOUTH ELEVATION				

Table 4-11 - Survey Results BU_834

Date of Survey	Start and End Times and Time of Sunset	Structure Reference	Equipment Used (include make of bat detectors and logging equipment)	Weather (include start and end temps, precipitation, Beaufort wind scale etc)
17/07/2019	N/A Daytime inspection (external only)	BU_834	N/A	Air temp: 23 (˚C), no rain, cloud cover 7, wind speed 1
Comments: Atkins: SK and IH				
Visual inspection results (roost type, roost location, access points and dimensions of roost or explanation where the roost is): Red brick barn with duo-pitched roof laid with clay double roman roof tiles and concrete ridge tiles. Single timber bargeboard on southern gable end. Timber fascia boards present on side elevations. Walls painted not rendered. Large timber barn doors present on both side elevations. No evidence recorded, potential bat access under ridge from southern gable end.				
Proposed for winter 2021/2022	Hibernation static deployment	BU_834		
22/07/2019	20:58 to 23:13 (sunset = 21:13)	BU_834/ BU_378/ BU_356	Walkabout x 1 and EMT 2 x 3	Air temp: 19.8 down to 16.9 (˚C), no rain, cloud cover 6, wind speed 0
Comments: Biocensus: CB, AM, AB and JS				
Roost survey results: (species and numbers, roost location, access points (include number of them) and dimensions where appropriate: One common pipistrelle emerged from east facing roof pitch of BU_834. Majority of bat activity was attributed to commuting and to a lesser extent foraging common pipistrelles. One soprano pipistrelle and one noctule pass recorded, with a couple of Myotis passes also.				
16/09/2020	19:05 to 20:50 (sunset = 19:20)	BU_834/ BU_378/ BU_356	Walkabout, Batlogger M, EMT 2 and Scout	Air temp: 19 down to 17 (˚C), no rain, cloud cover 8, wind speed 3/5
Comments: Biocensus: JC, CM, AB and VB				
Roost survey results: (species and numbers, roost location, access points (include number of them) and dimensions where appropriate: Records of common pipistrelle and soprano pipistrelle, and noctule. No bats seen to emerge.				
02/07/2021	02:40 to 05:10 (sunrise 04:55)	BU_834	EMT 2 x 2	TBC
Comments: Middlemarch: HS and RD				
Roost survey results: (species and numbers, roost location, access points (include number of them) and dimensions where appropriate: Pipistrelle, brown long-eared and Myotis activity, no emergences recorded.				
Photos/ diagrams: 				

Table 4-12 - Survey Results BU_507

Date of Survey	Start and End Times and Time of Sunset	Structure Reference	Equipment Used (include make of bat detectors and logging equipment)	Weather (include start and end temps, precipitation, Beaufort wind scale etc)
25/09/2020	Daytime inspection (external only)	BU_507	N/A	Air temp: 11 (˚C), no rain, cloud cover 2, wind speed 4
Comments: AL and TS				
Visual inspection results (roost type, roost location, access points and dimensions of roost or explanation where the roost is): Two-storey semi-detached residential property which is owned by the council (built in 1924) and has now become derelict. The structure is constructed from red brick masonry which is in generally good condition. Attached to BU_629. The roof is hipped and laid with imitation slate tiles. The ridge tiles are likely concrete and appear to be intact. Across the entirety of the property the windows are modern uPVC, with no evidence of gaps around the frames. The structure has three chimneys across its roof, with lead flashing at each base. There is also lead flashing between the extension and the main structure. On the eastern aspect there is a porch with a pitched roof of slate imitation tiles. On the gable end of the porch there is wooden cladding. On the northern, rear, elevation of the house there is an extension containing two out structures. In one of these outbuildings, with doors propped open, there is a concentration of droppings (see DNA below) found in the middle room of the extension which can be accessed via an open door. There are a number of slipped and missing roof tiles and uneven ridge tiles present on the main house. There is missing lead flashing between the extension and house with mortar missing between the bricks. Closed soffits are present under the eaves of the main house with some minor gaps between the structure and soffit box. The porch roof tiles and ridge tiles are significantly damaged. The porch cladding has been painted and hence there are no gaps suitable for roosting.				
DNA: date collected 28/10/2020 – Lesser horseshoe				
Proposed for winter 2021/2022	Hibernation static deployment	BU_507		
09/06/2021	03:14 to 04:59 (sunrise = 04:44)	BU_507	EMT 2 x 4	Air temp: 13 down to 10 (˚C), no rain, cloud cover 0, wind speed 5/ 2
Comments: Biocensus: NS, CT, RS and BC				
Roost survey results: (species and numbers, roost location, access points (include number of them) and dimensions where appropriate: Return to roost (soprano pipistrelle) on east side porch under tiles of BU_507 (circled in front of roost then appeared to fly under one of the slipped tiles on the small porch over door) at 03:56 (48 minutes before sunrise). Lots of common pip activity with them foraging around the structure and particularly in the gardens.				
Photos/ diagrams:				

Table 4-13 - Survey Results BU_610

Date of Survey	Start and End Times and Time of Sunset	Structure Reference	Equipment Used (include make of bat detectors and logging equipment)	Weather (include start and end temps, precipitation, Beaufort wind scale etc)
25/09/2020	Daytime inspection (external only)	BU_610	N/A	Air temp: 11 (˚C), no rain, cloud cover 2, wind speed 4
Comments: AL and TS				
Visual inspection results (roost type, roost location, access points and dimensions of roost or explanation where the roost is): Two-storey semi-detached residential property which is owned by the council (built in 1924) and was formerly occupied by council tenants but has now become derelict. The walls are constructed from red brick. The roof is hipped and laid with (possibly imitation) slate roof tiles. On the western aspect there is an open porch with a pitched roof also with slate imitation tiles. The front elevation to the south is largely covered by ivy. The windows were updated uPVC with no evidence of crevices. On the northern elevation there is an extension with a pitched roof. There was lead flashing present between the extension and main structure, and around the three chimneys. On the northern extension one doorway, the central outhouse room, was covered by chipboard. There are a number of missing, broken, uneven or slipped roof tiles. The hip tiles on the NW hip are uneven and the last tile is missing. There are gaps under the ridge tiles. Between the extension and main house the lead flashing is missing with missing mortar between the bricks which would have been covered by lead flashing. There is ivy on the front of the house which may hide features. On the western aspect there appears to be a gap in the chimney above the lead flashing. There is a waste pipe out of the roof with possible lifted lead flashing at its base but which may not provide a suitable crevice. Across the structure, including the extension, there is a soffit box with small gaps evident above the second storey windows. On the extension there are a number of slipped tiles. The ridge tiles of the extension are uneven. The right hand door to the extension was closed. The left hand door (central) was boarded shut. One noted access point into structure through open vent (missing vent pipe approx. 7cm across). Ivy cover potentially hiding gaps. Access points for bats into structure through open vent (missing vent pipe approx. 7 cm across). Evidence of birds are getting in due to the presence of bird droppings			
Winter 2021/2022	Hibernation static deployment	BU_610		
22/06/2021	21:17 to 23:05 (sunset = 21:32)	BU_610/ BU_611	Walkabout x 4	Air temp: 16 down to 10 (˚C), no rain, cloud cover 1, wind speed 0
Comments: Biocensus: KS, DT, WF and PC				
Roost survey results: (species and numbers, roost location, access points (include number of them) and dimensions where appropriate: A very quiet survey comprising of a few soprano and common pipistrelle, ***Myotis*** and noctule calls. Noctule emergence at 22:11 (39 minutes after sunset) from the base of the chimney. One common pipistrelle also emergence from a gap under the tile at 22:00 (28 minutes after sunset), observed by a surveyor on the south eastern observation location (both from BU_610).				
15/07/2021	21:17 to 23:05 (sunset = 21:32)	BU_610/ BU_611	SM4/ Duet	Air temp: 22 down to 18 (˚C), no rain, cloud cover 0, wind speed 0/ 1
Comments: Keystone: JH and GW				
Roost survey results: (species and numbers, roost location, access points (include number of them) and dimensions where appropriate: No emergences observed. Bats not inside the outdoor room.				
04/08/21	20:41 to 22:54 (sunset = 21:54)	BU_610/ BU_611	SM4/ Duet and EMT 2	Air temp: 19 down to 17 (˚C), no rain, cloud cover 6/ 7, wind speed 0
Comments: Keystone: TS and LS				
Roost survey results: (species and numbers, roost location, access points (include number of them) and dimensions where appropriate: One common pipistrelle emergence from the north side of roof.				
Photos/ diagrams:  				

Table 4-14 - Survey Results BU_611

Date of Survey	Start and End Times and Time of Sunset	Structure Reference	Equipment Used (include make of bat detectors and logging equipment)	Weather (include start and end temps, precipitation, Beaufort wind scale etc)
25/09/2020	N/A Daytime inspection (external only)	BU_611		Air temp: 11 (˚C), no rain, cloud cover 2, wind speed 4
Comments: AL and TS				
Visual inspection results (roost type, roost location, access points and dimensions of roost or explanation where the roost is): Two-storey semi-detached residential property which is owned by the council (built in 1927) and was formerly occupied by council tenants but has now become derelict. The walls are brick construct and in generally good condition. The roofs are comprised of slate imitation tiles generally in good condition and flush the roof, there are some evidence of lifted tiles. The northern, rear, elevation is partially covered by scrub including bramble which may limit visibility. The windows are modern white uPVC with no features around them. The structure has 3 chimneys across the roof, with lead flashing at each base. To the rear, northern elevation, of the property there is an extension with two outhouse doors facing east. One of these doors, on the right, was left open. Within this external toilet there were a number of bat droppings found (see below). Ridge tiles on the NE hip roof ridge of the main house have some gaps, with a small gap below one of the hip tiles. There is also lifted lead flashing on the eastern aspect of the chimney. Left hand side room to the extension is a confirmed bat roost, within the room there is a hole in the top right-hand corner of the room which may lead into a roof void. Although the most likely access into the toilet is via the open door. Droppings were characteristic of lesser horseshoe bats. There are gaps under the ridge tile of the extension, and holes in the wall and bricks above the extension. There is a significant access limitation to this property due to the bramble. This structure is directly attached to BU_610 and should be surveyed as one. In the outside toilet are ca100 droppings, accessed via doorway, likely lesser horseshoe.				
DNA: date collected 28/10/2020 – Lesser horseshoe				
Winter 2021/2022	Hibernation static deployment	BU_611		
22/06/2021	21:17 to 23:05 (sunset = 21:32)	BU_611	Walkabout x 4	Air temp: 16 down to 10 (˚C), no rain, cloud cover 1, wind speed 0
Comments: Biocensus: KS, DT, WF and PC				
Roost survey results: (species and numbers, roost location, access points (include number of them) and dimensions where appropriate: A very quiet survey comprising of few soprano and common pipistrelle, ***Myotis*** and noctule calls. No emergences from this property during the survey.				
15/07/2021	21:17 to 23:05 (sunset = 21:32)	BU_610/ BU_611	SM4/ Duet x 2	Air temp: 22 down to 18 (˚C), no rain, cloud cover 0, wind speed 0/ 1
Comments: Keystone: TS and LH and camera				
Roost survey results: (species and numbers, roost location, access points (include number of them) and dimensions where appropriate: No emergences observed. Bats not inside the outdoor room.				
04/08/2021	20:41 to 22:54 (sunset = 21:54)	BU_610/ BU_611	SM4/ Duet and EMT 2	Air temp: 19 down to 17 (˚C), no rain, cloud cover 6/ 7, wind speed 0
Comments: Keystone: TA and JM				
Roost survey results: (species and numbers, roost location, access points (include number of them) and dimensions where appropriate: No bats emerged from BU_611.				
Photos/ diagrams:  				

Table 4-15 - Survey Results BU_709

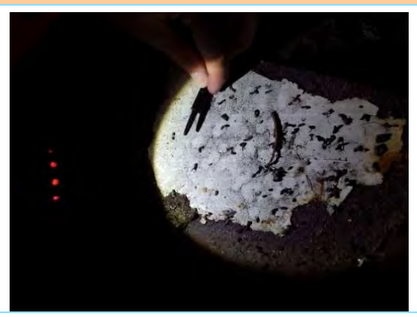
Date of Survey	Start and End Times and Time of Sunset	Structure Reference	Equipment Used (include make of bat detectors and logging equipment)	Weather (include start and end temps, precipitation, Beaufort wind scale etc)
25/09/2020	N/A Daytime inspection (external only)	BU_709		Air temp: 11 (˚C), no rain, cloud cover 2, wind speed 4
Comments: AL and TS				
Visual inspection results (roost type, roost location, access points and dimensions of roost or explanation where the roost is): Two-storey semi-detached residential property which is owned by the council (built in 1927) and was formerly occupied by council tenants but has now become derelict. The property has a hipped roof laid with flat slate imitation tiles. The walls are made of red brick and are in good condition. The ridge tiles are likely concrete. A closed timber soffit box is present all around the main house. The structure has three chimneys across its entirety with lead flashing at each base. The windows are modern uPVC. On the western elevation of the structure, there is a porch with a pitched roof and slate imitation tiles, brick walls and a double door made of PVC. The porch has painted timber cladding on its gable end. Towards the northern elevation, the rear of the property, there is an extension with an external door and two outhouse structures. The extension has a pitched roof also laid with (imitation) slate tiles. On the main house there are gaps under the ridge tiles near the westernmost chimney. Missing mortar is present below the hip tiles on the NW aspect. The roof tiles of the porch have slipped, but the lead flashing between the porch and house is flush. Out of the roof there is a waste pipe, the lead flashing at the base of this appears to be lifted but may not provide a suitable crevice. Visibility of these aspects is limited due to the vegetation. There is lead flashing missing between the extension and the main house. The roof tiles on the western elevation of the extension are severely damaged with large numbers missing. The outhouse door to the toilet was left open allowing access to the inside and number of further crevices were found within the toilet and storage structures. A concentration of droppings characteristic of lesser horseshoe bats was found in the outhouse toilet.				
DNA: date collected 28/10/2020 – Lesser horseshoe				
Winter 2021/2022	Hibernation static deployment	BU_709		
24/06/2021	21:20 to 23:35 (sunset = 21:35)	BU_709	SM4/ Duet and EMT 2	Air temp: 20 down to 15 (˚C), rain 2/ 1, cloud cover 7, wind speed 1
Comments: Middlemarch: LH and HS				
Roost survey results: (species and numbers, roost location, access points (include number of them) and dimensions where appropriate: Multiple foraging bats, mostly common pipistrelles foraging in the north east of the properties, no bat emergences. ***Myotis*** also foraging in the area. Limitations included: Light Rain, Adjacent to A4019 meant interference from traffic. South west corner of the property heavily vegetated and visibility hindered.				
9/07/21	03:30 to 05:15 (sunrise = 05:00)	BU_709	EMT 2 and Samsung tablet plus IR camera	Air temp: 16 (˚C), no rain, cloud cover 2, wind speed 0
Comments: Biocensus: AR, CM, NS and JM				
Roost survey results: (species and numbers, roost location, access points (include number of them) and dimensions where appropriate: No bat roosting was observed.				
Photos/ diagrams:  				

Table 4-16 - Survey Results BU_819

Date of Survey	Start and End Times and Time of Sunset	Structure Reference	Equipment Used (include make of bat detectors and logging equipment)	Weather (include start and end temps, precipitation, Beaufort wind scale etc)
25/09/2020	Daytime inspection (external only)	BU_819	N/A	Air temp: 11 (˚C), no rain, cloud cover 2, wind speed 4
Comments: AL and TS				
Visual inspection results (roost type, roost location, access points and dimensions of roost or explanation where the roost is): Two-storey semi-detached residential property which is owned by the council (built in 1924) and was formerly occupied by council tenants but has now become derelict. The roof is hipped and comprises of slate imitation tiles, with concrete ridge tiles many of which have been replaced. The structure has three chimneys with lead flashing at each of their bases. Some of the ridge tiles on the southern elevation are lifted. The window frames and door frames have been updated to modern uPCV. The structure has a porch on the western elevation which has a pitched roof with slate imitation tiles. On the northern elevation, the rear of the property, there is an extension which is an original outhouse. On the main house the ridge tiles are intact with some minor lifting along the crest, particularly on the front southern elevation. There are some gaps between the closed soffit box and the wall. There is some lifted lead flashing at the base of the chimney. There are some uneven roof tiles on the main house. All lead flashing is intact and flush to the roof. There is a large gap around the waste pipe on the NW corner of the structure. The slate imitation tiles on the extension to the north are mostly flush to the roof with some evidence of lifting. On the northern elevation there is a waste pipe under the guttering, with a potential access point for bats. There are small gaps in the soffit box above the door to the extension either side of the door approximately 2 to 4 cm. An original door to the outhouse remains, which has been left open allowing bats access to the toilet. A number of bat droppings characteristic of lesser horseshoe bats were found and droppings collected. Within the garden there is also a shed with tight shiplap timber cladding. This was assessed to have negligible suitability. In the outside toilet are approximately 30 droppings, accessed via doorway, likely lesser horseshoe.				
DNA: date collected 28/10/2020 – Lesser horseshoe				
Winter 2021/2022	Hibernation static deployment	BU_819		
08/07/2021	21:14 to 23:29 (sunset = 21:29)	BU_819	EMT 2 x 2	TBC
Comments: Middlemarch: HS and RD				
Roost survey results: (species and numbers, roost location, access points (include number of them) and dimensions where appropriate: Foraging at the northern garden of the property. Mostly P. pip and a single ***Myotis***. Single noctule pass heading south. No bats emerged.				
22/07/21	03:16 to 05:3 (sunrise = 05:16)	BU_819	EMT 2 and Batlogger M2	TBC
Comments: Middlemarch: VW and RD				
Roost survey results: (species and numbers, roost location, access points (include number of them) and dimensions where appropriate: Heard pipistrelles, but very little activity. No activity from 04:20 onwards.				
09/08/2021	20:29 to 22:44 (sunset = 20:44)	BU_819	EMT 2 x 2 and thermal camera	Air temp: 16/ 15 (˚C), no rain, cloud cover 8/ 3, wind speed 1
Comments: Keystone: JH and TS				
Roost survey results: (species and numbers, roost location, access points (include number of them) and dimensions where appropriate:				
Photos/ diagrams:  				

Table 4-17 - Survey Results BU_574

Date of Survey	Start and End Times and Time of Sunset	Structure Reference	Equipment Used (include make of bat detectors and logging equipment)	Weather (include start and end temps, precipitation, Beaufort wind scale etc)
03/12/2020	N/A Daytime inspection (external only)	BU_574	N/A	Air temp: 5 (˚C), no rain, cloud cover 8, wind speed 1
Comments: Atkins: SK and RM				
Visual inspection results (roost type, roost location, access points and dimensions of roost or explanation where the roost is): Shed: Red brick single storey stable block. Three open rooms (2x stable blocks and a storage tack room), doors open. Wooden window frames. Clay roof and ridge tiles. Gable ended to west and east. Sarking boarding between rafters and tiles. Rooms are all used for storage. There is also an open window on the western gable end and on the south side of the central room. East stable block: Small cluster of medium sized droppings, directly under the ridge. There could be access at this point to the ridge. Approximately 20 to 30 dropping present. Accessed by open barn door. Tack room: Small cluster of medium sized droppings, underneath the ridge found on compost bags and amongst leaves. Taken for analysis as could be shrew droppings. Approximately 30 to 40 droppings present. Accessed via an open door.				
DNA: date collected 3/12/2020 – Lesser horseshoe (on compost in the tack room / stable room) and Natterer's (under stained section of sarking / storage room)				
03/02/2021 – 25/03/2021	03/02/2021 – 25/03/2021	03/02/2021 – 25/03/2021	03/02/2021 – 25/03/2021	03/02/2021 – 25/03/2021
Comments: Atkins: RM and TS, however deployed internally by landowner				
Hibernation results: No bat activity was recorded				
25/05/2021	20:55 to 22:47 (sunset = 21:12)	BU_574	Walkabout x 4	TBC
Comments: Biocensus: OG, KS, DT and JC				
Roost survey results: (species and numbers, roost location, access points (include number of them) and dimensions where appropriate: Common pipistrelle emergence at 21:30 (TBC)				
02/07/2021	02:40 to 05:10 (sunrise 04:55)	BU_574	EMT 2 x 2	TBC
Comments: Middlemarch SM and BH				
Roost survey results: (species and numbers, roost location, access points (include number of them) and dimensions where appropriate: No bats emerged from or entered any features. Low numbers of brown long-eared, common pipistrelle, soprano pipistrelle, ***Myotis*** and noctule passes.				
20/07/2021	21:00 to 23:15 (sunset 21:15)	BU_574	SM4/ Duet	Air temp: 27 down to 24 (˚C), no rain, cloud cover
Comments: Keystone: JH and TS				
Roost survey results: (species and numbers, roost location, access points (include number of them) and dimensions where appropriate: One common pipistrelle re-entry and emerged a few seconds after. Flew into other side of stables soon after. At end of survey a bat emerged but did not echolocate assumed to be brown long-eared.				
Photos/ diagrams:   				

Table 4-18 - Survey Results BU_1030

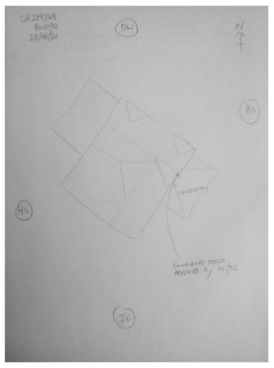
Date of Survey	Start and End Times and Time of Sunset	Structure Reference	Equipment Used (include make of bat detectors and logging equipment)	Weather (include start and end temps, precipitation, Beaufort wind scale etc)
31/07/2021	Daytime inspection (external only)	BU_1030	N/A	Air temp: 20 (˚C), no rain, cloud cover 8, wind speed 2
Comments: Atkins: SK and RM				
Visual inspection. Butterfly roof with two pitched roofs with gable ends. Slate roof tiles which are flush to the roof. Two dormers with lead flashing at the base where they meet the main roof. Large gap where the ridge tile meets the lead flashing. Plastic soffit boxes and timber bargeboards on the gable ends. Red brick chimney. Red brick around door frame. Walls are brick, rendered with concrete and painted. Lead flashing on eastern chimney is lifted. Conservatory on eastern extension consists of brick and glass. Hole under apex on eastern aspect above conservatory. Skylight in rear of property. Missing tile on eastern aspect of southern elevation. Gaps under southern bargeboard. Broken tile on the southern aspect to west of pitched roof end. Garage corrugated asbestos roof, slightly pitched. Access under the roof through into garage. No bat evidence recorded.				
Proposed for winter 2021/2022	Hibernation static deployment	BU_1030		
28/08/2020	19:49 to 21:34 (sunset = 20:04)	BU_1030	Batlogger, EMT 2 x 2, Scout	Air temp: 14.3 down to 12.7 (˚C), no rain, cloud cover 8, wind speed 2/ 3
Comments: Biocensus: FW, HC, HS and JC				
Roost survey results: (species and numbers, roost location, access points (include number of them) and dimensions where appropriate: Noctules commuting/foraging overhead, single passes from common pipistrelle, ***Myotis*** and long-eared bat. Two common pipistrelle bats emerged from apex and flew south at 20:30 and 20:36 (26 and 32 minutes after sunset)				
Photos/ diagrams:				

Table 4-19 - Survey Results BU_747

Date of Survey	Start and End Times and Time of Sunset	Structure Reference	Equipment Used (include make of bat detectors and logging equipment)	Weather (include start and end temps, precipitation, Beaufort wind scale etc)
18/07/2019	N/A Daytime inspection (external only)	BU_747	N/A	Air temp: 19 (˚C), no rain, cloud cover 6, wind speed 1
Comments: Atkins: SK and IH				
Visual inspection. Shed with timber frame, flat corrugated asbestos roof and walls; one wall is partially brick; concrete floor. 1-4 small sized droppings on stored wood.				
No hibernation suitability				
05/09/2019	19:32 to 21:17 (sunset = 19:47)	BU_747	EMT 2 and Walkabout	Air temp: 12.4 down to 11 (˚C), no rain, cloud cover 0, wind speed 0/ 1
Comments: Biocensus: CB and JC – Seven surveyors covering ten structure references.				
Roost survey results: (species and numbers, roost location, access points (include number of them) and dimensions where appropriate: Lots of common pipistrelle foraging and commuting with occasional ***Myotis*** passes. Regular bat activity throughout survey by ***Myotis*** (likely Natterer's) , common pipistrelle and few passes from brown long-eared and soprano pipistrelle. One Lesser horseshoe bat at 20:16 emerged (29 minutes after sunset), seen by S3 (James Sweetman) from BU_747.				
Access refused				

Photos/ diagrams:





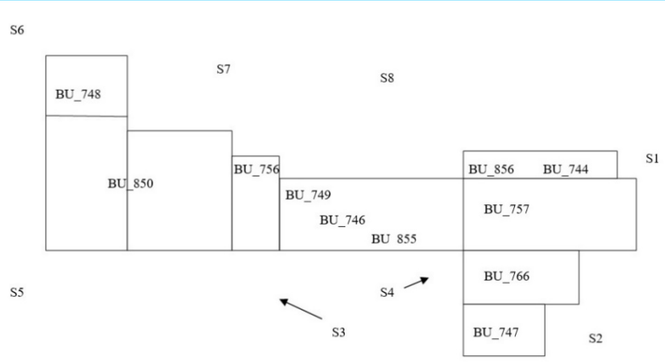


Table 4-20 - Survey Results BU_748

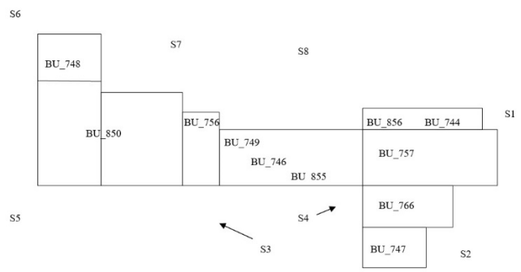
Date of Survey	Start and End Times and Time of Sunset	Structure Reference	Equipment Used (include make of bat detectors and logging equipment)	Weather (include start and end temps, precipitation, Beaufort wind scale etc)
18/07/2019	N/A Daytime inspection (external only)	BU_748/ BU_850	N/A	Air temp: 19 (˚C), no rain, cloud cover 6, wind speed 1
Comments: Atkins: SK and IH				
Visual inspection: Three storey residential structure with a series of extensions. On the northern elevation a two-storey extension with gabled roof and church style windows with stone surrounds (maybe formerly a chapel). On the eastern elevation of the main house a two-storey extension is attached with a dormer window on the southern side, attached to the east of this a single storey extension containing garages which is listed as a separate structure (BU_855). Main house is cross-gabled; three brick chimneys; plain clay tiles; stone ridge; lead flashing; dormer window covered with lead. Some new PVC windows. Timber beams on wall plate with joint holes. A brick wall is attached to the northern most extension. Stone wall (attached to house) has gaps between brickwork. No internal access.				
Access refused for hibernation survey	Hibernation static deployment	N/A	N/A	N/A
05/09/2019	19:32 to 21:17 (sunset = 19:47)	BU_748 / BU_850	EMT 2 and Walkabout	Air temp: 12.4 down to 11 (˚C), no rain, cloud cover 0, wind speed 0/ 1
Comments: Biocensus: CB and AB Seven surveyors covering ten structure references.				
Roost survey results: (species and numbers, roost location, access points (include number of them) and dimensions where appropriate: Lots of common pipistrelle foraging and commuting with occasional ***Myotis*** passes. Regular bat activity throughout survey by ***Myotis*** (likely Natterer's) , common pipistrelle and few passes from brown long-eared and soprano pipistrelle. One common pipistrelle emergence from gable end of 'BU_748' observed by S6 (Alex Blundell).				
Access refused				
Photos/ diagrams:   				

Table 4-21 - Survey Results BU_751

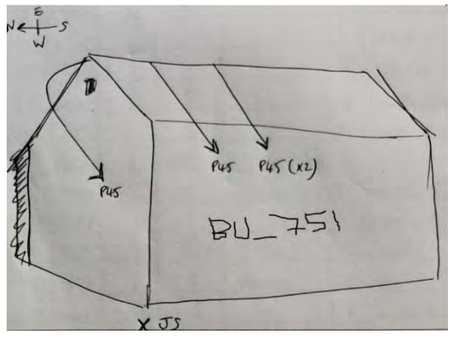
Date of Survey	Start and End Times and Time of Sunset	Structure Reference	Equipment Used (include make of bat detectors and logging equipment)	Weather (include start and end temps, precipitation, Beaufort wind scale etc)
18/07/2019	Daytime inspection (external only)	BU_751	N/A	Air temp: 19 (˚C), no rain, cloud cover 6, wind speed 1
Comments: Atkins: SK and IH				
Visual inspection. 'The Hayloft' - red brick structure with two storeys and pitched roof with gable ends; separate loft space; flat, plain clay tiles with clay ridge; gable end has timber cladding in old window opening (south). No bargeboards present. Tiles directly on top of wall plate; battens visible at Northern gable end; lead flashing on southern gable end. Access points include: Uneven, slipped, missing roof tiles; gaps between brick at south gable end; gaps where tiles meet wall plate; gaps at northern gable end where battens and tiles overhang.				
Access refused for hibernation survey				
29/07/2019	20:43 to 22:33 (sunset = 21:03)	BU_751	Walkabout and EMT 2	Air temp: 18.3 down to 16.5 (˚C), no rain, cloud cover 4, wind speed 3
Comments: Biocensus: CB and JS				
Roost survey results: (species and numbers, roost location, access points (include number of them) and dimensions where appropriate: JS observed four common pipistrelle bats emerging from the west elevation, (three from the ridge tiles at gable end at 21:24, 21 minutes after sunset, and one at 21:35, 33 minutes after sunset). Also an assumed brown long-eared bat was seen returning to the roost at 21:50 (47 minutes after sunset), but was not echo-locating. Other bats recorded include ***Myotis*** and noctule.				
09/09/2020	19:20 to 21:05 (sunset = 19:36)	BU_751	Scout and EMT 2	Air temp: 18 down to 16 (˚C), no rain, cloud cover 3, wind speed 2
Comments: AH and DN				
Roost survey results: (species and numbers, roost location, access points (include number of them) and dimensions where appropriate: Likely brown long-eared bat emerged at 19:58 (22 minutes after sunset) from wooden slats on gable end. Emerged and flew west (no recorded noise). Also recorded common and soprano pipistrelle, brown long-eared***. Myotis*** and a big bat (Nyctaloid)				
Access refused				
Photos/ diagrams:   				

Table 4-22 - Survey Results BU_752

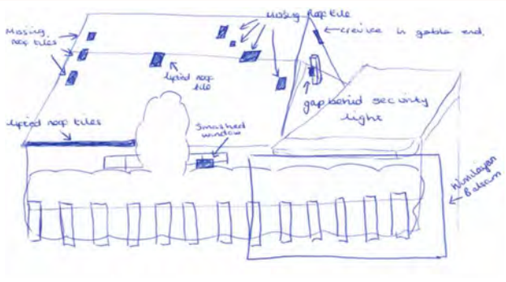
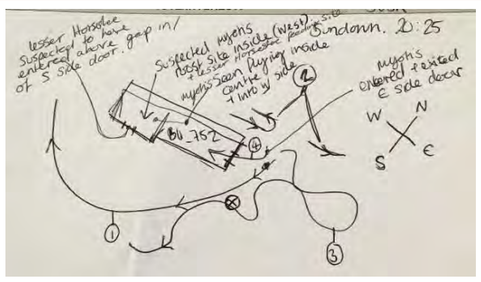
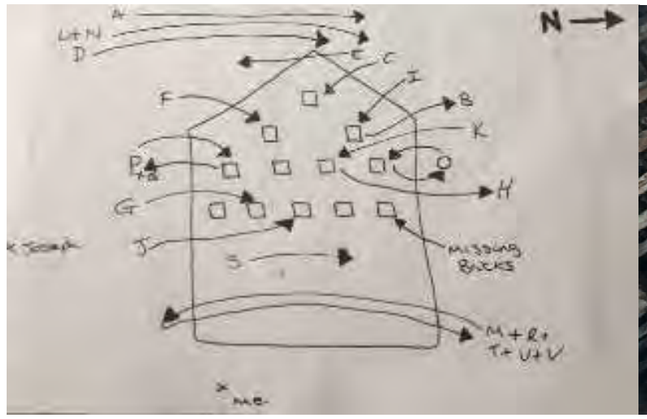
Date of Survey	Start and End Times and Time of Sunset	Structure Reference	Equipment Used (include make of bat detectors and logging equipment)	Weather (include start and end temps, precipitation, Beaufort wind scale etc)
18/07/2019	Daytime inspection (external only)	BU_752	N/A	Air temp: 19 (˚C), no rain, cloud cover 6, wind speed 1
Comments: Atkins: SK and IH				
Visual inspection. Single-storey red brick outbuilding; duo-pitched roof with plain clay tiles and clay ridge; door on gable end and side elevation open, timber lintels present; internal breeze block walls.				
DNA: date collected 18/07/2019 – Natterer's bat (lesser horseshoe suspected)				
Access refused for hibernation survey	Hibernation static deployment	N/A	N/A	N/A
19/08/2019	21:00 to 23:15 (sunset = 21:15)	BU_752	EMT 2 x 2 (AM and HS)	Air temp: 15 down to 14 (˚C), no rain, cloud cover 0, wind speed 3/4
Comments: Biocensus: GW, JS, SM, HS. Out of the team of four surveyors led by GW, AM and HS focused on BU_752.				
Roost survey results: (species and numbers, roost location, access points (include number of them) and dimensions where appropriate: Mostly harmonics were recorded. Lesser horseshoe seen through a window roosting within BU_752 before the survey began. AM also recorded a lesser horseshoe bat feeding and hanging on a perch at 22:06 (51 minutes after sunset). AM located on the SE corner of the structure recorded re-entry (one ***Myotis*** at 21:20 returning to roost, 5 minutes after sunset) and emergence (one ***Myotis*** at 21:25 (10 minutes after sunset) emerging via leaving the structure, exact roost site unknown). HS recorded a potential emergence from ***Myotis*** at 21:32 (17 minutes after sunset), however the location it came from could not be confirmed, so this is included as a roost as a precautionary basis, however visibility was too poor to guarantee confirmation of emergence from NW side.				
24/09/2020	18:48 to 20:31 (sunset = 19:03)	BU_752	Batlogger M, EMT 2, Walkabout and Scout	Air temp: 11 down to 10 (˚C), no rain (0) to 3 (moderate rain) by the end of the survey, cloud cover 4 up to 7, wind speed 1
Comments: Biocensus: JC, CM, WT and LS				
Roost survey results: (species and numbers, roost location, access points (include number of them) and dimensions where appropriate: Common pipistrelle foraging and noctule passes (seen foraging on previous surveys). No				
Access refused				
Photos/ diagrams:     				

Table 4-23 - Survey Results BU_757

Date of Survey	Start and End Times and Time of Sunset	Structure Reference	Equipment Used (include make of bat detectors and logging equipment)	Weather (include start and end temps, precipitation, Beaufort wind scale etc)
18/07/2019	Daytime inspection (external only)	BU_757	N/A	Air temp: 19 (˚C), no rain, cloud cover 6, wind speed 1
Comments: Atkins: SK and IH				
Visual inspection. Single-storey red brick outbuilding; duo-pitched roof with plain clay tiles and clay ridge; door on gable end and side elevation open, timber lintels present; internal breeze block walls. Access points: Exposed beams and ridge; gaps in ridge; uneven, loose, missing tiles. Open door. Droppings recorded: Medium sized droppings in Eastern section (collected for analysis). Small sized bat droppings underneath roof void box.				
Access refused for hibernation survey	Hibernation static deployment	N/A	N/A	N/A
05/09/2019	19:32 to 21:17 (sunset = 19:47)	BU_757	EMT 2 and Walkabout	Air temp: 12.4 down to 11 (˚C), no rain, cloud cover 0, wind speed 0/ 1
Comments: Biocensus: CB and JI - Seven surveyors covering ten structure references (CB and JI focusing on BU_757)				
Roost survey results: (species and numbers, roost location, access points (include number of them) and dimensions where appropriate: Lots of common pipistrelle foraging and commuting with occasional ***Myotis*** passes. Regular bat activity throughout survey by ***Myotis*** (likely Natterer's based on call analysis), common pipistrelle and few passes from brown long-eared and soprano pipistrelle bats. A lesser horseshoe from BU_757 at 20:11 (24 minutes after sunset), was an early detection but not sighted, possible light sampling before emergence; seen later (20:17) commuting low to the ground from BU_757 E-W past BU_855. Considered to be an emergence of a single lesser horseshoe with no further data available.				
29/09/2020	18:35 to 20:50 (sunset = 18:50)	BU_757	EMT 2, Scout x 2 and Batlogger M2	Air temp: 14 down to 13 (˚C), no rain, cloud cover 2/ 4, wind speed 1
Comments: Biocensus: JC, LS, DN and AB				
Roost survey results: (species and numbers, roost location, access points (include number of them) and dimensions where appropriate: Four emergences recorded from the gaps in the brick wall. Eight re-entries also recorded into the same spaces. A couple of times the bats emerged then re-entered immediately. There was a lot of activity after it was dark as well so potentially more emergences/ re-entries as they were flying around this area of the structure continuously, but it had got too dark to be sure. There was a lot of foraging activity in front of the structure and commuting bats from south-north. Mainly Common pipistrelles recorded but also a ***Myotis*** and noctule. One lesser horseshoe and one brown long-eared was recorded. Location B: Common pipistrelle emerged at 19:26 (36 minutes after sunset), then a bat re-entered at 19:27. Location F: Common pipistrelle entered the brickwork from south,-re-entry into gap on left side at 19:28 (38 minutes after sunset) Location G: Common pipistrelle entered third row from the top left side Location H = Common pipistrelle emergence, flew north from right side Location I: Common pipistrelle entered from north to top, right of structure Location J: Common pipistrelle entered middle, 3rd row down Location K: Common pipistrelle entered Location O = Common pipistrelle emerged then re-entered immediately Location P = Common pipistrelle emerged then re-entered immediately				
Access refused				

Photos/ diagrams:





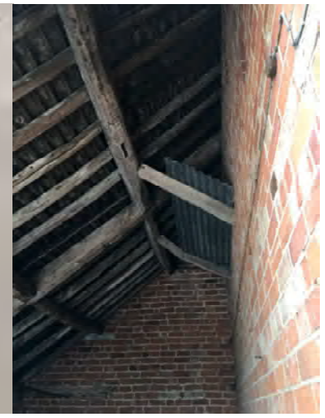




Table 4-24 - Survey Results BU_761

Date of Survey	Start and End Times and Time of Sunset	Structure Reference	Equipment Used (include make of bat detectors and logging equipment)	Weather (include start and end temps, precipitation, Beaufort wind scale etc)
18/07/2019	Daytime inspection (external only)	BU_761	N/A	Air temp: 19 (˚C), no rain, cloud cover 6, wind speed 1
Comments: Atkins: SK and IH				
Visual inspection. Open-fronted, dutch style barn with breeze block walls and corrugated asbestos sheets on roof; metal clad walls. Metal frame. Dropping found on caravan inside shed (no DNA carried out).				
No Hibernation suitability				
29/09/2020	18:34 to 20:49 (sunset = 18:49)	BU_761	Walkabout x 2	Air temp: 16 down to 15 (˚C), a light drizzle at 19:05, cloud cover 3/ 7, wind speed 0/ 1
Comments: Atkins: SK and IH				
Roost survey results: (species and numbers, roost location, access points (include number of them) and dimensions where appropriate: Social calls by common pipistrelle throughout survey. Frequent ***Myotis*** passes recorded. At 19:39 and 19:42 (50 and 53 minutes after sunset) ***Myotis*** (from call analysis deemed to be Natterer's) bats were recorded emerging from the barn at location C. At 19:43 and subsequently at 19:46 ***Myotis*** bats were recorded re-entering the roost at the same location. At 20:26 and 20:35 ***Myotis*** (from call analysis deemed to be Natterer's) bats were recorded emerging from Location C, assumed likely to be the same as the bats that previously emerged, i.e. maximum count of two ***Myotis*** (deemed to be Natterer's). A brown long-eared bat was recorded within the barn at 20:49 (2 hours after sunset) assumed to be using the barn.				
Access refused				

Photos/ diagrams:



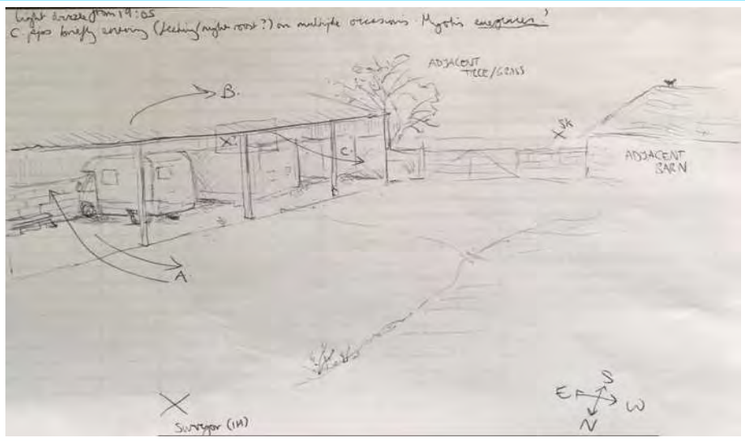


Table 4-25 - Survey Results BU_763

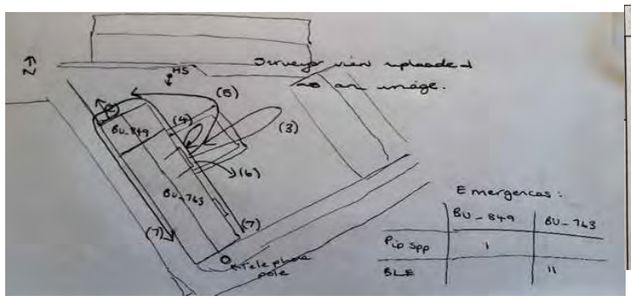
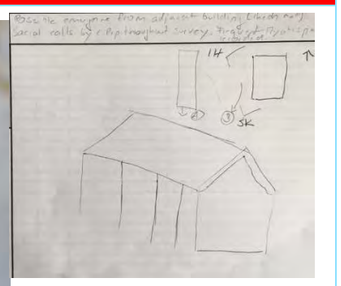
Date of Survey	Start and End Times and Time of Sunset	Structure Reference	Equipment Used (include make of bat detectors and logging equipment)	Weather (include start and end temps, precipitation, Beaufort wind scale etc)
18/07/2019	Daytime inspection (external only)	BU_763 (also known as BU_849)	N/A	Air temp: 19 (˚C), no rain, cloud cover 6, wind speed 1
Comments: Atkins: SK and IH				
Visual inspection. Brick barn with duo-pitched roof. Roof laid with clay tiles and clay ridge tiles, no underlay. Open doorway at Northern gable end and Eastern side elevation. Timber beams along wall plate/ lintel. Dropping s record on a stack of bricks adjacent to East elevation (outside structure). Roosting features: Accessible ridge beam and exposed rafters; uneven, missing and loose tiles. Annie Hatt observed bat droppings in doorway at the beginning of survey on 09/09/2020 (no DNA survey undertaken).				
Access refused for hibernation survey				
19/08/2019	20:20 to 21:55 (sunset = 20:25)	BU_763	Batlogger & EMT 2	Air temp: 23 up to 26 (˚C), no rain, cloud cover 0/ 1, wind speed 3/ 4
Comments: Biocensus: GW and JS.				
Roost survey results: (species and numbers, roost location, access points (include number of them) and dimensions where appropriate: Regular activity by ***Myotis*** probably Natterers bat as well as foraging activity by common and soprano pipistrelle. No emergence seen but difficult structure to see emergence once light levels dropped.				
09/09/2020	19:20 to 21:05 (sunset = 19:36)	BU_763	Annabat Scout and EMT 2	Air temp: 18 down to 16 (˚C), no rain, cloud cover 2/ 3, wind speed 2
Comments: AH and HS (AB surveying BU_751 at the same time)				
Roost survey results: (species and numbers, roost location, access points (include number of them) and dimensions where appropriate: A roosting pipistrelle species (no sound file to confirm species) under northern apex of the structure (labelled as BU_849 but is actually BU_763) at 19:20 (15 minutes before sunset). A further roosting pipistrelle species (no sound file to confirm species) emerged at 20:01 (25 minutes after sunset) emerged from the same location on BU_849. Both assumed to be common pipistrelle. At 20:10 (34 minutes after sunset) a common pipistrelle bat emerged from BU_763 (location 3 on the plan). At 20:22 and 20:25 (46 and 49 minutes after sunset) ***Myotis*** were seen to emerge from location 4 on the plan (two in total one briefly re-entering).				
29/09/2020	18:34 to 20:49 (sunset = 18:49)	BU_761 (incidental sighting)	Walkabout x 2	Air temp: 16 down to 15 (˚C), no rain, cloud cover between 3 and 7, wind speed 0/ 1
Comments: SK and IH				
Roost survey results: (species and numbers, roost location, access points (include number of them) and dimensions where appropriate: While surveyors were surveying BU_761 they saw a likely emergence from adjacent structure (BU_763), of a common pipistrelle.				
Access refused				
Photos / diagrams:   Open fronted access to interior Slipped and raised tiles   				

Table 4-26 - Survey Results BU_765

Date of Survey	Start and End Times and Time of Sunset	Structure Reference	Equipment Used (include make of bat detectors and logging equipment)	Weather (include start and end temps, precipitation, Beaufort wind scale etc)
18/07/2019	Daytime inspection (external only)	BU_765	N/A	Air temp: 19 (˚C), no rain, cloud cover 6, wind speed 1
Comments: Atkins: SK and IH				
Visual inspection. Large shed/ barn used for caravan parking. Breeze block walls with corrugated metal cladding and corrugated metal roof divided into two sections; internally the roof is supported by timber beams. Droppings likely from brown long-eared and pipistrelle on cars at western end of structure.				
No hibernation suitability				
20/08/2019	04:30 to 06:15 (sunrise = 06:15)	BU_765	EMT 2 x Walkabout	Air temp: 10 (˚C), no rain, cloud cover 0, wind speed 1
Comments: Biocensus: GW, AM and NM				
Roost survey results: (species and numbers, roost location, access points (include number of them) and dimensions where appropriate: Regular activity by ***Myotis*** probably Natterers bat as well as foraging activity by common and soprano pipistrelle. No emergence seen but difficult structure to see emergence once light levels dropped.				
15/09/2020	19:07 to 20:52 (sunset = 19:22)	BU_765	EMT 2 and Scout	Air temp: 23/ 22 (˚C), no rain, cloud cover 3/ 5, wind speed 0
Comments: Biocensus: CM and FT were watching BU_765				
Roost survey results: (species and numbers, roost location, access points (include number of them) and dimensions where appropriate: No bats were recorded emerging from the structure. Bats recorded during the survey included noctule, common pipistrelle, ***Myotis*** and soprano pipistrelle.				
Access refused				
Photos/ diagrams: 				

Table 4-27 - Survey Results BU_766

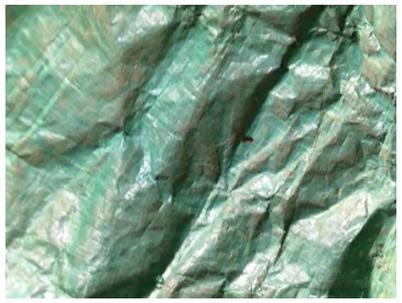
Date of Survey	Start and End Times and Time of Sunset	Structure Reference	Equipment Used (include make of bat detectors and logging equipment)	Weather (include start and end temps, precipitation, Beaufort wind scale etc)
18/07/2019	Daytime inspection (external only)	BU_766	N/A	Air temp: 19 (˚C), no rain, cloud cover 6, wind speed 1
Comments: Atkins: SK and IH				
Visual inspection. Timber framed lean-to with corrugated metal roof. Used for storage. Scattered droppings and moth wing found				
DNA: date collected 18/07/2019 – Natterer's, common pipistrelle and soprano pipistrelle				
No hibernation suitability				
05/09/2019	19:32 to 21:17 (sunset = 19:47)	BU_766	EMT 2 and Walkabout	Air temp: 12.4 down to 11 (˚C), no rain, cloud cover 0, wind speed 0/1
Comments: Biocensus: CB (lead) - Seven surveyors covering ten structure references.				
Roost survey results: (species and numbers, roost location, access points (include number of them) and dimensions where appropriate: Lots of common pipistrelle foraging and commuting with occasional ***Myotis*** passes. Regular bat activity throughout survey by ***Myotis*** (likely Natterer's from call analysis), common pipistrelle and few passes from brown long-eared and soprano pipistrelle. No emergences were recorded.				
Access refused				
Photos / diagrams:				

Table 4-28 - Survey Results BU_981

Date of Survey	Start and End Times and Time of Sunset	Structure Reference	Equipment Used (include make of bat detectors and logging equipment)	Weather (include start and end temps, precipitation, Beaufort wind scale etc)
03/12/2020	Daytime inspection (external only)	BU_981	N/A	Air temp: 5 (˚C), very light rain, cloud cover 8, wind speed 1
Comments: Atkins: SK and RM				
Visual inspection. Residential property with a cross gabled roof. Roof tiles are clay with clay ridge tiles. Gable on front, southern aspect. Catslide roof forming the porch roof from front gable end. Gable ends on east and western aspect. Wooden cladding on front gable end and porch roof. Walls are red brick. Modern uPVC windows. Roof timbers extend over external walls. Closed timber soffit around structure. The property has 3 chimneys; one central to the property, one on the northern aspect of the property and on the flat roof extension on the northern aspect. East aspect has two bay windows with the upstairs acting as a bay dormer, between these windows there are hanging tiles. On the eastern aspect gable end there is further timber cladding. Some lead flashing. Extension on north aspect has flat roof with a timber fascia. Timber box present above window on northern aspect. No gable end on western aspect. Small single storey extension with mono pitch tiled roof and wooden fascia. Rear aspect to the north has a hipped style roof. Emergence features: Wooden cladding sufficiently lifted to allow roosting opportunities. Closed soffit on gable end may have small gaps. Roof tiles are slipped and uneven, with some missing roof tiles. Some lifting under ridge tiles. The hanging tiles on the eastern aspect are generally loose and lifted. On the south east corner there is a gap at the base of the roof tiles behind the guttering. Indent above front window appears to be a bird nesting site.				
19/01/2021 – 25/03/2021	Hibernation static deployment	BU_981	Swift and EasyLog USB - Lascar temperature and humidity data	Between 6.5 and 21 (˚C)
Comments: Atkins: TM and TS, however deployed internally by landowner				
Hibernation results: No bat activity was recorded				
15/06/2021	21:15 to 23:05 (sunset = 21:29)	BU_981	Walkabout and EMT 2	Air temp: 17 (˚C), no rain, cloud cover 0, wind speed 1
Comments: Biocensus: KS,DT, WF, NB and AB				
Roost survey results: (species and numbers, roost location, access points (include number of them) and dimensions where appropriate: Six emerging pipistrelle bats from three different locations on the structure. Other activity included common pipistrelle and noctule passes				
07/07/2021	21:12 to 23:27 (sunset = 21:27)	BU_981	Walkabout x 4	Air temp: 19 (˚C) no rain, cloud cover 7, wind speed 1
Comments: Biocensus: FL, NM, WF and PP				
Roost survey results: (species and numbers, roost location, access points (include number of them) and dimensions where appropriate: Emergence recorded by one pair of surveyors (species to be confirmed). No emergences (seen or heard) recorded from north or north-west side of structure.				
Comments:				
Roost survey results: (species and numbers, roost location, access points (include number of them) and dimensions where appropriate:				
Photos/ diagrams:   				

Table 4-29 - Survey Results BU_853

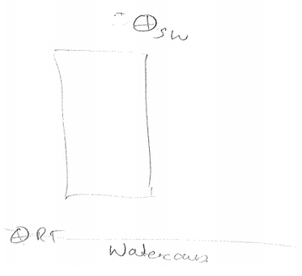
Date of Survey	Start and End Times and Time of Sunset	Structure Reference	Equipment Used (include make of bat detectors and logging equipment)	Weather (include start and end temps, precipitation, Beaufort wind scale etc)
18/07/2019	Daytime inspection (external only)	BU_853	N/A	Air temp: 19 (˚C), no rain, cloud cover 6, wind speed 1
Comments: Atkins: SK and IH				
Visual inspection Single storey barn open at the front and with open roof void dating from 1858. Walls are constructed from red brick; top of the northern (front) gable end is clad with timber boards; The roof is laid with plain, flat clay tiles and clay ridge tiles. There is no underlay present below tiles. Roof is supported by a traditional timber truss construction in A-frame formation with no central beam and one purlin each side. Materials are stored on the trusses potentially obscuring bat droppings.				
No hibernation suitability				
27/06/2019	21:17 to 23:32 (sunset = 21:32)	BU_853	Walkabout x 2	Air temp: 20 down to 18 (˚C), no rain, cloud cover 0, wind speed 0-6
Comments: Atkins: RT and SW				
Roost survey results: (species and numbers, roost location, access points (include number of them) and dimensions where appropriate: Calls from ***Nyctalus*** spp, common pipistrelle soprano pipistrelle, ***Myotis*** and brown long-eared. At 22:33 (59 minutes after sunset) a ***Myotis*** (Likely to be Natterer's from sound analysis) emerged from a lifted roof tile. At 22:46 (1 hr 14 minutes after sunset) a brown long-eared bat was seen to emerge from the barn. Finally, 22:50 (1 hr 22 min after sunset) a further ***Myotis*** (likely to be Natterer's from sound analysis) bat was seen to emerge from the open front of the shed.				
29/07/2019	20:43 to 22:33 (sunset = 21:03)	BU_853	EMT 2 x 2	Air temp: 18 down to 16.5 (˚C), no rain, cloud cover 4-6, wind speed 0-3
Comments: Biocensus: CB, HB and AB				
Roost survey results: (species and numbers, roost location, access points (include number of them) and dimensions where appropriate: Foraging bats recorded include common pipistrelle and noctule. No bats were recorded to emerge from the structure.				
Photos/ diagrams:   				

Table 4-30 - Survey Results BU_854

Date of Survey	Start and End Times and Time of Sunset	Structure Reference	Equipment Used (include make of bat detectors and logging equipment)	Weather (include start and end temps, precipitation, Beaufort wind scale etc)
18/07/2019	N/A Daytime inspection (external only)	BU_854	N/A	Air temp: 19 (˚C), no rain, cloud cover 6, wind speed 1
Comments: Atkins: SK and IH				
Visual inspection BU 854, 863, 355, 865 and 860 (all one structure): Large brick hay barn with cross-gabled roof laid with corrugated metal sheeting, dated 1837; the barn is open at both the east and west facing gable ends, on the eastern gable end large open barn doors are present. A timber lintel is present above the barn door. The west facing gable end is stacked high with hay. Stone coping stones present on the gable ends; square holes are present in the northern and southern gable end walls and alongside elevations. Internally traditional lath and plaster is present below the metal sheeting, this would have been likely laid with tiles in the past. A bat roost is present beneath the lath and plaster (see evidence section below). Traditional timber trusses in A shape without central beam.				
DNA: date collected 18/07/2019 – Natterer's bat, brown long-eared and common pipistrelle				
24/06/2019	21:18 to 23:31 (sunset = 21:31)	BU_854	Walkabout x 5	Air temp: 22 to 24 (˚C), no rain, cloud cover 7, wind speed 0
Comments: Atkins: RT, RM, ED and CH				
Roost survey results: (species and numbers, roost location, access points (include number of them) and dimensions where appropriate: Species heard includes: Nyctaloid, common pipistrelle, ***Myotis***, brown long-eared, and soprano pipistrelle calls, later in the survey. Roost located by RM and RT; likely internal roosting- exact locations unconfirmed. At 21:45 (14 minutes after sunset) a common pipistrelle was observed emerging out of the main barn, a further bat (not recorded on the detector, although its assumed it was a common pipistrelle) emerged from the top of the roof entrance and flew into the barn. Between 21:56 and 22:01 an assumed seven (two bats were seen at one time) further common pipistrelles emerged from the structure, likely to be light sampling/ foraging under cover. Finally, CH also saw two common pipistrelle bats emerging at 22:00 and 22:03 (29 and 32 minutes after sunset) from the barn door. A maximum count of 11 bats were observed. Additionally, two ***Myotis*** (assumed to be Natterer's based on DNA analysis) bats emerged at 22:13 and 22:19 from the barn (location B on the plan) seen by RM. RT recorded three ***Myotis*** bats (exact number unknown, max. of 3 bats seen at one time) likely to be emerging from the barn at 21:55 (two bats) and a single bat at 21:57 (24 and 26 minutes after sunset). At 22:05 and 22:08 three further ***Myotis*** bats were seen within the barn, likely to have emerged from within the barn, assumed to be additional to the three bats that had already emerged. A max count of eight Natterer's bats are assumed.				
30/07/2019	03:58 to 05:43 (sunrise = 05:28)	BU_854	EMT 2 x 3 and Walkabout	Air temp: 16.2 down to 15.6 (˚C), no rain, cloud cover 0, wind speed 2
Comments: Biocensus: CB, HB, Ab and JS				
Roost survey results: (species and numbers, roost location, access points (include number of them) and dimensions where appropriate: Very little bat activity from ***Myotis*** and common pipistrelle and soprano pipistrelle and brown long-eared bats. At 04:51 (37 minutes before sunrise) a common pipistrelle was recorded likely to be re-entering the roost to the open front, east orientation of BU_854.				
26/05/2021	20:56 to 23:11 (sunset = 21:11)	BU_854	EMT 2 x4	Air temp: 15 down to 9 (˚C), no rain, cloud cover 3/ 2, wind speed 5/ 2
Comments: Biocensus: NS, BP, LM and AR				
Roost survey results: (species and numbers, roost location, access points (include number of them) and dimensions where appropriate: Relatively quiet survey. No signs of emerging bats, despite noting some feeding debris (butterfly wings) inside the barn on the northern internal wall. IR camera was facing the northern aspect on this survey. Only a couple of pips were in the space around the farmyard and structure, generally foraging back and forth towards the end of the survey. Limitations: Security lights on the southern end of the structure cast a glare and shadows. The sound of the river flowing overwhelmed any possibility of audibly detecting bats by ear unless they were very close.				
Photos/ diagrams:    				

Table 4-31 - Survey Results BU_855

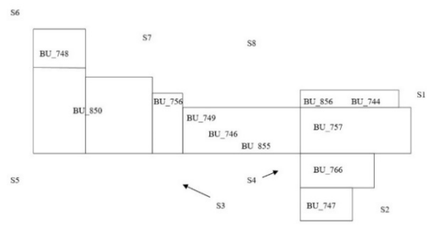
Date of Survey	Start and End Times and Time of Sunset	Structure Reference	Equipment Used (include make of bat detectors and logging equipment)	Weather (include start and end temps, precipitation, Beaufort wind scale etc)
18/07/2019	N/A Daytime inspection (external only)	BU_855	N/A	Air temp: 19 (˚C), no rain, cloud cover 6, wind speed 1
Comments: Atkins: SK and IH				
Visual inspection Series of garages attached to BU_850 and BU_757 with duo pitched roof laid with plain clay tiles and clay ridge tiles. Walls are constructed from red brick. Most eastern garage has a stud ceiling but is partially open to the roof void, it has a traditional timber truss construction, no underlay is present below tiles. Small number of scattered droppings were found here. Middle garage has chipboard ceiling and breeze block wall; corrugated metal sliding doors. Access includes: Uneven roof tiles; gaps between beams; hole in gable end.				
DNA: date collected 18/07/2019 – Common pipistrelle bat				
05/09/2019	19:32 to 21:17 (sunset = 19:47)	BU_855	EMT 2 and Walkabout	Air temp: 12.4 down to 11 (˚C), no rain, cloud cover 0, wind speed 0/ 1
Comments: Biocensus: CB(lead) – Seven surveyors covering ten structures				
Roost survey results: (species and numbers, roost location, access points (include number of them) and dimensions where appropriate: Lots of common pipistrelle foraging and commuting with occasional ***Myotis*** passes. Regular bat activity throughout survey by ***Myotis*** (likely Natterer's) , common pipistrelle and few passes from brown long-eared and soprano pipistrelle. No emergences from this structure.				
27/05/21	21:00 to 23:15 (sunset = 21:15)	BU_855	Batlogger M2 and EMT 2 x 3	Air temp: 18 down to 11 (˚C), no rain, cloud cover 5-10, wind speed 2/ 1
Comments: Middlemarch: WW, RD, HS and SM				
Roost survey results: (species and numbers, roost location, access points (include number of them) and dimensions where appropriate: Mostly common pipistrelles with occasional soprano pipistrelle were observed, brown long eared also seen commuting and foraging around the structure, as well as ***Myotis*** bat calls. At 21:19 and 21:37 (4 and 22 minutes after sunset) common pipistrelle bats were seen to emerge, dropping out of the garage and flying north east and another flying east over the house.				
Photos/ diagrams:    				

Table 4-32 - Survey Results BU_857

Date of Survey	Start and End Times and Time of Sunset	Structure Reference	Equipment Used (include make of bat detectors and logging equipment)	Weather (include start and end temps, precipitation, Beaufort wind scale etc)
18/07/2019	N/A Daytime inspection (external only)	BU_857	N/A	Air temp: 19 (˚C), no rain, cloud cover 6, wind speed 1
Comments: Atkins: SK and IH				
Visual inspection Large shed/ barn used for caravan parking. Breeze block walls with corrugated metal cladding and corrugated metal roof divided into two sections; internally the roof is supported by timber beams. Droppings likely from pipistrelle and droppings and feeding remains likely from brown long-eared recorded based on surveyor knowledge.				
DNA: date collected 31/07/2019 – Natterer's, whiskered and common pipistrelle (notes say BU_852, which is the same structure as BU_857)				
No hibernation suitability				
20/08/2019	04:30 to 06:16 (sunrise = 06:15)	BU_857	Batlogger & EMT 2	Air temp: 18 down to 11 (˚C), no rain, cloud cover 0/ 1, wind speed 2/ 1
Comments: Biocensus: GW and JS focused on BU_857.				
Roost survey results: (species and numbers, roost location, access points (include number of them) and dimensions where appropriate: Regular activity by ***Myotis***, probably Natterer's bat as well as foraging activity by common and soprano pipistrelle. No emergence seen but difficult structure to see emergence once light levels dropped.				
15/09/20	19:07 to 20:52 (sunset = 19:22)	BU_857	Batlogger & Scout	Air temp: 23 down to 22 (˚C), no rain, cloud cover 3/ 5, wind speed 0
Comments: Biocensus: JC and AB				
Roost survey results: (species and numbers, roost location, access points (include number of them) and dimensions where appropriate: No emergences recorded. Bat recording included noctule, common and soprano pipistrelle and brief passes from lesser horseshoe, ***Myotis*** and brown long-eared				
Photos/ diagrams:  				

Table 4-33 - Survey Results BU_862

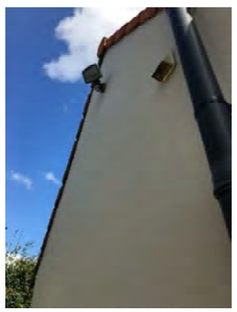
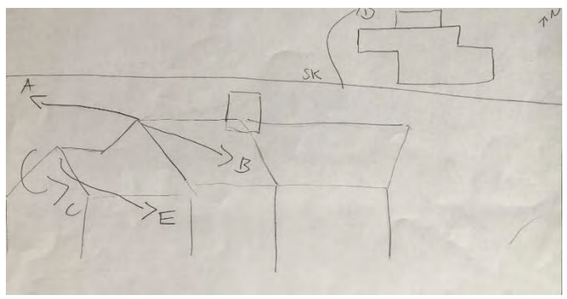
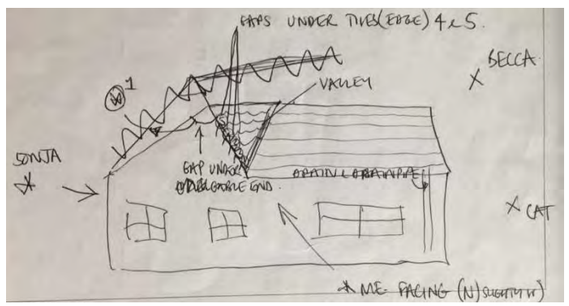
Date of Survey	Start and End Times and Time of Sunset	Structure Reference	Equipment Used (include make of bat detectors and logging equipment)	Weather (include start and end temps, precipitation, Beaufort wind scale etc)
21/08/2019	N/A Daytime inspection (external only)	BU_862	N/A	Air temp: 18 (˚C), no rain, cloud cover 4, wind speed 0
Comments: Atkins: SK and IH				
Visual inspection Residential structure (incl. barn conversions) A few gaps in roof tiles, but fairly tight. Soffit box has one small gap, no droppings.				
02/03/2021 – 25/03/2021	Hibernation static deployment	BU_862	Swift and EasyLog USB - Lascar temperature and humidity data logger	Between -0.5 and 27 (˚C)
Comments: Atkins: RM and TS, however deployed internally by landowner				
Hibernation results: No bat activity was recorded				
20/07/2020	20:59 to 22:44 (sunset = 21:14)	BU_862	Walkabout x 4	Air temp: 19 down to 17 (˚C), no rain, cloud cover 1/ 7, wind speed 1
Comments: Atkins: SK, RM, EH and CH				
Roost survey results: (species and numbers, roost location, access points (include number of them) and dimensions where appropriate: At 21:32 two bats (not echolocating) emerged from under the ridge flying in the directions of 'A' and 'B' (east and west). One further bat emerged from this location and heading in the direction of 'A' at 22:06 (52 minutes after sunset), determined to be a common pipistrelle bat. On this basis all three bats have been presumed to be common pipistrelle. At 21:57 (43 minutes after sunset) a re-entry and possible emergence of another common pipistrelle coming from a different gable wall 'E' was detected. At 21:45 and 21:54 (29 and 38 minutes after sunset) two common pipistrelle bats in total emerged from a ridge tile at gable end.				
21/09/2020	18:53 to 20:38 (sunset = 19:08)	BU_862	Scout, Walkabout, Batlogger M2 and EMT 2	Air temp: 22 down to 19 (˚C), no rain, cloud cover 1/ 3, wind speed 1
Comments: JC, CM, LS and FT				
Roost survey results: (species and numbers, roost location, access points (include number of them) and dimensions where appropriate: Regular bat calls from common pipistrelle with occasional noctule and ***Myotis***. No bats emerged				
03/08/2021	20:26 to 22:56 (sunset = 20:56)	BU_862	SM4/ Duet	Air temp: 18 down to 16 (˚C), light drizzle then dry, cloud cover 8/ 6, wind speed 0
Comments: Keystone: TA, RT, DF and TS				
Roost survey results: (species and numbers, roost location, access points (include number of them) and dimensions where appropriate: Limited activity, occasional foraging. No emergences.				
Photos/ diagrams:    				

Table 4-34 - Survey Results BU_963

Date of Survey	Start and End Times and Time of Sunset	Structure Reference	Equipment Used (include make of bat detectors and logging equipment)	Weather (include start and end temps, precipitation, Beaufort wind scale etc)
01/08/2019	N/A Daytime inspection (external only)	BU_963		Air temp: 20 (˚C), no rain, cloud cover 8, wind speed 2
Comments: Atkins: SK and RM				
Visual inspection Two storey residential structure likely constructed from brick with rendered and painted walls which appear intact. Cross gabled roof laid with simple, flat concrete tiles. Gaps behind timber fascia boards which extend under the eaves of the structure. Ridge tiles appear to be concrete and there are slight gaps under the ridge tiles. Red brick chimney with lead flashing. No bargeboards. The roof tiles are mostly flush to the roof. Some missing mortar under roof tiles on southern gable end.				
Proposed for winter 2021/2022	Hibernation static deployment	BU_963		
03/07/2019	21:15 to 23:30 (sunset = 21:30)	BU_963	Walkabout x 4	Air temp: 24 down to 21 (˚C), no rain, cloud cover 0, wind speed 0
Comments: Atkins: SK, RM, EM and RJ				
Roost survey results: (species and numbers, roost location, access points (include number of them) and dimensions where appropriate: No bats emerged. Species recorded included soprano pipistrelle, ***Myotis***, common pipistrelle and noctule. Several serotine were also recorded.				
21/08/2019	04:28 to 06:15 (sunrise = 05:58)	BU_963	Batlogger M and EMT 2 x 2	Air temp: 12 to 17 (˚C), no rain, cloud cover 0, wind speed 1/ 0
Comments: Biocensus: NW, AM, JS and AB				
Roost survey results: (species and numbers, roost location, access points (include number of them) and dimensions where appropriate: Species recorded during the survey included common and soprano pipistrelle, noctule, ***Myotis*** and once suspected serotine (not recorded). One soprano pipistrelle was recorded circling the car park before roosting within the structure at 05:36 (32 minutes before sunrise).				
7/7/2021	21:12 to 23:22 (sunset = 21:27)	BU_963	EM Touch and Walkabout	Air temp: 18 (˚C), no rain, cloud cover 6, wind speed 1
Comments: Biocensus: BM GW, AB and PP				
Roost survey results: (species and numbers, roost location, access points (include number of them) and dimensions where appropriate: No bats observed emerging by any surveyor. One surveyor observed a bat (BM) on a brief				
Photos/ diagrams:  				

Table 4-35 - Survey Results BU_370

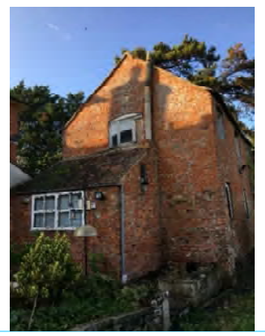
Date of Survey	Start and End Times and Time of Sunset	Structure Reference	Equipment Used (include make of bat detectors and logging equipment)	Weather (include start and end temps, precipitation, Beaufort wind scale etc)
24/10/2019	Daytime inspection (external only)	BU_370	N/A	No rain, cloud cover 5, wind speed 0, sunny spells, cool
Comments: Atkins: SK and EE				
Visual inspection An old hay loft or storage barn dating from 1800s (date stone rubbed out). Two storey high, red brick walls, gabled roof laid with plain clay tiles and clay ridge. All windows have been boarded from inside. Northern elevation appears to have formerly been open and was subsequently bricked up. Timber beams and trusses are still visible as is wooden cladding. Several timber doors and windows present on western elevation where a pipistrelle bat was observed re-entering during an emergence survey. During the daytime survey the tenant made an un-verified comment about seeing a bat leave the structure.				
Access refused for hibernation survey	Hibernation static deployment	N/A	N/A	N/A
Photos/ diagrams:  				

Table 4-36 - Survey Results BU_987

Date of Survey	Start and End Times and Time of Sunset	Structure Reference	Equipment Used (include make of bat detectors and logging equipment)	Weather (include start and end temps, precipitation, Beaufort wind scale etc)
24/07/2019	Daytime inspection (external only)	BU_987	N/A	Air temp: 20 (˚C), no rain, cloud cover 2, wind speed 2
Comments: Atkins: SK and RM				
Visual inspection Two-storey multi pitch residential structure in residential street with several extensions. Main house with gabled roof, attached to southern elevation is an extension with hipped roof. A further two hipped roof extensions are attached to eastern elevation. On southern hipped extension and one of the eastern hipped extensions roof tiles appear to be asbestos. New extension to south and further new extension to SE laid with imitation slate tiles throughout which are simple, flat. Rendered brick walls in good condition with no obvious entry points. Closed soffits with minor access. Minor lifting of the ridge tiles. Decorative half timbering present on front (north) gable end of house. Decorative bargeboard has small access points behind. Gaps on eaves under the soffit board. Entire eastern aspect is a new extension.				
Proposed for winter 2021/2022	Hibernation static deployment	BU_987		
01/09/2020	19:35 to 21:20 (sunset = 19:50)	BU_987	Scout x 2, EMT 2 and Walkabout	Air temp: 16 down to 14 (˚C), no rain, cloud cover 1, wind speed 2
Comments: Biocensus: TS, FT, HC and LS				
Roost survey results: (species and numbers, roost location, access points (include number of them) and dimensions where appropriate: Noctule, ***Myotis***, common pipistrelle and soprano pipistrelle bats recorded during the survey. A single soprano pipistrelle bat emerged from the apex of south gable end and flew SW at 20:09 (19 minutes after sunset).				
TBC – 31/8/2021	19:43 to 21:58 (sunset = 19:58)	BU_987	EMT 2 and Samsung tablets x 4 plus one infra-red Canon XA15 and two x Eerel 140 LED Infra-red lamps	Air temp: 16 (˚C), no rain, cloud cover 3, wind speed 2
Comments: Biocensus: PP, SN, NS and AK				
Roost survey results: (species and numbers, roost location, access points (include number of them) and dimensions where appropriate: Two emergences recorded from the same feature. One confirmed soprano pipistrelle, the other bat didn't call. Emerged from very top of the roof where it looks like loose lead flashing is present.				
TBC – 29/09/2021				
Photos/ diagrams:				

Table 4-37 - Survey Results BU_990

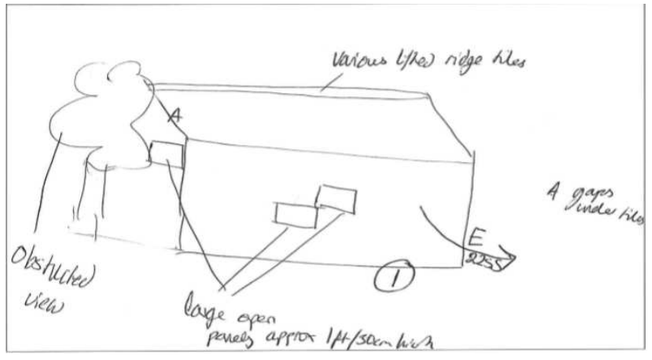
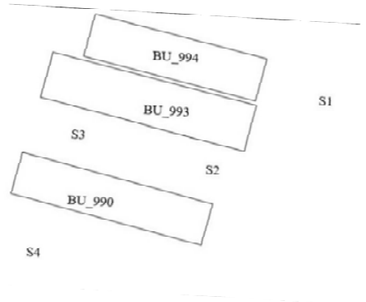
Date of Survey	Start and End Times and Time of Sunset	Structure Reference	Equipment Used (include make of bat detectors and logging equipment)	Weather (include start and end temps, precipitation, Beaufort wind scale etc)
31/07/2019	Daytime inspection (external only)	BU_990	N/A	Air temp: 20 (˚C), no rain, cloud cover 8, wind speed 2
Comments: Atkins: AK and RM				
Visual inspection: Timber framed barn with timber cladding. Clay double roman tiles on a duo-pitched roof. Clay ridge tiles. Ridge very lifted, many open spaces. Gable ends only partially clad, therefore open to outside. Many open spaces between timber panels. Door on the northern gable end, and another on the eastern aspect have large gaps around them. Large missing panels on all aspects.				
No hibernation suitability				
24/07/2019	20:56 to 22:55 (sunset = 21:11)	BU_990	Walkabout x 2	Air temp: 26 down to 21 (˚C), no rain, cloud cover 6/ 1, wind speed 0/ 1
Comments: Atkins: SK and RM				
Roost survey results: (species and numbers, roost location, access points (include number of them) and dimensions where appropriate: Passes of common pipistrelle early, probably emerged from one of the adjacent barns. Frequent foraging between barns and in the field to north of structures. Occasional soprano pipistrelle passes. Noctule passes recorded early on and throughout (occasionally). At 21:55 (44 minutes after sunset) a single bat emerged from the end of the barn, shown by location 'E' on the plan. No data as the card was corrupt, however common pipistrelle was recorded by the other surveyor at the same time, so this species was assumed to be a single common pipistrelle bat.				
13/08/2019	04:20 to 06:05 (sunrise = 05:50)	BU_990	EMT 2 x 2	Air temp: 11.1 down to 8.8 (˚C), no rain, cloud cover 0, wind speed 0
Comments: Biocensus: CB (lead) watching an adjacent structure, AH and AB watched BU_990				
Roost survey results: (species and numbers, roost location, access points (include number of them) and dimensions where appropriate: Very little bat activity from common pipistrelle's and noctules and one ***Myotis***. One common pipistrelle bat re-entered BU_992, not this structure.				
29/07/2020	20:47 to 22:32 (sunrise = 21:02)	BU_990	Walkabout x 2	No data
Comments): Atkins: EH and TS				
Roost survey results: (species and numbers, roost location, access points (include number of them) and dimensions where appropriate: One common pipistrelle bat was seen to emerge at 21:19 from the northern gable that is vegetated with elder or the south easter elevation (the exact location was unknown). Other bats recorded regularly during the survey were ***Myotis***, common pipistrelle and noctule.				
Photos/ diagrams:   				

Table 4-38 - Survey Results BU_992

Date of Survey	Start and End Times and Time of Sunset	Structure Reference	Equipment Used (include make of bat detectors and logging equipment)	Weather (include start and end temps, precipitation, Beaufort wind scale etc)
31/07/2019	N/A Daytime inspection (external only)	BU_992	N/A	Air temp: 20 (˚C), no rain, cloud cover 8, wind speed 2
Comments: Atkins: SK and RM				
Visual inspection: Brick farmhouse currently in residential use. Cross gabled roof laid with plain clay tiles. Ridge tiles made of slate, no obvious gaps under ridge tiles. Large gable overhangs are present with decorative bargeboards. Red brick chimney with lead flashing. Hole visible in the chimney. Ventilation tiles in roof. Conservatory on the northern aspect of the house. In addition, a single storey lean-to is also present on the northern elevation. Gaps present under eaves of lower pitched roof. Gaps under fascia on western aspect. Stone surroundings of all windows with old timber frames. A porch is present at the southern elevation of the house. Porch made of timber with clay tiles on a pitched roof. Bat droppings found on porch floor. Possibly accessing behind the timber frame between the porch and house. Access around stone window ledge into brickwork but a unable to see full extension from the ground. Ventilation grate above bay window on southern aspect. Blocked up window on the eastern aspect. Unable to see if there are gaps under the eaves throughout due to remnant dead vegetation. Swallows nest in southern gable end. Tenant in house has previously mentioned a bat being in the bedroom. Unable to reach feature to endoscope. Able to visually inspect from the ground using a torch. Approximately 15 droppings in the porch.				
DNA: date collected 31/07/2019 – Whiskered bat				
24/07/2019	20:56 to 22:55 (sunset = 21:11)	BU_990	Walkabout x 2	Air temp: 26 down to 21 (˚C), no rain, cloud cover 6/ 1, wind speed 0/ 1
Proposed for winter 2021/2022				
31/07/2019	20:45 to 22:55 (sunset = 21:00)	BU_992	Walkabout x 4	Air temp: 22 down to 18 (˚C), no rain, cloud cover 7/ 8, wind speed 1
Comments: Atkins: SK, CH, RJ and RM				
Roost survey results: (species and numbers, roost location, access points (include number of them) and dimensions where appropriate: Bat species recorded included common pipistrelle, noctule, soprano pipistrelle. One barbastelle was recorded at 22:22. A common pipistrelle bat weas recorded by RJ emerging at 21:15/16 (15/ 16 minutes after sunset) from the eaves of the house on the north east gable towards the barn (Ref A). One bat (not recorded) emerged from under the eaves (Ref B) seen by SK emerging from the south west gable at approximately 21:18 (18 minutes after sunset), assumed to be a pipistrelle based on the time of emergence (and later bat species identification). A further common pipistrelle bat was seen to emerge (Ref B) at 21:21 (21 minutes after sunset) from the south west gable. A bat was seen to exit the structure at this location at 21:27, although it was not echolocating it was assumed to be a common pipistrelle based on the location, time and other bat recorded from this location. A total of 4 x common pipistrelle bats emerged from two locations (Ref A & B).				
12/08/2019	20:23 to 22:08 (sunset = 20:38)	BU_992	EMT 2 x 2 and Batlogger M2 x 2	Air temp: 18 down to 16 (˚C), no rain, cloud cover 0/ 1, wind speed 2
Comments: Biocensus: NW, HB, AB and AM				
Roost survey results: (species and numbers, roost location, access points (include number of them) and dimensions where appropriate: Multiple passes and foraging of common pipistrelle and serotines between structures BU_993 and BU_990, foraging about BU_992. There were also a few noctule / serotine passes and brown long-eared and possible ***Myotis***. A single common pipistrelle bat emerged from the raised roof tiles nearest to the chimney stack at 20:58 (20 minutes after sunset) (Ref C).				
13/08/2019	04:20 to 06:05 (sunrise = 05:50)	BU_990 (incidental sighting)	EMT 2 x 2	Air temp: 11.1 down to 8.8 (˚C), no rain, cloud cover 0, wind speed 0
Comments: Biocensus: CB watching an adjacent structure, HB and AM watched BU_990 but saw a common pipistrelle bat enter BU_992.				
Roost survey results: (species and numbers, roost location, access points (include number of them) and dimensions where appropriate: Very little bat activity from common pipistrelle's and noctules and one ***Myotis***. One bat re-entered BU_992, out of sight of the surveyors on the south west side of the structure (likely to be location Ref B or C)				
14/07/2020	21:04 to 22:51 (sunset = 21:21)	BU_992	Walkabout x 4	Air temp: 17 down to 16 (˚C), no rain, cloud cover 8, wind speed 1

Date of Survey	Start and End Times and Time of Sunset	Structure Reference	Equipment Used (include make of bat detectors and logging equipment)	Weather (include start and end temps, precipitation, Beaufort wind scale etc)
Comments: Atkins: SK, IH, RM and HM				
Roost survey results: (species and numbers, roost location, access points (include number of them) and dimensions where appropriate: At 21:34 (21:13 minutes after sunset) a common pipistrelle bat exited from the gable wall (Ref D). At 21:35 (14 minutes after sunset) a common pipistrelle bat was seen foraging and then re-entering the same location. At 21:42 (21 minutes after sunset) a common pipistrelle bat was seen to exit from the same location. Bats recorded during the survey include serotine, noctule, ***Myotis***, common and soprano pipistrelle and Leisler's. A total of 2 x common pipistrelle bats emerged from Ref D.				
Photos/ diagrams:    				

Table 4-39 - Survey Results BU_993

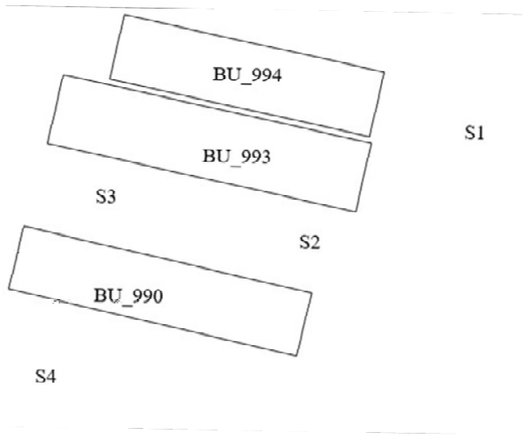
Date of Survey	Start and End Times and Time of Sunset	Structure Reference	Equipment Used (include make of bat detectors and logging equipment)	Weather (include start and end temps, precipitation, Beaufort wind scale etc)
31/07/2019	N/A Daytime inspection (external only)	BU_993	N/A	Air temp: 20 (˚C), no rain, cloud cover 8, wind speed 2
Comments: Atkins: SK and RM				
Visual inspection: Single storey red brick long barn laid with clay double roman tiles. Timber barge boards present on gable end walls. 5 barn entrances on the eastern aspect of the structure. Slate ridge tiles across the top. Swifts flying through barn. Gaps under the barge board on the northern aspect of the structure. Large open windows throughout. On western aspect there are many broken or lifted tiles. Lean to present on western elevation covered with corrugated metal sheeting where cows appear to get fed (ground heavily poached).				
No hibernation suitability				
13/08/2019	04:20 to 06:05 (sunrise = 05:50)	BU_993	Walkabout + EMT 2	Air temp: 11.1 down to 8.8 (˚C), no rain, cloud cover 0, wind speed 0
Comments: Biocensus: AB and AB				
Roost survey results: (species and numbers, roost location, access points (include number of them) and dimensions where appropriate: very little bat activity including ***Myotis***, common pipistrelle and noctules. No emergences				
29/07/2020	20:47 to 22:32 (sunset = 21:02)	BU_993	Walkabout x 2	Air temp: 22.8 down to 16 (˚C), no rain, cloud cover 8, wind speed 0
Comments: Atkins: RM and EE				
Roost survey results: (species and numbers, roost location, access points (include number of them) and dimensions where appropriate: Bat calls from noctule, common and soprano pipistrelle. A common pipistrelle bat is likely to have emerged from the north elevation at 21:19 (17 minutes after sunset). At 21:26 seven common pipistrelle bats were recorded within the cattle shed; No emergence was seen, but it's assumed that the bats emerged from within the barn and were flying within the cattle shed (lean-to) before they exited the structure.				
Access refused				
Photos/ diagrams:				

Table 4-40 - Survey Results BU_642

Date of Survey	Start and End Times and Time of Sunset	Structure Reference	Equipment Used (include make of bat detectors and logging equipment)	Weather (include start and end temps, precipitation, Beaufort wind scale etc)
28/10/2020	Daytime inspection (external only)	BU_642 (was mislabelled as BU_723)	N/A	Air temp: 10 (˚C), rain 3, cloud cover 7, wind speed 1
Comments: Atkins: SK and RM				
Visual inspection: Two barns connected. Dutch barn. Corrugated asbestos roofing. Concrete base. Used for storage of hay and other items such as an old caravan and car. East barn has corrugated metal roof and is open on both north and south elevations. Internal frame is metal. No suitable crevice.				
DNA: date collected 28/10/2020 – Natterer's bat (sample was originally mislabelled as BU_723)				
No hibernation suitability				
Roost survey 1				
Roost survey 1				
Roost survey 1				
Photos/ diagrams:				

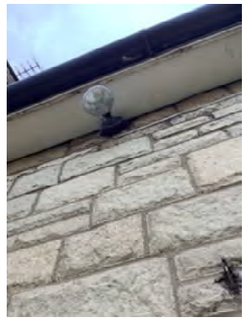
Table 4-41 - Survey Results BU_357

Date of Survey	Start and End Times and Time of Sunset	Structure Reference	Equipment Used (include make of bat detectors and logging equipment)	Weather (include start and end temps, precipitation, Beaufort wind scale etc)
22/08/2019	Daytime inspection (external only)	BU_357	N/A	Air temp: 19 (˚C), very light rain, cloud cover 8, wind speed 1
Comments: Atkins: SK and IH				
Visual inspection: Open agricultural (dutch) barn with metal trusses and timber beams. Corrugated asbestos roof, one side elevation clad with corrugated metal otherwise open on all sides. Bat dropping indicative of pipistrelle droppings were recorded throughout the barn (no DNA has been carried out).				
No hibernation suitability				
05/08/2020	20:35 to 22:20 (sunset = 20:50)	BU_357	Walkabout x 2	Air temp: 19 down to 17 (˚C), no rain, cloud cover 7/ 2, wind speed 2
Comments: Atkins: RM and HM				
Roost survey results: (species and numbers, roost location, access points (include number of them) and dimensions where appropriate: No emergences were recorded, although common pipistrelle were recorded regularly, with				
30/09/2020	19:36 to 21:21 (sunset = 19:51)	BU_357	Walkabout x 2	Air temp: 17 down to 16 (˚C), no rain, cloud cover 7, wind speed 2
Comments: Atkins: SK and IH				
Roost survey results: (species and numbers, roost location, access points (include number of them) and dimensions where appropriate: No emergences were recorded, although common pipistrelle were recorded regularly, with occasional soprano pipistrelle, ***Myotis*** and noctule were recoded.				
Access refused				
Photos/ diagrams:  				

Table 4-42 - Survey Results BU_753

Date of Survey	Start and End Times and Time of Sunset	Structure Reference	Equipment Used (include make of bat detectors and logging equipment)	Weather (include start and end temps, precipitation, Beaufort wind scale etc)
05/09/2019	Daytime inspection (external only)	BU_753	N/A	Air temp: 16 (˚C), no rain, cloud cover 5, wind speed 1
Comments: Atkins: SK and RJ				
Visual inspection: Converted mill house partially dating to the 17th century. Formally consisted of two structures converted into a single dwelling. Roof laid with plain clay tiles and ridge tiles (oldest section) and interlocking concrete tiles on middle section. Walls constructed from brick and partially rendered. Black beams (Tudor style) present within some sections of wall (decorative half timbering). Two lean to extensions present on northern elevation. Wood store/ shed attached to south western gable end covered with corrugated cement asbestos roof. Surveyors have spoken to the house owner individually who confirmed anecdotally they have seen bats in their westernmost loft space which is difficult to access.				
02/03/2021 – 25/03/2021	Hibernation static deployment	BU_753	Swift and EasyLog USB - Lascar temperature and humidity data logger	Between 1 and 25 (˚C)
Comments: Atkins: RM and TS, however deployed internally by landowner				
Hibernation results: No bat activity was recorded				
11/09/2019	19:19 to 21:04 (sunset = 19:34)	BU_753	Walkabout x 2 and EMT 2 x 2	Air temp: 19.7 down to 17.1 (˚C), no rain, cloud cover 7/ 6, wind speed 2
Comments: Biocensus: SB, AB, AM and FT				
Roost survey results: (species and numbers, roost location, access points (include number of them) and dimensions where appropriate: Moderate bat activity mostly attributed to foraging and commuting common pips, noctule passes recorded and two ***Myotis*** passes. At 20:05 (29 minutes after sunset) a single bat was seen to emerge from the SW corner, although it was not echolocating.				
27/07/2020	20:50 to 22:35 (sunset = 21:05)	BU_753	Walkabout x 4	Air temp: 17 down to 16 (˚C), no rain, cloud cover 0/ 1, wind speed 1/ 2
Comments: Atkins: Sonja SK, RM, EE and CH				
Roost survey results: (species and numbers, roost location, access points (include number of them) and dimensions where appropriate: At 21:25 a single soprano pipistrelle was seen by the lead surveyor to have emerged, however the exact location was not recorded. Other species recorded included noctule, serotine, ***Myotis***, common pipistrelle and soprano pipistrelle.				
Access refused				
Photos / diagrams:				

Table 4-43 - Survey Results BU_653

Date of Survey	Start and End Times and Time of Sunset	Structure Reference	Equipment Used (include make of bat detectors and logging equipment)	Weather (include start and end temps, precipitation, Beaufort wind scale etc)
27/10/2020	Daytime inspection (external only)	BU_653	N/A	Air temp: 10 (˚C), rain 2, cloud cover 7, wind speed 1
Comments: Atkins: SK and RM				
Visual inspection: Bungalow constructed from reconstituted concrete brick. Modern double glazed PVC windows. Roof tiles are double Roman clay with a clay/ concrete ridge tile. Tiles are all flush to the roof. Evidence of gaps under the ridge tiles on the northern aspect. On the northern aspect there is a conservatory with a plastic roof, and a flat roofed extension. Between the flat roof extension and main house there is a chimney, there is lead flashing around the chimney. The eastern aspect has a gable end with no obvious features. Currently empty but being renovated. Flat roof extension. Had a plastic soffit box with some gaps between the soffit box and wall. The northern aspect between the western gable end and the flat roof extension there is a gap between the soffit box and wall which appears to extend inwards. On the western gable end there is a brick porch with plastic soffit boxing. There are gaps between the porch which may offer suitable roosting opportunities. On the southern aspect there is a flat roof garage. On the house on the southern aspect there are no gaps under the soffit box. The garage has flat concrete roof tiles and no pitch. Garage is a new construct, very fresh as the mortar is still fresh on the base of the walls. The garage has 3 parapet walls and a corrugated roof, there is a fascia on the eastern aspect of the garage with no evidence of lifting.				
Hibernation survey				
117/06/2021	21:17 to 23:32 (sunset = 21:32)	BU_653	EMT 2 x 3 and Batlogger M2	Air temp: 17 down to 14 (˚C), no rain, cloud cover 8, wind speed 2
Comments: Middlemarch: VW, HS, RD and BH				
Roost survey results: (species and numbers, roost location, access points (include number of them) and dimensions where appropriate: Non-echolocating bat, believed to be a pipistrelle species based on visual characteristics emerged from the soffit box on the north west aspect of the property. Other bat activity included foraging south and east of the property outside of the property boundaries.				
Survey 2 required				
Survey 3 required				
Photos/ diagrams:  				

Appendix B. Tree Assessments

A.3. Tree Survey Results

A.3.1. Tree Survey Data and Results

Table 4-44 - Individual Tree Survey Data and Results

Number[33]	Tree Feature Reference	Impact from the Scheme	GLTA Result	PRA Survey Date	Hibernation suitability	Hibernation survey 2021	Roost Survey 1	Roost Survey 2	Roost Survey 3	Overall Tree Assessment
1	13	100 m[34]	Moderate	03/06/2019	No	N/A	Emergence - 10/08/2020	Emergence - 17/08/2020	N/A	Moderate
2	16	100 m	Low	03/06/2019	No	N/A	N/A	N/A	N/A	Low
3	17	50 m[35]	Low	03/06/2019	No	N/A	N/A	N/A	N/A	Low
4	18	Felled[36]	Negligible	03/06/2019	No	N/A	N/A	N/A	N/A	Negligible
5	19	Felled	Negligible	03/06/2019	No	N/A	N/A	N/A	N/A	Negligible
6	20	100 m	Low	03/06/2019	No	N/A	N/A	N/A	N/A	Low
7	21	100 m	Negligible	03/06/2019	No	N/A	N/A	N/A	N/A	Negligible
8	22	100 m	Negligible	03/06/2019	No	N/A	N/A	N/A	N/A	Negligible
9	24	100 m	Low	03/06/2019	No	N/A	N/A	N/A	N/A	Low
10	25	100 m	Low	03/06/2019	No	N/A	N/A	N/A	N/A	Low
11	28	100 m	Low	03/06/2019	No	N/A	N/A	N/A	N/A	Low
12	30	100 m	Negligible	04/06/2019	No	N/A	N/A	N/A	N/A	Negligible
13	31	100 m	Negligible	04/06/2019	No	N/A	N/A	N/A	N/A	Negligible
14	32	100 m	Negligible	04/06/2019	No	N/A	N/A	N/A	N/A	Negligible
15	33	100 m	Negligible	04/06/2019	No	N/A	N/A	N/A	N/A	Negligible
16	34	Fragmented[37]	Moderate	04/06/2019	Yes	21/02/2020	Emergence - 11/08/2020	Emergence - 26/08/2020	N/A	Moderate
17	35	100 m	Moderate	04/06/2019	No	N/A	Emergence - 11/08/2020	Emergence - 26/08/2020	N/A	Low
18	36	50 m	Moderate	04/06/2019	No	N/A	Emergence - 11/08/2020	Emergence - 26/08/2020	N/A	Low
19	37	100 m	Low	04/06/2019	No	N/A	N/A	N/A	N/A	Low
20	38	100 m	Low	04/06/2019	No	N/A	N/A	N/A	N/A	Low

[33] Red in table = survey access refused. Amber in table = surveys outstanding
[34] Refers to tree being between 50 m and 100 m of the Scheme
[35] Refers to tree being within 50 m of the Scheme
[36] Refers to tree being felled as a result of the Scheme
[37] Refers to tree being located between the M5 and the new Link Road as a result of the Scheme

Number[33]	Tree Feature Reference	Impact from the Scheme	GLTA Result	PRA Survey Date	Hibernation suitability	Hibernation survey 2021	Roost Survey 1	Roost Survey 2	Roost Survey 3	Overall Tree Assessment
21	39	100 m	Moderate	04/06/2019	No	N/A	Tree climb - 27/07/2020	N/A	N/A	Low
22	40	100 m	Moderate	04/06/2019	No	21/02/2020	N/A	N/A	N/A	Low
23	41	100 m	Moderate	04/06/2019	Yes	21/02/2020	N/A	N/A	N/A	Low
24	42	100 m	High	04/06/2019	Yes	21/02/2020	Emergence - 11/08/2020	Emergence - 26/08/2020	N/A	Moderate
25	43	100 m	Moderate	04/06/2019	Yes	21/02/2020	N/A	N/A	N/A	Low
26	44	100 m	Negligible	04/06/2019	No	N/A	N/A	N/A	N/A	Negligible
27	45	100 m	High	04/06/2019	Yes	17/02/2020	N/A	N/A	N/A	Low
28	46	100 m	Low	04/06/2019	No	N/A	N/A	N/A	N/A	Low
29	47	100 m	Negligible	04/06/2019	No	N/A	N/A	N/A	N/A	Negligible
30	48	100 m	High	04/06/2019	Yes	17/02/2020	N/A	N/A	N/A	Low
31	49	100 m	High	04/06/2019	Yes	17/02/2020	Tree climb - 30/07/2020	Tree climb - 17/08/2020	Tree climb - 01/09/2020	High
32	50	100 m	High	04/06/2019	Yes	17/02/2020	N/A	N/A	N/A	Low
33	51	100 m	Moderate	04/06/2019	No	17/02/2020	N/A	N/A	N/A	Low
34	52	100 m	Moderate	04/06/2019	No	17/02/2020	N/A	N/A	N/A	Low
35	53	100 m	Moderate	04/06/2019	No	17/02/2020				Low
36	54	100 m	High	04/06/2019	Yes	N/A - pole replaced	N/A - pole replaced	N/A - pole replaced	N/A - pole replaced	Negligible
37	55	100 m	Moderate	04/06/2019	Yes	17/02/2020 - emergence surveys recommended	Emergence - 11/08/2020	Emergence - 26/08/2020	N/A	Negligible
38	56	100 m	Moderate	04/06/2019	Yes	17/02/2020	Tree climb - 11/08/2020	N/A	N/A	Low
39	57	100 m	High	04/06/2019	Yes	17/02/2020	Tree climb - 11/08/2020	Tree climb - 26/08/2020	Tree climb - 16/09/2020	High
40	58	100 m	Negligible	04/06/2019	No	N/A	N/A	N/A	N/A	Negligible
41	59	100 m	Negligible	04/06/2019	No	N/A	N/A	N/A	N/A	Negligible
42	60	100 m	High	04/06/2019	Yes	18/02/2020	Emergence - 17/08/2020	Emergence - 02/09/2020	N/A	Moderate
43	61	100 m	High	04/06/2019	Yes	18/02/2020	Tree climb - 27/07/2020	Tree climb - 17/08/2020	N/A	Moderate
44	62	100 m	High	04/06/2019	Yes	18/02/2020	N/A	N/A	N/A	Low
45	63	100 m	Low	04/06/2019	No	N/A	N/A	N/A	N/A	Low
46	64	100 m	High	04/06/2019	Yes	18/02/2020	N/A	N/A	N/A	Low

Number[33]	Tree Feature Reference	Impact from the Scheme	GLTA Result	PRA Survey Date	Hibernation suitability	Hibernation survey 2021	Roost Survey 1	Roost Survey 2	Roost Survey 3	Overall Tree Assessment
47	65	100 m	Moderate	04/06/2019	Yes	18/02/2020	Tree climb - 27/07/2020	Tree climb - 17/08/2020	N/A	Moderate
48	66	100 m	Moderate	04/06/2019	Yes	18/02/2020	Tree climb - 27/07/2020	Tree climb - 17/08/2020	N/A	Moderate
49	67	100 m	High	04/06/2019	Yes	18/02/2020	N/A	N/A	N/A	Low
50	68	100 m	Low	04/06/2019	No	N/A	N/A	N/A	N/A	Low
51	69	100 m	Low	04/06/2019	No	N/A	N/A	N/A	N/A	Low
52	70	100 m	Moderate	04/06/2019	Yes	18/02/2020	N/A	N/A	N/A	Low
53	71	100 m	Low	04/06/2019	No	N/A	N/A	N/A	N/A	Low
54	72	100 m	High	04/06/2019	Yes	18/02/2020	Tree climb - 27/07/2020	Tree climb - 17/08/2020	Tree climb - 02/09/2020	High
55	73	100 m	High	04/06/2019	Yes	18/02/2020 - emergence survey recommended	Tree climb and emergence - 17/08/2020	N/A	N/A	Low
56	74	100 m	Negligible	04/06/2019	No	N/A	N/A	N/A	N/A	Negligible
57	75	100 m	Negligible	04/06/2019	No	N/A	N/A	N/A	N/A	Negligible
58	76	100 m	Low	04/06/2019	No	N/A	N/A	N/A	N/A	Low
59	77	100 m	Negligible	04/06/2019	No	N/A	N/A	N/A	N/A	Negligible
60	78	100 m	Negligible	04/06/2019	No	N/A	N/A	N/A	N/A	Negligible
61	79	50 m	Negligible	04/06/2019	No	N/A	N/A	N/A	N/A	Negligible
62	80	50 m	Low	04/06/2019	No	N/A	N/A	N/A	N/A	Low
63	81	50 m	Negligible	04/06/2019	No	N/A	N/A	N/A	N/A	Negligible
64	82	50 m	Negligible	04/06/2019	No	N/A	N/A	N/A	N/A	Negligible
65	83	50 m	Negligible	04/06/2019	No	N/A	N/A	N/A	N/A	Negligible
66	84	50 m	Low	04/06/2019	No	N/A	N/A	N/A	N/A	Low
67	85	50 m	Low	05/06/2019	No	N/A	N/A	N/A	N/A	Low
68	86	50 m	High	05/06/2019	Yes	21/02/2020	Emergence - 17/08/2020	Emergence - 02/09/2020	Emergence - 16/09/2020	High
69	87	50 m	High	05/06/2019	Yes	21/02/2020	N/A	N/A	N/A	Negligible
70	88	50 m	Negligible	05/06/2019	No	N/A	N/A	N/A	N/A	Negligible
71	89	50 m	Moderate	05/06/2019	Yes	21/02/2020	Emergence - 17/08/2020	Emergence - 02/09/2020	N/A	Moderate
72	90	50 m	Negligible	05/06/2019	No	N/A	N/A	N/A	N/A	Negligible
73	91	50 m	Negligible	05/06/2019	No	N/A	N/A	N/A	N/A	Negligible
74	92	50 m	Moderate	05/06/2019	No	21/02/2020	N/A	N/A	N/A	Negligible

Number[33]	Tree Feature Reference	Impact from the Scheme	GLTA Result	PRA Survey Date	Hibernation suitability	Hibernation survey 2021	Roost Survey 1	Roost Survey 2	Roost Survey 3	Overall Tree Assessment
75	93	50 m	High	05/06/2019	Yes	21/02/2020	N/A	N/A	N/A	Negligible
76	94	50 m	Low	05/06/2019	No	N/A	N/A	N/A	N/A	Low
77	95	50 m	Low	05/06/2019	No	N/A	N/A	N/A	N/A	Low
78	96	Felled	Moderate	05/06/2019	Yes	21/02/2020	N/A	N/A	N/A	Low
79	97	50 m	Moderate	05/06/2019	Yes	21/02/2020	Tree climb - 30/07/2020	Tree climb - 17/08/2020	N/A	Moderate
80	98	50 m	Negligible	05/06/2019	No	N/A	N/A	N/A	N/A	Negligible
81	99	50 m	Negligible	05/06/2019	No	N/A	N/A	N/A	N/A	Negligible
82	100	50 m	Negligible	05/06/2019	No	N/A	N/A	N/A	N/A	Negligible
83	101	50 m	Moderate	05/06/2019	Yes	02/03/2020	N/A	N/A	N/A	Low
84	102	100 m	Negligible	05/06/2019	No	N/A	N/A	N/A	N/A	Negligible
85	103	100 m	Negligible	05/06/2019	No	N/A	N/A	N/A	N/A	Negligible
86	104	100m	Low	05/06/2019	No	N/A	N/A	N/A	N/A	Low
87	105	100 m	Low	05/06/2019	No	N/A	N/A	N/A	N/A	Low
88	106	100 m	High	05/06/2019	Yes	18/02/2020	Tree climb 27/07/2020	Tree climb - 17/08/2020	Tree climb - 02/09/2020	High
89	107	100 m	Negligible	05/06/2019	No	N/A	N/A	N/A	N/A	Negligible
90	108	100 m	Negligible	05/06/2019	No	N/A	N/A	N/A	N/A	Negligible
91	109	100 m	Moderate	05/06/2019	No	N/A	Tree climb and emergence - 17/08/2020	N/A	N/A	Low
92	110	100 m	Low	05/06/2019	No	N/A	N/A	N/A	N/A	Low
93	111	100 m	Negligible	05/06/2019	No	N/A	N/A	N/A	N/A	Negligible
94	112	100 m	Negligible	05/06/2019	No	N/A	N/A	N/A	N/A	Negligible
95	113	100 m	Low	05/06/2019	No	N/A	N/A	N/A	N/A	Low
96	114	100 m	Low	05/06/2019	No	N/A	N/A	N/A	N/A	Low
97	115	100 m	Low	05/06/2019	No	N/A	N/A	N/A	N/A	Low
98	116	100 m	High	05/06/2019	Yes	N/A	Tree climb - 28/07/2020	N/A	N/A	Negligible
99	117	100 m	Negligible	05/06/2019	No	N/A	N/A	N/A	N/A	Negligible
100	118	100 m	Negligible	05/06/2019	No	N/A	N/A	N/A	N/A	Negligible
101	119	100 m	Negligible	05/06/2019	No	N/A	N/A	N/A	N/A	Negligible
102	120	100 m	Low	05/06/2019	No	N/A	N/A	N/A	N/A	Low
103	121	100 m	Negligible	05/06/2019	No	N/A	N/A	N/A	N/A	Negligible

Number[33]	Tree Feature Reference	Impact from the Scheme	GLTA Result	PRA Survey Date	Hibernation suitability	Hibernation survey 2021	Roost Survey 1	Roost Survey 2	Roost Survey 3	Overall Tree Assessment
104	122	100 m	Negligible	05/06/2019	No	N/A	N/A	N/A	N/A	Negligible
105	123	50 m	High	05/06/2019	Yes	20/02/2020	Tree climb - 30/07/2020	Tree climb - 18/08/2020	N/A	Moderate
106	124	50 m	High	05/06/2019	Yes	20/02/2020	Tree climb - 30/07/2020	Tree climb - 18/08/2020	N/A	Moderate
107	125	Felled	High	05/06/2019	Yes	20/02/2020	Tree climb - 30/07/2020	Tree climb - 18/08/2020	N/A	Moderate
108	126	Felled	High	05/06/2019	Yes	20/02/2020	Tree climb - 30/07/2020	N/A	N/A	Low
109	129	Felled	Moderate	12/06/2019	No	N/A	Tree climb - 28/07/2020	N/A	N/A	Negligible
110	130	50 m	Low	12/06/2019	No	N/A	N/A	N/A	N/A	Low
111	131	100 m	Moderate	12/06/2019	No	N/A	N/A	N/A	N/A	Low
112	132	100 m	High	12/06/2019	Yes	21/02/2020	Tree climb - 28/07/2020	Tree climb - 01/09/2020	Tree climb - 17/09/2020	High
113	133	100 m	Negligible	12/06/2019	No	N/A	Tree climb - 28/07/2020	N/A	N/A	Negligible
114	134	Fragmented	Negligible	12/06/2019	No	N/A	N/A	N/A	N/A	Negligible
115	135	100 m	Negligible	12/06/2019	No	N/A	N/A	N/A	N/A	Negligible
116	136	100 m	Moderate	12/06/2019	No	N/A	N/A	N/A	N/A	Negligible
117	137	100 m	Low	12/06/2019	No	N/A	N/A	N/A	N/A	Low
118	138	100 m	Negligible	12/06/2019	No	N/A	N/A	N/A	N/A	Negligible
119	139	100 m	Negligible	12/06/2019	No	N/A	N/A	N/A	N/A	Negligible
120	140	100 m	Negligible	12/06/2019	No	N/A	N/A	N/A	N/A	Negligible
121	141	100 m	Negligible	12/06/2019	No	N/A	N/A	N/A	N/A	Negligible
122	142	100 m	Negligible	12/06/2019	No	N/A	N/A	N/A	N/A	Negligible
123	143	100 m	Negligible	12/06/2019	No	N/A	N/A	N/A	N/A	Negligible
124	144	100 m	Negligible	12/06/2019	No	N/A	N/A	N/A	N/A	Negligible
125	145	100 m	Negligible	12/06/2019	No	N/A	N/A	N/A	N/A	Negligible
126	146	100 m	Negligible	12/06/2019	No	N/A	N/A	N/A	N/A	Negligible
127	147	Fragmented	Negligible	12/06/2019	No	N/A	N/A	N/A	N/A	Negligible
128	148	Fragmented	Negligible	12/06/2019	No	N/A	N/A	N/A	N/A	Negligible
129	149	Fragmented	Negligible	12/06/2019	No	N/A	N/A	N/A	N/A	Negligible
130	150	Fragmented	Negligible	12/06/2019	No	N/A	N/A	N/A	N/A	Negligible
131	151	Fragmented	Negligible	12/06/2019	No	N/A	N/A	N/A	N/A	Negligible

Number[33]	Tree Feature Reference	Impact from the Scheme	GLTA Result	PRA Survey Date	Hibernation suitability	Hibernation survey 2021	Roost Survey 1	Roost Survey 2	Roost Survey 3	Overall Tree Assessment
132	152	Fragmented	Low	12/06/2019	No	N/A	N/A	N/A	N/A	Low
133	153	Fragmented	Low	12/06/2019	No	N/A	N/A	N/A	N/A	Low
134	154	Fragmented	Negligible	12/06/2019	No	N/A	N/A	N/A	N/A	Negligible
135	155	100 m	Moderate	12/06/2019	No	N/A	Tree climb - 28/07/2020	N/A	N/A	Negligible
136	156	100 m	Moderate	12/06/2019	Yes	21/02/2020	Emergence - 18/08/2020	Emergence - 01/09/2020	N/A	Moderate
137	157	Fragmented	Negligible	12/06/2019	No	N/A	N/A	N/A	N/A	Negligible
138	158	100 m	Negligible	12/06/2019	No	N/A	N/A	N/A	N/A	Negligible
139	159	100 m	Moderate	12/06/2019	No	N/A	Tree climb - 01/09/2020	N/A	N/A	Negligible
140	160	Felled	Moderate	12/06/2019	No	N/A	Tree climb - 01/09/2020	N/A	N/A	Negligible
141	161	Felled	Moderate	12/06/2019	No	N/A	Tree climb - 01/09/2020	N/A	N/A	Negligible
142	162	Felled	Moderate	12/06/2019	No	N/A	Tree climb - 01/09/2020	N/A	N/A	Negligible
143	163	Felled	Moderate	12/06/2019	No	N/A	Tree climb - 01/09/2020	N/A	N/A	Negligible
144	164	Felled	Moderate	12/06/2019	No	27/02/2020 (surveyed despite no hibernation potential)	N/A	N/A	N/A	Negligible
145	165	100 m	Negligible	12/06/2019	No	N/A	N/A	N/A	N/A	Negligible
146	166	100 m	Negligible	12/06/2019	No	N/A	N/A	N/A	N/A	Negligible
147	167	100 m	Negligible	12/06/2019	No	N/A	N/A	N/A	N/A	Negligible
148	168	100 m	Negligible	12/06/2019	No	N/A	N/A	N/A	N/A	Negligible
149	169	100 m	Negligible	12/06/2019	No	N/A	N/A	N/A	N/A	Negligible
150	170	100 m	Negligible	12/06/2019	No	N/A	N/A	N/A	N/A	Negligible
151	171	100 m	Low	12/06/2019	No	N/A	N/A	N/A	N/A	Low
152	172	100 m	Moderate	12/06/2019	No	N/A	Tree climb - 27/07/2020	Tree climb - 17/08/2020	Tree climb - 01/09/2020	Confirmed
153	195	100 m	Negligible	24/06/2019	No	N/A	N/A	N/A	N/A	Negligible
154	196	100 m	Negligible	24/06/2019	No	N/A	N/A	N/A	N/A	Negligible
155	197	100 m	Negligible	24/06/2019	No	N/A	N/A	N/A	N/A	Negligible
156	198	100 m	Negligible	24/06/2019	No	N/A	N/A	N/A	N/A	Negligible
157	199	100 m	Negligible	24/06/2019	No	N/A	N/A	N/A	N/A	Negligible

Number[33]	Tree Feature Reference	Impact from the Scheme	GLTA Result	PRA Survey Date	Hibernation suitability	Hibernation survey 2021	Roost Survey 1	Roost Survey 2	Roost Survey 3	Overall Tree Assessment
158	200	100 m	High	24/06/2019	Yes	17/02/2020	Tree climb - 27/07/2020	Tree climb - 17/08/2020	N/A	Moderate
159	201	100 m	Moderate	24/06/2019	Yes	17/02/2020	Tree climb - 27/07/2020	Tree climb - 17/08/2020	N/A	Moderate
160	202	100 m	Moderate	24/06/2019	Yes	17/02/2020	Tree climb - 27/07/2020	Tree climb - 17/08/2020	N/A	Moderate
161	203	100 m	Moderate	24/06/2019	Yes	17/02/2020	Tree climb - 27/07/2020	Tree climb - 17/08/2020	N/A	Moderate
162	204	100 m	Moderate	24/06/2019	Yes	17/02/2020	Tree climb - 27/07/2020	Tree climb - 17/08/2020	N/A	Moderate
163	205	50 m	Negligible	24/06/2019	No	N/A	N/A	N/A	N/A	Negligible
164	206	50 m	Low	24/06/2019	No	N/A	N/A	N/A	N/A	Low
165	207	50 m	Low	24/06/2019	No	N/A	N/A	N/A	N/A	Low
166	208	50 m	Low	24/06/2019	No	N/A	N/A	N/A	N/A	Low
167	209	50 m	Negligible	24/06/2019	No	N/A	N/A	N/A	N/A	Negligible
168	210	Felled	Negligible	24/06/2019	No	N/A	N/A	N/A	N/A	Negligible
169	211	50 m	High	24/06/2019	Yes		Tree climb - 30/07/2020	Tree climb - 18/08/2020	N/A	Moderate
170	212	50 m	Low	24/06/2019	No	N/A	N/A	N/A	N/A	Low
171	213	Felled	Low	24/06/2019	No	N/A	N/A	N/A	N/A	Low
172	214	Felled	Low	24/06/2019	No	N/A	N/A	N/A	N/A	Low
173	215	felled	Negligible	24/06/2019	No	N/A	N/A	N/A	N/A	Negligible
174	216	50 m	High	24/06/2019	Yes					High
175	217	50 m	Low	24/06/2019	No	N/A	N/A	N/A	N/A	Low
176	218	100 m	High	24/06/2019	Yes					High
177	220	100 m	Low	24/06/2019	No	N/A	N/A	N/A	N/A	Low
178	221	100 m	Negligible	24/06/2019	No	N/A	N/A	N/A	N/A	Negligible
179	222	50 m	Low	24/06/2019	No	N/A	N/A	N/A	N/A	Low
180	223	50 m	Low	24/06/2019	No	N/A	N/A	N/A	N/A	Low
181	224	100 m	Low	24/06/2019	No	N/A	N/A	N/A	N/A	Low
182	225	100 m	Low	24/06/2019	No	N/A	N/A	N/A	N/A	Low
183	226	100 m	Low	24/06/2019	No	N/A	N/A	N/A	N/A	Low
184	227	100 m	Negligible	24/06/2019	No	N/A	N/A	N/A	N/A	Negligible
185	228	100 m	Negligible	24/06/2019	No	N/A	N/A	N/A	N/A	Negligible

Number[33]	Tree Feature Reference	Impact from the Scheme	GLTA Result	PRA Survey Date	Hibernation suitability	Hibernation survey 2021	Roost Survey 1	Roost Survey 2	Roost Survey 3	Overall Tree Assessment
186	229	100 m	High	24/06/2019	Yes		Tree climb - 30/07/2020	Tree climb - 18/08/2020	N/A	Moderate
187	230	50 m	High	24/06/2019	Yes					High
188	232	50 m	Negligible	24/06/2019	No	N/A	N/A	N/A	N/A	Negligible
189	233	50 m	Negligible	24/06/2019	No	N/A	N/A	N/A	N/A	Negligible
190	234	50 m	Negligible	25/06/2019	No	N/A	N/A	N/A	N/A	Negligible
191	235	Felled	High	25/06/2019	Yes	20/02/2020	N/A	N/A	N/A	Negligible
192	235a	Felled	High	20/02/2020	Yes	20/02/2020	Emergence - 10/08/2020	Emergence - 24/08/2020	Emergence - 14/09/2020	High
193	236	Felled	Moderate	25/06/2019	Yes	20/02/2020	Emergence - 30/07/2020	Emergence - 24/08/2020	N/A	Moderate
194	237	Felled	Moderate	25/06/2019	Yes	20/02/2020	Emergence - 10/08/2020	Emergence - 24/08/2020	Emergence - 14/09/2020	High
195	238	50 m	Negligible	25/06/2019	No	N/A	N/A	N/A	N/A	Negligible
196	239	50 m	Negligible	25/06/2019	No	N/A	N/A	N/A	N/A	Negligible
197	240	50 m	Moderate	25/06/2019	No	02/03/2020			N/A	Moderate
198	241	50 m	High	25/06/2019	Yes	02/02/2020				High
199	242	50 m	Moderate	25/06/2019	Yes	02/03/2020	N/A	N/A	N/A	Low
200	243	50 m	Low	25/06/2019	No	N/A	N/A	N/A	N/A	Low
201	244	50 m	High	25/06/2019	Yes	19/02/2020	N/A	N/A	N/A	Low
202	245	50 m	High	25/06/2019	Yes	19/02/2020	N/A	N/A	N/A	Low
203	246	50 m	Moderate	25/06/2019	Yes	19/02/2020	N/A	N/A	N/A	Low
204	247	50 m	Moderate	25/06/2019	Yes	19/02/2020	Tree climb - 30/07/2020	Tree climb - 18/08/2020	N/A	Moderate
205	248	50 m	High	25/06/2019	Yes	19/02/2020	Tree climb - 30/07/2020	Tree climb - 18/08/2020	N/A	Moderate
206	249	50 m	Moderate	25/06/2019	Yes	19/02/2020	N/A	N/A	N/A	Low
207	250	Felled	Low	25/06/2019	No	N/A	N/A	N/A	N/A	Low
208	251	Felled	Moderate	25/06/2019	Yes	19/02/2020	N/A	N/A	N/A	Low
209	252	Felled	High	25/06/2019	Yes	19/02/2020	Tree climb - 30/07/2020	Tree climb 18/08/2020	N/A	Moderate
210	253	Felled	Moderate	25/06/2019	Yes	20/02/2020	Tree climb - 30/07/2020	Tree climb 18/08/2020	N/A	Moderate
211	254	Felled	Moderate	25/06/2019	Yes	20/02/2020	N/A	N/A	N/A	Low
212	255	50 m	Low	25/06/2019	No	N/A	N/A	N/A	N/A	Low

Number[33]	Tree Feature Reference	Impact from the Scheme	GLTA Result	PRA Survey Date	Hibernation suitability	Hibernation survey 2021	Roost Survey 1	Roost Survey 2	Roost Survey 3	Overall Tree Assessment
213	256	50 m	Low	25/06/2019	No	N/A	N/A	N/A	N/A	Low
214	257	50 m	High	25/06/2019	Yes	20/02/2020	Tree climbing - 30/07/2020	Tree climbing 19/08/2020	Tree climbing 01/09/2020	High
215	266	100 m	Negligible	25/06/2019	No	N/A	N/A	N/A	N/A	Negligible
216	267	Felled	Negligible	25/06/2019	No	N/A	N/A	N/A	N/A	Negligible
217	268	Felled	Negligible	25/06/2019	No	N/A	N/A	N/A	N/A	Negligible
218	269	Felled	Negligible	25/06/2019	No	N/A	N/A	N/A	N/A	Negligible
219	274	100 m	Negligible	29/08/2019	No	N/A	N/A	N/A	N/A	Negligible
220	275	50 m	Negligible	29/08/2019	No	N/A	N/A	N/A	N/A	Negligible
221	276	100 m	High	29/08/2019	Yes	28/02/2020	N/A	N/A	N/A	Low
222	277	50 m	Moderate	29/08/2019	No	03/03/2020 (climbed un-necessarily)	N/A	N/A	N/A	Low
223	278	50 m	Low	29/08/2019	No	N/A	N/A	N/A	N/A	Low
224	279	Felled	Negligible	29/08/2019	No	N/A	N/A	N/A	N/A	Negligible
225	280	Felled	Negligible	29/08/2019	No	N/A	N/A	N/A	N/A	Negligible
226	281	Felled	Moderate	29/08/2019	No	03/03/2020 (climbed un-necessarily)	Tree climb - 27/07/2020	Tree climb - 19/08/2020	N/A	Moderate
227	282	Felled	Negligible	29/08/2019	No	N/A	N/A	N/A	N/A	Negligible
228	283	Felled	Low	29/08/2019	No	N/A	N/A	N/A	N/A	Low
229	284	50 m	Low	29/08/2019	No	N/A	N/A	N/A	N/A	Low
230	285	50 m	Low	29/08/2019	No	N/A	N/A	N/A	N/A	Low
231	324	100 m	Negligible	30/08/2019	No	N/A	N/A	N/A	N/A	Negligible
232	325	100 m	Negligible	30/08/2019	No	N/A	N/A	N/A	N/A	Negligible
233	326	100 m	Low	30/08/2019	No	N/A	N/A	N/A	N/A	Low
234	327	50 m	Negligible	30/08/2019	No	N/A	N/A	N/A	N/A	Negligible
235	328	Felled	Negligible	30/08/2019	No	N/A	N/A	N/A	N/A	Negligible
236	329	Felled	Low	30/08/2019	No	N/A	N/A	N/A	N/A	Low
237	330	Felled	Low	30/08/2019	No	N/A	N/A	N/A	N/A	Low
238	331	Felled	Negligible	30/08/2019	No	N/A	N/A	N/A	N/A	Negligible
239	332	Felled	Negligible	30/08/2019	No	N/A	N/A	N/A	N/A	Negligible
240	333	Felled	Negligible	30/08/2019	No	N/A	N/A	N/A	N/A	Negligible
241	334	Felled	Low	30/08/2019	No	N/A	N/A	N/A	N/A	Low

Number[33]	Tree Feature Reference	Impact from the Scheme	GLTA Result	PRA Survey Date	Hibernation suitability	Hibernation survey 2021	Roost Survey 1	Roost Survey 2	Roost Survey 3	Overall Tree Assessment
242	335	Felled	Low	30/08/2019	No	N/A	N/A	N/A	N/A	Low
243	336	Felled	Negligible	30/08/2019	No	N/A	N/A	N/A	N/A	Negligible
244	337	Felled	Negligible	30/08/2019	No	N/A	N/A	N/A	N/A	Negligible
245	338	Felled	Negligible	30/08/2019	No	N/A	N/A	N/A	N/A	Negligible
246	339	Felled	Negligible	30/08/2019	No	N/A	N/A	N/A	N/A	Negligible
247	340	Felled	Negligible	30/08/2019	No	N/A	N/A	N/A	N/A	Negligible
248	341	100 m	Moderate	30/08/2019	No	02/03/2020 (climbed un-necessarily)	N/A	N/A	N/A	Negligible
249	347	100 m	Negligible	30/08/2019	No	N/A	N/A	N/A	N/A	Negligible
250	486	50 m	Low	29/10/2019	No	N/A	N/A	N/A	N/A	Low
251	487	50 m	High	29/10/2019	Yes	24/02/2020	Tree climb - 27/07/2020	Tree climb - 19/08/2020	N/A	Moderate
252	488	50 m	Moderate	29/10/2019	Yes	24/02/2020	N/A	N/A	N/A	Low
253	489	50 m	High	29/10/2019	Yes	24/02/2020	N/A	N/A	N/A	Low
254	490	50 m	Moderate	29/10/2019	Yes	24/02/2020	Tree climb - 27/07/2020	Tree climb - 19/08/2020	N/A	Moderate
255	494	50 m	Moderate	29/10/2019	Yes	24/02/2020	N/A	N/A	N/A	Low
256	496	Felled	Confirmed	24/10/2019	Yes	24/02/2020	Tree climb - 27/07/2020	Tree climb - 19/08/2020	Tree climb - 01/09/2020	Confirmed
257	498	Felled	Low	24/10/2019	No	N/A	N/A	N/A	N/A	Low
258	499	Felled	Moderate	24/10/2019	Yes	03/03/2020	Tree climb - 27/07/2020	Tree climb - 19/08/2020	N/A	Moderate
259	500	50 m	Negligible	24/10/2019	No	N/A	N/A	N/A	N/A	Negligible
260	501	Felled	Negligible	24/10/2019	No	N/A	N/A	N/A	N/A	Negligible
261	502	Felled	Moderate	24/10/2019	Yes	27/02/2020	N/A	N/A	N/A	Negligible
262	503	Felled	Negligible	24/10/2019	No	N/A	N/A	N/A	N/A	Negligible
263	504	50 m	Low	24/10/2019	No	N/A	N/A	N/A	N/A	Low
264	505	50 m	Low	24/10/2019	No	N/A	N/A	N/A	N/A	Low
265	512	50 m	Moderate	24/10/2019	No	N/A			N/A	Moderate
266	513	50 m	Negligible	24/10/2019	No	N/A	N/A	N/A	N/A	Negligible
267	514	50 m	Low	24/10/2019	No	N/A	N/A	N/A	N/A	Low
268	515	50 m	High	24/10/2019	No	03/03/2020				Moderate
269	516	50 m	Moderate	24/10/2019	No	03/03/2020				Moderate
270	517	Felled	High	24/10/2019	No	03/03/2020	N/A	N/A	N/A	Low
271	518	Felled	Low	24/10/2019	No	N/A	N/A	N/A	N/A	Low

Number[33]	Tree Feature Reference	Impact from the Scheme	GLTA Result	PRA Survey Date	Hibernation suitability	Hibernation survey 2021	Roost Survey 1	Roost Survey 2	Roost Survey 3	Overall Tree Assessment
272	519	Felled	Negligible	24/10/2019	No	N/A	N/A	N/A	N/A	Negligible
273	520	Felled	Low	24/10/2019	No	N/A	N/A	N/A	N/A	Low
274	521	Felled	Moderate	24/10/2019	Yes	19/02/2020	Tree climb - 27/07/2020	Tree climb - 19/08/2020	N/A	Moderate
275	522	100 m	High	24/10/2019	Yes	19/02/2020	Tree climb - 27/07/2020	Tree climb - 19/08/2020	N/A	Moderate
276	543	Felled	Moderate	24/10/2019	Yes	24/02/2020				Low
277	544	Felled	Low	24/10/2019	No	N/A	N/A	N/A	N/A	Low
278	545	Felled	Low	24/10/2019	No	N/A	N/A	N/A	N/A	Low
279	546	Felled	Low	24/10/2019	No	N/A	N/A	N/A	N/A	Low
280	548	Felled	Low	23/10/2019	No	N/A	N/A	N/A	N/A	Low
281	549	Felled	Low	23/10/2019	No	N/A	N/A	N/A	N/A	Low
282	551	Felled	Low	23/10/2019	No	N/A	N/A	N/A	N/A	Low
283	552	Felled	Moderate	23/10/2019	No	N/A	Tree climb - 27/02/2020	N/A	N/A	Low
284	553	Felled	High	23/10/2019	Yes	24/02/2020	N/A	N/A	N/A	Low
285	554	Felled	Negligible	23/10/2019	No	N/A	N/A	N/A	N/A	Negligible
286	555	Felled	Negligible	23/10/2019	No	N/A	N/A	N/A	N/A	Negligible
287	557	Felled	Negligible	23/10/2019	No	N/A	N/A	N/A	N/A	Negligible
288	569	50 m	High	23/10/2019	No	N/A	Tree climb - 28/07/2020	Tree climb - 19/08/2020	Tree climb - 01/09/2020	High
289	570	50 m	Low	23/10/2019	No	N/A	N/A	N/A	N/A	Low
290	571	50 m	Low	23/10/2019	No	N/A	N/A	N/A	N/A	Low
291	572	100 m	Negligible	23/10/2019	No	N/A	N/A	N/A	N/A	Negligible
292	573	50 m	Negligible	23/10/2019	No	N/A	N/A	N/A	N/A	Negligible
293	576	Felled	High	23/10/2019	Yes	24/02/2020	Tree climb - 28/07/2020	Tree climb - 19/08/2020	Tree climb - 01/09/2020	Confirmed
294	578	Felled	High	23/10/2019	Yes	24/02/2020	Tree climb - 28/07/2020	Tree climb - 19/08/2020	Tree climb - 01/09/2020	Confirmed
295	581	100 m	High	23/10/2019	Yes					High
296	582	100 m	Moderate	23/10/2019	Yes					Moderate
297	583	100 m	Low	23/10/2019	No	N/A	N/A	N/A	N/A	Low
298	584	100 m	Moderate	23/10/2019	Yes	24/02/2020	Emergence - 19/08/2020	Emergence - 27/08/2020	N/A	Moderate
299	585	100 m	Negligible	23/10/2019	No	N/A	N/A	N/A	N/A	Negligible
300	595	Felled	Negligible	12/11/2019	No	N/A	N/A	N/A	N/A	Negligible
301	596	Felled	Moderate	12/11/2019	Yes					Moderate

Number[33]	Tree Feature Reference	Impact from the Scheme	GLTA Result	PRA Survey Date	Hibernation suitability	Hibernation survey 2021	Roost Survey 1	Roost Survey 2	Roost Survey 3	Overall Tree Assessment
302	597	Felled	Negligible	12/11/2019	No	N/A	N/A	N/A	N/A	Negligible
303	598	Felled	Negligible	12/11/2019	No	N/A	N/A	N/A	N/A	Negligible
304	599	Felled	Negligible	12/11/2019	No	N/A	N/A	N/A	N/A	Negligible
305	600	Felled	Negligible	12/11/2019	No	N/A	N/A	N/A	N/A	Negligible
306	601	Felled	Negligible	12/11/2019	No	N/A	N/A	N/A	N/A	Negligible
307	602	Felled	Moderate	12/11/2019	Yes					Negligible
308	603	Felled	Negligible	12/11/2019	No	N/A	N/A	N/A	N/A	Negligible
309	604	Felled	Negligible	12/11/2019	No	N/A	N/A	N/A	N/A	Negligible
310	605	Felled	Low	12/11/2019	No	N/A	N/A	N/A	N/A	Low
311	606	Felled	Negligible	12/11/2019	No	N/A	N/A	N/A	N/A	Negligible
312	607	Felled	Moderate	12/11/2019	Yes					Low
313	616	Felled	Moderate	12/11/2019	Yes	27/02/2020	N/A	N/A	N/A	Negligible
314	617	Felled	Negligible	12/11/2019	No	N/A	N/A	N/A	N/A	Negligible
315	618	Felled	Negligible	12/11/2019	No	N/A	N/A	N/A	N/A	Negligible
316	619	Felled	Negligible	12/11/2019	No	N/A	N/A	N/A	N/A	Negligible
317	620	Felled	Moderate	12/11/2019	Yes	27/02/2020	N/A	N/A	N/A	Negligible
318	621	Felled	Negligible	12/11/2019	No	N/A	N/A	N/A	N/A	Negligible
319	627	Felled	Moderate	28/11/2019	Yes	02/03/2020				Confirmed
320	635	50 m	Moderate	24/10/2019	Yes					Moderate
321	636	50 m	Moderate	24/10/2019	No	N/A			N/A	Moderate
322	637	50 m	Moderate	24/10/2019	Yes				N/A	Moderate
323	638	50 m	Negligible	24/10/2019	No	N/A	N/A	N/A	N/A	Negligible
324	639	Felled	Moderate	24/10/2019	Yes	24/02/2020	N/A	N/A	N/A	Low
325	640	Felled	Low	24/10/2019	No	N/A	N/A	N/A	N/A	Low
326	641	Felled	Low	24/10/2019	No	N/A	N/A	N/A	N/A	Low
327	642	Felled	Low	24/10/2019	No	N/A	N/A	N/A	N/A	Low
328	643	Felled	Low	28/11/2019	No	N/A	N/A	N/A	N/A	Low
329	644	Felled	Moderate	28/11/2019	Yes	27/02/2020	N/A	N/A	N/A	Negligible
330	645	50 m	Moderate	28/11/2019	Yes	24/02/2020	Emergence - 19/08/2020	Emergence - 03/09/2020	Emergence - 17/09/2020	High
331	646	Felled	Moderate	28/11/2019	Yes	27/02/2020	Tree climb - 27/07/2020		N/A	Moderate
332	647	Felled	Moderate	28/11/2019	Yes	27/02/2020	N/A	N/A	N/A	Negligible
333	648	50 m	Moderate	28/11/2019	Yes	02/03/2020				High
334	649	50 m	Moderate	28/11/2019	Yes	03/03/2020				High

Number[33]	Tree Feature Reference	Impact from the Scheme	GLTA Result	PRA Survey Date	Hibernation suitability	Hibernation survey 2021	Roost Survey 1	Roost Survey 2	Roost Survey 3	Overall Tree Assessment
335	650	50 m	Moderate	28/11/2019	Yes	27/02/2020	N/A	N/A	N/A	Low

Table 4-45 - Tree Groups Survey Data and Results

Number[38]	Tree Feature Reference	Impact from the Scheme	GLTA Result	PRA Survey Date	Hibernation suitability	Hibernation survey 2021	Roost Survey 1	Roost Survey 2	Roost Survey 3	Overall Tree Assessment
1	G2	100 m[39]	Low	03/06/3019	No	N/A	N/A	N/A	N/A	Low
2	G3	Felled	Negligible	03/06/3019	No	N/A	N/A	N/A	N/A	Negligible
3	G4	100m	Negligible	03/06/3019	No	N/A	N/A	N/A	N/A	Negligible
4	G10	Felled	Low	03/06/3019	No	N/A	N/A	N/A	N/A	Low
5	G11	Felled	Low	04/06/2019	No	N/A	N/A	N/A	N/A	Low
6	G12	Felled	Low	04/06/2019	No	N/A	N/A	N/A	N/A	Low
7	G141	100 m	Negligible	04/06/2019	No	N/A	N/A	N/A	N/A	Negligible
8	G13	100 m	Low	04/06/2019	No	N/A	N/A	N/A	N/A	Low
9	G14	100 m	Negligible	04/06/2019	No	N/A	N/A	N/A	N/A	Negligible
10	G15	100 m	Low	05/06/2019	No	N/A	N/A	N/A	N/A	Low
11	G16	100 m	Low	05/06/2019	No	N/A	N/A	N/A	N/A	Low
12	G17	100 m	Negligible	05/06/2019	No	N/A	N/A	N/A	N/A	Negligible
13	G18	100 m	Negligible	05/06/2019	No	N/A	N/A	N/A	N/A	Negligible
14	G19	Felled	Low	05/06/2019	No	N/A	N/A	N/A	N/A	Low
15	G20	Felled	Negligible	12/06/2019	No	N/A	N/A	N/A	N/A	Negligible
16	G21	Felled	Low	12/06/2019	No	N/A	N/A	N/A	N/A	Low
17	G22	Felled	Low	12/06/2019	No	N/A	N/A	N/A	N/A	Low
18	G23	100 m	Negligible	12/06/2019	No	N/A	N/A	N/A	N/A	Negligible
19	G24	Felled	Low	12/06/2019	No	N/A	N/A	N/A	N/A	Low
20	G25	Felled	Low	12/06/2019	No	N/A	N/A	N/A	N/A	Low
21	G26	100 m	Low	24/06/2019	No	N/A	N/A	N/A	N/A	Low
22	G27	100 m	Low	24/06/2019	No	N/A	N/A	N/A	N/A	Low
23	G28	Felled	Negligible	24/06/2019	No	N/A	N/A	N/A	N/A	Negligible
24	G29	Felled	Negligible	24/06/2019	No	N/A	N/A	N/A	N/A	Negligible
25	G30	100 m	Negligible	24/06/2019	No	N/A	N/A	N/A	N/A	Negligible
26	G31	100 m	Negligible	24/06/2019	No	N/A	N/A	N/A	N/A	Negligible
27	G32	Felled	Negligible	24/06/2019	No	N/A	N/A	N/A	N/A	Negligible
28	G33	100 m	Low	24/06/2019	No	N/A	N/A	N/A	N/A	Low

38 Red in table = survey access refused. Amber in table = surveys outstanding
39 Refers to tree being between 50 m and 100 m of the Scheme

Number[38]	Tree Feature Reference	Impact from the Scheme	GLTA Result	PRA Survey Date	Hibernation suitability	Hibernation survey 2021	Roost Survey 1	Roost Survey 2	Roost Survey 3	Overall Tree Assessment
29	G34	100 m	Negligible	24/06/2019	No	N/A	N/A	N/A	N/A	Negligible
30	G35	100 m	Negligible	24/06/2019	No	N/A	N/A	N/A	N/A	Negligible
31	G36	100 m	Negligible	24/06/2019	No	N/A	N/A	N/A	N/A	Negligible
32	G37	100 m	Negligible	24/06/2019	No	N/A	N/A	N/A	N/A	Negligible
33	G38	Felled	Negligible	25/06/2019	No	N/A	N/A	N/A	N/A	Negligible
34	G39	Felled	Low	25/06/2019	No	N/A	N/A	N/A	N/A	Low
35	G40	Felled	Low	25/06/2019	No	N/A	N/A	N/A	N/A	Low
36	G41	Felled	Low	25/06/2019	No	N/A	N/A	N/A	N/A	Low
37	G42	Felled	Negligible	25/06/2019	No	N/A	N/A	N/A	N/A	Negligible
38	G44	Felled	Negligible	29/08/2019	No	N/A	N/A	N/A	N/A	Negligible
39	G45	Felled	Low	29/08/2019	No	N/A	N/A	N/A	N/A	Low
40	G46	100m	Low	29/08/2019	No	N/A	N/A	N/A	N/A	Low
41	G47	100 m	Low	29/08/2019	No	N/A	N/A	N/A	N/A	Low
42	G48	100 m	Low	29/08/2019	No	N/A	N/A	N/A	N/A	Low
43	G49	felled	Low	29/08/2019	No	N/A	N/A	N/A	N/A	Low
44	G50	Felled	Low	29/08/2019	No	N/A	N/A	N/A	N/A	Low
45	G54	Felled	Low	30/08/2019	No	N/A	N/A	N/A	N/A	Low
46	G55	Felled	Low	30/08/2019	No	N/A	N/A	N/A	N/A	Low
47	G56	Felled	Low	30/08/2019	No	N/A	N/A	N/A	N/A	Low
48	G84	Felled	Negligible	12/11/2019	No	N/A	N/A	N/A	N/A	Negligible
49	G85	Felled	Negligible	12/11/2019	No	N/A	N/A	N/A	N/A	Negligible
50	G86	Felled	Negligible	12/11/2019	No	N/A	N/A	N/A	N/A	Negligible
51	G87	Felled	Negligible	12/11/2019	No	N/A	N/A	N/A	N/A	Negligible
52	G88	Felled	Negligible	12/11/2019	No	N/A	N/A	N/A	N/A	Negligible
53	G89	Felled	Negligible	12/11/2019	No	N/A	N/A	N/A	N/A	Negligible
54	G95	Felled	Negligible	23/10/2019	No	N/A	N/A	N/A	N/A	Negligible
55	G96	Felled	Negligible	23/10/2019	No	N/A	N/A	N/A	N/A	Negligible
56	G97	Felled	Negligible	23/10/2019	No	N/A	N/A	N/A	N/A	Negligible
57	G98	Felled	Low	23/10/2019	No	N/A	N/A	N/A	N/A	Low
58	G99	Felled	Negligible	23/10/2019	No	N/A	N/A	N/A	N/A	Negligible
59	G100	Felled	Negligible	23/10/2019	No	N/A	N/A	N/A	N/A	Negligible

Number[38]	Tree Feature Reference	Impact from the Scheme	GLTA Result	PRA Survey Date	Hibernation suitability	Hibernation survey 2021	Roost Survey 1	Roost Survey 2	Roost Survey 3	Overall Tree Assessment
60	G101	Felled	Negligible	23/10/2019	No	N/A	N/A	N/A	N/A	Negligible
61	G102	Felled	Negligible	23/10/2019	No	N/A	N/A	N/A	N/A	Negligible
62	G103	100 m	Negligible	23/10/2019	No	N/A	N/A	N/A	N/A	Negligible
63	G106	Felled	Negligible	29/10/2019	No	N/A	N/A	N/A	N/A	Negligible
64	G107	Felled	Negligible	29/10/2019	No	N/A	N/A	N/A	N/A	Negligible
65	G108	Felled	Negligible	29/10/2019	No	N/A	N/A	N/A	N/A	Negligible
66	G109	Felled	Low	29/10/2019	No	N/A	N/A	N/A	N/A	Low
67	G111	Felled	Negligible	24/10/2019	No	N/A	N/A	N/A	N/A	Negligible
68	G112	Felled	Negligible	24/10/2019	No	N/A	N/A	N/A	N/A	Negligible
69	G113	Felled	Negligible	24/10/2019	No	N/A	N/A	N/A	N/A	Negligible
70	G114	Felled	Negligible	24/10/2019	No	N/A	N/A	N/A	N/A	Negligible
71	G115	Felled	Negligible	24/10/2019	No	N/A	N/A	N/A	N/A	Negligible
72	G116	Felled	Negligible	24/10/2019	No	N/A	N/A	N/A	N/A	Negligible
73	G117	Felled	Negligible	24/10/2019	No	N/A	N/A	N/A	N/A	Negligible
74	G118	Felled	Negligible	24/10/2019	No	N/A	N/A	N/A	N/A	Negligible
75	G119	Felled	Negligible	24/10/2019	No	N/A	N/A	N/A	N/A	Negligible
76	G120	Felled	Negligible	24/10/2019	No	N/A	N/A	N/A	N/A	Negligible
77	G121	Felled	Negligible	24/10/2019	No	N/A	N/A	N/A	N/A	Negligible
78	G122	Felled	Negligible	24/10/2019	No	N/A	N/A	N/A	N/A	Negligible
79	G123	Felled	Negligible	23/10/2019	No	N/A	N/A	N/A	N/A	Negligible
80	G124	Felled	Negligible	23/10/2019	No	N/A	N/A	N/A	N/A	Negligible
81	G125	Felled	Negligible	23/10/2019	No	N/A	N/A	N/A	N/A	Negligible
82	G126	Felled	Negligible	23/10/2019	No	N/A	N/A	N/A	N/A	Negligible
83	G127	Felled	Negligible	23/10/2019	No	N/A	N/A	N/A	N/A	Negligible
84	G130	Felled	Negligible	12/11/2019	No	N/A	N/A	N/A	N/A	Negligible
85	G131	Felled	Negligible	12/11/2019	No	N/A	N/A	N/A	N/A	Negligible
86	G132	Felled	Negligible	12/11/2019	No	N/A	N/A	N/A	N/A	Negligible
87	G139	Felled	Negligible	24/10/2019	No	N/A	N/A	N/A	N/A	Negligible
88	G140	Felled	Negligible	12/11/2019	No	N/A	N/A	N/A	N/A	Negligible

A.4. Confirmed Tree Roosts

A.4.1. Confirmed Tree Roosts Results

Table 4-46 - Survey Results Tree 172

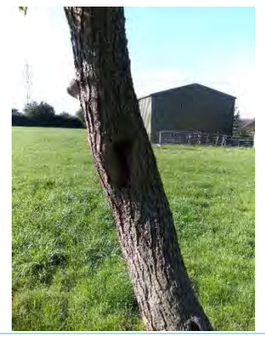
Date of Survey	Start and End Times and Time of Sunset	Structure Reference	Equipment Used (include make of bat detectors and logging equipment)	Weather (include start and end temps, precipitation, Beaufort wind scale etc)
12/06/2019	Daytime Ground level tree assessment (GLTA)	172	Torch and endoscope	Air temp: 12°C, Wind 2, cloud cover 7, rain 2
Comments: Keystone CG				
Visual inspection: A plum tree within an orchard. The tree is approximately 6 m tall with a 25cm DBH				
No hibernation suitability and no DNA surveys				
27/07/2020	Aerial tree climb	172	Endoscope	Air temp: 20°C, Wind 1, cloud cover 3 and rain 0
Comments: Arbology SS and WE				
Roost survey results: (species and numbers, roost location, access points (include number of them) and dimensions where appropriate: A knot hole on the southern aspect approximately 2 m high was assessed to extend upwards 20 cm and downwards 10 cm but was assessed to be very open and therefore of low suitability to support roosting bats. A further wound was identified on the northern aspect approximately 2 m high extending upwards 50cm, within which there is a secondary chamber on the left with a single Bechstein's bat present.				
17/08/2020	Aerial tree climb	172	Endoscope	Air temp: 19°C, wind 2, cloud cover 2 and rain 0
Comments: Arbology SS and EK				
Roost survey results: (species and numbers, roost location, access points (include number of them) and dimensions where appropriate: The wound identified on the northern aspect approximately 2 m high extending upwards 50cm, was endoscoped again within which there is a secondary chamber on the left with a single Bechstein's bat present.				
01/09/2020	Aerial tree climb	172	Endoscope	Air temp: 14°C, wind 1, cloud cover 0 and rain 0
Comments: Arbology SS and EK				
Roost survey results: (species and numbers, roost location, access points (include number of them) and dimensions where appropriate: The wound identified on the northern aspect approximately 2 m high extending upwards 50 cm, was endoscoped again within which there is a secondary chamber on the left with a single Bechstein's bat present.				
Photos:  				

Table 4-47 - Survey Results Tree 576

Date of Survey	Start and End Times and Time of Sunset	Structure Reference	Equipment Used (include make of bat detectors and logging equipment)	Weather (include start and end temps, precipitation, Beaufort wind scale etc)
23/10/2019	Daytime GLTA	576	Torch and endoscope	Air temp: 8°C, wind 0, rain 0 and cloud cover 8.
Comments: Atkins: SW and RM				
Visual inspection: A mature common ash tree within a line of trees along an agricultural field boundary. Approximately 19 m tall with a 45cm DBH. Two roosting features were identified from the ground, a callus roll and a woodpecker				
24/02/2020	Hibernation tree climbing	576	Endoscope	Air temp 6°C, wind 3, cloud cover 8, rain 3.
Comments: Arbology: SS and JK				
Hibernation results Woodpecker hole facing south approximately 10 m high was fully inspected and found to extend 40 cm with nesting materials at the base. A second woodpecker hole facing south east approximately 8m high extended inwards 10cm, then upwards 20 cm with a smooth dry substrate.				
28/07/2020	Aerial tree climbing	576	Endoscope	Air temp: 19°C, wind 2, cloud cover 2, rain 0.
Comments: Arbology SS and WE				
Roost survey results: (species and numbers, roost location, access points (include number of them) and dimensions where appropriate: Woodpecker hole facing south approximately 10m high was fully inspected and found to extend inwards 10cm then upwards by 20 cm. A second woodpecker hole facing south east approximately 8 m high extended inwards approximately 20cm with nesting materials at it base.				
19/08/2020	Aerial tree climbing	576	Endoscope	Air temp: 16°C, wind 3, cloud cover 8, rain 4
Comments: Arbology: SS and EK				
Roost survey results: (species and numbers, roost location, access points (include number of them) and dimensions where appropriate: The woodpecker hole facing south has snapped out leaving only the south east facing feature. The south east facing feature had a single noctule bat present with droppings observed at the base.				
01/09/2020	Aerial tree climbing	576	Endoscope	Air temp: 14°C, wind 1, cloud cover 0 and rain 0
Comments: Arbology: SS and EK				
Roost survey results: (species and numbers, roost location, access points (include number of them) and dimensions where appropriate: The south east facing feature had a single noctule bat present.				
Photos:  				

Table 4-48 - Survey Results Tree 578

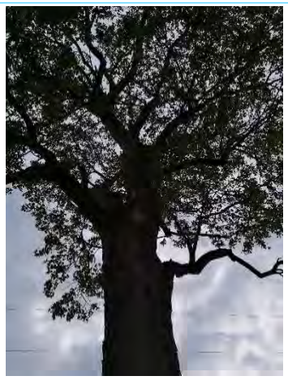
Date of Survey	Start and End Times and Time of Sunset	Structure Reference	Equipment Used (include make of bat detectors and logging equipment)	Weather (include start and end temps, precipitation, Beaufort wind scale etc)
23/10/2019	Daytime GLTA	578	Torch	Air temp: 8°C, wind 0, rain 0 and cloud cover 8.
Comments: Atkins: SW and RM				
Visual inspection: An over-mature ash tree approximately 16m high with a 40cm DBH, situated within a field boundary of agricultural fields. The tree was identified to have a number of features include a woodpecker hole facing south, and north and a callus roll facing south west.				
24/02/2020	Hibernation tree climbing	576	Endoscope	Air temp 6°C, wind 3, cloud cover 8, rain 3.
Comments: Arbology: SS and JK				
Hibernation results: Three woodpecker holes were identified; on the northern aspect 9 m high extending upwards by 8cm and downwards by 40cm with nesting materials at the base. On the northern aspect at 12 m high which had failed to become exposed and damp. And a third south facing approximately 8m high extending upwards 20 cm, downwards 30cm with nesting materials at the base whilst being smooth, clean and dry. Two wounds were also inspected, one south facing at 3 m high exposed with a 10 cm diameter open cavity extending upwards by 8cm. A further wound was identified on the northern aspect 5 m high and found to be shallow and exposed.				
28/07/2020	Aerial tree climbing	576	Endoscope	Air temp: 19°C, wind 2, cloud cover 2, rain 0.
Comments: Arbology SS and WE				
Roost survey results: (species and numbers, roost location, access points (include number of them) and dimensions where appropriate: Two woodpecker holes were inspected, one north facing approximately 10m high extending upward 8cm, back and down approximately 40 cm and was found to be dry and dusty. A second woodpecker hole 8m and south facing was found to have numerous feathers and nesting materials present, extending downwards by				
19/08/2020	Aerial tree climbing	576	Endoscope	Air temp: 16°C, wind 3, cloud cover 8, rain 4
Comments: Arbology SS and EK				
Roost survey results: (species and numbers, roost location, access points (include number of them) and dimensions where appropriate: The woodpecker hole facing north at 10m high at the base of a dead limb was found to have a single noctule bat present.				
01/09/2020	Aerial tree climbing	576	Endoscope	Air temp: 14°C, wind 1, cloud cover 0 and rain 0
Comments: Arbology SS and EK				
Roost survey results: (species and numbers, roost location, access points (include number of them) and dimensions where appropriate: The woodpecker hole facing north at 10m high at the base of a dead limb was found to have a small number (assumed three) noctules present.				
Photos:  				

Table 4-49 - Survey Results Tree 496

Date of Survey	Start and End Times and Time of Sunset	Structure Reference	Equipment Used (include make of bat detectors and logging equipment)	Weather (include start and end temps, precipitation, Beaufort wind scale etc)
24/10/2019	Daytime GLTA	496	Torch and endoscope	Air temp. 5 °C, wind 0, cloud 2, rain 0
Comments: Atkins: SK and EE				
Visual inspection: A mature willow tree located in the middle of field. Approximately 90cm DBH and a height of 7m. Features on this tree include lifting bark on the southwest aspect 2m high, and a wound on the south east aspect 1m high. During ground level tree assessment of the tree a barbastelle was observed within the wound using a torch.				
24/02/2020	Hibernation assessment	496	Endoscope	Moderate to heavy rain with a strong breeze / gusts. Temp 6ºC, wind 3, cloud cover 8 and rain 3
Comments: Arbology SS and JK				
Roost survey results: (species and numbers, roost location, access points (include number of them) and dimensions where appropriate: Features include lifting bark on the south west aspect, 1 m high which extends upward approximately 40cm and was damp and smooth. The wound facing south east extends inwards approximately 35 cm which was smooth and dry inside.				
24/07/2020	Ground and aerial assessment	496	Endoscope	Air temp. 4 °C, wind 2, cloud 7, rain 1
Comments: Arbology SS and WE				
Roost survey results: (species and numbers, roost location, access points (include number of them) and dimensions where appropriate: The south west facing lifting bark extends upwards approximately 15 cm and was very dust with cobwebs. The south east facing wound was heavily cobwebbed and dust inside.				
19/08/2020	Ground and aerial assessment	496	Endoscope	Air temp. 16 °C, wind 3, cloud 8, rain 4
Comments: Arbology SS and EK				
Roost survey results: (species and numbers, roost location, access points (include number of them) and dimensions where appropriate: The south west facing lifting bark extends upwards approximately 15 cm and was very dust with cobwebs. The south east facing wound was heavily cobwebbed and dust inside.				
01/09/2020	Ground and aerial assessment	496	Endoscope	Not provided
Comments: Arbology SS and EK				
Roost survey results: (species and numbers, roost location, access points (include number of them) and dimensions where appropriate: The south west facing lifting bark extends upwards approximately 15 cm and was very dust with cobwebs. The south east facing wound was heavily cobwebbed and dust inside. A further lifting bark feature was inspected east facing which was dry smooth and partially dusty.				





Photos:

Table 4-50 - Survey Results Tree 627

Date of Survey[40]	Start and End Times and Time of Sunset	Structure Reference	Equipment Used (include make of bat detectors and logging equipment)	Weather (include start and end temps, precipitation, Beaufort wind scale etc)
28/11/2019	Daytime GLTA	627	Torch and endoscope	Air temp. 0 °C, wind 0, cloud 8, rain 0
Comments: Atkins: EE and CH				
Visual inspection: A mature ash tree within a field boundary, approximately 16 m tall and 40 cm DBH. The common ash was identified to have ivy covering throughout and a woodpecker hole west facing at 7 m.				
08/10/2019	Transect (incidental)	627	Walkabout	Air temp. 13 °C, wind 3, cloud 3, rain 0
Comments: Atkins: RM and IH				
Roost survey results: (species and numbers, roost location, access points (include number of them) and dimensions where appropriate: Whilst undertaking transect 5, and stationary at stopping point 3 a big bat (considered to be noctule based on call analysis) was observed emerging from the tree at 19:05 then flying northwest.				
02/03/2020	Hibernation tree climb	627	Endoscope	Air temp: 6 °C, wind 2, cloud cover 1, rain 0
Comments: Arbology: SS and JK				
Roost survey results: (species and numbers, roost location, access points (include number of them) and dimensions where appropriate: A single woodpecker hole west facing at 7 m was identified and inspected. One feeding hole and two holes were present within the branch connecting into a larger cavity assessed to be too exposed to be suitable to roosting bats.				
Roost survey 1				
Roost survey 2				
Roost survey 3				
Photos:  				

40 Amber in table = surveys outstanding

Appendix C.

A.5. Transect Survey Information

Table 4-51 - Transect 2 Survey Details

Survey Date	Weather Conditions (max temp /min temp / cloud cover[41] / wind speed[42] / rainfall)	Surveyors	Sunset / Sunrise	Survey Start Time	Survey End Time	Survey Limitations
19/06/2019	Max. temp. 17°C, min. temp. 13°C, slight rain before survey start, min. humidity 79%, max. humidity 86%, max. wind speed 1, min. wind speed 0, max. cloud 7, min. cloud 6, moon phase – waxing gibbous	RJ and ND	Sunset – 21:31	21:31	00:31	N/A
09/07/2019	Max. temp. 23°C, max wind speed 6 mph, rainfall = 0[43]	AP and JH	Sunset – 21:27	21:40	00:32	Started 13 minutes after sunset
06/08/2019	Max. temp. 21°C, min. temp. 19°C, min. humidity 60%, max. humidity 70%, max. wind speed 1, min. wind speed 1, max. cloud 3, min. cloud 2, moon phase – waxing crescent	AP and SW	Sunset – 20:50	20:50	23:50	N/A
03/09/2019	Max. temp. 18°C, min. temp. 16°C, min. humidity 72%, max. humidity 79%, max. wind speed 3, min. wind speed 3, max. cloud 8, min. cloud 8	RM and WS	Sunset – 19:52	19:52	22:52	N/A
01/10/2019	Max. wind speed 6, min. wind speed 6, max. cloud 8, min. cloud 8	RM and JS	Sunset – 18:47	18:47	21:47	N/A
19/05/2020	Max. temp. 19°C, min. humidity 57%, , min. wind speed 0, min. cloud 1	SR and LH	Sunset – 21:01	21:01	00:01	N/A

Table 4-52 - Transect 4 Survey Details

Survey Date	Weather Conditions (max temp/min temp/cloud cover/wind speed/rainfall)	Surveyors	Sunset / Sunrise	Survey Start Time	Survey End Time	Survey Limitations
26/06/2019	Max. temp. 16°C, min. temp. 15°C, dry, min. humidity 70%, max. humidity 71%, max. wind speed 6, min. wind speed 6, max. cloud 8, min. cloud 8.	RT and RM	Sunset – 21:31	21:31	00:31	N/A
15/07/2019	Max. temp. 23°C, max wind speed 6 mph, rainfall = 0[44]	RM and ND	Sunset – 21:22	22:22	00:22	N/A
07/08/2019	Max. temp. 20°C, min. temp. 20°C, min. humidity 59%, max. humidity 61%, max. wind speed 3, min. wind speed 0, max. cloud 4, min. cloud 3, moon phase – half moon	CH and SW	Sunset – 20:48	20:48	23:48	N/A
04/09/2019	Max. temp. 20°C, max wind speed 18 mph, rainfall = 0[45]	AP and JH	Sunset 19:51	19:51	23:51	N/A
02/10/2019	Max. temp. 11°C, min. temp. 5°C, min. humidity 52%, max. humidity 91%, max. wind speed 1, min. wind speed 1, max. cloud 0, min. cloud 0, moon phase – new moon	ND and TS	Sunset – 18:35	18:40	21:36	N/A
21/05/2020	Max. temp. 24°C, max wind speed 6 mph, rainfall = 0[46]	RM and JC	Sunset – 21:04	21:00	00:00	N/A

[41] Cloud cover was recorded by surveyors using the Okta scale (the unit of measure for cloud cover is the Okta). Using this scale, cloud cover is measured on an eight point scale, 0 Oktas being clear sky, one Okta being 1/ 8 of the sky covered in cloud, and so on, up to 8 Oktas - completely overcast.
[42] Windspeed was recorded against Beaufort scale (with scores of 0-12). Using this scale 0 = calm, 2 = light breeze, 4 = Moderate breeze, 6 = strong breeze, 7 = High wind, 9 = Strong gale, 12 = Hurricane
[43] Data not collected during the survey therefore historical data has been used for this information: https://www.yourweather.co.uk/weather_Uckington-Europe-United+Kingdom-Gloucestershire--1-123446.html?d=historical
[44] Data not collected during the survey therefore historical data has been used for this information: https://www.yourweather.co.uk/weather_Uckington-Europe-United+Kingdom-Gloucestershire--1-123446.html?d=historical
[45] Data not collected during the survey therefore historical data has been used for this information: https://www.yourweather.co.uk/weather_Uckington-Europe-United+Kingdom-Gloucestershire--1-123446.html?d=historical
[46] Data not collected during the survey therefore historical data has been used for this information: https://www.yourweather.co.uk/weather_Uckington-Europe-United+Kingdom-Gloucestershire--1-123446.html?d=historical

Table 4-53 - Transect 5 Survey Details

Survey Date	Weather Conditions (max temp/min temp/cloud cover/wind speed/rainfall)	Surveyors	Sunset / Sunrise	Survey Start Time	Survey End Time	Survey Limitations
27/06/2019	Max. temp. 21°C, min. temp. 16°C, dry, min. humidity 62%, max. humidity 72%, max. wind speed 2, min. wind speed 1, max. cloud 0, min. cloud 0	EH and PE	Sunset – 21:31	21:31	00:35	No bat pass data saved due to error
09/07/2019	Max. temp. 25°C, min. temp. 13°C, min. humidity 61%, max. humidity 86%, max. wind speed 1, min. wind speed 0, max. cloud 5, min. cloud 1	RM and HM	Sunset – 21:27	21:30	00:30	No end of survey weather data
07/08/2019	Max. temp. 17°C, min. temp. 16°C, min. humidity 76%, max. humidity 80%, max. wind speed 2, min. wind speed 1, max. cloud 7, min. cloud 6, moon phase – waxing gibbous	SK and JH	Sunset – 20:48	20:48	23:48	N/A
04/09/2019	Max. temp. 15°C, min. temp. 14°C, min. humidity 65%, max. humidity 73%, max. wind speed 3, min. wind speed 2, max. cloud 5, min. cloud 3	RM and WS	Sunset – 19:50	19:50	22:50	N/A
08/10/2019	Max. temp. 14°C, min. temp. 11°C, min. humidity 76%, max. humidity 80%, max. wind speed 9, min. wind speed 1, max. cloud 4, min. cloud 0	RM and IH	Sunset – 18:31	18:31	21:31	N/A
14/05/2020	Max. temp. 12°C, min. temp. 16°C, min. humidity 11%, max. humidity 80%, max. wind speed 2, min. wind speed 0, max. cloud 7, min. cloud 0	EH and SK	Sunset – 20:53	20:53	23:55	PC 2 abandoned as cows in field

Table 4-54 - Transect 7 Survey Details

Survey Date	Weather Conditions (max temp/min temp/cloud cover/wind speed/rainfall)	Surveyors	Sunset / Sunrise	Survey Start Time	Survey End Time	Survey Limitations
17/06/2019	Max. temp. 23°C, max wind speed 3 mph, rainfall = 0[47]	ED and RM	Sunset - 21:30	21:30	00:31	N/A
10/07/2019	Max. temp. 23°C, min. temp. 22°C, min. humidity 48%, max. humidity 61%, max. wind speed 0, min. wind speed 0, max. cloud 8, min. cloud 8	AP and JH	Sunset – 21:27	21:27	00:30	N/A
13/08/2019	Max. temp. 21°C, max wind speed 10 mph, rainfall = 0[48]	RM and IH	Sunset – 20:35	20:35		N/A
10/09/2019	Max. temp. 20°C, min. temp. 18°C, min. humidity 55%, max. humidity 55%, max. wind speed 2, min. wind speed 0, max. cloud 8, min. cloud 7	AP and JH	Sunset – 19:37	19:37	22:37	N/A
08/10/2019	Max. temp. 13°C, min. temp. 11°C, min. humidity 74%, max. humidity 81%, max. wind speed 3, min. wind speed 1, max. cloud 3, min. cloud 0, moon phase – half moon	ND and TS	Sunset – 18:31	18:31	21:31	N/A
27/05/2020	Max. temp. 24°C, max wind speed 6 mph, rainfall = 0[49]	TS and CH	Sunset – 21:14	21:14	00:14	N/A

[47] Data not collected during the survey therefore historical data has been used for this information: https://www.yourweather.co.uk/weather_Uckington-Europe-United+Kingdom-Gloucestershire--1-123446.html?d=historical
[48] Data not collected during the survey therefore historical data has been used for this information: https://www.yourweather.co.uk/weather_Uckington-Europe-United+Kingdom-Gloucestershire--1-123446.html?d=historical
[49] Data not collected during the survey therefore historical data has been used for this information: https://www.yourweather.co.uk/weather_Uckington-Europe-United+Kingdom-Gloucestershire--1-123446.html?d=historical

Table 4-55 - Transect 8 Survey Details

Survey Date	Weather Conditions (max temp/min temp/cloud cover/wind speed/rainfall)	Surveyors	Sunset / Sunrise	Survey Start Time	Survey End Time	Survey Limitations
17/06/2019	Max. temp. 16°C, min. temp. 14°C, dry, min. humidity 72%, max. humidity 80%, max. wind speed 1, min. wind speed 1, max. cloud 8, min. cloud 6, waning gibbous	RM and CH	Sunset – 21:31	21:31	00:36	Point 1 skipped at latter part of survey due to access gate being blocked.
10/07/2019	Max. temp. 25°C, min. temp. 18°C, dry, min. humidity 45%, max. wind speed 0, min. wind speed 0, max. cloud 8, min. cloud 8	RM and SF	Sunset – 21:27	21:26	00:26	No access to field with stop 1.
13/08/2019	Max. temp. 17°C, min. temp. 15°C, min. humidity 61%, max. humidity 72%, max. wind speed 1, min. wind speed 0, max. cloud 7, min. cloud 7	SK and JH	Sunset – 20:35	20:35	23:35	N/A
10/09/2019	Max. temp. 21°C, min. temp. 20°C, min. humidity 48%, max. humidity 53%, max. wind speed 3, min. wind speed 1, max. cloud 7, min. cloud 7	TS and RM	Sunset – 19:37	19:37	22:33	N/A
08/10/2019	Max. temp. 9°C, min. temp. 9°C, min. humidity 78%, max. humidity 80%, max. wind speed 1, min. wind speed 1, max. cloud 4, min. cloud 0, moon phase – half moon	EE and TS	Sunset – 18:28	18:28	21:28	N/A
26/05/2020	Max. temp. 23°C, max wind speed 7 mph, rainfall = 0[50]	RM and RJ	Sunset – 21:11	21:11		N/A

Table 4-56 - Transect 9 Survey Details

Survey Date	Weather Conditions (max temp/min temp/cloud cover/wind speed/rainfall)	Surveyors	Sunset / Sunrise	Survey Start Time	Survey End Time	Survey Limitations
19/06/2019	Max. temp. 18°C, max wind speed 15 mph, rainfall = 0[51]	RM and SF	Sunset – 21:31	21:30	00:31	Swapped detector at 22:35 due to dead battery 22:38 Detector sound stopped, visual only. Reboot at 00:04, sound working again
11/07/2019	Max. temp. 24°C, min. temp. 18°C, min. humidity 54%, max. humidity 88%, max. wind speed 1, min. wind speed 1, max. cloud 7, min. cloud 5, waxing gibbous	RJ and JH	Sunset – 21:25	21:25	00:25	N/A
14/08/2019	Max. temp. 18°C, min. temp. 17°C, max. wind speed 2, min. wind speed 2, max. cloud 8, min. cloud 8	RM and ND	Sunset – 20:35	20:35		N/A
11/09/2019	Max. temp. 19°C, min. temp. 16°C, min. humidity 76%, max. humidity 84%, max. wind speed 1, min. wind speed 1, max. cloud 6, min. cloud 6	SK and JH	Sunset – 19:32	19:32	00:00	N/A
09/10/2019	Max. temp. 11°C, min. temp. 10°C, min. humidity 79%, max. humidity 87%, max. wind speed 10, min. wind speed 9, max. cloud 2, min. cloud 0, moon phase – half moon	ND and JA	Sunset – 18:28	18:28	21:29	N/A
26/05/2020	Max. temp. 23°C, max wind speed 7 mph, rainfall = 0[52]	LH and SK	Sunset – 21:11	21:11	00:11	N/A

[50] Data not collected during the survey therefore historical data has been used for this information: https://www.yourweather.co.uk/weather_Uckington-Europe-United+Kingdom-Gloucestershire--1-123446.html?d=historical
[51] Data not collected during the survey therefore historical data has been used for this information: https://www.yourweather.co.uk/weather_Uckington-Europe-United+Kingdom-Gloucestershire--1-123446.html?d=historical
[52] Data not collected during the survey therefore historical data has been used for this information: https://www.yourweather.co.uk/weather_Uckington-Europe-United+Kingdom-Gloucestershire--1-123446.html?d=historical

Table 4-57 - Transect 10 Survey Details

Survey Date	Weather Conditions (max temp/min temp/cloud cover/wind speed/rainfall)	Surveyors	Sunset / Sunrise	Survey Start Time	Survey End Time	Survey Limitations
25/06/2019	Max. temp. 16°C, min. temp. 15°C, dry, min. humidity 59%, max. humidity 70%, max. wind speed 4, min. wind speed 1, max. cloud 8, min. cloud 8	SF and RM	Sunset – 21:31	21:31	00:31	N/A
July	No survey possible					No access provided, as owners away
14/08/2019	Max. temp. 18°C, min. temp. 18°C, dry, min. humidity 86%, max. humidity 91%, max. wind speed 1, min. wind speed 1, max. cloud 8, min. cloud 7, full moon	SK and JH	Sunset – 20:35	20:35	23:35	N/A
11/09/2019	Max. temp. 24°C, min. temp. 21°C, min. humidity 60%, max. humidity 68%, max. wind speed 1, min. wind speed 1, max. cloud 6, min. cloud 3	RM and IH	Sunset – 19:33	19:33	22:35	N/A
09/10/2019	Max. temp. 12°C, min. temp. 10°C, min. humidity 65%, max. wind speed 4, min. wind speed 1, max. cloud 6, min. cloud 0, moon phase – full moon	RM and AR	Sunset – 18:28	18:28	21:28	Brief rain shower at 19:54
28/05/2020	Max. temp. 23°C, max wind speed 7 mph, rainfall = 0[53]	SK and AT	Sunset – 21:14	21:14	00:11	N/A

[53] Data not collected during the survey therefore historical data has been used for this information: https://www.yourweather.co.uk/weather_Uckington-Europe-United+Kingdom-Gloucestershire--1-123446.html?d=historical

A.6. Transect Survey Results

Table 4-58 - Transect Survey Results

Transect	Bat Species	Jun 2019 (total number of passes)	PC (where the total number of passes were recorded, i.e. 4 to 5 (x13) = between PC 4 to PC 5, 13 bat passes were recorded)	Jul 2019 (total number of passes)	PC (where the total number of passes were recorded, i.e. 4 to 5 (x13) = between PC 4 to PC 5, 13 bat passes were recorded)	Aug 2019 dusk / dawn (total number of passes)	PC (where the total number of passes were recorded, i.e. 4 to 5 (x13) = between PC 4 to PC 5, 13 bat passes were recorded)	Sep 2019 (total number of passes)	PC (where the total number of passes were recorded, i.e. 4 to 5 (x13) = between PC 4 to PC 5, 13 bat passes were recorded)	Oct 2019 (total number of passes)	PC (where the total number of passes were recorded, i.e. 4 to 5 (x13) = between PC 4 to PC 5, 13 bat passes were recorded)	May 2020 (total number of passes)	PC (where the total number of passes were recorded, i.e. 4 to 5 (x13) = between PC 4 to PC 5, 13 bat passes were recorded)	Total
Transect 2	Common pipistrelle	**35**	4 to 5 (x13), 5 (x13), 1, 2, 2 to 7 (x6), 7	**19**	6, 6 to 5 (x3), 5, 5 to 4, 4 to 3 (x3), 3 to 2, 2 (x2), 2 to 1, 1 to 7, 6 (x2), 6 to 5, 5, 5 to 4	**Dusk: 13** **Dawn: 7** **Total: 20**	Dusk: A to 2, 2, 2 to 1, 7, 7 to E (x 2), E to 6, D to 5, 3 to A, A (x2), A to 2, 2 Dawn: 3 to A (x 2), A (x 2), 2, E, 6, 6 to D	**12**	3 to B, B to 4 (x5), 6 to F, A (x2), A to 2, 2, 3	**3**	1, 1 to 2, 3 to B	**38**	4 to 5, 5, D to 6, 6 (x4), 6 to C (x10), C, C to 1 (x4), 1 to 7, 7, 7 to E (x2), E (x3), E to 2 (x2), 2, 2 to A (x2), A, 4, 4 to 5 (x2)	**127**
	Soprano pipistrelle	**8**	4 to 5 (x5), 5 to 7, 2 to 7 (x2)	**2**	4 to 3 (x2)	**Dusk: 4** **Dawn: 0** **Total 4**	Dusk: 2 to 1, A to 2, 2 (x2)	**5**	6 to F, A, A to 2, 2 (x2)	**5**	7, 1, 1 to 2, 3 to B, 1 to 2	**8**	D to 6, 6 to C (x4), 2, A, 4	**32**
	Pipistrelle											**6**	6 to C, R to 2, 2 (x2), A, 3	**6**
	Myotis	**1**	4	**3**	3 to 2, 2, 1 to 7	**Dusk 6** **Dawn: 1** **Total: 7**	Dusk: A, 6, 4 to B, B, 3 to A, 2 Dawn: A	**6**	B to 4 (x2), C, C to 5, 6 to F, A	**4**	3 to B, 1, 1 to 2, 2 to A	**5**	6 to C, A (x2), 3 to B, B	**30**
	Noctule			**3**	7 to 6 (x3)					**1**	1 to 2	**2**	B, 4	**6**
	Leisler's													**0**
	Nyctaloid									**1**	5 to D			**1**
	Brown long-eared													**0**
	Lesser horseshoe roost													**0**
	Serotine													**0**
	Barbastelle													**0**
	Bat							**1**	3 to B					**1**
Transect 4	Common pipistrelle	**39**	5 to 6 (x3), 6, 6 to 3 (x6), 3 to 7 (x17), 7 to 1 (x4), 1 to 2 (x5), 2 to 3 (x2), 3 to 2	**14**	A to 2, 2, 2 to 3, 3, B, B to E, 8, F to D (x3), D to 7, A, A to 1, 1 to 2	**Dusk: 30** **Dawn: 7** **Total: 37**	Dusk: 2, 2 to 3, F to 8, 8, 8 to E (x2), E, B to N (x6), N (x2), N to D (x5), D to 7, 7 (x 2), 7 to A (x8) Dawn: A, A to 1 (x2), 1, 3 to F, E, 5 to D	**18**	B to D, 7, 7 to A (x2), A to 1, 1 to 2 (x2), 3 to F, 8 to E, B to D, 7 to A, A, A to 1 (x2), 1 to 2 (x2), 8 to E (x2)	**2**	3 to F (x2)	**45**	B (x2), 3 (x2), 3 to 2 (x5), 2 to 1 (x4), 1, 1 to A, A to 7 (x7), 7 to D (x2), D to B (x9), B to 3 (x2), 3 (x3), 3 to 2 (x4), 2 (x2), 2 to 1	**155**

Transect	Bat Species	Jun 2019 (total number of passes)	PC (where the total number of passes were recorded, i.e. 4 to 5 (x13) = between PC 4 to PC 5, 13 bat passes were recorded)	Jul 2019 (total number of passes)	PC (where the total number of passes were recorded, i.e. 4 to 5 (x13) = between PC 4 to PC 5, 13 bat passes were recorded)	Aug 2019 dusk / dawn (total number of passes)	PC (where the total number of passes were recorded, i.e. 4 to 5 (x13) = between PC 4 to PC 5, 13 bat passes were recorded)	Sep 2019 (total number of passes)	PC (where the total number of passes were recorded, i.e. 4 to 5 (x13) = between PC 4 to PC 5, 13 bat passes were recorded)	Oct 2019 (total number of passes)	PC (where the total number of passes were recorded, i.e. 4 to 5 (x13) = between PC 4 to PC 5, 13 bat passes were recorded)	May 2020 (total number of passes)	PC (where the total number of passes were recorded, i.e. 4 to 5 (x13) = between PC 4 to PC 5, 13 bat passes were recorded)	Total
	Soprano pipistrelle	**4**	5 to 6, 6, 6 to 3 (x2)	**1**	8	**Dusk: 3** **Dawn: 1** **Total: 4**	Dusk: B to N (x3) Dawn: 1	**2**	7 to A, E			**3**	4 to B, B to 3 (x2),	**22**
	Pipistrelle													**0**
	Myotis	**9**	5 to 6 (x2), 3 to 7 (x2), 1 to 2, 2, 2 to 3, 3 to 2, end	**1**	F to D	**Dusk: 6** **Dawn:2** **Total: 8**	Dusk: 2 to 3, B to N (x3), D, 7 to 1A Dawn: A, A to 1,	**4**	8 to E, 1 to 2, 3, 3 to F	**9**	3 to F (x2), F, 8 E to C, D, D to 1 (x3), 1 to A	**7**	3 to 2, 1 to A, A to 7, 7 to D, D to B (x2), 2 to 1	**38**
	Noctule	**1**	5 to 6	**5**	A, B to E, E to 8, F to D (x2)	**Dusk: 4** **Dawn: 1** **Total: 5**	Dusk: A to 1, 1 to 2, 8 to E, N Dawn: 5 to D	**2**	3 to F (x2)	**4**	A to 2,2 to 3 (x3)	**5**	6 to C (x3),4, 3 to 2	**22**
	Leisler's	**1**	3 to 7			**Dusk: 1** **Dawn: 0** **Total: 1**	F	**2**	2 to 3, 3 to F					**4**
	Nyctaloid	**1**	0 to 4			**Dusk: 1** **Dawn: 0** **Total: 1**	8 to E	**2**	2 to 3, 7 to A	**2**	3 to F, F to 8			**6**
	Brown long-eared					**Dusk: 1** **Dawn: 0** **Total: 1**	8 to E							**1**
	Lesser horseshoe roost					**Dusk:1** **Dawn: 0** **Total: 1**	D to 7	**1**	A to 1					**2**
	Serotine							**1**	8					**9**
	Barbastelle	**1**	2 to 3											**1**
	Bat													**0**
Transect 5	Common pipistrelle	**8**	5, 1, 7 (x2), 8, 5, 5 to 4, 4	**10**	4 to 3 (x2), 3 to 2 (x3), 2, 2 to 1 (x3), 1 to 7	**Dusk: 13** **Dawn: 2** **Total: 15**	Dusk: C to 7 (x2), 7, 7 to 1 (x3), 1, 2 to 3 (x5), A Dawn: 4 to 5, 5 to B	**13**	7, C to 7 (x3), 2 (x2), 2 to 3 (x2), B to 6, C to 7, 7, 7 to 1 (x2)	**3**	1 to 7, 7, 7 to C	**10**	A, A to 4, A to 4, 4, 5, 5 to 3, 3, B to 6 (x2), 6	**59**
	Soprano pipistrelle	**1**	1			**Dusk: 10** **Dawn: 1** **Total: 11**	Dusk: 6 to C, 6 to 7 (x 2), 7, 7 to 1 (x2), 2 to 3 (x3), A Dawn: access gate	**3**	C to 7, 7 to 1, 2 to 3	**2**	3 to 2, C	**3**	C to 7 (x3)	**21**

Transect	Bat Species	Jun 2019 (total number of passes)	PC (where the total number of passes were recorded, i.e. 4 to 5 (x13) = between PC 4 to PC 5, 13 bat passes were recorded)	Jul 2019 (total number of passes)	PC (where the total number of passes were recorded, i.e. 4 to 5 (x13) = between PC 4 to PC 5, 13 bat passes were recorded)	Aug 2019 dusk / dawn (total number of passes)	PC (where the total number of passes were recorded, i.e. 4 to 5 (x13) = between PC 4 to PC 5, 13 bat passes were recorded)	Sep 2019 (total number of passes)	PC (where the total number of passes were recorded, i.e. 4 to 5 (x13) = between PC 4 to PC 5, 13 bat passes were recorded)	Oct 2019 (total number of passes)	PC (where the total number of passes were recorded, i.e. 4 to 5 (x13) = between PC 4 to PC 5, 13 bat passes were recorded)	May 2020 (total number of passes)	PC (where the total number of passes were recorded, i.e. 4 to 5 (x13) = between PC 4 to PC 5, 13 bat passes were recorded)	Total
	Pipistrelle	**1**	6									**1**	1	**9**
	Myotis	**3**	3, 4, 6	**2**	2 to 1 (x2)	**Dusk: 8** **Dawn: 2** **Total 10**	1 to 2, 2 to 3 (x4), 3 to A, A to 4, 4 Dawn: 2 to 3, 5	**6**	7 to 1, 1 to 2, 2 to 3 (x2), 3 to A, 7	**4**	1 to 7 (x2), 7, 6 to B	**2**	1 to A, 6	**27**
	Noctule	**2**	1,2	**2**	2 to 1, 3	**Dusk: 0** **Dawn: 1** **Total: 1**	A	**2**	C, 7			**2**	A to 4, 1	**9**
	Leisler's													**0**
	Nyctaloid													**0**
	Brown long-eared									**2**	3 (x2)			**2**
	Lesser horseshoe roost									**1**	4			**5**
	Serotine													**0**
	Bat	**1**	4											**5**
Transect 7	Common pipistrelle	**11**	2, 2 to 3 (x5), 3, 3 to 4, 1 to 7 (x2), 3 to 2	**17**	5 to 4, 4 to 3 (x2), 3, 3 to 2, 2 to 1 (x2), 1, 1 to 7 (x3), 7 (x3), 5, 2 to 1, 1 to 7	**Dusk: 37** **Dawn: 3**	Dusk: 3, 3 to 2, 2 (x 2), 2 to A (x2), A to 1, 1, 1 to C, C (x3), C to B (x2) B, B to 7 (x2), 7, 6, 6 to 3, 3 to 2, 2 (x4), 2 to A (x2), A, A to 1 (x2), C, C to B (x2), B to 7, 7 to 6, 6 to 3 (x2) Dawn: 1, 2 to 3, 7 to B, 7, 6 to 3,	**37**	4 to 5 (x2), 5, 5 to 6 (x2), 6, 7, 7 to B (x2), B, B to C (x2), C, C to 1, A, 2 (x2), 2 to 3 (x2), 3, 3 to 4 (x2), 4 (x2), 4 to 5, 5, 5 to 6 (x2), 6, 6 to 7, B (x2), B to C (x2), c to 1, 2, 2 to 3	**1**	B to C	**22**	5 to 4 (x8), 4, 4 to 3, 3 to 2, 2, 2 to A, A, 1 to C, C, C to B, B (x2), 7, 6 (x2)	**128**
	Soprano pipistrelle	**1**	1 to 7	**1**	4	**Dusk: 1** **Dawn: 0** **Total: 1**	Dusk: 3 to 2,	**2**	5 to 6, 1			**5**	5 to 4, 2 (x2), 2 to A (x2),	**14**
	Pipistrelle					**Dawn: 2** **Total: 2**	A to 1, 3 to F							**2**
	Myotis			**1**	3	**Dusk: 18** **Dawn: 2**	Dusk: 3 to 2, C to B, B (x2), 6 to 3 (x2), 3, 3 to 2, 2 (x3), 2 to A (x4) B, 7, 6 to 3 Dawn: 2 to 3 (x2),	**8**	6, 7 to B, B (x2), 2 to 3, 3 to 4, 4, B to C	**1**	7 to B	**4**	3 to 2, 2 to A (x2), A to 1	**37**

Transect	Bat Species	Jun 2019 (total number of passes)	PC (where the total number of passes were recorded, i.e. 4 to 5 (x13) = between PC 4 to PC 5, 13 bat passes were recorded)	Jul 2019 (total number of passes)	PC (where the total number of passes were recorded, i.e. 4 to 5 (x13) = between PC 4 to PC 5, 13 bat passes were recorded)	Aug 2019 dusk / dawn (total number of passes)	PC (where the total number of passes were recorded, i.e. 4 to 5 (x13) = between PC 4 to PC 5, 13 bat passes were recorded)	Sep 2019 (total number of passes)	PC (where the total number of passes were recorded, i.e. 4 to 5 (x13) = between PC 4 to PC 5, 13 bat passes were recorded)	Oct 2019 (total number of passes)	PC (where the total number of passes were recorded, i.e. 4 to 5 (x13) = between PC 4 to PC 5, 13 bat passes were recorded)	May 2020 (total number of passes)	PC (where the total number of passes were recorded, i.e. 4 to 5 (x13) = between PC 4 to PC 5, 13 bat passes were recorded)	Total
	Noctule	**1**	3 to 4	**1**	5 to 4	**Dusk: 1** **Dawn: 0** **Total: 1**	Dusk: 3 to 2	**4**	5, 5 to 6 (x2), 6			**2**	B, 5 to 4	**9**
	Leisler's			**1**	2									**1**
	Nyctaloid													**0**
	Brown long-eared											**1**	1 to C	**1**
	Lesser horseshoe roost							**1**	7 to B					**1**
	Serotine			**3**	2 to 1. 4 to 3, 2 to 1			**1**	C to 1					**4**
	Barbastelle													**0**
	Bat													**0**
Transect 8	Common pipistrelle	**9**	3 (x3), 5 to 4, 4 (x2), 4 to 7, 7, 3	**36**	3 to 4 (x2), 4 (x2), 4 to 5 (x4), 5 (x2), 5 to 6 (x3), 6, 6 to 2 (x7), 2 (x2), 2 to 3, 3 to 4 (x5), 5 to 6 (x2), 6 (x2), 6 to 2 (x3)	**Dusk: 28** **Dawn: 7** **Total: 35**	Dusk: 1 to A (x5), A to D (x2), D to 6 (x2), 6, 5 (x3), 5 to 4 (x2), 4 (x3), 4 to C, C (x2), C to B, 3, 2 (x2), A (x3) Dawn: 5, 5 to 4 (x3), 4 (x2), PCC->PCB	**18**	4, 4 to C (x2), C to B, B to 3, 2 to 1 (x4), 1, 1 to A, 3 to B, C to 4, 4 (x3), 4 to 5 (x2),	**5**	C to 4, 4, 4 to 5 (x3)	**27**	C to B (x4), B, B to D (x3), D, D to 1 (x2), 1 to A (x2), 2, 3 to D (x2), D, D to 6, 6, 6 to B (x3), B, B to D, D (x2), D to A	**130**
	Soprano pipistrelle			**5**	4, 5 to 6, 6 to 2 (x2), 3 to 4	**Dusk: 3** **Dawn: 4** **Total: 7**	Dusk: A to 1, D to 6, B to 3 Dawn: A, 1, 4(x2)			**1**	C to 4	**1**	D	**14**
	Pipistrelle													**0**
	Myotis	**4**	5 (x2), 5 to 4, 4	**5**	4, 6, 6 to 2, 3 to 4, 4	**Dusk: 2** **Total: 2**	Dusk: A, 4 to C	**10**	A, 2, 3, 3 to B, B to C, C to 4, 4 (x3), 6 to D	**2**	2 to 3, C to 4	**3**	A, 2 to 3, D	**22**
	Noctule			**1**	4 to 5	**Dusk: 2** **Total: 2**	Dusk: 2 to A, A to 1, 1 to A,	**1**	1			**1**	6 to 5	**6**
	Leisler's													**0**
	Nyctaloid	**1**	0 to 1			**Dusk: 3** **Total: 3**	Dusk: A to 1 (x2), 1 to A							**4**
	Brown long-eared									**1**	5			**1**

Transect	Bat Species	Jun 2019 (total number of passes)	PC (where the total number of passes were recorded, i.e. 4 to 5 (x13) = between PC 4 to PC 5, 13 bat passes were recorded)	Jul 2019 (total number of passes)	PC (where the total number of passes were recorded, i.e. 4 to 5 (x13) = between PC 4 to PC 5, 13 bat passes were recorded)	Aug 2019 dusk / dawn (total number of passes)	PC (where the total number of passes were recorded, i.e. 4 to 5 (x13) = between PC 4 to PC 5, 13 bat passes were recorded)	Sep 2019 (total number of passes)	PC (where the total number of passes were recorded, i.e. 4 to 5 (x13) = between PC 4 to PC 5, 13 bat passes were recorded)	Oct 2019 (total number of passes)	PC (where the total number of passes were recorded, i.e. 4 to 5 (x13) = between PC 4 to PC 5, 13 bat passes were recorded)	May 2020 (total number of passes)	PC (where the total number of passes were recorded, i.e. 4 to 5 (x13) = between PC 4 to PC 5, 13 bat passes were recorded)	Total
	Lesser horseshoe roost									**1**	D to 1	**1**	D	**2**
	Serotine					**Dusk: 1** **Total: 1**	Dusk: 1 to A					**1**	D to A	**2**
	Barbastelle			**1**	6 to 2					**1**	6			**8**
	Bat	**2**	2 to 3, 7											**2**
Transect 9	Common pipistrelle	**20**	3 (x2), 4 (x3), 4 to 5 (x4), 5, 5 to 6 (x 4), 6, 7 to 1, 1, 2, 2 to 3, 3	**33**	6 (x2), 6 to 5, 5, 5 to 4 (x5), 3 (x4), 3 to 2 (x7), 2 to 1 (x2), 1, 3, 7, 7 to 6 (x3), 6 to 1 (x4), 1	**Dusk: 11** **Dawn: 9** **Total: 20**	Dusk: 3 to C, C, 4 to 7, B to 5 (x2), 5, 5 to A, 2 (x2), 2 to 1 (x2) Dawn: 0 to 1, 1, 1 to 2, 2, A to 3 (x2), 3, 3 to 5 (x2),	**24**	3, 3 to B (x3), 5, B to 6 (x2), 6, 7, 7 to 4 (x2), 4, 4 to C, C to 3 (x2), 3 to 1, 1, 1 to 2 (x2), 2, 2 to A, A, A to 5, 5 to 3	**13**	5 (x2), 3, 3 to B, 7 to 4 (x2), C to 3, 3, 3 to 1, 1, 1 to 1, 1 to 2, 3	**24**	6 (x2), 6 to B, B (x2), B to 3 (x2), 5 to 3, 3 (x3), 3 to 5, 5 to A (x2), A (x2), 2 (x3), 2 to 1, 1 to C (x3), C	**134**
	Soprano pipistrelle	**2**	7 to 1, 2 to 3	**30**	6 to 5 (x5), 5 to 4 (x7), 3 (x3), 3 to 3 (x7), 2, 2 to 1, 1, 3, 1 to 7, 6 (x2), 1	**Dusk: 12** **Dawn: 7** **Total: 19**	Dusk: 1 to 3, 3, 4 to 7, B to 5 (x3), 5, 5 to A, 2 to 1 (x3), 1 Dawn: 1, 1 to 2, 3 to 5, 5 (x3), 5 to B	**19**	3 (x2), 3 to B, 5, 5 to B, B to 6 (x2), 7 , 7 to 4, C to 3 (x2), 3 to 1, 1, 1 to 2 (x2), A, A to 5, 5, 3	**11**	2 to A, 5, 3 to B, 3 to 1, 1, 1 to 2 (x2), 2 (x2), 5 to 3, 3	**12**	6, B, B to 3, 3, 3 to 5, 5, 2 (x2), 2 to 1, 1 to C, C to 4 (x2)	**93**
	Pipistrelle	**2**	2 to 3, 4 to 5									**1**	6	**9**
	Myotis	**3**	4 to 5 (x2), 5 to 6	**2**	2, 1	**Dusk:3** **Dawn: 4**	Dusk: 3, B to 5, 2 to 1 Dawn: 3 to 5, 5 (x2), 5 to B			**5**	7 to 4, 4, 1 to 2 (x3),		B, 3 (x2), A, A to 2, 2 to 1 (x2), 1 to C	**17**
	Noctule	**6**	2 to 3, 3, 4, 5 to 6 (x2), 7 to 1	**2**	5 to 4 (x2)	**Dusk: 3** **Total:3**	Dusk: A to 2, 2 to 1 (x2)	**4**	A, A to 3, B, 1 to 2			**8**	C, 4 (x2), B to 3, A to 3, 5 to A, A (x2)	**23**
	Leisler's													**0**
	Nyctaloid							**1**	A to 3			**2**	5 to A (x2)	**3**
	Brown long-eared													**0**
	Lesser horseshoe roost											**1**	A	**1**
	Serotine													**0**
	Barbastelle			**1**	1 to 7									**1**
	Bat													**0**

Transect	Bat Species	Jun 2019 (total number of passes)	PC (where the total number of passes were recorded, i.e. 4 to 5 (x13) = between PC 4 to PC 5, 13 bat passes were recorded)	Jul 2019 (total number of passes)	PC (where the total number of passes were recorded, i.e. 4 to 5 (x13) = between PC 4 to PC 5, 13 bat passes were recorded)	Aug 2019 dusk / dawn (total number of passes)	PC (where the total number of passes were recorded, i.e. 4 to 5 (x13) = between PC 4 to PC 5, 13 bat passes were recorded)	Sep 2019 (total number of passes)	PC (where the total number of passes were recorded, i.e. 4 to 5 (x13) = between PC 4 to PC 5, 13 bat passes were recorded)	Oct 2019 (total number of passes)	PC (where the total number of passes were recorded, i.e. 4 to 5 (x13) = between PC 4 to PC 5, 13 bat passes were recorded)	May 2020 (total number of passes)	PC (where the total number of passes were recorded, i.e. 4 to 5 (x13) = between PC 4 to PC 5, 13 bat passes were recorded)	Total
Transect 10	Common pipistrelle	**17**	2 to 3, 3 to 4 (x2), 4 to 5, 5, 6 to 7 (x2), 7, 2, 2 to 3, 4 to 5, 5 (x2), 5 to 6 (x2), 6 to 7, 7	No survey – due to access restrictions	No survey – due to access restrictions	**Dusk: 27** **Dawn: 8** **Total: 35**	Dusk: 6 to 5, 5, 5 to D (x3), 4 to 3, 3 (x2), 3 to C, C to B, C to A, B to A, A, b to 1, B to 2, 1, 1 to 7 (x6), 7, 7 to E (x2) Dawn: 7, 7 to 1 (x2), A (x2), A to B, C, D	**15**	B to 1, 1 (x3), 1 to 3, E to 6, 6, 5, C to B, A to 1, 1, 1 to 3, 3, 3 to 7, 3	**3**	6 to E, 2 to A, A to C	**10**	4, 4 to D, 5 to 6, 6, 1 (x2), 1 to 2, 2 to A, 3 (x2)	**80**
	Soprano pipistrelle	**4**	2 to 3, 3 to 4, 4, 5	No survey – due to access restrictions	No survey – due to access restrictions	**Dusk: 8** **Dawn:** **Total:**	Dusk: 6, 6 to 5 (x2), 3, 3 to C, 7 to E, 7 to E (x2) Dawn: 7 to 1, 1 to 2, 2 to A, A (x2),	**9**	B, B to 1, 1, 1 to 3, 3, 5, 2 to A, A to 1, 3	**2**	D to 5 (x2)	**9**	4 to D, 5, 5 to 6, 6 (x2), 7 to 1, 1 to 2, C, 3	**32**
	Pipistrelle			No survey – due to access restrictions	No survey – due to access restrictions							**3**	D to 5, 6, 7 to 1	**3**
	Myotis	**3**	3 to 4, 5, 2 to 3	No survey – due to access restrictions	No survey – due to access restrictions	**Dusk: 12** **Dawn: 2** **Total: 14**	Dusk: 5 to D, 4 to 3 (x2), A (x2), B to 1, 1 to 7, 7, 7 to E (x2), E, E to 6 Dawn: 7 to 1, B	**9**	1 (x2), 1 to 3, 3, 5 to D, B to 2, A to 1, 3, 3 to 7	**3**	E, 2 to A, 5 to 6	**6**	6 to 7, 7 to 1, 1, 2 to A, A, C	**35**
	Noctule	**4**	2, 2 to 3 (x2), 4,	No survey – due to access restrictions	No survey – due to access restrictions	**Dusk: 5** **Total: 5**	Dusk: 5, 5 to D, C to B, B, B to A	**5**	2 to A, B to 1 (x2), 6, 5	**3**	D to 5, 5, 6 to E	**4**	B (x2), D to 5, 3 to 4	**21**
	Leisler's			No survey – due to access restrictions	No survey – due to access restrictions	**Dusk: 3** **Total: 3**	Dusk: 5 to D (x2), 3 to C							**3**
	Nyctaloid			No survey – due to access restrictions	No survey – due to access restrictions			**1**	6 to 5					**1**
	Brown long-eared			No survey – due to access restrictions	No survey – due to access restrictions									**0**
	Lesser horseshoe roost			No survey – due to	No survey – due to access restrictions			**1**	4 to C			**1**	3 to 4	**2**

Transect	Bat Species	Jun 2019 (total number of passes)	PC (where the total number of passes were recorded, i.e. 4 to 5 (x13) = between PC 4 to PC 5, 13 bat passes were recorded)	Jul 2019 (total number of passes)	PC (where the total number of passes were recorded, i.e. 4 to 5 (x13) = between PC 4 to PC 5, 13 bat passes were recorded)	Aug 2019 dusk / dawn (total number of passes)	PC (where the total number of passes were recorded, i.e. 4 to 5 (x13) = between PC 4 to PC 5, 13 bat passes were recorded)	Sep 2019 (total number of passes)	PC (where the total number of passes were recorded, i.e. 4 to 5 (x13) = between PC 4 to PC 5, 13 bat passes were recorded)	Oct 2019 (total number of passes)	PC (where the total number of passes were recorded, i.e. 4 to 5 (x13) = between PC 4 to PC 5, 13 bat passes were recorded)	May 2020 (total number of passes)	PC (where the total number of passes were recorded, i.e. 4 to 5 (x13) = between PC 4 to PC 5, 13 bat passes were recorded)	Total
				access restrictions										
	Serotine			No survey – due to access restrictions	No survey – due to access restrictions	**Dusk: 1 Total:1**	Dusk: 1 to 7							
	Barbastelle			No survey – due to access restrictions	No survey – due to access restrictions									**0**
	Bat			No survey – due to access restrictions	No survey – due to access restrictions									**0**

Appendix D.

A.7. Static Survey D

Table 4-59 - Static Survey Details[54]

Heading	Static		20/06/19 to 24/06/19	09/07/19 to 13/07/19*	06/08/19 to 10/08/19*	04/09/19 to 08/09/19	04/10/19 to 08/10/19	14/05/20 to 18/05/20*
Transect 2	3	Temperature (OC)	Min 10 Max 17	Min 14 Max 18	Min 14 Max 18	Min 15 Max 16	Min 12 Max 16	Min 5 Max 11
		Rain	Light rain throughout	Heavy rain on 9th and 13th	Drizzle on the 6th, 7th, 8th and 9th	Dry throughout	Drizzle on 4th	Dry throughout
		Limitations	No survey limitations	Heavy rain on the 9th and 13th	SD card full only four nights of data available	No survey limitations	No survey limitations	Temperature sub-optimal during deployment
	4		01/06/20 to 05/06/20*	09/0720 to 13/07/19*	06/08/19 to 12/09/19	03/09/19 to 07/09/19	02/10/19 to 06/10/19	18/05/20 to 22/05/20
		Temperature (OC)	Min 6 Max 17	Min 14 Max 18	Min 14 Max 18	Min 15 Max 16	Min 12 Max 16	Min 10 Max 17
		Rain	Drizzle throughout	Heavy rain on 9th and 13th	Drizzle on the 6th, 7th, 8th and 9th	Dry throughout	Drizzle on 4th	Dry throughout
		Limitations	Temperature below optimum on the 4th and 5th	Heavy rain on the 9th and 13th	No survey limitations	No survey limitations	No survey limitations	No survey limitations
Transect 4	7		13/06/20 to 17/06/20	03/07/19 to 07/07/19	07/08/19 to 11/08/19*	04/09/19 to 08/09/19*	04/10/19 to 08/10/19	18/05/20 to 22/05/20
		Temperature (OC)	Min 13 Max 15	N/A	Min 14 Max 18	Min 15 Max 16	Min 12 Max 16	Min 10 Max 17
		Rain	Drizzle on 13th, 14th, 16th and 17th	N/A	Drizzle on the 7th, 8th, 9th	Dry throughout	Drizzle on 4th	Dry throughout
		Limitations	No survey limitations	Detector did not record any bat passes	SD card full only four nights of data available	SD card full only three nights of data available	No survey limitations	No survey limitations
	8		22/06/19 to 26/06/19	09/0719 to 13/07/19*	07/08/19 to 21/08/19	04/09/19 to 08/09/19	16/10/19 to 21/10/19*	06/05/20 to 10/05/20
		Temperature (OC)	Min 13 Max 15	Min 14 Max 17	Min 14 Max 18	Min 15 Max 16	Min 10 Max 13	Min 14 Max 16
		Rain	Drizzle on 13th, 14th, 16th and 17th	Drizzle on the 6th	Drizzle on the 7th, 8th, 9th	Dry throughout	Drizzle on 6th	Drizzle on 26th
		Limitations	No survey limitations	No survey limitations	SD card full only four nights of data available	No survey limitations	No survey limitations	No survey limitations
Transect 5	9		22/06/19 to 26/06/19	09/0719 to 13/07/19*	07/08/19 to 21/08/19	04/09/19 to 08/09/19	16/10/19 to 21/10/19*	06/05/20 to 10/05/20
		Temperature (OC)	Min 13 Max 17	Min 14 Max 18	Min 14 Max 18	Min 15 Max 16	Min 9 Max 10	Min 5 Max 15
		Rain	Drizzle on the 23rd and 24th	Heavy rain on the 9th, 11th and 13th	Drizzle on the 7th, 8th, 9th	Dry throughout	Drizzle on the 19th and 20th	Drizzle on 7th, 8th and 9th

[54] Please note that this table includes the five first full survey dates, or where there was unfavourable data (cold nights or heavy rain), the five most favourable survey night's data is displayed. Other data was discarded.

Heading	Static		20/06/19 to 24/06/19	09/07/19 to 13/07/19*	06/08/19 to 10/08/19*	04/09/19 to 08/09/19	04/10/19 to 08/10/19	14/05/20 to 18/05/20*
		Limitations	No survey limitations	Heavy rain on the 9th, 11th and 13th	No survey limitations	No survey limitations	Only two nights recorded	No survey limitations
	10		20/06/19 to 24/06/19*	10/07/19 to 14/07/19	07/08/19 to 11/08/19*	05/09/19 to 09/09/19	16/10/19 to 20/10/19	06/05/20 to 10/05/210
		Temperature (OC)	Min 10 Max 18	Min 14 Max 16	Min 14 Max 18	Min 14 Max 16	Min 9 Max 10	Min 5 Max 15
		Rain	Heavy rain on 23rd Drizzle on the 21st	Heavy rain on the 11th and 13th	Drizzle on the 7th, 8th, 9th	Drizzle on 9th	Drizzle on the 19th and 20th	Drizzle on 7th, 8th and 9th
		Limitations	Heavy rain on the 23rd	No survey limitations	Detector microphone found on the floor	No survey limitations	No survey limitations	No survey limitations
Southern quadrant - area directly south east of the junction	21		21/06/19 to 25/06/19*	July 2019 - No data*	06/08/19 to10/08/19	04/09/19 to 08/09/19	October 2019 - No data*	06/05/20 to 10/05/20
		Temperature (OC)	Min 13 Max 17	N/A	Min 14 Max 18	Min 15 Max 16		Min 5 Max 15
		Rain	Heavy rain on the 23rd and 24th	N/A	Drizzle on the 6th, 7th, 8th and 9th	Dry throughout		Drizzle on 7th, 8th and 9th
		Limitations	Heavy rain on the 23rd and 24th	No land access for deployment	No survey limitations	No survey limitations	Detector did not record	No survey limitations
	35		01/06/2020 to 05/06/19*	July 2019 - No data*	06/08/19 to 10/08/19	04/09/19 to 08/09/19	October 2019 - No data*	06/05/20 to 10/05/20
		Temperature (OC)	Min 6 Max 17	N/A	Min 14 Max 18	Min 15 Max 16		Min 5 Max 15
		Rain	Drizzle throughout	N/A	Drizzle on the 6th, 7th, 8th and 9th	Dry throughout		Drizzle on 7th, 8th and 9th
		Limitations	Temperature below optimum on the 4th and 5th	No land access for deployment	No survey limitations	No survey limitations	Detector did not record	No survey limitations
Transect 7	11		24/06/2020 to 28/06/20	10/07/19 to 14/07/19*	19/09/19 to 23/08/19	19/09/20 to 23/09/20	15/10/19 to 19/10/19	18/05/20 to 22/05/20
		Temperature (OC)	Min 12 Max 22	Min 14 Max 16	Min 12 Max 16	Min 15 Max 18	Min 11 Max 13	Min 10 Max 17
		Rain	Drizzle on 26th	Heavy rain 11th and 13th	Drizzle on the 19th, 20th, 21st and 22nd	Dry throughout	Drizzle on 17th	Dry throughout
		Limitations	No survey limitations	Heavy rain 11th and 13th	No survey limitations	No survey limitations	No survey limitations	No survey limitations
	12		20/06/2019 to 24/06/19*	10/07/19 to 14/07/19*	19/08/19 to 20/08/19 and 30/08/19 to 31/08/19*	19/09/20 to 23/09/20	15/10/19 to 19/10/19	27/05/20 to 31/05/20
		Temperature (OC)	Min 10 Max 17	Min 14 Max 16	Min 12 Max 19	Min 15 Max 18	Min 11 Max 13	Min 14 Max 16
		Rain	Heavy rain on the 23rd and 24th	Heavy rain 11th and 13th	Drizzle on the 19th, 20th and 31st	Dry throughout	Drizzle on 17th	Dry throughout
		Limitations	Heavy rain on the 23rd and 24th	Heavy rain 11th and 13th	Detector deployed twice with only two days data per deployment as SD card was full	No survey limitations	No survey limitations	No survey limitations
Transect 8	14		20/06/2019 to 24/06/19*	10/07/19 to 14/07/19*	28/08/19 to 01/09/19	04/09/19 to 08/09/19	15/10/19 to 19/10/19	06/05/20 to 10/05/20

Heading	Static		20/06/19 to 24/06/19	09/07/19 to 13/07/19*	06/08/19 to 10/08/19*	04/09/19 to 08/09/19	04/10/19 to 08/10/19	14/05/20 to 18/05/20*
		Temperature (°C)	Min 13 Max 17	Min 14 Max 16	Min 14 Max 19	Min 15 Max 16	Min 11 Max 13	Min 5 Max 15
		Rain	Heavy rain on the 23rd and 24th	Heavy rain 11th and 13th	Drizzle 31st and 1st	Dry throughout	Drizzle on 17th	Drizzle on 7th, 8th and 9th
		Limitations	Heavy rain on the 23rd and 24th	Heavy rain 11th and 13th	No survey limitations	No survey limitations	No survey limitations	No survey limitations
	36		22/06/20 to 26/06/20	10/07/19 to 14/07/19	19/08/19 to 22/08/19*	19/09/20 to 23/09/20*	15/10/19 to 19/10/19	13/05/20 to 17/05/20*
		Temperature (°C)	Min 14 Max 22	Min 14 Max 16	Min 12 Max 13	Min 15 Max 18	Min 11 Max 13	Min 3 Max 11
		Rain	Dry throughout	Heavy rain 11th and 13th	Drizzle on the 20th	Dry throughout	Drizzle on 17th	Dry throughout
		Limitations	No survey limitations	Heavy rain 11th and 13th	SD card full so only four nights were recorded	SD card full so only three nights were recorded	No survey limitations	Survey temperatures frequently below optimum
Transect 9	15		13/06/2019 to 17/06/19	03/07/19 to 07/07/19	23/08/19 to 25/08/19*	No data*	15/10/19 to 19/10/19	26/05/20 to 30/05/20
		Temperature (°C)	Min 13 Max 15	Min 14 Max 17	Min 15 Max 19	N/A	Min 11 Max 13	Min 14 Max 16
		Rain	Drizzle on 13th, 14th, 16th and 17th	Drizzle on 6th	Dry throughout	N/A	Drizzle on 17th	Drizzle on 26th
		Limitations	No survey limitations	No survey limitations	Did not record for full five nights data	Detector did not record	No survey limitations	No survey limitations
	16		13/06/20 to 18/06/20	03/07/19 to 07/07/19	19/08/19 to 23/08/19	19/09/20 to 23/09/20	15/10/19 to 20/10/19	26/05/20 to 30/05/20
		Min 13 Max 15	Min 14 Max 17	Min 11 Max 16	Min 13 Max 16	Min 11 Max 13	Min 14 Max 16	Min 13 Max 15
		Drizzle on 13th, 14th, 16th and 17th	Drizzle on 6th	Drizzle on 20th	Drizzle on 23rd	Drizzle on 17th	Drizzle on 26th	Drizzle on 13th, 14th, 16th and 17th
		No survey limitations	No survey limitations	No survey limitations	No survey limitations	No survey limitations	No survey limitations	No survey limitations
Transect 10	17		13/06/2020 to 17/06/20	03/07/19 to 07/07/19	19/08/19 to 23/08/19	19/09/20 to 23/09/20	15/10/19 to 19/10/19	6/05/20 to 10/05/20
		Temperature (°C)	Min 13 Max 15	Min 14 Max 17	Min 11 Max 16	Min 13 Max 16	Min 11 Max 13	Min 5 Max 15
		Rain	Drizzle on 13th, 14th, 16th and 17th	Drizzle on 6th	Drizzle on 20th	Drizzle on 23rd	Drizzle on 17th	Drizzle on 7th, 8th and 9th
		Limitations	No survey limitations	No survey limitations	No survey limitations	No survey limitations	No survey limitations	No survey limitations
	18		01/06/2020 to 05/06/20	03/07/19 to 07/07/19	19/08/19 to 23/08/19*	21/09/20 to 25/09/20	15/10/19 to 19/10/19	06/05/20 to 10/05/20
		Temperature (°C)	Min 6 Max 17	Min 14 Max 17	Min 12 Max 15	Min 11 Max 13	Min 11 Max 13	Min 5 Max 15
		Rain	Drizzle throughout	Drizzle on 6th	Drizzle on 20th	Drizzle on 17th	Drizzle on 17th	Drizzle on 7th, 8th and 9th
		Limitations	No survey limitations	No survey limitations	SD card full after 4 days	No survey limitations	No survey limitations	No survey limitations

Heading	Static		20/06/19 to 24/06/19	09/07/19 to 13/07/19*	06/08/19 to 10/08/19*	04/09/19 to 08/09/19	04/10/19 to 08/10/19	14/05/20 to 18/05/20*
Highways England Land	22		11/06/19 to 15/06/20	No data*	20/08/19 to 24/08/19	16/09/20 to 20/09/20	16/10/19 to 19/10/19*	26/05/20 to 30/05/20
		Temperature (°C)	Min 13 Max 15	N/A	Min 13 Max 16	Min 11 Max 15	Min 9 Max 11	Min 12 Max 16
		Rain	Drizzle on 13th and 14th	N/A	Drizzle on 20th and 21st	Drizzle 19th	Drizzle on 19th	Drizzle on 26th
		Limitations	No survey limitations	No land access	No survey limitations	No survey limitations	Only four nights data available	No survey limitations
	23		22/06/2020 to 26/06/20	No data*	19/08/19 to 23/08/19	26/09/20 to 30/09/20	16/10/19 to 20/10/19*	26/05/20 to 30/05/20
		Temperature (°C)	Min 13 Max 17		Min 12 Max	Min 12 Max 14	Min 9 Max 11	Min 12 Max 16
		Rain	Drizzle on the 23rd and 24th		Drizzle on 19th, 20th and 21st	Drizzle on 29th	Drizzle on 19th	Drizzle on 26th
		Limitations	No survey limitations	No land access	No survey limitations	No survey limitations	No survey limitations	No survey limitations
Transect 11	39		30/06/2020*	01/07/20*	29/08/19 to 02/09/19*	19/09/20 to 23/09/20	02/10/19 to 06/10/19	13/05/20 to 17/05/20
		Temperature (°C)	13	12	Min 14 Max 19	Min 15 Max 18	Min 10 Max 13	Min 3 Max 11
		Rain	Dry	Drizzle	Drizzle on 31st, 1st and 2nd	Dry throughout	Drizzle on 6th	Dry throughout
		Limitations	Only one night of data	Only one night of data	Three nights in August, remaining two in September	No survey limitations	No survey limitations	No survey limitations
Transect 12	33		01/06/2020 to 05/06/20	03/07/19 to 07/07/19	29/08/19 to 01/09/19*	No data*	15/10/19 to 19/10/19	13/05/20 to 17/05/20
		Temperature (°C)	Min 6 Max 17	Min 14 Max 17	Min 14 Max 19		Min 9 Max 11	Min 3 Max 11
		Rain	Drizzle throughout	Drizzle on 6th and 7th	Drizzle on 31st, 1st and 2nd		Drizzle on 19th	Dry throughout
		Limitations	No survey limitations	No survey limitations	Three nights in August, one in September. Only four nights data	Detector did not record	No survey limitations	No survey limitations

A.8. Static Survey Results

Table 4-60 - Static Survey Results (Bat Passes)

Heading	Static	Species	20/06/19 to 24/06/19	09/07/19 to 13/07/19*	06/08/19 to 10/08/19*	04/09/19 to 08/09/19	04/10/19 to 08/10/19	14/05/20 to 18/05/20*	Total
Transect 2	3	Common pipistrelle	1409	2493	902	2857	16	4222	11899
		Soprano pipistrelle	1653	667	1022	757	183	1427	5709
		Nathusius' pipistrelle	1					3	4
		Pipistrelle species	10	12	35	71	4	455	587
		Myotis	802	1125	263	911	490	1876	5467
		Noctule	22	40	3	17	3	4	89
		Leisler's	5	5		1			11
		Nyctaloid	2	14	1	3	1	109	130
		Brown long-eared	48	6	1	3	4	80	142
		Lesser horseshoe	5	2	2	6	4	1	20
		Greater horseshoe				2		3	5
		Serotine	1	3				1	5
		Barbastelle	1			4	2	4	11
		Unidentified bat						65	65
	4	Species	01/06/20 to 05/06/20*	09/0720 to 13/07/19*	06/08/19 to 12/09/19	03/09/19 to 07/09/19	02/10/19 to 06/10/19	18/05/20 to 22/05/20	Total
		Common pipistrelle	886	610	65	147	32	1990	3730
		Soprano pipistrelle	95	22	10	120	10	129	386
		Nathusius' pipistrelle							0
		Pipistrelle species	112		1			51	164
		Myotis	107	96	38	47	102	1040	1430
		Noctule	7	13	9	5	8	11	53
		Leisler's		2		1	1		4
		Nyctaloid		11		2	1		14
		Brown long-eared						1	1
		Lesser horseshoe	1		1	2	6	35	45
		Greater horseshoe				1			1
		Serotine	1	1	2			1	5
		Barbastelle							0

Heading	Static	Species	20/06/19 to 24/06/19	09/07/19 to 13/07/19*	06/08/19 to 10/08/19*	04/09/19 to 08/09/19	04/10/19 to 08/10/19	14/05/20 to 18/05/20*	Total
		Unidentified bat	1						1
Transect 4	7	Species	13/06/20 to 17/06/20	July 2019 – No data*	07/08/19 to 11/08/19*	04/09/19 to 08/09/19*	04/10/19 to 08/10/19	18/05/20 to 22/05/20	Total
		Common pipistrelle	2661		626	106	59	2424	5876
		Soprano pipistrelle	96		10	2	3	119	230
		Nathusius' pipistrelle	22						22
		Pipistrelle species	11		3			517	531
		Myotis	246		26	47	38	283	640
		Noctule	65		7		2	12	86
		Leisler's	1		1				2
		Nyctaloid	7		1	1	1	1	11
		Brown long-eared	7			3		2	12
		Lesser horseshoe	17		2	4		11	34
		Greater horseshoe							0
		Serotine	3		1			1	5
		Barbastelle	6			1			7
		Unidentified bat	2					1	3
	8	Species	22/06/19 to 26/06/19	09/0719 to 13/07/19*	07/08/19 to 21/08/19	04/09/19 to 08/09/19	16/10/19 to 21/10/19*	06/05/20 to 10/05/20	Total
		Common pipistrelle	1312	701	2229	418	105	1195	5960
		Soprano pipistrelle	26	8	13	13	9	21	90
		Nathusius' pipistrelle						1	1
		Pipistrelle species	50		4				54
		Myotis	72	16	63	121	3	45	320
		Noctule	9	12	24	91	4	19	159
		Leisler's		2	4	1	2		9
		Nyctaloid		3	6	11	13	3	36
		Brown long-eared				1		1	2
		Lesser horseshoe	4	2		14		6	26
		Greater horseshoe				1			1
		Serotine		1	1	1	1	3	7
		Barbastelle			6	8		2	16

Heading	Static	Species	20/06/19 to 24/06/19	09/07/19 to 13/07/19*	06/08/19 to 10/08/19*	04/09/19 to 08/09/19	04/10/19 to 08/10/19	14/05/20 to 18/05/20*	Total
		Unidentified bat						2712	2712
Transect 5	9	Species	22/06/19 to 26/06/19	09/0719 to 13/07/19*	07/08/19 to 21/08/19	04/09/19 to 08/09/19	16/10/19 to 21/10/19*	06/05/20 to 10/05/20	Total
		Common pipistrelle	2182	142	480	107	5	2694	5610
		Soprano pipistrelle	277	21	181	41	2	494	1016
		Nathusius' pipistrelle							0
		Pipistrelle species	15	4	2	1		207	229
		Myotis	335	40	46	15	6	49	491
		Noctule	50	40	8	15		20	133
		Leisler's		2	3	2			7
		Nyctaloid	4	2	3	4		1	14
		Brown long-eared	7	1		2		1	11
		Lesser horseshoe	10	3		1		1	15
		Greater horseshoe				1			1
		Serotine	2		3				5
		Barbastelle			1				1
		Unidentified bat						1	1
	10	Species	20/06/19 to 24/06/19*	10/07/19 to 14/07/19	07/08/19 to 11/08/19*	05/09/19 to 09/09/19	16/10/19 to 20/10/19	06/05/20 to 10/05/210	Total
		Common pipistrelle	28	1094	408	116	467	1067	3180
		Soprano pipistrelle	4	45	15	48	2	105	219
		Nathusius' pipistrelle							0
		Pipistrelle species	24	6	2	2			34
		Myotis	28	477	117	82	31	101	836
		Noctule	7	48	9	1	4	127	196
		Leisler's		2	3	2			7
		Nyctaloid	3	2	11	5			21
		Brown long-eared		8		8	1	1	18
		Lesser horseshoe				7	1	1	9
		Greater horseshoe							0
		Serotine		6	1	3			10
		Barbastelle			3	10			13

Heading	Static	Species	20/06/19 to 24/06/19	09/07/19 to 13/07/19*	06/08/19 to 10/08/19*	04/09/19 to 08/09/19	04/10/19 to 08/10/19	14/05/20 to 18/05/20*	Total
		Unidentified bat							0
Southern quadrant - area directly south east of the junction	21	Species	21/06/19 to 25/06/19*	July 2019 - No data*	06/08/19 to10/08/19	04/09/19 to 08/09/19	October 2019 - No data*	06/05/20 to 10/05/20	Total
		Common pipistrelle	1042		160	1117		3710	6029
		Soprano pipistrelle	49		24	124		1551	1748
		Nathusius' pipistrelle						1	1
		Pipistrelle species	8		1	32		260	301
		Myotis	100		31	99		69	299
		Noctule	18		5	24		147	194
		Leisler's	2		1				3
		Nyctaloid	14			1		2	17
		Brown long-eared	3		3	7		8	21
		Lesser horseshoe	1			9		6	16
		Greater horseshoe				7			7
		Serotine	3					2	5
		Barbastelle				8		1	9
		Unidentified bat						2	2
	35	Species	01/06/2020 to 05/06/19*	July 2019 - No data*	06/08/19 to 10/08/19	04/09/19 to 08/09/19	October 2019 - No data*	06/05/20 to 10/05/20	Total
		Common pipistrelle	1926		152	374		1999	4451
		Soprano pipistrelle	93		35	258		258	644
		Nathusius' pipistrelle	1						1
		Pipistrelle species	15			3		14	32
		Myotis	24		102	237		158	521
		Noctule	24		7	12		34	77
		Leisler's			1	1			2
		Nyctaloid			7	3			10
		Brown long-eared			14	4		1	19
		Lesser horseshoe	1		2	6		1	10
		Greater horseshoe							0
		Serotine	2						2
		Barbastelle				5		1	6

Heading	Static	Species	20/06/19 to 24/06/19	09/07/19 to 13/07/19*	06/08/19 to 10/08/19*	04/09/19 to 08/09/19	04/10/19 to 08/10/19	14/05/20 to 18/05/20*	Total
		Unidentified bat							0
Transect 7	11	Species	24/06/2020 to 28/06/20	10/07/19 to 14/07/19*	19/09/19 to 23/08/19	19/09/20 to 23/09/20	15/10/19 to 19/10/19	18/05/20 to 22/05/20	Total
		Common pipistrelle	131	311	179	101	36	135	893
		Soprano pipistrelle	10	7	19	13	1	7	57
		Nathusius' pipistrelle							0
		Pipistrelle species			1			11	12
		Myotis	21	8	62	58	11	39	199
		Noctule	6	10	19	4		5	44
		Leisler's		1	92	1			94
		Nyctaloid	4		7	1	1		13
		Brown long-eared	1	2		3	1	2	9
		Lesser horseshoe		1		11	10	7	29
		Greater horseshoe				1			1
		Serotine	1		8				9
		Barbastelle			3	1	1	1	6
		Unidentified bat							0
	12	Species	20/06/2019 to 24/06/19*	10/07/19 to 14/07/19*	19/08/19 to 20/08/19 and 30/08/19 to 31/08/19*	19/09/20 to 23/09/20	15/10/19 to 19/10/19	27/05/20 to 31/05/20	Total
		Common pipistrelle	324	84	169	471	478	743	2269
		Soprano pipistrelle	142	13	27		19	32	233
		Nathusius' pipistrelle							0
		Pipistrelle species	1					1	2
		Myotis	69	3	138	10	23	168	411
		Noctule	23	2	23	11	1	22	82
		Leisler's				3			3
		Nyctaloid		1	12				13
		Brown long-eared			1				1
		Lesser horseshoe	4				1	18	23
		Greater horseshoe						1	1
		Serotine		1	2				3

Heading	Static	Species	20/06/19 to 24/06/19	09/07/19 to 13/07/19*	06/08/19 to 10/08/19*	04/09/19 to 08/09/19	04/10/19 to 08/10/19	14/05/20 to 18/05/20*	Total
		Barbastelle				1	1	1	3
		Unidentified bat							0
Transect 8	14	Species	20/06/2019 to 24/06/19*	10/07/19 to 14/07/19*	28/08/19 to 01/09/19	04/09/19 to 08/09/19	15/10/19 to 19/10/19	06/05/20 to 10/05/20	Total
		Common pipistrelle	238	73	61	81	59	637	1149
		Soprano pipistrelle	3	14	15	7	21	92	152
		Nathusius' pipistrelle	1						1
		Pipistrelle species		7				4	11
		Myotis	19	18	24	23	4	6	94
		Noctule	7	2	12	20	3	16	60
		Leisler's			5	94			99
		Nyctaloid		1	1	27			29
		Brown long-eared			2	1		1	4
		Lesser horseshoe				4		2	6
		Greater horseshoe						1	1
		Serotine			3	1			4
		Barbastelle			8	3	2		13
		Unidentified bat						1	1
	36	Species	22/06/20 to 26/06/20	10/07/19 to 14/07/19	19/08/19 to 22/08/19*	19/09/20 to 23/09/20*	15/10/19 to 19/10/19	13/05/20 to 17/05/20*	Total
		Common pipistrelle	2336	1751	412	55	14	978	5546
		Soprano pipistrelle	170	164	11	20	10	118	493
		Nathusius' pipistrelle	3						3
		Pipistrelle species	8	5			2	1	16
		Myotis	15	132	13	13	1	36	210
		Noctule	43	19	6	8		4	80
		Leisler's			2				2
		Nyctaloid	10	3	3	1			17
		Brown long-eared	1	3	1	3			8
		Lesser horseshoe			2	2	1		5
		Greater horseshoe							0
		Serotine	1						1

Heading	Static	Species	20/06/19 to 24/06/19	09/07/19 to 13/07/19*	06/08/19 to 10/08/19*	04/09/19 to 08/09/19	04/10/19 to 08/10/19	14/05/20 to 18/05/20*	Total
		Barbastelle			2				2
		Unidentified bat							0
Transect 9	15	Species	13/06/2019 to 17/06/19	03/07/19 to 07/07/19	23/08/19 to 25/08/19*	No data*	15/10/19 to 19/10/19	26/05/20 to 30/05/20	Total
		Common pipistrelle	667	500	548		893	5159	7767
		Soprano pipistrelle	93	267	288		674	1452	2774
		Nathusius' pipistrelle	1						1
		Pipistrelle species	4		30		17	120	171
		Myotis	115	62	130		312	1516	619
		Noctule	102	81	28		10	337	558
		Leisler's		2	10		4	1	17
		Nyctaloid		3	6			9	18
		Brown long-eared	1	4	6		6	6	23
		Lesser horseshoe	2	5	14		7	2	30
		Greater horseshoe							0
		Serotine		2	4			1	7
		Barbastelle			2			1	3
		Unidentified bat							0
	16	Species	13/06/20 to 18/06/20	03/07/19 to 07/07/19	19/08/19 to 23/08/19	19/09/20 to 23/09/20	15/10/19 to 20/10/19	26/05/20 to 30/05/20	Total
		Common pipistrelle	357	1225	7	72	3	1877	3534
		Soprano pipistrelle	15	92	175	44		198	524
		Nathusius' pipistrelle							0
		Pipistrelle species	13	8	6	10		127	164
		Myotis	142	866	65	86	19	2619	3797
		Noctule	14		5	17	2	76	114
		Leisler's			1	3	1	6	11
		Nyctaloid	1	4		7		20	32
		Brown long-eared	1	4		4		7	16
		Lesser horseshoe	1	4	2		1	7	15
		Greater horseshoe							0
		Serotine	1	1	3			11	16

Heading	Static	Species	20/06/19 to 24/06/19	09/07/19 to 13/07/19*	06/08/19 to 10/08/19*	04/09/19 to 08/09/19	04/10/19 to 08/10/19	14/05/20 to 18/05/20*	Total
		Barbastelle							0
		Unidentified bat							0
Transect 10	17	Species	13/06/2020 to 17/06/20	03/07/19 to 07/07/19	19/08/19 to 23/08/19	19/09/20 to 23/09/20	15/10/19 to 19/10/19	6/05/20 to 10/05/20	Total
		Common pipistrelle	59	777	856	121		301	2114
		Soprano pipistrelle	22	14	28	46	4	82	196
		Nathusius' pipistrelle				1			1
		Pipistrelle species	41	110	1	4		21	177
		Myotis	69	52	129	107	49	47	453
		Noctule	23		16	18		213	270
		Leisler's		1	1	4			6
		Nyctaloid		1	17	9		1	28
		Brown long-eared	2		2	8		1	13
		Lesser horseshoe			2	6		2	10
		Greater horseshoe					1	1	2
		Serotine	1		2	1			4
		Barbastelle			1	2		1	4
		Unidentified bat							0
	18	Species	01/06/2020 to 05/06/20	03/07/19 to 07/07/19	19/08/19 to 23/08/19*	21/09/20 to 25/09/20	15/10/19 to 19/10/19	06/05/20 to 10/05/20	Total
		Common pipistrelle	77	86	36	26	21	193	439
		Soprano pipistrelle	22	10	6	36	8	1	83
		Nathusius' pipistrelle							0
		Pipistrelle species						12	12
		Myotis	22	63	74	83	27	32	301
		Noctule	6	41	200	35	145	414	841
		Leisler's		6	69	7	6		88
		Nyctaloid	1	11	116	6	196	1	331
		Brown long-eared		3	9	3		3	18
		Lesser horseshoe		6	3	3		1	13
		Greater horseshoe				2		1	3
		Serotine		7					7

Heading	Static	Species	20/06/19 to 24/06/19	09/07/19 to 13/07/19*	06/08/19 to 10/08/19*	04/09/19 to 08/09/19	04/10/19 to 08/10/19	14/05/20 to 18/05/20*	Total
		Barbastelle		1	3	1			5
		Unidentified bat							0
Highways England Land	22	Species	11/06/19 to 15/06/20	No data*	20/08/19 to 24/08/19	16/09/20 to 20/09/20	16/10/19 to 19/10/19*	26/05/20 to 30/05/20	Total
		Common pipistrelle							0
		Soprano pipistrelle				2		1	3
		Nathusius' pipistrelle							0
		Pipistrelle species							0
		Myotis	1			5	1	18	25
		Noctule	11		21	45	1		78
		Leisler's							0
		Nyctaloid			2			8	10
		Brown long-eared				3	1		4
		Lesser horseshoe							0
		Greater horseshoe							0
		Serotine							0
		Barbastelle							0
		Unidentified bat							0
	23	Species	22/06/2020 to 26/06/20	No data*	19/08/19 to 23/08/19	26/09/20 to 30/09/20	16/10/19 to 20/10/19*	26/05/20 to 30/05/20	Total
		Common pipistrelle	1			1			2
		Soprano pipistrelle	1						1
		Nathusius' pipistrelle							0
		Pipistrelle species							0
		Myotis	5					3	8
		Noctule	11		1	4	2	5	23
		Leisler's			1				1
		Nyctaloid			2	1			3
		Brown long-eared							0
		Lesser horseshoe				3			3
		Greater horseshoe							0
		Serotine			1				1

Heading	Static	Species	20/06/19 to 24/06/19	09/07/19 to 13/07/19*	06/08/19 to 10/08/19*	04/09/19 to 08/09/19	04/10/19 to 08/10/19	14/05/20 to 18/05/20*	Total
		Barbastelle							0
		Unidentified bat							0
Transect 11	39	Species	30/06/2020*	01/07/20*	29/08/19 to 02/09/19*	19/09/20 to 23/09/20	02/10/19 to 06/10/19	13/05/20 to 17/05/20	Total
		Common pipistrelle	28	24	2	120		73	247
		Soprano pipistrelle	4	1	6	25	8	6	50
		Nathusius' pipistrelle				1			1
		Pipistrelle species					40	3	43
		Myotis	2	2	2	26	8	9	49
		Noctule	28	3	4	16	16	6	73
		Leisler's					5		5
		Nyctaloid	14		1	2	21		38
		Brown long-eared	1		1	4		3	9
		Lesser horseshoe			1	3	3	2	9
		Greater horseshoe							0
		Serotine							0
		Barbastelle				2	5	1	8
		Unidentified bat							0
Transect 12	33	Species	01/06/2020 to 05/06/20	03/07/19 to 07/07/19	29/08/19 to 01/09/19*	No data*	15/10/19 to 19/10/19	13/05/20 to 17/05/20	Total
		Common pipistrelle	57	42	22		7	49	177
		Soprano pipistrelle	28		15		2	22	67
		Nathusius' pipistrelle							0
		Pipistrelle species						1	1
		Myotis	7	5	19		33	7	71
		Noctule	23	126	44		7	163	363
		Leisler's			4				4
		Nyctaloid		2	9				11
		Brown long-eared			2		1		3
		Lesser horseshoe		2				1	3
		Greater horseshoe							0
		Serotine	1	1					2

Heading	Static	Species	20/06/19 to 24/06/19	09/07/19 to 13/07/19*	06/08/19 to 10/08/19*	04/09/19 to 08/09/19	04/10/19 to 08/10/19	14/05/20 to 18/05/20*	Total
		Barbastelle			2		1		3
		Unidentified bat							0

Appendix E.

A.9. Crossing Point Survey Data

Table 4-61 - Summary of Bat Roosts to be Potentially Lost (within the Southern Quadrant)

CP	Survey Date	Surveyors	Temperature	Wind	Rain	Sunset / Sunrise	Survey Start Time	Survey End Time	Survey Limitations
1	02/06/2020	RM, SK	Start 21 End 20	1	0	2118	2118	2222	Dark quickly within the culvert
1	22/06/2020	SK, EE	Start 19 End 17	1	0	2132	2132		Bat detector froze several times
1	01/09/2020	SK, EE	Start 18 End 16	1	0	1954	1954	2124	
1	07/09/2020	RM, EH	Start 18 End 16	0	0	1940	1940	2110	
1	17/09/2020	EE, TS	Start 20 End 17	Start 1 End 0	0	1923	1908	2047	Survey finished early
1	28/09/2020	SK, IH	Start 17 End 18	1	Start 0 End 1	1851	1851	2021	
2	04/06/2020	SK, RM	Start 12 End 13	1	0	2123	2119	2223	Insufficient surveyors, 4 required
2	16/07/2020	SK,RM, EH, CH	Start 21 End 21	1	0	2119	2119	2245	
2	10/08/2020	RM, JH, ND, IH	Start 26 End 22	0	0	2040	2040	2210	
2	24/08/2020	RM, IH, JH, TS	Start 20 End 18	Start 1 End 0	0	2012	2012	2142	Detector stopped working so RM had to move to replace detector momentarily
2	09/09/2020	SK, JH, LH, RM	Start 16 End 16	1	0	1936	1936	2106	
2	15/09/2020	HM, IH, LH, RM	Start 24 End 24	0	0	1922	1922	2052	
3	15/06/2020	SK, EE, TS, RM	Start 21 End 20	Start 0 End 2	Start 0 End 1	2129	2129	2229	
3	01/07/2020	RM, CH, RJ, EH	Start 15 End 14	Start 4 End 3	0	2130	2130	2245	Survey extended by 15 minutes due to late emerging species. Windy.
3	26/08/2020	SK, JH, EE, CH	Start 18	1	0	2007	2007	2137	

CP	Survey Date	Surveyors	Temperature	Wind	Rain	Sunset / Sunrise	Survey Start Time	Survey End Time	Survey Limitations
			End 18						
3	10/09/2020	SK, EE, EH, JH	Start 18 End 19	0	0	1933	1933	2103	
3	16/09/2020	SK, TS, ND, IH	Start 21 End 20	Start 1 End 2	0	1919	1919	2049	Very dark making it difficult to see
3	24/09/2020	RM, IH, JH, TS	Start 14 End 13	0	Start 0 End 3	1901	1901	2020	Survey finished early due to rain
4	08/06/2020	SK, RM, EE, TS	Start 17 End 16	Start 1 End 2	0	2125	2125	2225	
4	06/07/2020	SK, RM, EE, TS	Start 17 End 16	1	0	2129	2129	2259	
4	20/08/2020	SK, JH, RM, CH	Start 21 End 19	Start 2 End 2-3	0	2020	2020	2150	
4	27/08/2020	SK, EE, IH, JH	Start 16 End 16	0	0	2005	2005	2135	
4	03/09/2020	SK, JH, IH, AL	Start 18 End 17	Start 2 End 1	0	1949	1949	2119	
4	14/09/2020	RM, EH, IH, TS	Start 24 End 20	0	0	2124	2124	2154	
5	10/06/2020	SK, RM, EH, CH	Start 15 End 15	Start 1 End 2	0	2127	2127	2227	SD card failed in SK detector
5	24/06/2020	RM, SK, EE, LT	Start 24 End 24	1	0	2131	2131	2231	SK detector failed
5	17/08/2020	SK, IH, JH, EH	Start 21 End 20	1	0	2027	2027	2157	
5	08/09/2020	SK, RM, ND, JH	Start 19 End 18	Start 2 End 1	0	1938	1938	2108	
5	21/09/2020	RM, TS, EH, JH	Start 20 End 19	0	0	1908	1908	2038	TS detector failed
5	28/09/2020	RM, EH, HM, JH	Start 17 End 13	Start 1 End 0	Start 0 End 1	1851	1851	2021	Light rain throughout the survey

A.10. Crossing Point Survey Results

Table 4-62 - Crossing Point 1 Survey Results

Crossing Point	Total no. of Bats 'Using' the Feature (≤5 m)	Total no. of Bats Not 'Using' the Feature (>5 m)	Total no. of Bats Where Flight Distance from the Feature is Unknown (heard not seen)
Crossing Point Location 1 (River Chelt – M5 River Chelt culvert) - Survey 1 (02/06/20)	10 Soprano pipistrelle (5), Common pipistrelle (5)	6 Noctule	33
Crossing Point Location 1 (River Chelt – M5 River Chelt culvert) - Survey 2 (02/06/20)	7 Soprano pipistrelle (4), Common pipistrelle (2), Pipistrelle (1)	1 Common pipistrelle	22
Crossing Point Location 1 (River Chelt – M5 River Chelt culvert) - Survey 3 (01/09/20)	18 Soprano pipistrelle (4), ***Myotis*** (11), Common pipistrelle (1), Lesser horseshoe (2)	1 Noctule	26
Crossing Point Location 1 (River Chelt – M5 River Chelt culvert) - Survey 4 (07/09/20)	6 Soprano pipistrelle (2), ***Myotis*** (1), Common pipistrelle (1), Lesser horseshoe (2)	2 Noctule (1) and Soprano pipistrelle (1)	43
Crossing Point Location 1 (River Chelt – M5 River Chelt culvert) - Survey 5 (17/09/20)	13 Soprano pipistrelle (8), ***Myotis*** (4), Lesser horseshoe (1)	N/A	25
Crossing Point Location 1 (River Chelt – M5 River Chelt culvert) - Survey 6 (28/09/20)	3 Soprano pipistrelle (1), ***Myotis*** (1), Common pipistrelle (1)	N/A	37

Table 4-63 - Crossing Point 2 Survey Results

Crossing Point		Total no. of Bats 'Using' the Feature (≤5 m)	Total no. of Bats Not 'Using' the Feature (>5 m)	Total no. of Bats Where Flight Distance from the Feature is Unknown (heard not seen)
Crossing Point Location 2 (A4019 – New Link Road Intersection) – survey 1 (04/06/20)	Crossing the Road	4 Common pipistrelle	N/A	12
	Feature B	12 Common pipistrelle	N/A	
	Feature C	1 Noctule	N/A	
Crossing Point Location 2 (A4019 – New Link Road Intersection) – survey 2 (16/07/20)	Crossing the Road	1 Soprano pipistrelle	8 Noctule	22
	Feature B	2 Common pipistrelle	2 Noctule (1) and Common pipistrelle (2)	
	Feature C	8 Common pipistrelle (5), pipistrelle species (1), soprano pipistrelle (1) and Noctule (1)	1 Common pipistrelle	
Crossing Point Location 2 (A4019 – New Link Road Intersection) – survey 3 (10/08/20)	Crossing the Road	1 Soprano pipistrelle	N/A	94
	Feature B	1 Common pipistrelle	N/A	
	Feature C	7 Common pipistrelle)	1 Noctule	
Crossing Point Location 2 (A4019 – New Link Road Intersection) – survey 4 (24/08/20)	Crossing the Road	3 Serotine	2 Serotine (1) and common pipistrelle (1)	107
	Feature B	1 Noctule	N/A	
	Feature C	1 Common pipistrelle	N/A	
Crossing Point Location 2 (A4019 – New Link Road Intersection) – survey 5 (24/08/20)	Crossing the Road	N/A	1 Noctule	87
	Feature B	1 Common pipistrelle	N/A	
	Feature C	1 Unconfirmed bat	N/A	
Crossing Point Location 2 (A4019 – New Link Road Intersection) – survey 6 (15/09/20)	Crossing the Road	1 Common pipistrelle	1 Noctule	92
	Feature B	N/A	N/A	

Crossing Point		Total no. of Bats 'Using' the Feature (≤5 m)	Total no. of Bats Not 'Using' the Feature (>5 m)	Total no. of Bats Where Flight Distance from the Feature is Unknown (heard not seen)
	Feature C	1 Unconfirmed bat	1 Common pipistrelle	

Table 4-64 - Crossing Point 3 Survey Results

Crossing Point		Total no. of Bats 'Using' the Feature (≤5 m)	Total no. of Bats Not 'Using' the Feature (>5 m)	Total no. of Bats Where Flight Distance from the Feature is Unknown (heard not seen)
Crossing Point Location 3 (East of Withybridge Lane) – survey 1 (15/06/20)	Feature A	N/A	N/A	70
	Feature B	1 Common pipistrelle	12 Noctule	
	Feature C	5 Common pipistrelle	N/A	
Crossing Point Location 3 (East of Withybridge Lane – survey 2 (01/07/20)	Feature A	N/A	1 Noctule	15
	Feature B	N/A	3 Noctule	
	Feature C	N/A	1 Noctule	
Crossing Point Location 3 (East of Withybridge Lane – survey 3 (26/08/20)	Feature A	1 Soprano pipistrelle	2 Noctule (1), soprano pipistrelle (1)	25
	Feature B	N/A	2 Noctule (1), soprano pipistrelle (1)	
	Feature C	N/A	1 Noctule	
Crossing Point Location 3 (East of Withybridge Lane – survey 4 (10/09/20)	Feature A	2 Common pipistrelle (1), ***Myotis*** (1)	N/A	52
	Feature B	3 Noctule (1), Common pipistrelle (2)	5 Noctule	
	Feature C	N/A	N/A	
Crossing Point Location 3 (East of Withybridge Lane – survey 5 (16/09/20)	Feature A	N/A	1 Noctule	123
	Feature B	6 Common pipistrelle (4), soprano pipistrelle (1), Unidentified bat (1)	1 Noctule	
	Feature C	1 Common pipistrelle (1)	2 Noctule	
Crossing Point Location 3 (East of Withybridge Lane – survey 6 (24/09/20)	Feature A	N/A	N/A	12
	Feature B	1 Common pipistrelle	N/A	
	Feature C	N/A	N/A	

Table 4-65 - Crossing Point 4 Survey Results

Crossing Point	Total no. of Bats 'Using' the Feature (≤5 m)	Total no. of Bats Not 'Using' the Feature (>5 m)	Total no. of Bats Where Flight Distance from the Feature is Unknown (heard not seen)
Crossing Point Location 4 (River Chelt - New Link Road Intersection) – survey 1 (08/06/20)	12 Common pipistrelle (11), soprano pipistrelle (1)	1 Noctule	59
Crossing Point Location 4 (River Chelt - New Link Road Intersection) – survey 2 (06/07/20)	14 Common pipistrelle (9), pipistrelle species (2), un-identified bat (1), Noctule (2)	8 Common pipistrelle (2), Noctule (6)	189
Crossing Point Location 4 (River Chelt - New Link Road Intersection) – survey 3 (20/08/20)	11 Soprano pipistrelle (1), ***Myotis*** (1), common pipistrelle (7) and pipistrelle species (2)	12 Common pipistrelle (10), pipistrelle species (1) and Noctule (1)	176
Crossing Point Location 4 (River Chelt - New Link Road Intersection) – survey 4 (27/08/20)	10 Common pipistrelle (9) and unidentified bat (1)	4 Common pipistrelle (2) and Noctule (2)	92
Crossing Point Location 4 (River Chelt - New Link Road Intersection) – survey 5 (03/09/20)	10 Soprano pipistrelle (1), common pipistrelle (8) and pipistrelle species (1)	7 Soprano pipistrelle (1), common pipistrelle (1) and Noctule (5)	72
Crossing Point Location 4 (River Chelt - New Link Road Intersection) – survey 6 (14/09/20)	19 Soprano pipistrelle (2) and common pipistrelle (17)	8 Noctule	**136**

Table 4-66 - Crossing Point 5 Survey Results

Crossing Point		Total no. of Bats 'Using' the Feature (≤5 m)	Total no. of Bats Not 'Using' the Feature (>5 m)	Total no. of Bats Where Flight Distance from the Feature is Unknown (heard not seen)
Crossing Point Location 5 (Old Gloucester Road) – survey 1 (10/06/20)	Road	3 Common pipistrelle	N/A	15
	Feature A	9 Common pipistrelle	N/A	
	Feature C	2 Common pipistrelle	1 Noctule	
Crossing Point Location 5 (Old Gloucester Road) – survey 2 (24/06/20)	Road	4 Common pipistrelle (3) and pipistrelle species (1)	N/A	15
	Feature A	6 Common pipistrelle (4) and pipistrelle species (2)	N/A	
	Feature C	3 Common pipistrelle (2) and pipistrelle species (1)	N/A	
Crossing Point Location 5 (Old Gloucester Road) – survey 3 (17/08/20)	Road	1 Common pipistrelle	1 Common pipistrelle	113
	Feature A	11 Common pipistrelle (9), ***Myotis*** (1) and pipistrelle species (1)	N/A	
	Feature C	1 Common pipistrelle	1 Common pipistrelle (1)	
Crossing Point Location 5 (Old Gloucester Road) – survey 4 (08/09/20)	Road	1 Common pipistrelle	1 Common pipistrelle	25
	Feature A	2 Common pipistrelle (1) and unidentified bat (1)	3 Noctule (2) and serotine (1)	
	Feature C	N/A	1 Common pipistrelle	
Crossing Point Location 5 (Old Gloucester Road) – survey 5 (21/09/20)	Road	2 Common pipistrelle (1) and unidentified bat (1)	N/A	161
	Feature A	N/A	N/A	
	Feature C	1 Common pipistrelle	1 Noctule	
Crossing Point Location 5 (Old Gloucester Road) – survey 6 (28/09/20)	Road	N/A	1 Common pipistrelle	125
	Feature A	2 Common pipistrelle (1) and Noctule (1)	9 Common pipistrelle	

Crossing Point		Total no. of Bats 'Using' the Feature (≤5 m)	Total no. of Bats Not 'Using' the Feature (>5 m)	Total no. of Bats Where Flight Distance from the Feature is Unknown (heard not seen)
	Feature C	N/A	1 Unidentified bat	

Appendix F.

A.11. Figure 7.3A Figure to Show all Buildings Within the Survey Area Subjected to Preliminary Roost Assessment

A.12. Figure 7.3B Figure to Show all Buildings' Bat Roost Suitability and Confirmed Bat Roosts

A.13. Figure 7.3C Figure to Show all Confirmed Buildings' and Trees' Bat Roost Characterisation

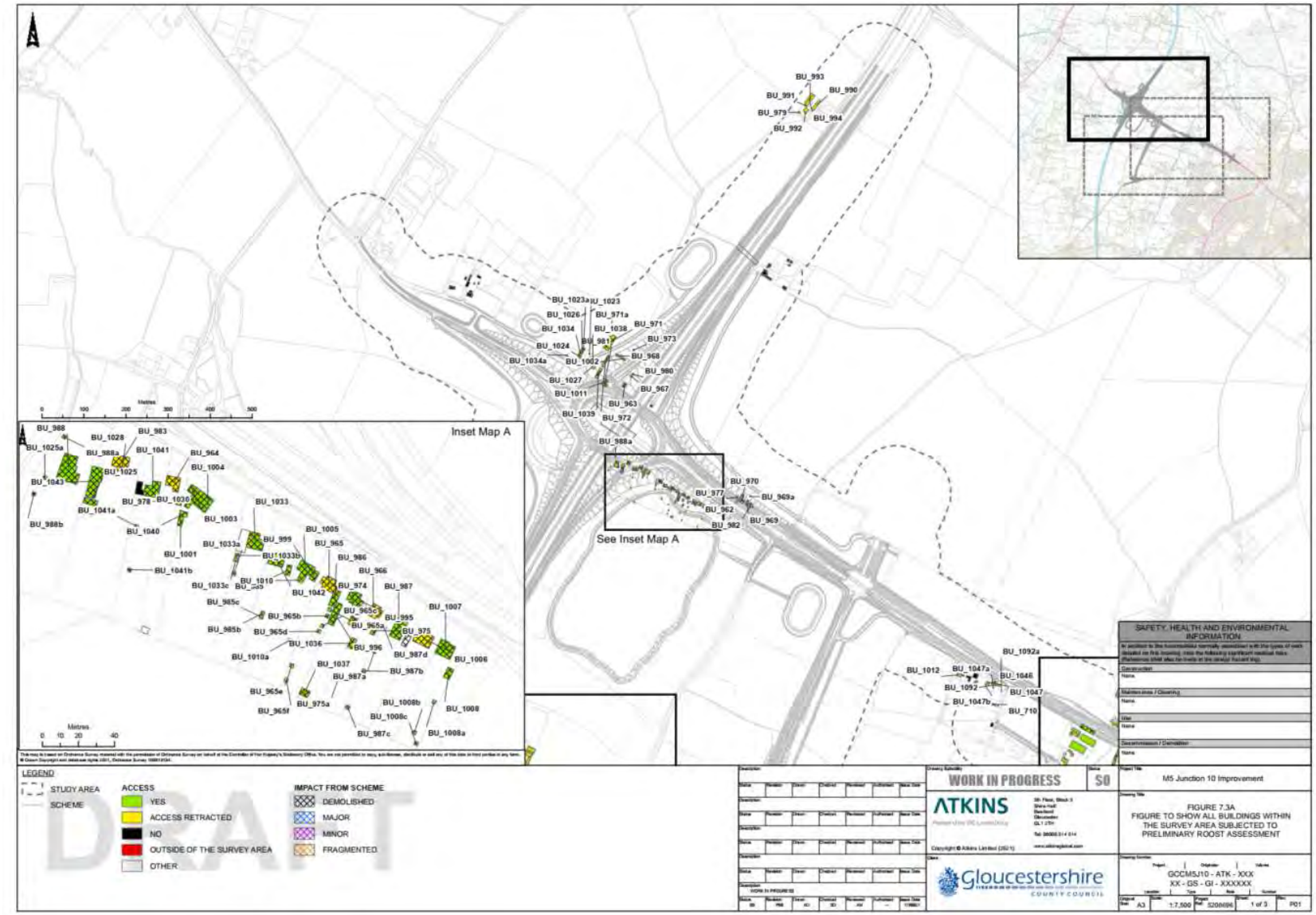
A.14. Figure 7.3D

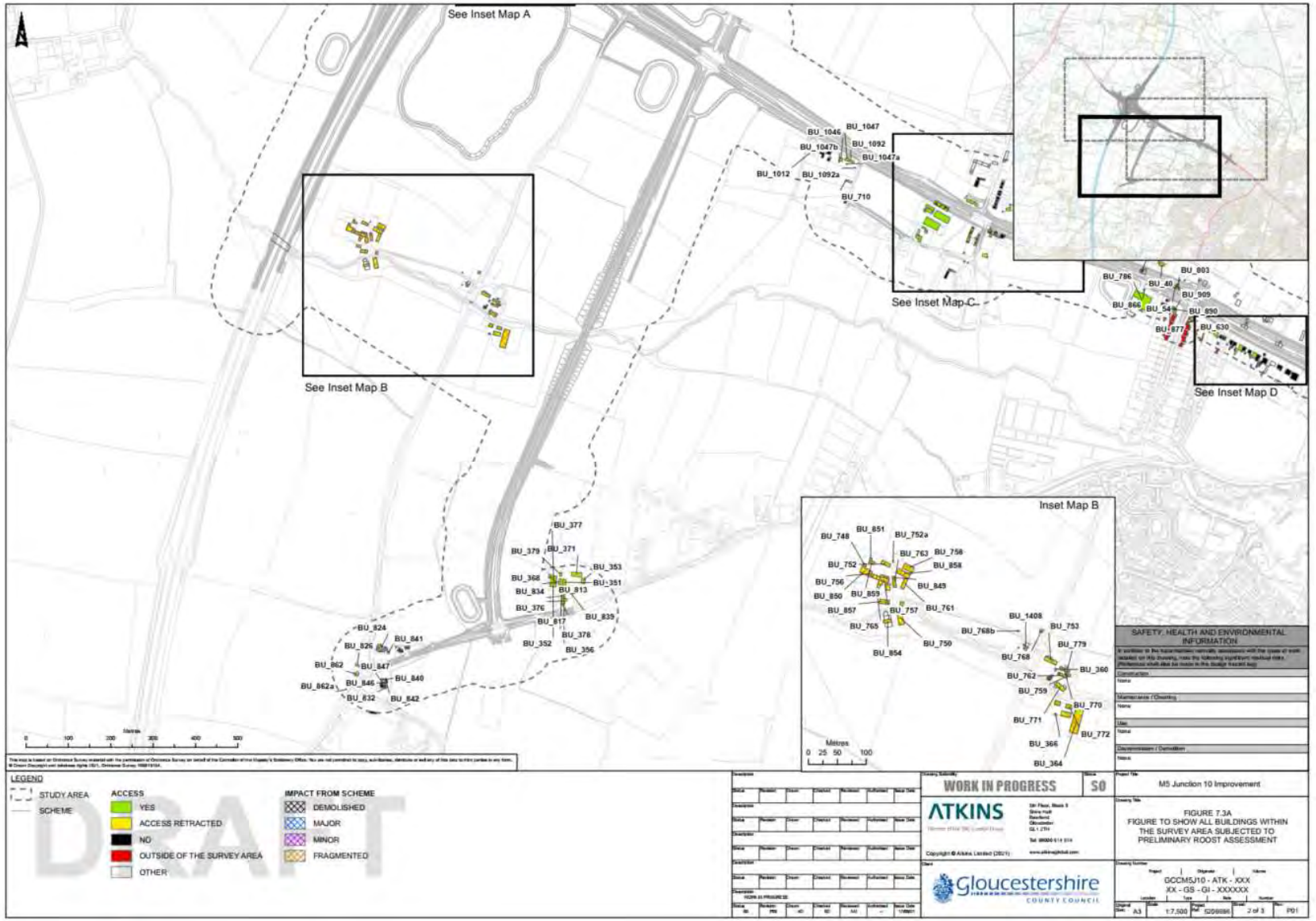
A.15. Figure 7.3E Figure to Show All 2019 / 2020 Transect Locations and Stopping Locations

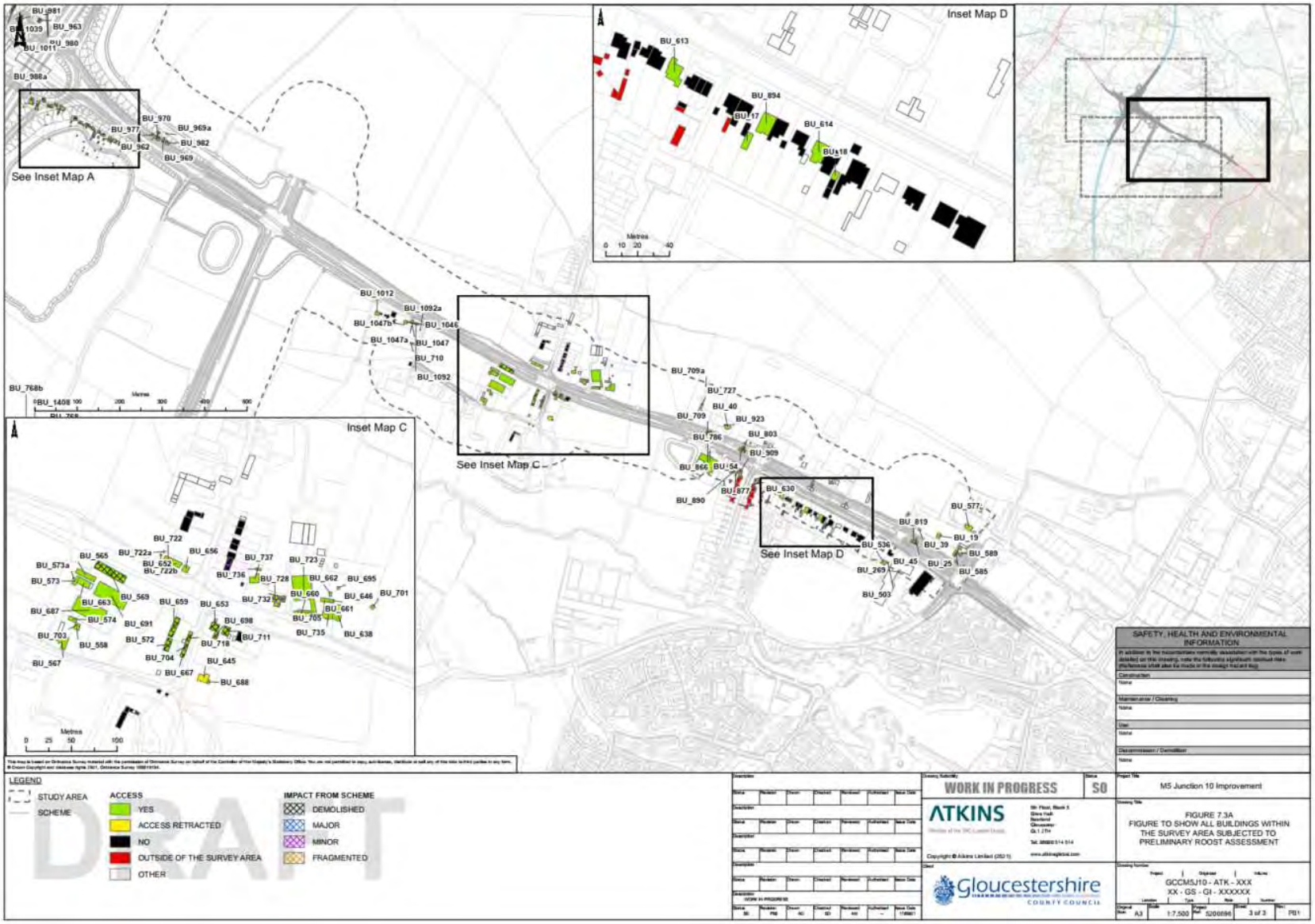
A.16. Figure 7.3F Figure to Show all 2020 Crossing Point Locations

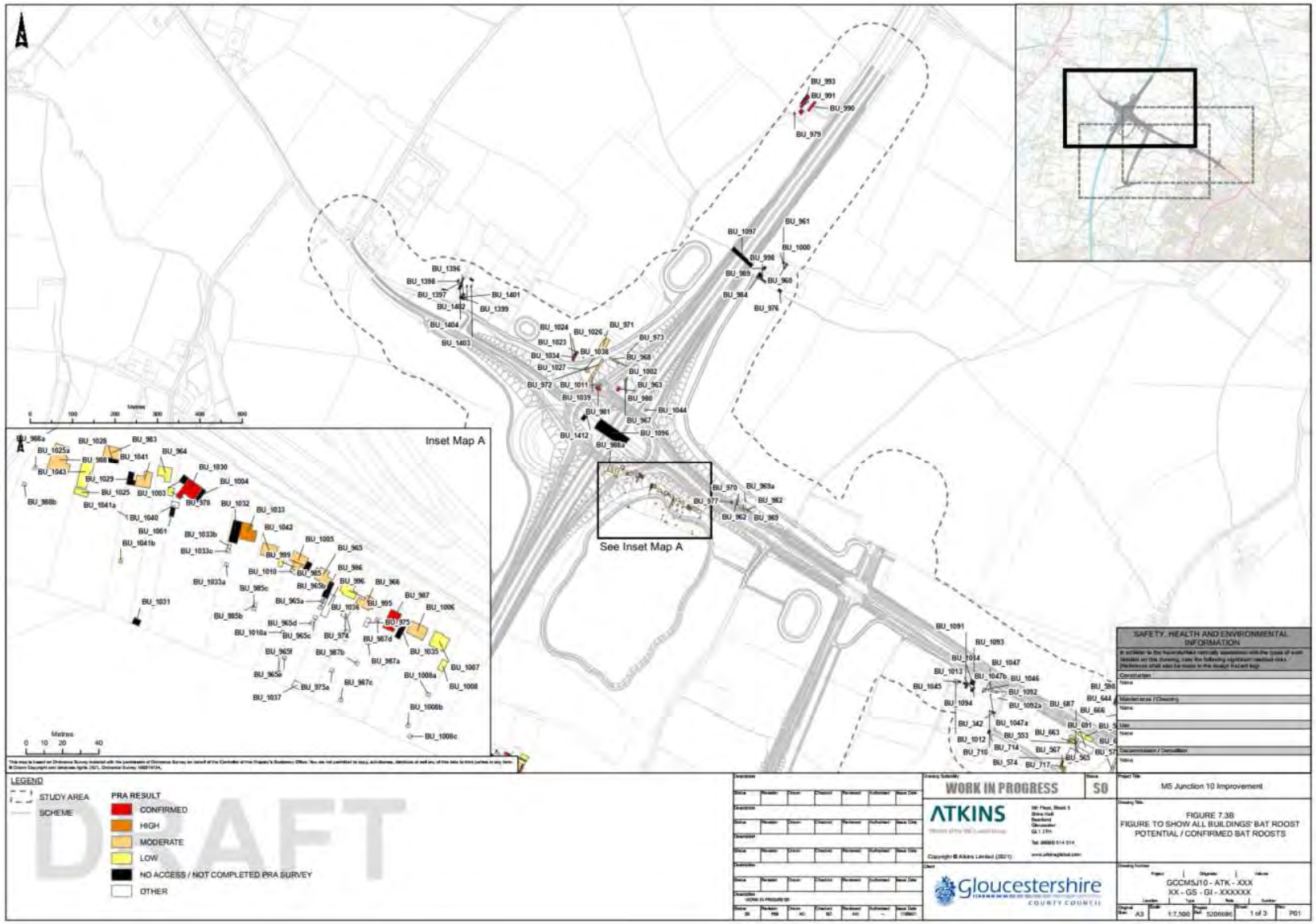
A.17. Figure 7.3F Figure to Show Desk Study Data

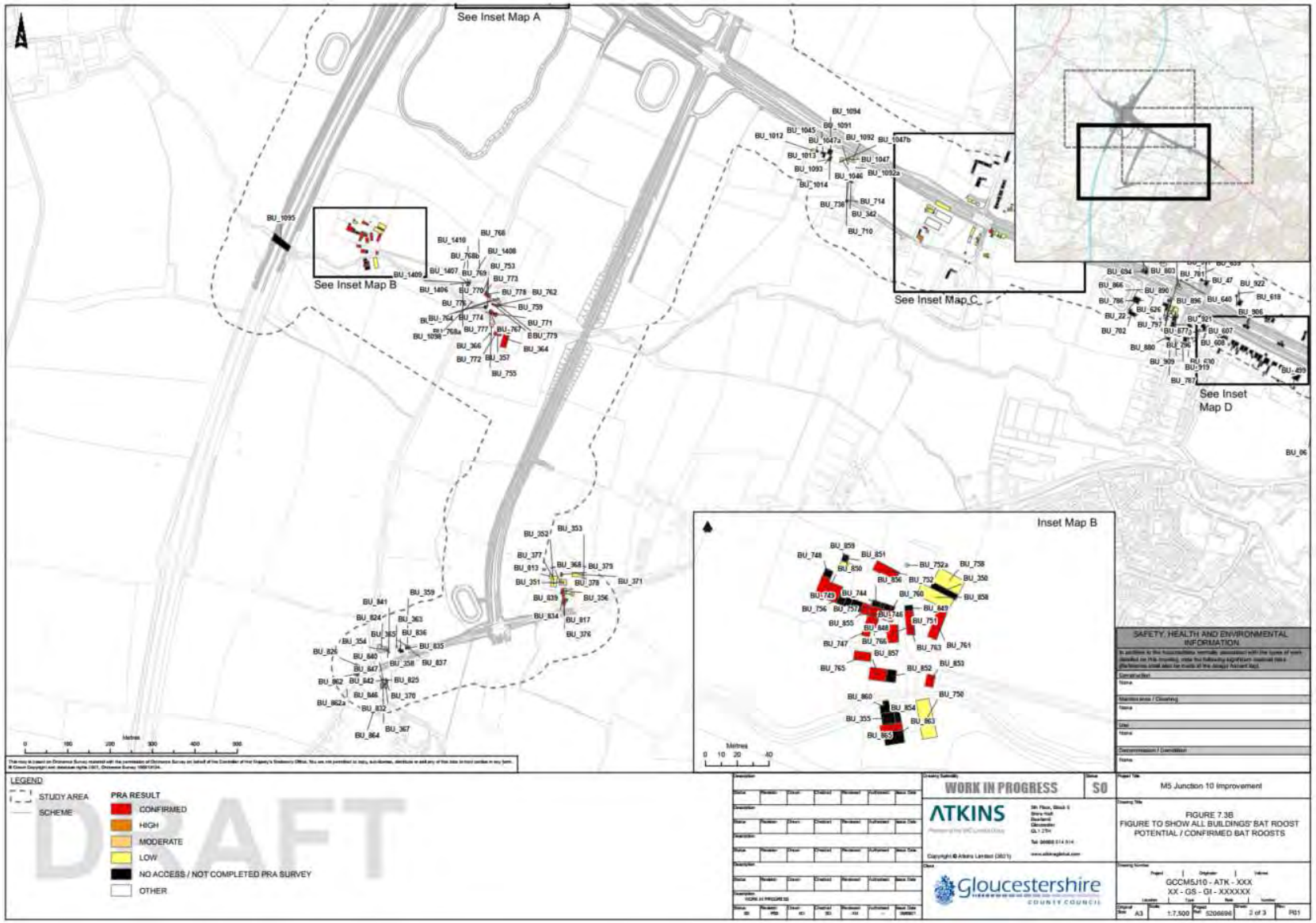
A.18. Figure 7.3H Figure to Show Bat Tree Locations and Overall GLTA Assessment

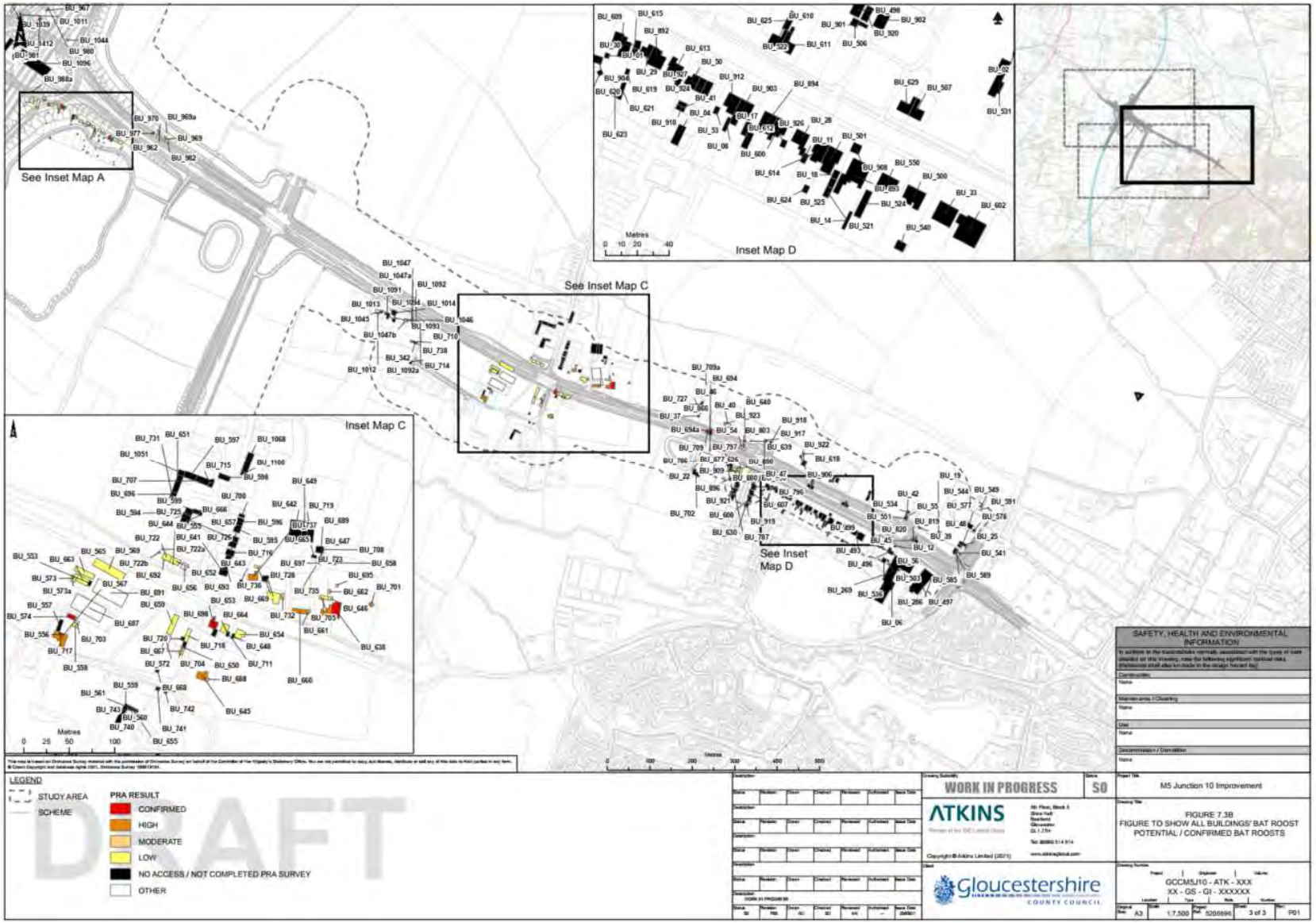

Inset Map A
See Inset Map A
LEGEND
STUDY AREA
SCHEME
ACCESS
YES
ACCESS RETRACTED
NO
OUTSIDE OF THE SURVEY AREA
OTHER
IMPACT FROM SCHEME
DEMOLISHED
MAJOR
MINOR
FRAGMENTED
DRAFT
WORK IN PROGRESS
S0
M5 Junction 10 Improvement
FIGURE 7.3A
FIGURE TO SHOW ALL BUILDINGS WITHIN THE SURVEY AREA SUBJECTED TO PRELIMINARY ROOST ASSESSMENT
SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION
ATKINS
Gloucestershire COUNTY COUNCIL

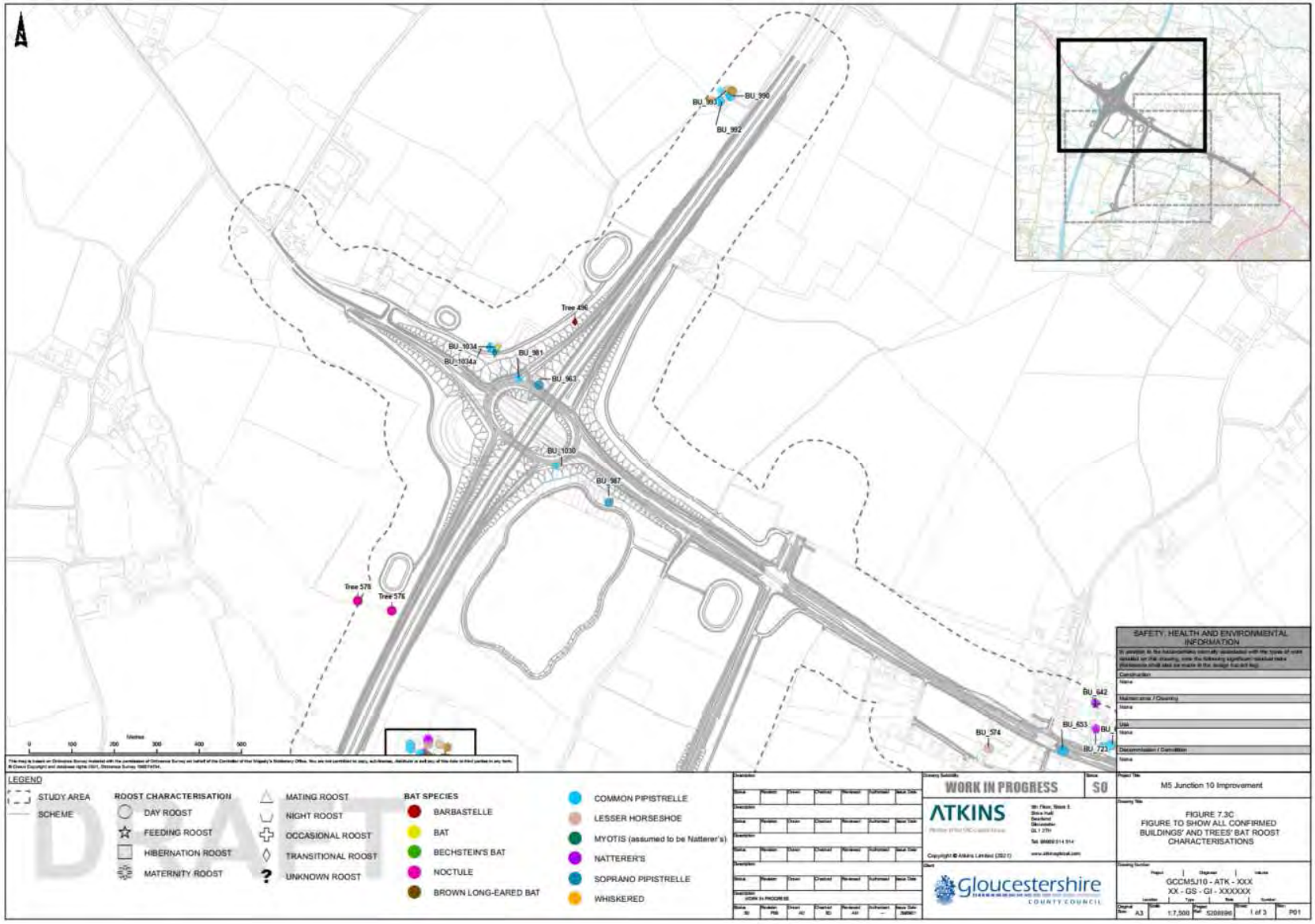

See Inset Map A
See Inset Map B
See Inset Map C
See Inset Map D
Inset Map B
LEGEND
STUDY AREA
SCHEME
ACCESS
YES
ACCESS RETRACTED
NO
OUTSIDE OF THE SURVEY AREA
OTHER
IMPACT FROM SCHEME
DEMOLISHED
MAJOR
MINOR
FRAGMENTED
DRAFT
WORK IN PROGRESS
ATKINS
Gloucestershire COUNTY COUNCIL
M5 Junction 10 Improvement
FIGURE 7.3A
FIGURE TO SHOW ALL BUILDINGS WITHIN THE SURVEY AREA SUBJECTED TO PRELIMINARY ROOST ASSESSMENT
GCCM5J10 - ATK - XXX
XX - GS - GI - XXXXXX

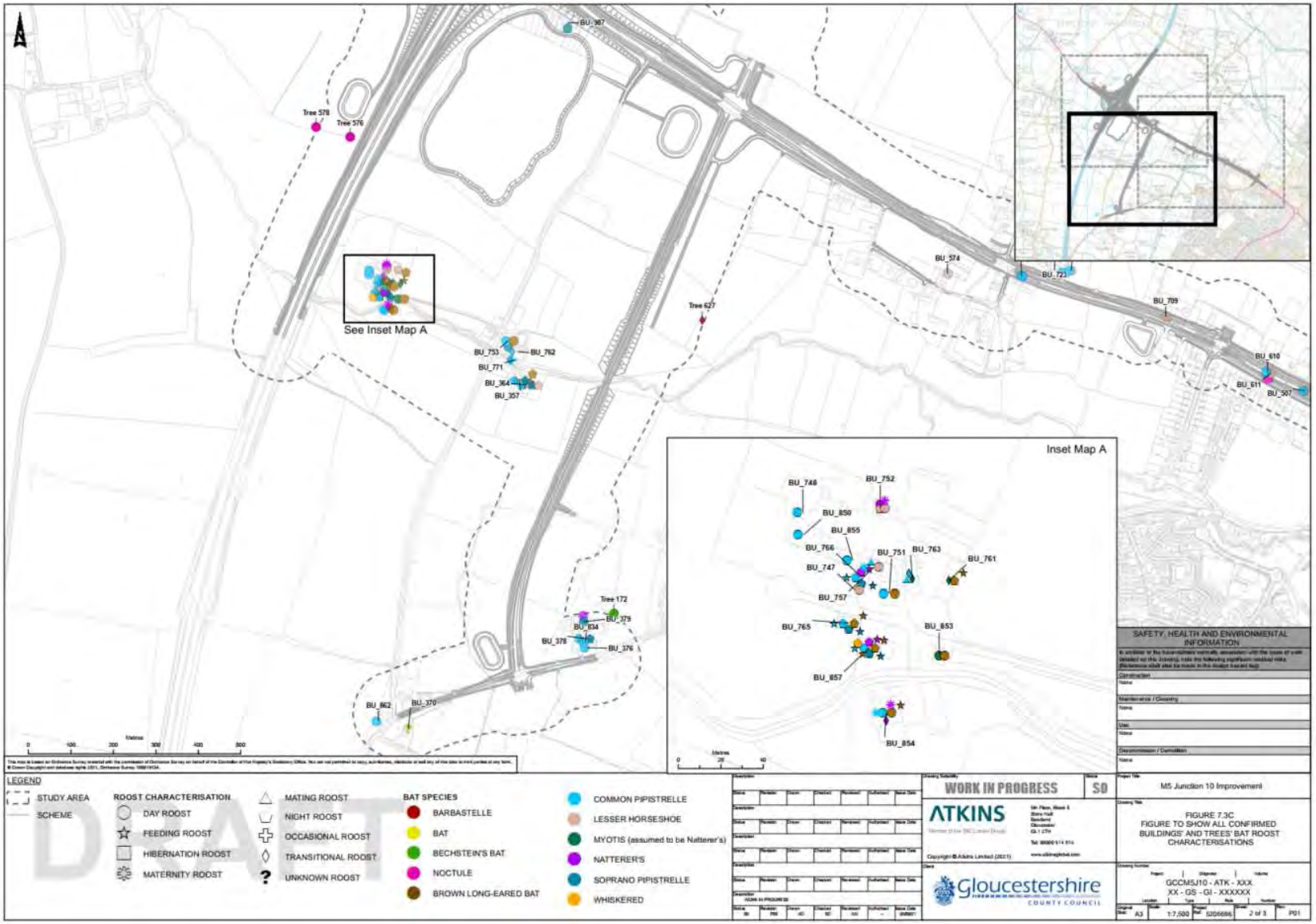

Inset Map D
See Inset Map A
See Inset Map C
See Inset Map D
Inset Map C
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STUDY AREA
SCHEME
ACCESS
YES
ACCESS RETRACTED
NO
OUTSIDE OF THE SURVEY AREA
OTHER
IMPACT FROM SCHEME
DEMOLISHED
MAJOR
MINOR
FRAGMENTED
DRAFT
SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION
WORK IN PROGRESS
S0
M5 Junction 10 Improvement
FIGURE 7.3A
FIGURE TO SHOW ALL BUILDINGS WITHIN THE SURVEY AREA SUBJECTED TO PRELIMINARY ROOST ASSESSMENT
GCCM5J10 - ATK - XXX
XX - GS - GI - XXXXXX

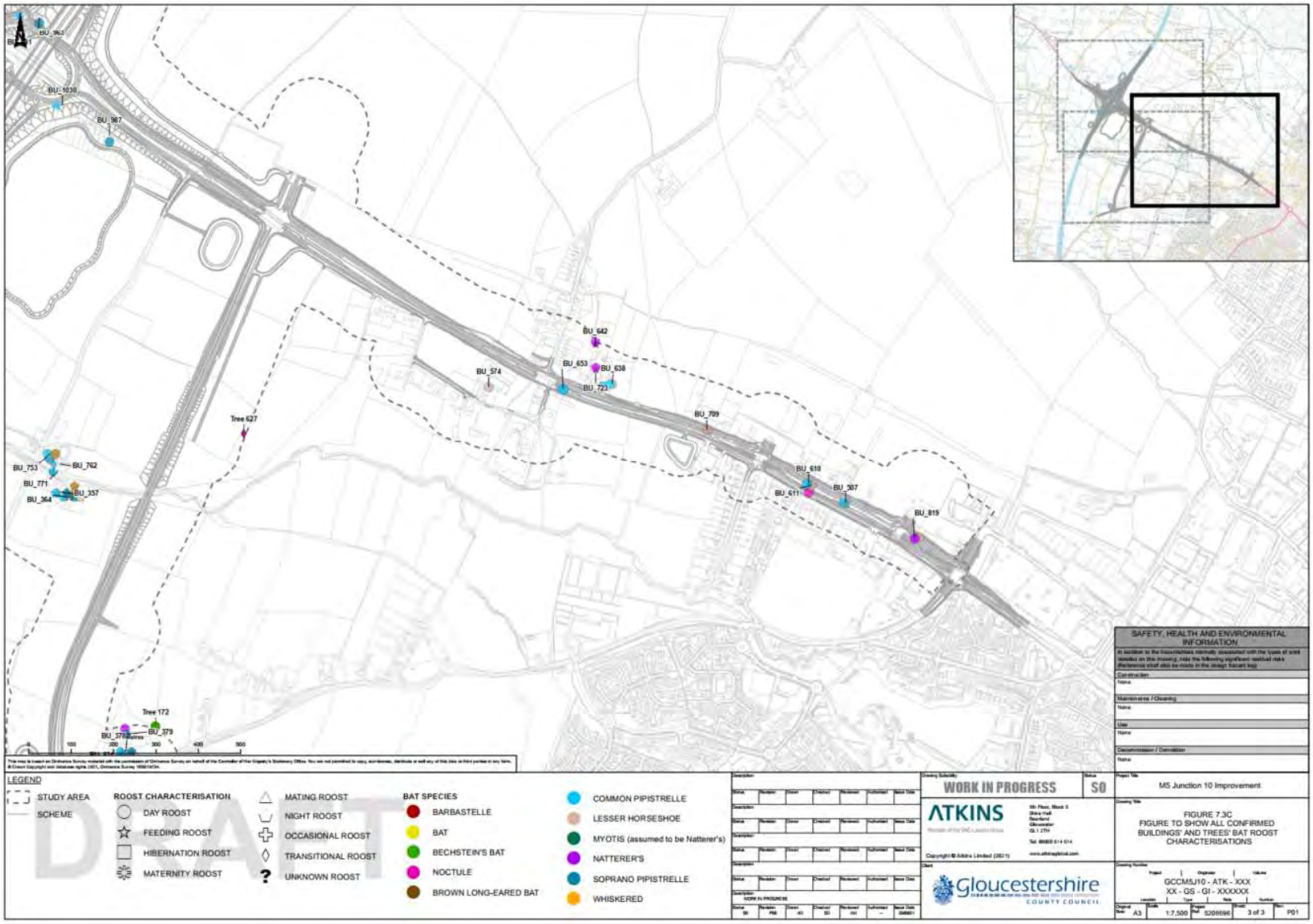

Inset Map A
See Inset Map A
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STUDY AREA
SCHEME
PRA RESULT
CONFIRMED
HIGH
MODERATE
LOW
NO ACCESS / NOT COMPLETED PRA SURVEY
OTHER
DRAFT
WORK IN PROGRESS
SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION
M5 Junction 10 Improvement
FIGURE 7.3B
FIGURE TO SHOW ALL BUILDINGS' BAT ROOST POTENTIAL / CONFIRMED BAT ROOSTS
GCCM5J10 - ATK - XXX
XX - GS - GI - XXXXXX

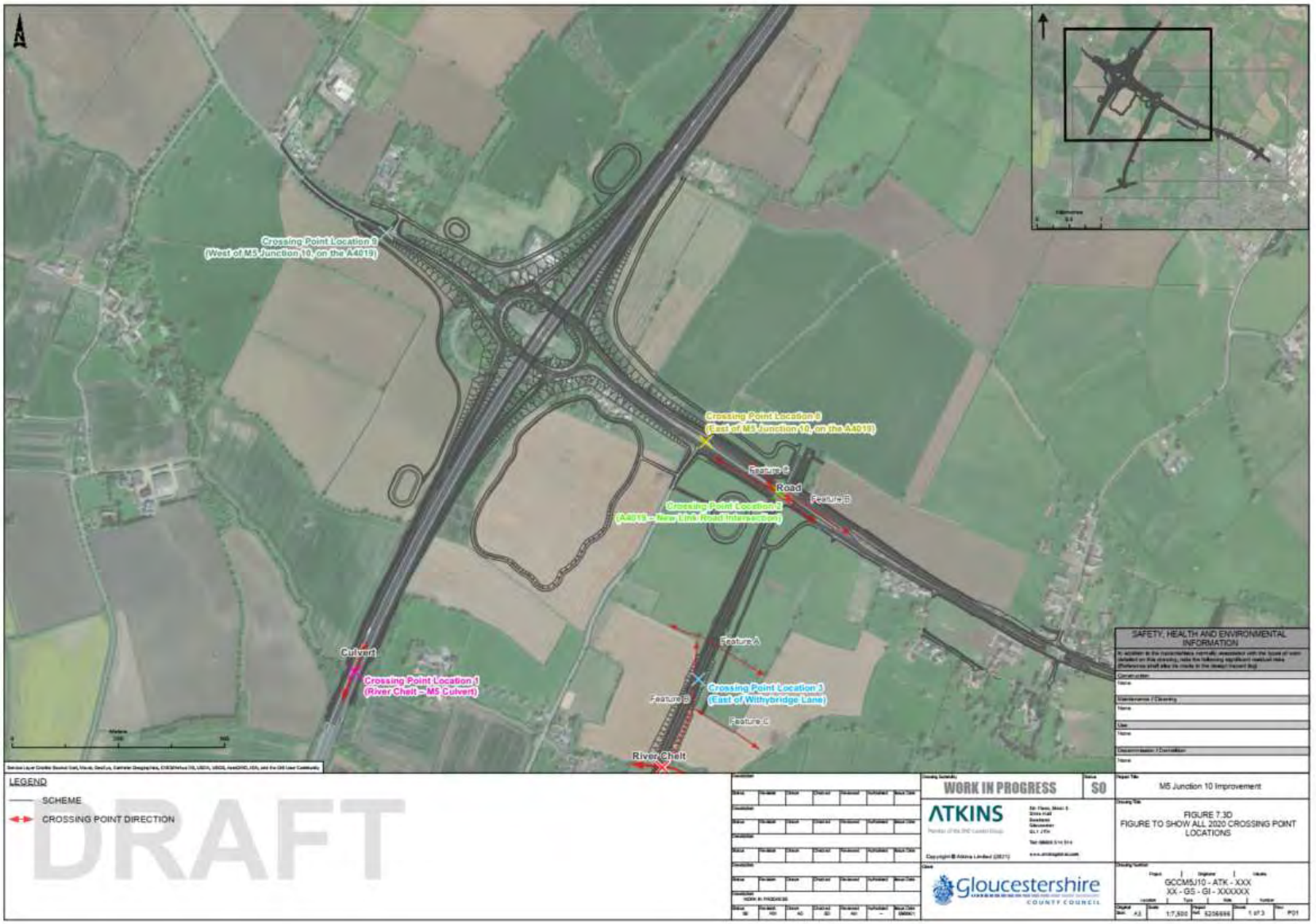

See Inset Map A
See Inset Map B
See Inset Map C
See Inset Map D
Inset Map B
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STUDY AREA
SCHEME
PRA RESULT
CONFIRMED
HIGH
MODERATE
LOW
NO ACCESS / NOT COMPLETED PRA SURVEY
OTHER
DRAFT
WORK IN PROGRESS
S0
ATKINS
Gloucestershire COUNTY COUNCIL
M5 Junction 10 Improvement
FIGURE 7.3B
FIGURE TO SHOW ALL BUILDINGS' BAT ROOST POTENTIAL / CONFIRMED BAT ROOSTS
GCCM5J10 - ATK - XXX
XX - GS - GI - XXXXXX
SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

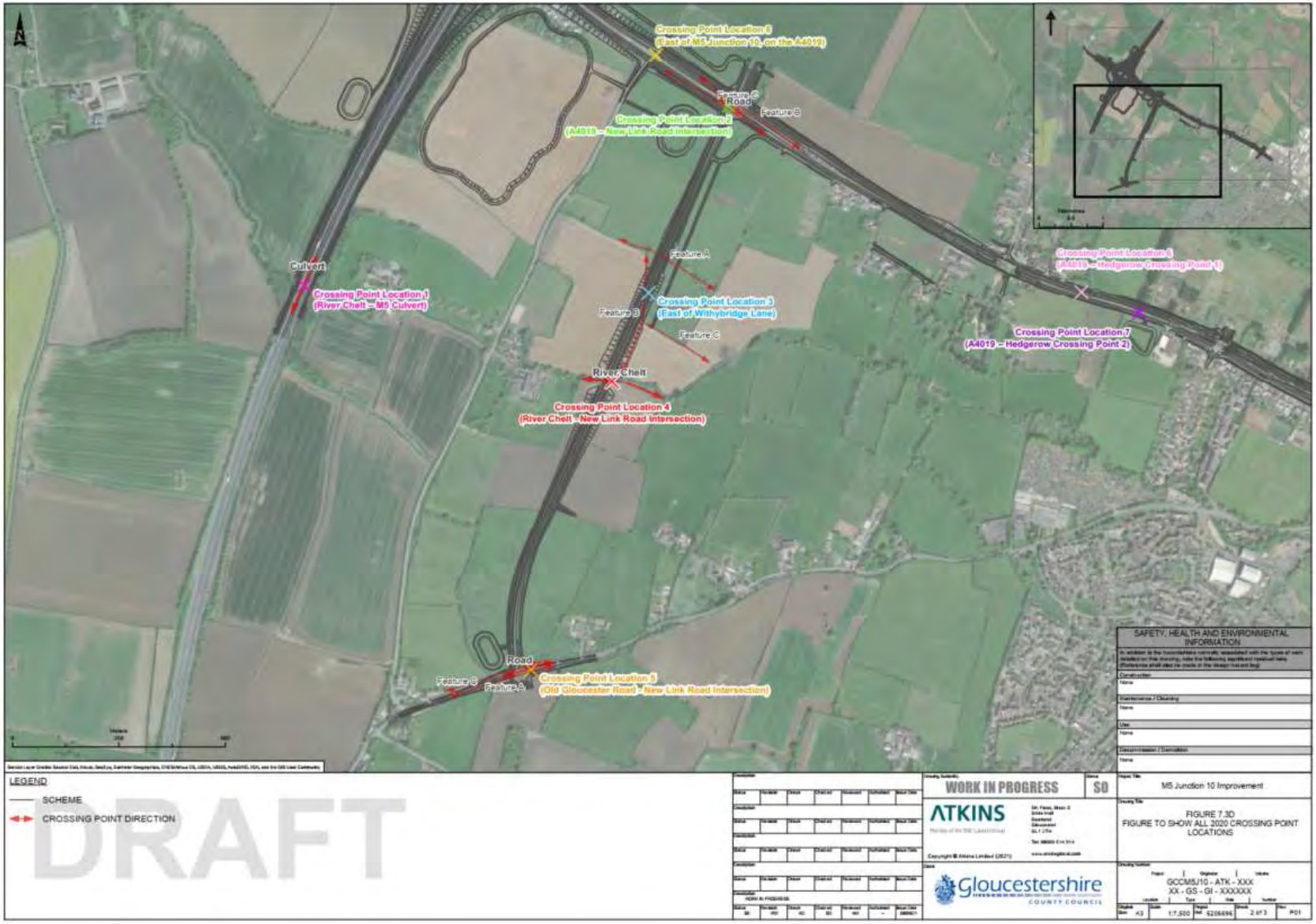

See Inset Map A
Inset Map D
See Inset Map C
Inset Map C
See Inset Map D
LEGEND
STUDY AREA
SCHEME
PRA RESULT
CONFIRMED
HIGH
MODERATE
LOW
NO ACCESS / NOT COMPLETED PRA SURVEY
OTHER
DRAFT
SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION
WORK IN PROGRESS
S0
M5 Junction 10 Improvement
FIGURE 7.3B
FIGURE TO SHOW ALL BUILDINGS' BAT ROOST POTENTIAL / CONFIRMED BAT ROOSTS
ATKINS
Gloucestershire COUNTY COUNCIL
GCCM5J10 - ATK - XXX
XX - GS - GI - XXXXXX
A3
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3 of 3
P01

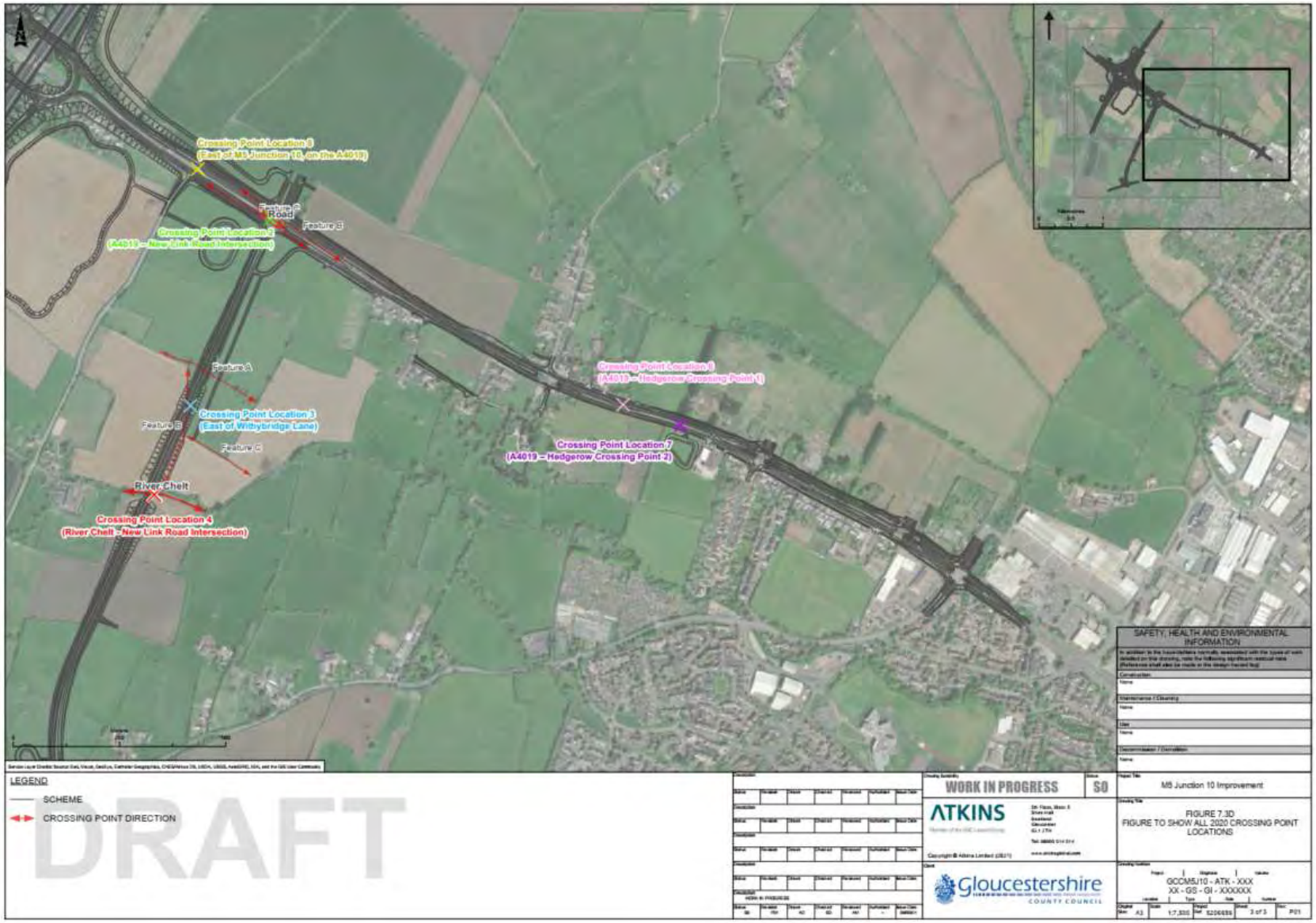

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BU_1030
BU_987
Tree 578
Tree 576
BU_642
BU_653
BU_723
BU_574
LEGEND
STUDY AREA
SCHEME
ROOST CHARACTERISATION
DAY ROOST
FEEDING ROOST
HIBERNATION ROOST
MATERNITY ROOST
MATING ROOST
NIGHT ROOST
OCCASIONAL ROOST
TRANSITIONAL ROOST
UNKNOWN ROOST
BAT SPECIES
BARBASTELLE
BAT
BECHSTEIN'S BAT
NOCTULE
BROWN LONG-EARED BAT
COMMON PIPISTRELLE
LESSER HORSESHOE
MYOTIS (assumed to be Natterer's)
NATTERER'S
SOPRANO PIPISTRELLE
WHISKERED
DRAFT
SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION
WORK IN PROGRESS
S0
M5 Junction 10 Improvement
FIGURE 7.3C
FIGURE TO SHOW ALL CONFIRMED BUILDINGS' AND TREES' BAT ROOST CHARACTERISATIONS
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XX - GS - GI - XXXXXX
A3
1:7,500
1 of 3
P01

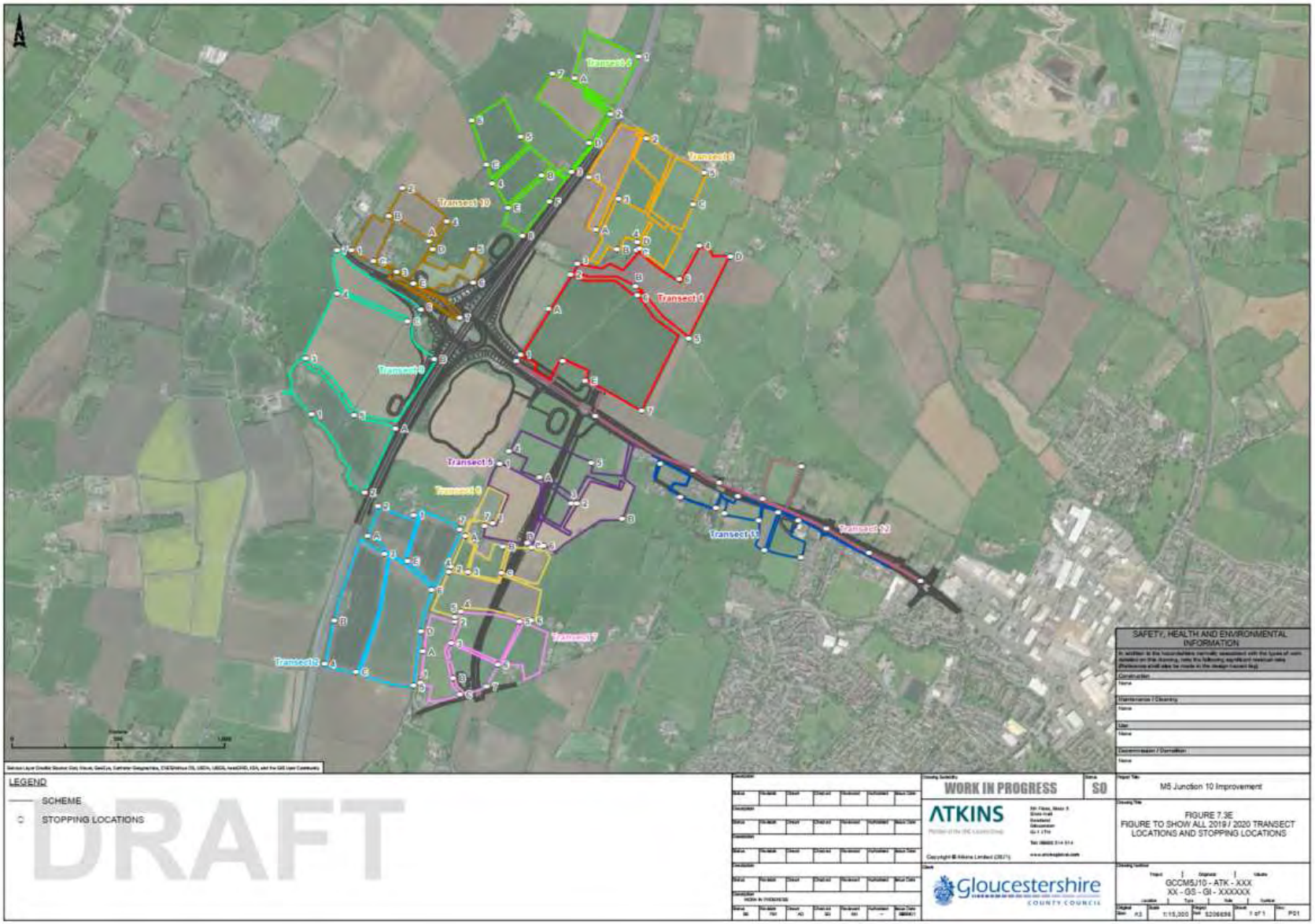

See Inset Map A
Inset Map A
LEGEND
STUDY AREA
SCHEME
ROOST CHARACTERISATION
DAY ROOST
FEEDING ROOST
HIBERNATION ROOST
MATERNITY ROOST
MATING ROOST
NIGHT ROOST
OCCASIONAL ROOST
TRANSITIONAL ROOST
UNKNOWN ROOST
BAT SPECIES
BARBASTELLE
BAT
BECHSTEIN'S BAT
NOCTULE
BROWN LONG-EARED BAT
COMMON PIPISTRELLE
LESSER HORSESHOE
MYOTIS (assumed to be Natterer's)
NATTERER'S
SOPRANO PIPISTRELLE
WHISKERED
DRAFT
WORK IN PROGRESS
SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION
M5 Junction 10 Improvement
FIGURE 7.3C
FIGURE TO SHOW ALL CONFIRMED BUILDINGS' AND TREES' BAT ROOST CHARACTERISATIONS
ATKINS
Gloucestershire COUNTY COUNCIL

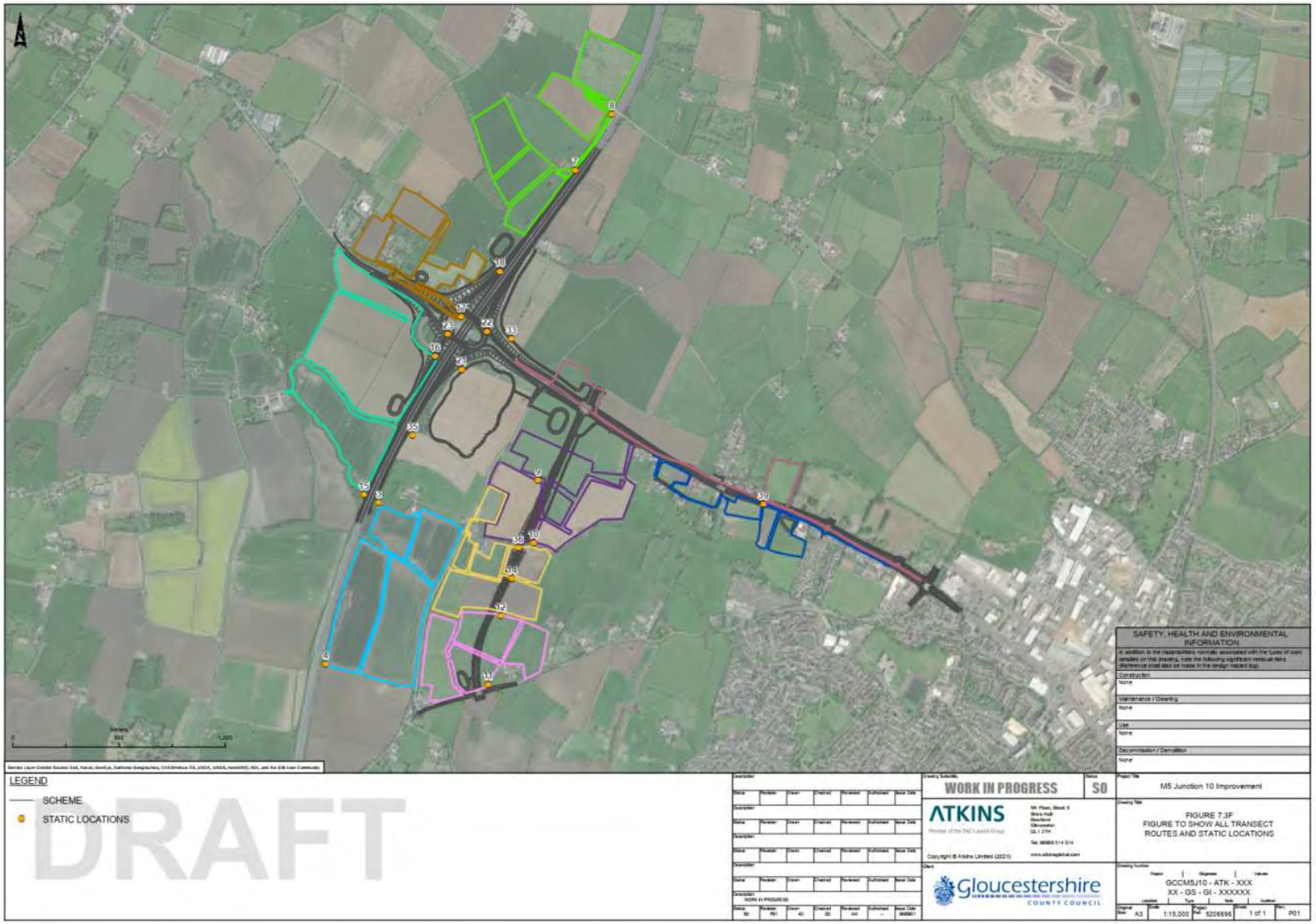

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BU_611
BU_507
BU_819
BU_753
BU_762
BU_771
BU_357
BU_364
Tree 172
BU_379
LEGEND
STUDY AREA
SCHEME
ROOST CHARACTERISATION
DAY ROOST
FEEDING ROOST
HIBERNATION ROOST
MATERNITY ROOST
MATING ROOST
NIGHT ROOST
OCCASIONAL ROOST
TRANSITIONAL ROOST
UNKNOWN ROOST
BAT SPECIES
BARBASTELLE
BAT
BECHSTEIN'S BAT
NOCTULE
BROWN LONG-EARED BAT
COMMON PIPISTRELLE
LESSER HORSESHOE
MYOTIS (assumed to be Natterer's)
NATTERER'S
SOPRANO PIPISTRELLE
WHISKERED
DRAFT
SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION
WORK IN PROGRESS
S0
M5 Junction 10 Improvement
FIGURE 7.3C
FIGURE TO SHOW ALL CONFIRMED BUILDINGS' AND TREES' BAT ROOST CHARACTERISATIONS
GCCM5J10 - ATK - XXX
XX - GS - GI - XXXXXX
A3
1:7,500
3 of 3
P01

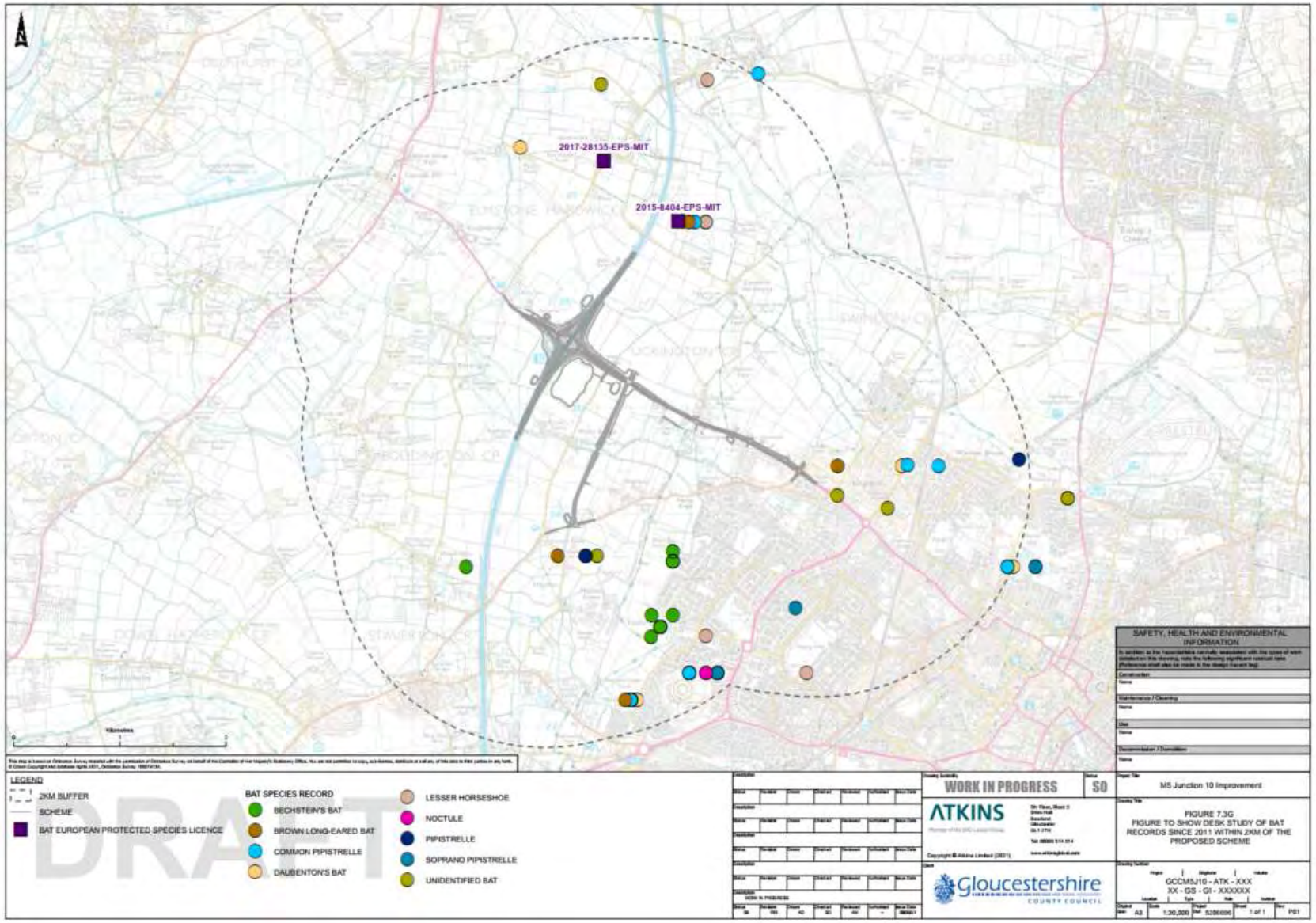

Crossing Point Location 5
(West of M5 Junction 10, on the A4019)
Crossing Point Location 6
(East of M5 Junction 10, on the A4019)
Feature C
Road
Feature B
Crossing Point Location 2
(A4019 – New Link Road Intersection)
Culvert
Crossing Point Location 1
(River Chelt – M5 Culvert)
Feature A
Feature D
Crossing Point Location 3
(East of Withybridge Lane)
Feature E
River Chelt
LEGEND
SCHEME
CROSSING POINT DIRECTION
DRAFT
WORK IN PROGRESS
S0
ATKINS
Gloucestershire
COUNTY COUNCIL
SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION
M5 Junction 10 Improvement
FIGURE 7.3D
FIGURE TO SHOW ALL 2020 CROSSING POINT LOCATIONS
GCCM5J10 - ATK - XXX
XX - GS - GI - XXXXXX
1:7,500
P01


Crossing Point Location 6
(East of M5 Junction 10, on the A4019)
Feature C
Road
Feature B
Crossing Point Location 2
(A4019 – New Link Road Intersection)
Feature A
Culvert
Crossing Point Location 1
(River Chelt – M5 Culvert)
Feature B
Crossing Point Location 3
(East of Withybridge Lane)
Feature C
Crossing Point Location 6
(A4019 – Hedgerow Crossing Point 1)
Crossing Point Location 7
(A4019 – Hedgerow Crossing Point 2)
River Chelt
Crossing Point Location 4
(River Chelt – New Link Road Intersection)
Road
Feature C
Feature A
Crossing Point Location 5
(Old Gloucester Road – New Link Road Intersection)
LEGEND
SCHEME
CROSSING POINT DIRECTION
DRAFT
SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION
WORK IN PROGRESS
S0
ATKINS
M5 Junction 10 Improvement
FIGURE 7.3D
FIGURE TO SHOW ALL 2020 CROSSING POINT LOCATIONS
GCCM5J10 - ATK - XXX
XX - GS - GI - XXXXXX
Gloucestershire
COUNTY COUNCIL


Crossing Point Location 5
(East of M5 Junction 10, on the A4019)
Feature D
Road
Feature E
Crossing Point Location 6
(A4019 – New Link Road Intersection)
Feature A
Crossing Point Location 3
(East of Wildybridge Lane)
Feature B
Feature C
River Chelt
Crossing Point Location 4
(River Chelt - New Link Road Intersection)
Crossing Point Location 8
(A4019 – Hedgerow Crossing Point 1)
Crossing Point Location 7
(A4019 – Hedgerow Crossing Point 2)
LEGEND
SCHEME
CROSSING POINT DIRECTION
DRAFT
SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION
WORK IN PROGRESS
S0
M5 Junction 10 Improvement
FIGURE 7.3D
FIGURE TO SHOW ALL 2020 CROSSING POINT LOCATIONS
GCCM5J10 - ATK - XXX
XX - GS - GI - XXXXXX
ATKINS
Gloucestershire
COUNTY COUNCIL


Transect 4
Transect 3
Transect 10
Transect 11
Transect 9
Transect 8
Transect 5
Transect 6
Transect 12
Transect 7
LEGEND
SCHEME
STOPPING LOCATIONS
DRAFT
WORK IN PROGRESS
SO
ATKINS
Gloucestershire
COUNTY COUNCIL
SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION
M5 Junction 10 Improvement
FIGURE 7.3E
FIGURE TO SHOW ALL 2019 / 2020 TRANSECT LOCATIONS AND STOPPING LOCATIONS
GCCM5J10 - ATK - XXX
XX - GS - GI - XXXXXX


LEGEND
SCHEME
STATIC LOCATIONS
DRAFT
WORK IN PROGRESS
S0
ATKINS
Gloucestershire COUNTY COUNCIL
SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION
Construction
None
Maintenance / Cleaning
None
Use
None
Decommission / Demolition
None
M5 Junction 10 Improvement
FIGURE 7.3F
FIGURE TO SHOW ALL TRANSECT ROUTES AND STATIC LOCATIONS
GCCM5J10 - ATK - XXX
XX - GS - GI - XXXXXX
A3
1:15,000
P01


2017-28135-EPS-MIT
2015-8404-EPS-MIT
LEGEND
2KM BUFFER
SCHEME
BAT EUROPEAN PROTECTED SPECIES LICENCE
BAT SPECIES RECORD
BECHSTEIN'S BAT
BROWN LONG-EARED BAT
COMMON PIPISTRELLE
DAUBENTON'S BAT
LESSER HORSESHOE
NOCTULE
PIPISTRELLE
SOPRANO PIPISTRELLE
UNIDENTIFIED BAT
DRAFT
SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION
WORK IN PROGRESS
S0
M5 Junction 10 Improvement
FIGURE 7.3G
FIGURE TO SHOW DESK STUDY OF BAT RECORDS SINCE 2011 WITHIN 2KM OF THE PROPOSED SCHEME
GCCM5J10 - ATK - XXX
XX - GS - GI - XXXXXX


LEGEND
SCHEME
OVERALL TREE ASSESSMENT
CONFIRMED
HIGH
MODERATE
LOW
NEGLIGIBLE
TREE GROUPS ROOSTING POTENTIAL
LOW
NEGLIGIBLE
DRAFT
WORK IN PROGRESS
S0
SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION
M5 Junction 10 Improvement
FIGURE 7.3H
FIGURE TO SHOW BAT TREE LOCATIONS AND OVERALL ASSESSMENT
GCCM5J10 - ATK - XXX
XX - GS - GI - XXXXXX
1:12,500
1 of 1
P01

Appendix 7.4 – Dormouse survey

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1. Introduction

1.1. Terms of Reference

1.1.1. Atkins, member of the SNC Lavalin group, was commissioned by Gloucestershire County Council (GCC) to undertake hazel dormouse (***Muscardinus avellanarius***) surveys to inform the Environmental Statement (ES) for the M5 Junction 10 Improvements Scheme (hereafter referred to as 'the Scheme').

1.1.2. The purpose of the hazel dormouse surveys was to determine whether hazel dormice are present within the Scheme area; provide recommendations to enable compliance with legislation and policy; and, if necessary, identify the need for avoidance, mitigation, compensation or enhancement measures.

1.1.3. This Technical Appendix summarises the results of the hazel dormouse surveys, including the methods used, and provides an evaluation of the nature conservation value of hazel dormice within the survey area.

1.1.4. This report provides factual information to support the ES, which will accompany the planning application for the Scheme.

1.2. Legislation

1.2.1. Relevant legislation in relation to the hazel dormouse is provided in Table 1-1 below.

Table 1-1 - Summary of Relevant Legislation

Species	Legislation	Offences	Licensing procedures and guidance
Hazel dormouse Tablet bullet	Conservation of Habitats and Species Regulations 2017 (as amended) Reg 43	Deliberately[1] capture, injure or kill a hazel dormouse; deliberate disturbance[2] of a hazel dormouse; or damage or destroy a breeding site or resting place used by a hazel dormouse.	A Natural England licence in respect of development is required. Guidance documents: NE Standing Advice for protected species 2013 European Protected Species: Mitigation Licensing- How to get a licence (NE 2013) Dormouse Conservation Handbook (English Nature 2006)
	Wildlife and Countryside Act 1981 (as amended) S.9	Intentionally or recklessly obstruct access to any structure or place used for shelter or protection or disturb[3] a hazel dormouse in such a place.	A Natural England licence is required for survey and conservation work in England.

[1] Deliberate capture or killing is taken to include "accepting the possibility" of such capture or killing.

[2] Deliberate disturbance of animals includes in particular any disturbance which is likely a) to impair their ability (i) to survive, to breed or reproduce, or to rear or nurture their young, or (ii) in the case of animals of hibernating or migratory species, to hibernate or migrate; or b) to affect significantly the local distribution or abundance of the species to which they belong.

[3] Lower levels of disturbance not covered by the Conservation of Habitats and Species Regulations 2017 (as amended) remain an offence under the Wildlife and Countryside Act 1981 (as amended) although a defence is available where such actions are the incidental result of a lawful activity that could not reasonably be avoided.

2. Methodology

2.1. Desk Study

2.1.1. The Multi-Agency Geographic Information for the Countryside (MAGIC) website[4] was reviewed to identify statutory designated nature conservation sites within 2 km of the Scheme citing hazel dormouse as a reason for designation. Desk study records of non-statutory designated sites for nature conservation within 1 km of the Scheme were requested from Gloucestershire Centre for Environmental Records (GCER) in September 2019 and again in April 2021, to identify those citing hazel dormouse as a reason for designation.

2.1.2. The MAGIC website[4] was reviewed to identify granted European Protected Species (EPS) licences for hazel dormouse[5] within 1 km of the Scheme. GCER also provided recent records[6] of hazel dormouse from within 1 km of the Scheme.

2.1.3. Ordnance Survey (OS) mapping and aerial imagery provided on the MAGIC website[4] was also reviewed to identify potentially suitable habitats for dormice within 250 m of the Scheme, as well as blocks of woodland in the wider landscape, in particular those areas that showed connectivity (i.e. via hedgerows) to the Scheme.

2.2. Field Survey

2.2.1. All hazel dormouse surveys detailed below have been undertaken in accordance with good practice guidance[7] and the Chartered Institute of Ecology and Environmental Management (CIEEM) competencies for undertaking hazel dormouse surveys[8].

2.2.2. CIEEM guidance on ecological survey during the Covid-19 outbreak[9] and advice from the Peoples Trust for Endangered Species (PTES)[10] were also considered in the planning and undertaking of hazel dormouse survey work.

Survey Area

2.2.3. The survey area for hazel dormouse surveys included suitable habitat comprising woody vegetation (i.e. woodland, hedgerow and scrub) up to 250 m from the Scheme. The hazel dormouse survey area comprises nine distinct areas within this 250 m zone, as shown on Figure 7.4A in Appendix A.

Habitat Assessment

2.2.4. An initial hazel dormouse habitat suitability assessment was undertaken during the terrestrial ecology walkover surveys undertaken on 16th, 17th, 20th, 22nd and 23rd May 2019, and 23rd, 26th and 27th September 2019. This included an assessment of habitat type, structure (for nest building, foraging and dispersal), species composition (availability of food sources) and connectivity with other areas of suitable habitat outside of the survey area. The habitat suitability assessment was aided by the results of the desk study to determine areas that had potential to support hazel dormice.

[4] Defra. c2019. Magic Map Application. [Online]. [Accessed July 2021]. Available from: https://magic.defra.gov.uk/MagicMap.aspx
[5] Licences granted by Natural England to permit activities that might otherwise cause a breach of the Conservation of Habitats and Species Regulations 2018, with respect to species protected by that legislation.
[6] Records of observations within the last 10 years.
[7] Natural England Standing Advice: Hazel or common dormice: surveys and mitigation for development projects, accessed May 2019 from: https://www.gov.uk/guidance/hazel-or-common-dormice-surveys-and-mitigation-for-development-projects
[8] CIEEM, 2013. ***Competencies for Species Survey: Hazel Dormouse.***
[9] CIEEM (February 2021). Guidance on Ecological Survey and Assessment in the UK During the Covid-19 Outbreak (version 4)
[10] Monitoring Dormice in the presence of SARS-CoV-2 - PTES

Presence/ Likely Absence Survey

2.2.5. A hazel dormouse survey was carried out using nest tubes between May and November 2019. Due to access restrictions earlier in the survey period, some nest tubes (those within survey areas 3 and 7) were installed later on in the season, in June, July and August 2019 (see the Limitations in Section 2.4 for further information).

2.2.6. Due to changes in the Scheme extent, further hazel dormouse nest tube surveys commenced in May 2021 and will be completed in November 2021. These comprise survey areas 8 and 9, which are located to the south and north of the A4019 corridor respectively, between the existing M5 Junction 10 leading to the Gallagher Retail Park.

2.2.7. A total of 886 artificial nest tubes were placed in nine distinct areas containing suitable habitat (i.e. woodland, hedgerow and scrub), as shown on Figure 7.4A in Appendix A. Nest tubes were spaced between 15 m and 20 m as far as possible. Where gaps in vegetation were present, tubes were placed closer or further apart, as necessary. Nest tubes were fastened below horizontal tree/scrub branches (including within bramble).

2.2.8. The nest tubes were set out in each habitat feature as permitted access became available between May and August 2019, and in March 2021. In general, nest tubes were set out within each survey area during the same month. However, within survey areas 4 and 6, nest tubes were installed within specific habitat features later in the survey season, as access became available (see the Limitations in section 2.4 for further information). The months nest tubes were deployed are shown in Table 2-2 below.

2.2.9. Nest tubes were checked every two months up to and including November 2019. Nest tubes in survey areas 8 and 9 will also be checked every two months up until November 2021. Survey checks were carried out by a surveyor with a hazel dormouse survey licence. Table 2-1 provides a summary of survey areas and habitat features where nest tubes were installed throughout the survey period.

Table 2-1 - Summary of hazel dormouse survey areas

Survey area	Habitat feature number (number of nest tubes in each habitat feature)	Total number of nest tubes
1	Habitat feature 7 (18) Habitat feature 8 (55) Habitat feature 9 (21) Habitat feature 10 (18) Habitat feature 11 (20)	132
2	Habitat feature 1 (22) Habitat feature 2 (26) Habitat feature 3 (3) Habitat feature 4 (30) Habitat feature 5 (23) Habitat feature 6 (42)	146
3	Habitat feature 27 (27) Habitat feature 28 (7) Habitat feature 29 (17) Habitat feature 30 (10) Habitat feature 31 (7)	68
4	Habitat feature 12 (24) Habitat feature 13 (17) Habitat feature 14 (11) Habitat feature 22 (41)	93
5	Habitat feature (16) Habitat feature (36) Habitat feature 20 (8) Habitat feature 21 (8)	68

Survey area	Habitat feature number (number of nest tubes in each habitat feature)	Total number of nest tubes
6	Habitat feature 15 (36) Habitat feature 16 (20) Habitat feature 17 (11) Habitat feature 32 (6) Habitat feature 33 (6) Habitat feature 34 (13) Habitat feature 35 (17)	109
7	Habitat feature 23 (5) Habitat feature 24 (6) Habitat feature 25 (6) Habitat feature 26 (33)	50
8	Habitat feature 36 (25) Habitat feature 38 (15) Habitat feature 41 (20)	60
9	Habitat feature 37 (46) Habitat feature 39 (39) Habitat feature 40 (75)	160

2.2.10. Using 50 tubes as a standard for surveying[11], a combined Index of Probability score can be calculated to judge presence/likely absence of hazel dormice in each survey area. The Index of Probability score is based on the likelihood of a tube being occupied in any specific month and is highest in May, August and September when nest tubes are most frequently occupied. The combined score is calculated by adding together the Index of Probability score for each full month the survey tubes are present and is increased or decreased depending on the number of nest tubes deployed[12]. Table 2-3 below shows the index of probability for score for each survey area within the Scheme.

[11] Natural England Standing Advice: Hazel or common dormice: surveys and mitigation for development projects, accessed May 2019 from: https://www.gov.uk/guidance/hazel-or-common-dormice-surveys-and-mitigation-for-development-projects.
[12] The process of determining scores is provided at https://www.gov.uk/guidance/hazel-or-common-dormice-surveys-and-mitigation-for-development-projects.

Table 2-2 - Index of Probability scores

Month (index of probability)	Survey area 1	Survey area 2	Survey area 3	Survey area 4	Survey area 5	Survey area 6	Survey area 7	Survey area 8	Survey area 9
March (0)	0	0	0	0	0	0	0	Nest tubes deployed	Nest tubes deployed
April (1)	0	0	0	0	0	0	0	1	1
May (4)	Nest tubes deployed	Nest tubes deployed	0	Nest tubes deployed in Habitat	Nest tubes deployed	Nest tubes deployed in Habitat	0	4	4
June (2)	2	2	0	2 Additional nest tubes deployed in Habitat Feature 22	2	2	0	2	2
July (2)	2	2	Nest tubes deployed	2	2	2	Nest tubes deployed	2	2
August (5)	5	5	5	5	5	5 Additional nest tubes deployed in Habitat Features 32, 33, 34 and 35	5	5	5
September (7)	7	7	7	7	7	7	7	7	7
October (2)	2	2	2	2	2	2	2	2	2

Month (index of probability)	Survey area 1	Survey area 2	Survey area 3	Survey area 4	Survey area 5	Survey area 6	Survey area 7	Survey area 8	Survey area 9
November (2)	2	2	2	2	2	2	2	2	2
TOTAL	**20**	**20**	**16**	**20**	**20**	**20**	**16**	**25 (TBC)**	**25 (TBC)**

2.2.11. A combined Index of Probability score of 20 or above must be achieved to be able to conclude likely absence of hazel dormice in any particular survey area. A combined score of at least 20 has been achieved in five of the nine areas surveyed: survey area s 1, 2, 4, 5 and 6. Due to access constraints earlier in the survey period, a total score of at least 20 was not achieved for survey area s 3 and 7 (see the Limitations in section 2.4 for further information). Surveys at the remaining two areas (survey area s 8 and 9) are in progress and due to be completed in November 2021. As such, the Index of Probability score is for these areas is provisional. However, given that these tubes were installed in March 2021, and it is intended for them to remain in place until November 2021, it is anticipated that an Index of Probability score of at least 20 will be achieved.

Population Density Estimate

2.2.12. An estimate of the size of the hazel dormouse population has been undertaken[13] by taking the number of hazel dormice found in May and dividing this by the area covered by the survey.

2.2.13. However, as no hazel dormice were found in May, reference has been made to the population densities discussed in the Dormouse Conservation Handbook[14], This is included in Section 4 of this report.

2.3. Assessment

2.3.1. The hazel dormouse population has been valued in a geographical context following the framework provided in LA 108[15]. The evaluation is based on the information gathered from the desk study and field surveys, using a combination of professional judgement and accepted criteria[16] (e.g. diversity, rarity and naturalness).

2.4. Limitations

2.4.1. GCER do not hold exhaustive records of all the species that occur within a given area. Therefore, the absence (or limited numbers) of records for hazel dormice does not demonstrate that the species is absent from any particular area. This limitation has been addressed by carrying out targeted presence/likely absence surveys for hazel dormice.

2.4.2. Access was not permitted to the entire Hazel Dormouse survey area (i.e. all land up to 250 m from the Scheme). However, this is not considered to be a significant limitation to the results or assessment, as sufficient coverage has been achieved by the nine survey areas, as shown on Figure 7.4A in Appendix A.

2.4.3. The nest tubes were set out in each habitat feature as permitted access became available between May and August 2019, and in March 2021. In general, nest tubes were set out within each survey area during the same month. However, within survey areas 4 and 6, nest tubes were installed within some habitat features later in the survey season, as access became available. Within survey area 4, nest tubes were deployed in habitat features 12, 13 and 14 in May 2019, with additional nest tubes deployed in habitat feature 22 in June 2019. Within survey area 6, nest tubes were deployed in habitat features 15, 16 and 17 in May 2019, with additional nest tubes deployed in habitat features 32, 33, 34 and 35 in August 2019. In both survey areas, at least 50 nest tubes were installed during the earlier month (62 and 67 nest tubes respectively) and the Index of Probability score has been calculated using 50 tubes as a standard for surveying from the earlier month. This is not considered to be a significant limitation.

[13] The process of estimating population density is provided at https://www.gov.uk/guidance/hazel-or-common-dormice-surveys-and-mitigation-for-development-projects
[14] Bright, P. W., Morris, P. A. & Mitchell-Jones, A. J. (2006) The Dormouse Conservation Handbook. 2nd Edition. Natural England, Peterborough.
[15] Highways England. March 2020. LA 108 Biodiversity [Online]. [Accessed October 2020]. Available from: https://www.standardsforhighways.co.uk/dmrb/search?discipline=SUSTAINABILITY_AND_ENVIRONMENT
[16] Set out in Ratcliffe, D.A (1977). A Nature Conservation Review. Cambridge University Press.

2.4.4. Due to access restrictions earlier in the survey period in 2019, some nest tubes were installed later on in the season, and this impacted the Index of Probability scores. Based on the Index of Probability scores, a total score of at least 20 was not achieved for survey areas 3 and 7 and, therefore, presence/likely absence of hazel dormice could not be confirmed. Due to design changes, survey area 7 is now outside the hazel dormouse survey area. There will be no impacts to hazel dormice at this location (if they are present) and, therefore, the score obtained in this area is not considered to be a limitation to the results or impact assessment. Survey area 3 is within the hazel dormouse survey area. However, complete surveys were achieved at all the remaining areas. This includes survey area 5, where there is some connectivity to survey area 3 beneath the A4019 and across the M5 on slip. It is considered that if individuals were present in survey area 3, they would also have been recorded in survey area 5 which will obtain an Index of Probability score of 20 once surveys are complete. In addition, the absence of desk study records from the western side of the M5 adds confidence to the negative result recorded at survey area 3. Furthermore, more than 50 tubes were installed in survey area 3 (68), and although the Index of Probability score has not been increased to account for this, it is considered that the actual Index of Probability scores is slightly higher than 16. On the basis of these combined factors, the score at survey area 3 is not considered to be a significant limitation as sufficient survey information has been obtained to inform the results and impact assessment.

2.4.5. During the hazel dormouse tube checks, it was not possible to find 27 tubes on at least one occasion (see Appendix B). Given the small number of nest tubes that could not be found as a proportion of the total number of nest tubes deployed, this is not considered to be a significant limitation.

2.4.6. It is assumed that the planning application for the Scheme will be submitted during Summer 2022. At that point, the survey data from 2019 will be three years old. It is proposed to undertake update extended Phase 1 Habitat Surveys in targeted areas in order to determine whether any of the baseline conditions have changed significantly (i.e. if additional areas of suitable habitat are present) and require hazel dormouse presence/likely absence surveys. This report will be updated to include the results of these surveys, if required, and will be submitted as part of the ES.

3. Results

3.1. Desk Study

3.1.1. There are no designated sites within the search area designated specifically, or in part, for hazel dormice.

3.1.2. No granted Natural England hazel dormouse EPS licences were identified within the desk study area.

3.1.3. GCER provided one record of a hazel dormouse nest within the desk study area. The nest was found in a nest tube in a hedgerow to the northwest of Gallagher Retail Park, located approximately 150 m north of the Scheme and within survey area 9 (subject to current surveys). The nest was found in April 2017, and remained present during checks in May, June, July, August and September 2017. It is likely that this record was identified during surveys undertaken in connection with the Elms Park development, a proposed large, multi-phased development on the outskirts of Cheltenham, just north of the A4019. It is referred to in the report[17] that was submitted in 2017 as part of the outline planning application (reference 16/02000/OUT) for the Elms Park development.

3.1.4. Another hazel dormouse nest was identified within the first phase of the Elms Park development (Swindon Farm), located approximately 415 m north of the Scheme, and approximately 800 m east of the above-mentioned record. The nest was found in August 2018[18]. Both records are shown on Figure 7.4A in Appendix A.

3.2. Field Survey

Habitat Assessment

3.2.1. Based on information adapted from The Dormouse Conservation Handbook[19], optimal hazel dormouse habitat is generally considered to comprise extensive stands of woodland, scrub or shrub habitat including a species-rich mix of tree and shrub species, with a range of ages present. Woodlands should have a well-developed understorey enabling hazel dormice to move easily through linked vegetation, ideally with coppiced hazel and/or sweet chestnut. Vegetation should also connect to other areas of suitable habitat in the wider area. The Dormouse Conservation Handbook[19] also states that woodlands smaller than 20 hectares are less likely to support hazel dormice than larger sites, unless they are linked to other areas of suitable habitat.

3.2.2. Habitats within the 250 m of the Scheme were dominated by large improved grassland and arable fields, with some smaller species-poor semi-improved grassland fields. These fields were often divided by native hedgerows, which ranged in condition from tightly flailed to tall, unmanaged tree-lines. The majority of the hedgerows were species-poor, although 75 hedgerows (out of 208 hedgerows surveyed) were species-rich. Broadleaved and mixed plantation woodlands were present mainly alongside the M5, although there were three copses located away from the motorway. The areas of plantation woodland generally comprised trees of a similar age and lacked a well developed understorey. One copse of broadleaved semi-natural woodland was present, however, which had a dense, well developed understorey.

3.2.3. Habitats within the wider area comprise further improved grassland and arable fields divided by hedgerows, with small pockets of woodland. There are no extensive blocks of

[17] Persimmon Homes/Bloor Homes (October 2017) Framework Dormouse and Reptile Mitigation Strategy [associated with planning application 16/02000/OUT].
[18] Persimmon Homes (May 2020) Swindon Farm, Cheltenham, Ecological Appraisal.
[19] Bright, P. W., Morris, P. A. & Mitchell-Jones, A. J. (2006) The Dormouse Conservation Handbook. 2nd Edition. Natural England, Peterborough.

woodland present. The Cheltenham urban area to the east and the M5 are major barriers to dispersal.

3.2.4. Sub-optimal hazel dormouse habitat is present in the majority, but not all of the areas surveyed. For example, some areas support a lower species diversity and have less of a developed structure, but others have a better developed understorey and higher species diversity (such habitat feature 17). Overall, the woody habitats within the hazel dormouse survey area are considered to provide sub-optimal habitat for hazel dormouse.

Presence/ Likely Absence Survey

3.2.5. During the hazel dormouse surveys carried out using nest tubes in 2019, no evidence of hazel dormice was recorded in any of the areas surveyed (i.e. survey areas 1, 2, 3, 4, 5, 6, and 7).

3.2.6. The hazel dormouse surveys using nest tubes in survey areas 8 and 9 are ongoing and due to be completed in November 2021. During the surveys in May and July 2021, no evidence of hazel dormouse was recorded.

3.2.7. Full details of the surveys are provided in Appendix B.

4. Evaluation

4.1.1. The desk study field survey results obtained to date indicate that hazel dormice are likely absent from survey areas 1, 2, 3, 4, 5, 6, and 7.

4.1.2. A report[20] produced for a separate planning application (the Elms Park development, north of the A4019) states 'Anecdotally dormice had not been recorded locally in recent history and this had also been confirmed by Gloucestershire Wildlife Trust who generally considered the species to be absent from this area of the Severn Valley.'

4.1.3. However, two records of hazel dormouse nests exist; one recorded in 2017 from within the hazel dormouse survey area, at survey area 9, which is subject to ongoing surveys, and the other record is from 2018 further east, within habitat that is connected to survey area 9. Based on this previous information, the presence of hazel dormice is currently assumed within survey area 9 to the north of the A4019 and to the east of Uckington. Further west (within survey area 9), the residential area of Uckington causes some habitat fragmentation, and immediately west of Uckington the field boundaries generally comprise fences and heavily managed, species poor hedgerows. However, there is some limited connectivity along the Leigh Brook. On this basis and given that surveys within survey area 9 are ongoing, the presence of hazel dormice is assumed within the entirety of survey area 9 on a precautionary basis. This will be reviewed as the surveys progress in survey area 9 and the results are analysed.

4.1.4. Based on the survey data to date and absence of desk study records, hazel dormice are likely absent south of the A4019. Although hazel dormice have been known to cross roads and other open areas[21], and roads less than 12 m wide are generally not considered barriers to hazel dormouse movements[22], the A4019 is a busy road varying in width between approximately 30 m and 10 m. Due to its heavy traffic flow and its overall width, it would likely act as a barrier to hazel dormouse dispersal. At the eastern extent of the A4019 within the Scheme, on the southern side of the road, habitats are unsuitable for hazel dormouse, comprising industrial units and residential properties and gardens on the outskirts of the western edge of Cheltenham. This will be reviewed as the surveys in survey area 8 progress and the results are analysed.

4.1.5. Based on the survey data and absence of desk study records, hazel dormice are likely absent to the west of the M5. Although assumed to be present to the east of the M5, at survey area 9 north of the A4019, this motorway would act as a barrier to hazel dormouse dispersal.

4.1.6. As no hazel dormice were found in May to estimate the size of the hazel dormouse population in line with Standing Advice[23], reference has been made to the population densities discussed in the Dormouse Conservation Handbook[24]. Dormice live at low densities. In early summer (before breeding) there are typically only three to five (but sometimes up to ten) adults per hectare in deciduous and conifer habitats. The National Dormouse Monitoring Programme (NDMP) suggests an average of between 1.75 and 2.5 adults per hectare pre-breeding (cited in The Dormouse Conservation Handbook, 2006) and across the country, including sub-optimal habitats, the average population density is approximately 2.2 adults per hectare[25]. Taking into account the largely sub-optimal

[20] Persimmon Homes/Bloor Homes (October 2017) Framework Dormouse and Reptile Mitigation Strategy [associated with planning application 16/02000/OUT]

[21] People's Trust for Endangered Species Why didn't the dormice cross the gaps? The Dormouse Monitor (2012)

[22] P. Chanin and L. Gubert, (2012) Common dormouse (***Muscardinus avellanarius***) movements in a landscape fragmented by roads, Lutra (2012)

[23] The process of estimating population density is provided at https://www.gov.uk/guidance/hazel-or-common-dormice-surveys-and-mitigation-for-development-projects

[24] Bright, P. W., Morris, P. A. & Mitchell-Jones, A. J. (2006) The Dormouse Conservation Handbook. 2nd Edition. Natural England, Peterborough.

[25] Bright, P. W., Morris, P. A. & Mitchell-Jones, A. J. (2006) The Dormouse Conservation Handbook. 2nd Edition. Natural England, Peterborough.

habitats present, a value of 2.2 adults per hectare is considered an appropriate density for the Scheme.

4.1.7. Assuming that hazel dormice are present within survey area 9 only, there is approximately 1.7 ha of suitable hazel dormouse habitat within this area. This gives a total number of three to four (3.74) adult hazel dormice within survey area 9.

4.1.8. The hazel dormouse receives the highest level of protection as an EPS. It is also a Species of Principal Importance for the Conservation of Biodiversity in England, as listed under Section 41 of the NERC Act (2006), and is identified as a priority species in the Gloucestershire County Council Biodiversity Action Plan[26]. The hazel dormouse is categorised as rare and vulnerable to extinction in the UK[27]. The State of Britain's Dormice report in 2019[28] highlighted that nationally the population has fallen by a half (51%) since 2000, decreasing on average by 3.8% per year.

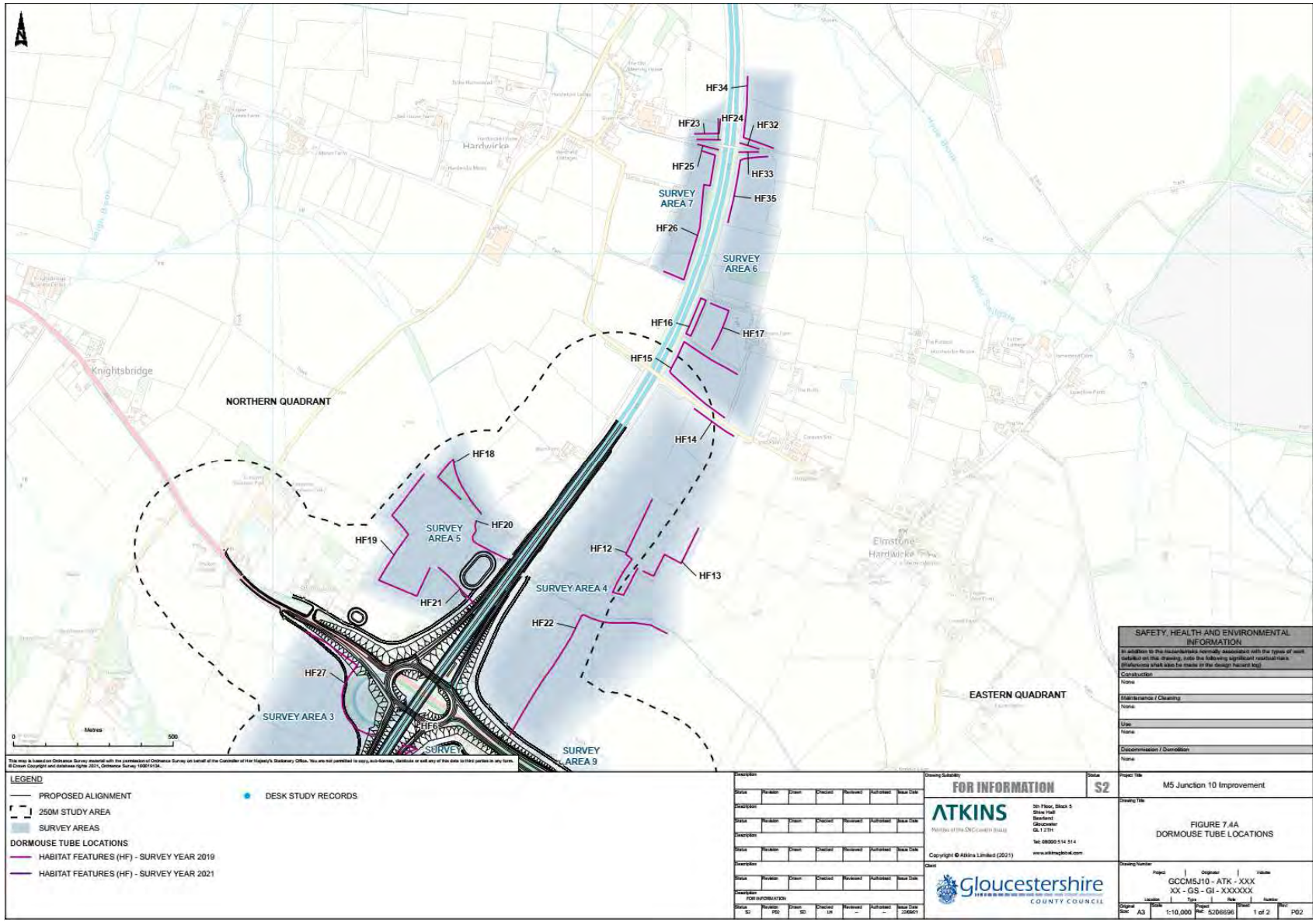
4.1.9. Given the high level of protection afforded to hazel dormice, their rarity and declining status, as well as consideration of the limited distribution of hazel dormouse within the Scheme, and that the species may be present in an area previously thought not to be occupied by hazel dormouse (see paragraph 4.1.2), the population within the hazel dormouse survey area is considered to be of County nature conservation value. This valuation will be confirmed and/or updated following completion of the ongoing surveys.

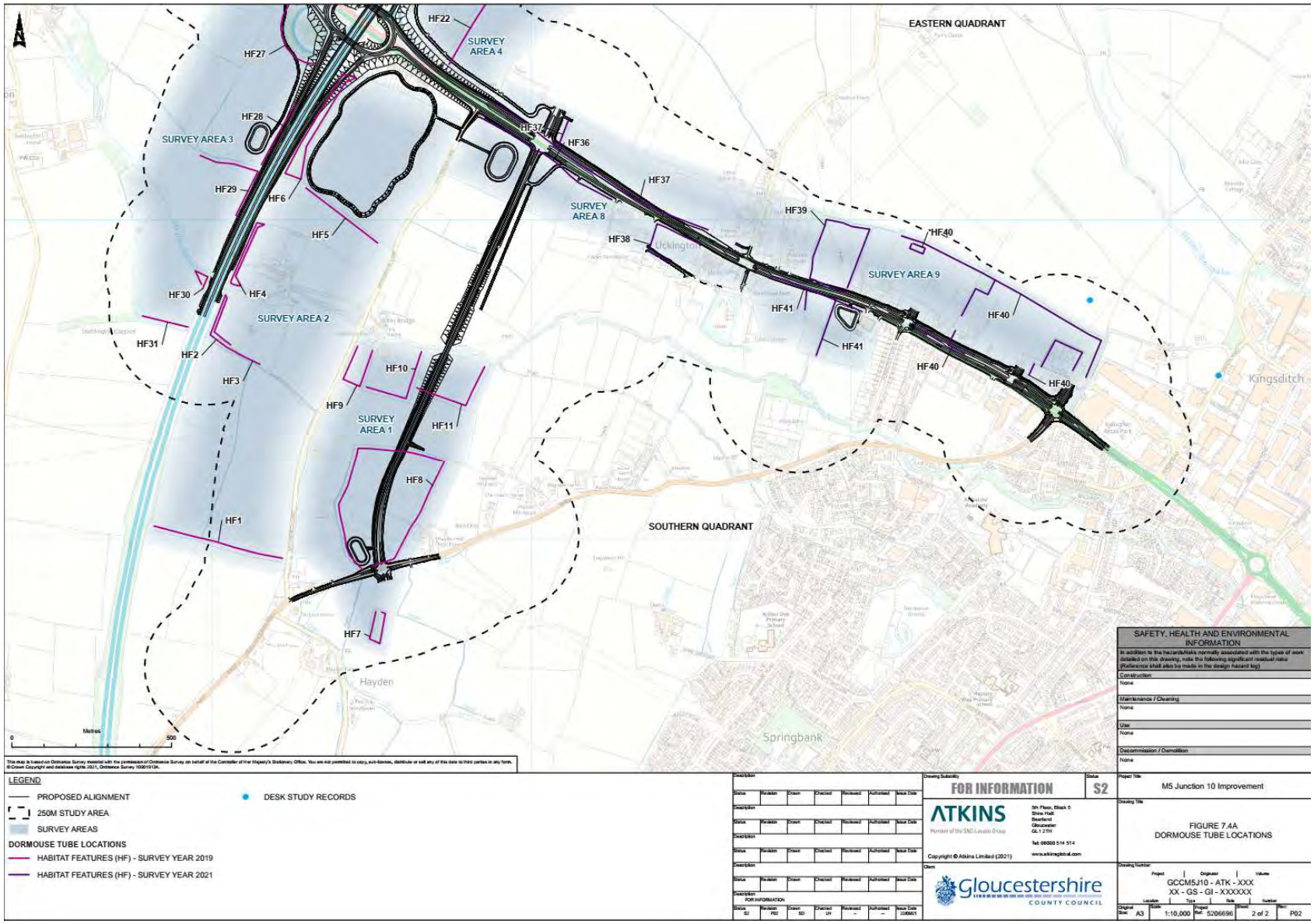
26 Gloucestershire Biodiversity Partnership (2000) Summary of the Biodiversity Action Plan for Gloucestershire
27 Dormouse Status and Conservation, People's Trust for Endangered Species url: https://ptes.org/get-informed/facts-figures/hazel-common-dormouse-muscardinus-avellanarius/, accessed October 2018.
28 David Wembridge, Nida Al-Fulaij and Steve Langdon (2019), The State of Britain's Dormice 2019, People's Trust for Endangered Species

Appendices to Appendix 7.4

- Appendix A
- Appendix B

Appendix A. Figure 7.4A – Dormouse tube locations


HF34
HF23
HF24
HF32
HF25
HF33
SURVEY AREA 7
HF35
HF26
SURVEY AREA 6
HF16
HF17
HF15
NORTHERN QUADRANT
HF14
HF18
HF19
SURVEY AREA 5
HF20
HF12
HF13
HF21
SURVEY AREA 4
HF22
HF27
SURVEY AREA 3
HF6
SURVEY AREA 9
EASTERN QUADRANT
Knightsbridge
Hardwicke
Elmstone Hardwicke
Metres
0
500
LEGEND
PROPOSED ALIGNMENT
250M STUDY AREA
SURVEY AREAS
DESK STUDY RECORDS
DORMOUSE TUBE LOCATIONS
HABITAT FEATURES (HF) - SURVEY YEAR 2019
HABITAT FEATURES (HF) - SURVEY YEAR 2021
FOR INFORMATION
S2
ATKINS
Gloucestershire COUNTY COUNCIL
SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION
Construction
None
Maintenance / Cleaning
None
Use
None
Decommission / Demolition
None
M5 Junction 10 Improvement
FIGURE 7.4A
DORMOUSE TUBE LOCATIONS
GCCM5J10 - ATK - XXX
XX - GS - GI - XXXXX
A3
1:10,000
5206696
1 of 2
P02


EASTERN QUADRANT
SOUTHERN QUADRANT
SURVEY AREA 1
SURVEY AREA 2
SURVEY AREA 3
SURVEY AREA 4
SURVEY AREA 8
SURVEY AREA 9
HF1
HF2
HF3
HF4
HF5
HF6
HF7
HF8
HF9
HF10
HF11
HF22
HF27
HF28
HF29
HF30
HF31
HF36
HF37
HF38
HF39
HF40
HF41
Hayden
Springbank
Kingsditch
LEGEND
PROPOSED ALIGNMENT
250M STUDY AREA
SURVEY AREAS
DESK STUDY RECORDS
DORMOUSE TUBE LOCATIONS
HABITAT FEATURES (HF) - SURVEY YEAR 2019
HABITAT FEATURES (HF) - SURVEY YEAR 2021
SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION
FOR INFORMATION
S2
M5 Junction 10 Improvement
FIGURE 7.4A
DORMOUSE TUBE LOCATIONS
GCCM5J10 - ATK - XXX
XX - GS - GI - XXXXXX
A3
1:10,000
5206696
2 of 2
P02

Appendix B. Detailed survey results

Survey Area 1 (nest tubes deployed in May 2019; X = no evidence of use by hazel dormouse)

Tube number	18th July 2019	26th September 2019	23rd October 2019	20th November 2019
265	X	Three wood mice	N/A	X
266	X	X	N/A	X
267	Mouse nest - green leaves, shredded grass - some structure	Wood mouse nest	N/A	Wood mouse nest
268	X	X	N/A	Wood mouse nest
269	X	Wood mouse nest	N/A	Wood mouse nest
270	X	Wood mouse	N/A	Wood mouse nest
271	X	Wood mouse nest	N/A	X
272	X	X	N/A	X
273	X	Shredded material	N/A	Wood mouse nest
274	X	X	N/A	Food cache
275	X	X	N/A	Wood mouse nest
276	X	Two wood mice	N/A	X
277	X	Two wood mice	N/A	Wood mouse nest
278	X	X	N/A	Wood mouse nest
279	X	X	N/A	X
280	X	X	N/A	X
281	X	Shredded material	N/A	X
282	X	X	X	X
283	X	X	X	Wood mouse nest
284	X	x	N/A	X
285	X	X	N/A	X
286	X	Wood mouse	N/A	X
287	X	X	N/A	Wood mouse nest
288	X	X	N/A	X
289	X	X	N/A	X

Tube number	18th July 2019	26th September 2019	23rd October 2019	20th November 2019
290	X	X	N/A	Wood mouse nest
291	X	Wood mouse	N/A	Wood mouse nest
292	X	X	N/A	Wood mouse nest
293	Mouse nest - green leaves, shredded bark, some structure	X	N/A	X
294	Mouse nest - green leaves, shredded bark, some structure	X	N/A	Wood mouse nest
295	Mouse nest - green leaves, shredded bark, some structure	Wood mouse nest	N/A	Wood mouse nest
296	X	X	N/A	X
297	X	X	N/A	X
298	X	Wood mouse	N/A	Wood mouse nest
299	X	X	N/A	Wood mouse nest
300	X	X	N/A	X
301	X	X	N/A	Wood mouse nest
302	X	x	N/A	X
303	X	X	N/A	X
304	X	X	N/A	X
305	X	X	N/A	Wood mouse nest
306	X	X	N/A	X
307	X	X	N/A	Wood mouse nest
308	X	Wood mouse nest	N/A	X
309	X	X	N/A	X
310	X	X	N/A	X
312	X	X	N/A	X
313	X	X	N/A	X
314	Unoccupied bird nest	Old bird nest	N/A	X
315	X	X	N/A	X

Tube number	18th July 2019	26th September 2019	23rd October 2019	20th November 2019
316	X	X	N/A	X
317	X	X	N/A	X
318	X	X	N/A	X
319	X	X	N/A	X
320	X	X	N/A	X
321	X	X	N/A	X
322	X	X	N/A	x
323	N/A	X	X	x
324	N/A	X	Wood mouse nest	X
325	N/A	X	Wood mouse nest	Wood mouse nest
326	N/A	X	X	X
327	N/A	X	X	Wood mouse nest
328	N/A	X	Wood mouse nest	X
329	N/A	X	X	X
330	N/A	X	X	X
331	N/A	X	Wood mouse food cache	X
332	N/A	X	X	X
333	N/A	X	Two wood mice	X
334	N/A	X	X	X
335	N/A	X	X	X
336	N/A	X	Wood mouse nest	X
337	N/A	X	X	X
338	N/A	X	X	X
339	N/A	X	X	X
340	N/A	X	X	X
341	X	Wood mouse	N/A	Wood mouse nest
342	X	Wood mouse nest	N/A	X
343	X	X	N/A	X
344	X	X	N/A	Food cache
345	X	Wood mouse nest	N/A	Wood mouse nest
346	X	X	N/A	X

Tube number	18th July 2019	26th September 2019	23rd October 2019	20th November 2019
347	X	X	N/A	X
348	X	X	N/A	X
349	X	Wood mouse nest	N/A	X
350	X	X	N/A	X
351	X	Wood mouse nest	N/A	X
352	X	X	N/A	X
353	X	X	N/A	X
354	X	X	N/A	X
355	X	X	N/A	X
356	X	X	N/A	Wood mouse
357	X	X	N/A	X
358	X	X	N/A	X
359	X	X	N/A	X
360	X	X	N/A	x
361	X	X	N/A	Wood mouse nest
362	X	Wood mouse nest	N/A	X
362	X	X	N/A	X
363	X	X	N/A	X
364	X	X	N/A	X
365	X	X	N/A	X
366	X	X	N/A	X
367	X	X	N/A	X
368	X	X	N/A	X
369	X	X	N/A	X
370	X	X	N/A	X
371	X	X	N/A	X
372	X	Wood mouse nest	N/A	X
373	X	X	N/A	X
374	X	X	N/A	X
375	X	X	N/A	X
376	X	X	N/A	X
377	X	Wood mouse nest	N/A	X
378	X	X	N/A	X
379	X	Wood mouse nest	N/A	X
380	X	X	N/A	X
381	X	X	N/A	X

Tube number	18th July 2019	26th September 2019	23rd October 2019	20th November 2019
382	X	X	N/A	X
383	X	X	N/A	X
384	X	X	N/A	X
385	Scattered brown and green leaves - no structure	X	N/A	X
386	X	X	N/A	Three wood mice
387	X	X	N/A	X
388	X	X	N/A	Two wood mice
389	X	X	N/A	X
390	X	X	N/A	X
391	X	X	N/A	X
392	X	X	N/A	X
393	X	X	N/A	X
394	X	X	N/A	X

Survey Area 2 (nest tubes deployed in May 2019; X = no evidence of use by hazel dormouse)

Tube number	31st July 2019	25th September 2019	20th November 2019
1	X	X	x
2	X	X	X
3	X	X	X
4	X	X	X
5	Scattered brown leaves	X	X
6	X	X	X
7	X	X	X
8	X	X	X
9	X	X	X
10	X	X	X
11	X	X	X
12	X	X	X
13	X	X	X
14	X	X	X
15	Green leaves (no structure)	X	X
16	Wood mouse	X	X
17	Wood mouse	X	X
18	X	2 wood mice	X
19	Wood mouse	X	X
20	Wood mouse	X	X
21	X	X	Pygmy shrew
22	x	Pygmy shrew	X
23	X	X	X
24	X	X	X
25	X	X	X
26	X	X	X
27	X	X	X
28	X	X	X
29	X	X	X
30	X	X	X
31	X	X	X
32	X	X	X
33	X	X	X
34	X	X	X
35	X	X	X

Tube number	31st July 2019	25th September 2019	20th November 2019
36	X	X	X
37	X	X	X
38	X	X	X
39	X	X	X
40	X	X	X
41	X	X	X
42	X	X	X
43	X	X	X
44	X	X	X
45	X	X	X
46	X	X	X
47	X	X	X
48	X	X	X
49	X	Shredded bark	Could not find
50	X	X	X
51	X	X	X
52	x	X	X
53	X	X	X
54	X	X	X
55	X	X	X
56	X	X	X
57	X	X	X
58	X	X	X
59	X	X	X
60	X	X	X
61	X	X	X
62	X	X	X
63	X	X	X
64	X	X	X
65	X	X	X
66	X	X	X
67	X	X	X
68	X	X	X
69	X	X	X
70	X	X	X
71	X	x	x
72	X	X	X

Tube number	31st July 2019	25th September 2019	20th November 2019
73	X	X	X
74	X	X	X
75	X	X	X
76	X	X	X
77	X	X	X
78	X	X	X
79	X	X	X
80	X	X	X
81	Bird droppings	X	X
82	X	X	X
83	X	X	X
84	X	X	X
85	Bird droppings	X	X
86	X	X	X
87	X	X	X
88	X	X	X
89	X	X	X
90	X	X	X
91	Could not find	X	X
92	X	X	X
93	Could not find	X	X
94	X	X	X
95	X	X	X
96	Two wood mice	X	X
97	X	X	X
98	X	X	X
99	Scattered green leaves	X	Wood mouse nest
100	X	X	X
101	Scattered green leaves	X	X
102	Scattered green leaves	Wood mouse nest	Wood mouse nest
103	X	X	X
104	X	Shredded bark	Food cache
105	Wood mouse	X	X
106	X	Wood mouse nest	Wood mouse nest
107	Wood mouse	X	X

Tube number	31st July 2019	25th September 2019	20th November 2019
108	X	X	X
109	Wood mouse	X	X
110	X	X	X
111	Wood mouse	X	Wood mouse nest
112	Wood mouse	X	X
113	X	Wood mouse	Wood mouse nest
114	X	X	X
115	Shredded bark and green leaved - limited structure	X	X
116	X	X	X
117	X	X	X
118	X	X	X
119	X	X	X
120	X	X	X
121	X	X	X
122	X	X	X
123	X	X	
124	X	X	Wood mouse nest
125	X	X	X
126	X	X	X
127	X	X	X
128	X	X	X
129	X	X	
130	X	X	Wood mouse nest
131	X	X	X
132	X	X	X
133	X	X	X
134	X	X	X
135	X	X	X
136	X	X	X
137	X	X	X
138	X	X	X
139	X	X	X
140	X	X	X
141	X	X	
142	X	X	Wood mouse nest
143	X	X	Wood mouse nest

Tube number	31st July 2019	25th September 2019	20th November 2019
144	X	X	X
145	X	X	X
146	X	X	X

Survey Area 3 (nest tubes deployed in July 2019; X = no evidence of use by hazel dormouse)

Tube number	19th August 2019	23rd September 2019	20th November 2019
555	X	X	X
556	X	X	X
557	X	X	X
558	X	X	X
559	X	X	X
560	X	X	Wood mouse nest
561	X	X	X
562	X	X	X
563	X	X	X
564	X	X	X
565	X	X	X
566	X	X	X
567	X	X	X
568	X	X	X
569	X	X	X
570	X	X	X
571	X	X	X
572	X	X	X
573	X	X	X
574	X	X	X
575	X	X	X
576	X	X	X
577	X	X	X
578	X	X	X
579	X	X	X
580	X	X	X
581	X	X	X
582	X	X	X
583	X	X	X
584	X	X	X
585	X	X	Wood mouse nest
586	X	Wood mouse	X
587	Wood mouse	X	X
588	Wood mouse	Needs replacing	X
589	X	X	X
590	X	X	X

Tube number	19th August 2019	23rd September 2019	20th November 2019
591	X	X	Wood mouse nest
592	X	X	X
593	X	X	X
594	Shredded bark	X	Wood mouse nest
595	X	Wood mouse nest	X
596	X	X	Wood mouse nest
597	X	X	X
598	X	X	X
599	X	X	X
600	X	X	X
601	X	X	X
602	X	X	X
603	Wood mouse	X	Wood mouse nest
604	X	X	X
605	Shredded bark	X	Food cache
606	X	x	X
607	X	X	X
608	X	X	X
609	Wood mouse	X	X
610	X	Two wood mice	Wood mouse nest
611	X	X	Wood mouse nest
612	X	X	X
613	X	X	X
614	X	X	X
615	X	X	X
616	X	X	Wood mouse nest
617	X	X	X
618	X	X	Dead wood mouse in nest
619	Green leaves, some structure	X	Wood mouse nest
620	X	X	Food cache
621	Green leaves, some structure	X	Food cache
622	X	X	Food cache

Survey Area 4 (nest tubes deployed in May 2019; X = no evidence of use by hazel dormouse)

Tube number	18th/24th July 2019	19th August 2019	25th September	19th/21st November
146	Scattered green leaves	N/A	Wood mouse	Wood mouse nest
147	X	N/A	X	Wood mouse nest with food cache
148	X	N/A	X	X
149	X	N/A	X	X
150	X	N/A	X	X
151	X	N/A	X	X
152	X	N/A	X	Wood mouse nest
153	Scattered green leaves	N/A	X	X
154	X	N/A	X	x
155	Scattered green leaves	N/A	X	Wood mouse nest
156	Scattered green leaves	N/A	X	Wood mouse nest
225	X	X	X	X
226	X	X	X	X
227	X	X	Tube damaged	Tube damaged
228	X	X	X	X
229	Food cache	X	Tube damaged	Tube damaged
230	X	X	X	X
231	X	X	X	Wood mouse nest
232	X	X	X	X
233	X	X	Tube damaged	Tube damaged
234	X	X	X	X
235	X	X	X	Wood mouse nest
236	X	X	X	X
237	X	X	X	Wood mouse nest
238	X	X	X	X
239	X	X	X	X
240	X	X	X	X
241	X	X	Wood mouse nest	X

Tube number	18th/24th July 2019	19th August 2019	25th September	19th/21st November
242	X	X	X	X
243	X	X	X	X
244	X	X	Tube damaged	Tube damaged
245	X	X	X	X
246	X	X	Tube damaged	Tube damaged
247	X	X	X	X
248	X	X	X	X
249	X	X	X	X
250	X	X	X	X
251	X	X	X	X
252	X	X	X	X
253	X	X	X	X
254	X	X	X	X
255	X	X	X	X
256	X	X	X	X
257	X	X	X	X
258	X	X	X	X
259	X	X	X	X
260	X	X	X	X
261	X	X	X	X
262	X	X	X	X
263	X	X	X	X
264	X	X	X	X
461	X	N/A	X	Wood mouse nest
462	X	N/A	X	X
463	X	N/A	X	X
464	X	N/A	X	X
465	X	N/A	X	X
466	X	N/A	X	X
467	X	N/A	X	X
468	X	N/A	X	X
469	X	N/A	X	X
470	X	N/A	Two wood mice	Wood mouse
471	X	N/A	X	X
472	X	N/A	X	X
473	X	N/A	X	X

Tube number	18th/24th July 2019	19th August 2019	25th September	19th/21st November
474	X	N/A	X	X
475	X	N/A	X	X
476	X	N/A	X	Wood mouse nest
477	X	N/A	X	X
478	X	N/A	X	X
479	X	N/A	Wood mouse	Wood mouse nest
480	X	N/A	X	X
481	X	N/A	X	X
482	X	N/A	X	Wood mouse nest
483	X	N/A	X	X
484	X	N/A	X	X
485	X	N/A	X	X
486	X	N/A	X	X
487	X	N/A	X	X
488	X	N/A	X	X
489	X	N/A	X	X
490	Wood mouse nest	N/A	X	X
491	X	N/A	X	Wood mouse
492	X	N/A	X	X
493	X	N/A	X	X
494	X	N/A	X	Wood mouse nest
495	X	N/A	X	X
496	X	N/A	X	X
497	X	N/A	X	X
498	X	N/A	X	X
499	Could not find	N/A	Could not find	X
500	X	N/A	X	Wood mouse
501	X	X	X	X

Survey Area 5 (nest tubes deployed in May 2019; X = no evidence of use by hazel dormouse)

Tube number	22nd July 2019	25th September 2019	21st November 2019
157	X	X	X
158	X	X	X
159	X	X	X
160	X	X	X
161	X	X	X
162	X	X	X
163	X	X	X
164	X	X	X
165	X	X	X
166	X	X	X
167	X	X	X
168	X	X	X
169	X	X	X
170	X	X	X
171	X	X	X
172	X	X	X
173	X	X	Wood mouse nest
174	X	X	X
175	X	X	X
176	X	X	X
177	Needs replacing	Wood mouse nest	X
178	X	X	X
179	X	X	X
180	X	X	X
181	X	X	X
182	X	X	X
183	X	X	X
184	X	X	X
185	X	Pygmy shrew	X
186	X	X	X
187	X	X	X
188	X	X	X
189	Needs replacing	X	X
190	X	X	X
191	X	X	X
192	X	Wood mouse nest	X

Tube number	22nd July 2019	25th September 2019	21st November 2019
193	X	X	X
194	X	X	X
195	X	X	Could not find
196	X	X	X
197	X	X	X
198	X	X	X
199	X	X	X
200	X	X	X
201	X	X	X
202	X	Wood mouse nest	X
203	X	X	X
204	X	X	X
205	X	X	X
206	X	X	X
207	X	X	X
208	X	X	X
209	X	X	X
210	X	Wood mouse nest	X
211	Needs replacing	X	X
212	X	X	X
213	Needs replacing	Wood mouse nest	X
214	X	X	X
215	X	X	X
216	X	X	X
217	X	X	X
218	X	X	X
219	X	X	X
220	X	X	X
221	X	X	X
222	X	X	X
223	X	X	X
224	X	X	X

Survey Area 6 (nest tubes 395 - 460 deployed in May 2019, nest tubes 623 - 664 deployed in August 2019; X = no evidence of use by hazel dormouse)

Tube number	18th July 2019	23rd/25th September 2019	23rd October 2019	19th/21st November 2019
395	X	X	N/A	X
396	X	Shredded bark	N/A	X
397	X	X	N/A	X
398	X	X	N/A	X
399	X	X	N/A	Wood mouse nest
400	X	X	N/A	X
401	X	X	N/A	X
402	X	X	N/A	X
403	X	X	N/A	X
404	X	Two wood mice	N/A	Wood mouse nest
405	X	Wood mouse	N/A	Wood mouse nest
406	X	X	N/A	X
407	X	Two wood mice	N/A	Wood mouse nest
408	X	Wood mouse nest	N/A	X
409	X	X	N/A	X
410	X	X	N/A	X
411	X	Two wood mice	N/A	X
412	X	X	N/A	X
413	X	X	N/A	Wood mouse nest
414	X	X	N/A	X
415	X	X	N/A	X
416	X	X	N/A	X
417	X	Wood mouse	N/A	X
418	X	X	N/A	X
419	X	X	N/A	X
420	X	X	N/A	X
421	X	X	N/A	Wood mouse nest
422	X	X	N/A	X
423	X	X	N/A	X
424	X	Wood mouse nest	N/A	X
425	X	X	N/A	X
426	X	X	N/A	X
427	X	X	N/A	X
428	X	X	N/A	X
429	X	X	N/A	X

Tube number	18th July 2019	23rd/25th September 2019	23rd October 2019	19th/21st November 2019
430	X	X	N/A	Wood mouse nest
431	X	X	N/A	Wood mouse nest
432	X	X	N/A	Wood mouse
433	X	X	N/A	X
434	X	X	N/A	Two wood mice
435	X	X	N/A	Wood mouse
436	X	X	N/A	X
437	Wood mouse nest	Wood mouse nest	N/A	X
438	X	X	N/A	X
439	Scattered green leaves	Wood mouse nest	N/A	X
440	X	X	N/A	X
441	X	X	N/A	X
442	X	X	N/A	X
443	X	X	N/A	X
444	X	X	N/A	X
445	X	X	N/A	X
446	X	X	N/A	X
447	X	X	N/A	X
448	Wood mouse	Wood mouse nest	N/A	X
449	X	X	N/A	X
450	X	X	N/A	X
451	X	X	N/A	X
452	X	X	N/A	Wood mouse nest
453	X	X	N/A	Wood mouse nest
454	X	X	N/A	X
455	X	X	N/A	X
456	X	X	N/A	X
457	X	X	N/A	X
458	X	X	N/A	X
459	X	X	N/A	X
460	Rodent skull	X	N/A	X
623	N/A	X	X	X
624	N/A	X	X	X
625	N/A	X	X	X
626	N/A	X	Wood mouse nest	X

Tube number	18th July 2019	23rd/25th September 2019	23rd October 2019	19th/21st November 2019
627	N/A	X	X	X
628	N/A	X	Wood mouse nest	X
629	N/A	X	X	X
630	N/A	X	Wood mouse food cache	X
631	N/A	X	Wood mouse food cache	X
632	N/A	X	X	X
633	N/A	X	Wood mouse food cache	X
634	N/A	X	X	X
635	N/A	X	Wood mouse nest	X
636	N/A	X	X	X
637	N/A	X	X	X
638	N/A	X	X	X
639	N/A	X	X	X
640	N/A	X	X	X
641	N/A	X	X	X
642	N/A	X	Wood mouse food cache	X
643	N/A	X	X	X
644	N/A	X	X	X
645	N/A	Wood mouse nest	Wood mouse nest	X
646	N/A	Wood mouse nest	X	X
647	N/A	X	X	X
648	N/A	X	X	X
649	N/A	X	X	X
650	N/A	X	X	X
651	N/A	X	X	X
652	N/A	X	X	X
653	N/A	X	X	X
654	N/A	X	X	X
655	N/A	X	Wood mouse nest	X
656	N/A	X	X	X
657	N/A	X	X	X

Tube number	18th July 2019	23rd/25th September 2019	23rd October 2019	19th/21st November 2019
658	N/A	X	X	X
659	N/A	X	X	X
660	N/A	X	X	X
661	N/A	X	Wood mouse food cache	X
662	N/A	X	X	X
663	N/A	X	X	X
664	N/A	X	Wood mouse	X

Survey Area 7 (nest tubes deployed in July 2019; X = no evidence of use by hazel dormouse)

Tube number	20th August 2019	23rd September 2019	19th November 2019
502	X	X	X
503	X	X	X
504	X	X	X
505	X	X	X
506	X	X	X
507	X	X	X
508	X	X	X
509	Small mammal droppings	X	X
510	X	X	X
511	X	X	X
512	X	X	X
513	X	X	X
514	X	X	X
515	X	X	Wood mouse nest
516	X	X	X
517	X	X	X
518	X	X	X
519	Food cache and small mammal droppings	Dead wood mouse	X
520	N/A	X	X
521	Wood mouse nest	X	X
522	N/A	X	Wood mouse nest
523	N/A	Food cache	X
524	N/A	X	X
525	N/A	X	Wood mouse nest
526	N/A	X	X
527	N/A	X	X
528	N/A	X	X
529	N/A	X	X
530	N/A	X	X
531	N/A	Wood mouse	X
532	N/A	X	X
533	N/A	X	X
534	N/A	X	X
535	N/A	X	X
536	N/A	X	X

Tube number	20th August 2019	23rd September 2019	19th November 2019
537	N/A	X	X
538	N/A	X	Wood mouse nest
539	N/A	X	Wood mouse nest
540	N/A	X	X
541	N/A	X	X
542	N/A	X	X
543	N/A	X	X
544	N/A	X	X
545	N/A	X	X
546	N/A	X	Wood mouse nest
547	N/A	Wood mouse	Wood mouse nest
548	N/A	Food cache	X
549	N/A	X	Wood mouse nest
550	N/A	X	X
551	N/A	Wood mouse nest	Wood mouse nest

Survey Area 8 (nest tubes deployed in April 2021; X = no evidence of use by hazel dormouse)

Tube number	17th May 2021	19th July 2021	20th September 2021	1st November 2021
1	X	X		
2	X	X		
3	X	X		
4	X	X		
5	X	X		
6	X	X		
7	X	X		
8	X	X		
9	X	X		
10	X	X		
11	X	X		
12	X	X		
13	X	X		
14	X	X		
15	X	X		
16	X	X		
17	X	Could not find		
18	X	X		
19	X	X		
20	X	X		
21	X	X		
22	X	Could not find		
23	X	Could not find		
24	X	X		
25	X	X		
72	X	X		
73	X	X		
74	X	X		
75	X	X		
76	X	X		
77	X	X		
78	X	X		
79	X	X		
80	X	X		
81	X	X		

Tube number	17th May 2021	19th July 2021	20th September 2021	1st November 2021
82	X	X		
83	X	X		
84	X	X		
85	X	X		
86	X	X		
201	X	X		
202	X	X		
203	X	X		
204	X	X		
205	X	X		
206	X	X		
207	X	X		
208	X	X		
209	X	X		
210	X	X		
211	X	X		
212	X	X		
213	X	X		
214	X	X		
215	X	X		
216	X	Could not find		
217	X	X		
218	X	X		
219	X	X		
220	X	X		

Survey Area 9 (nest tubes deployed in April 2021; X = no evidence of use by hazel dormouse)

Tube number	17th May 2021	19th July 2021	20th September 2021	1st November 2021
26	X	X		
27	X	X		
28	X	X		
29	X	X		
30	X	X		
31	X	X		
32	X	X		
33	X	X		
34	X	X		
35	X	X		
36	X	X		
37	X	X		
38	X	X		
39	X	X		
40	X	X		
41	X	Could not find		
42	X	X		
43	X	X		
44	X	X		
45	X	X		
46	X	X		
47	X	X		
48	X	Could not find		
49	X	X		
50	X	X		
51	X	X		
52	X	Could not find		
53	X	Could not find		
54	X	X		
55	X	X		
56	X	X		
57	X	X		
58	X	X		
59	X	X		
60	X	X		

Tube number	17th May 2021	19th July 2021	20th September 2021	1st November 2021
61	X	X		
62	X	X		
63	X	X		
64	X	X		
65	X	X		
66	X	X		
67	X	X		
68	X	X		
69	X	X		
70	X	X		
71	X	X		
87	X	X		
88	X	X		
89	X	X		
90	X	X		
91	X	X		
92	X	X		
93	X	X		
94	X	X		
95	X	X		
96	X	X		
97	X	X		
98	X	X		
99	X	X		
100	X	X		
101	X	X		
102	X	X		
103	X	X		
104	X	X		
105	X	X		
106	X	X		
107	X	X		
108	X	X		
109	X	X		
110	X	X		
111	X	X		

Tube number	17th May 2021	19th July 2021	20th September 2021	1st November 2021
112	X	X		
113	X	X		
114	X	X		
115	X	X		
116	X	X		
117	X	X		
118	X	X		
119	X	X		
120	X	X		
121	X	X		
122	X	Could not find		
123	X	X		
124	X	X		
125	X	X		
126	X	X		
127	X	X		
128	X	X		
129	X	X		
130	X	X		
131	X	X		
132	X	X		
133	X	X		
134	X	X		
135	X	Could not find		
136	X	X		
137	X	X		
138	X	X		
139	X	X		
140	X	X		
141	X	X		
142	X	X		
143	X	X		
144	X	X		
145	X	X		
146	X	X		
147	X	Could not find		

Tube number	17th May 2021	19th July 2021	20th September 2021	1st November 2021
148	X	X		
149	X	X		
150	X	X		
151	X	X		
152	X	X		
153	X	X		
154	X	X		
155	X	X		
156	X	X		
157	X	X		
158	X	X		
159	X	X		
160	X	X		
161	X	X		
162	X	Could not find		
163	X	X		
164	X	X		
165	X	X		
166	X	X		
167	X	Could not find		
168	X	X		
169	X	X		
170	X	X		
171	X	X		
172	X	Could not find		
173	X	Could not find		
174	X	X		
175	X	X		
176	X	X		
177	X	X		
178	X	X		
179	X	X		
180	X	Could not find		
181	X	X		
182	X	Could not find		
183	X	X		

Tube number	17th May 2021	19th July 2021	20th September 2021	1st November 2021
184	X	X		
185	X	X		
186	X	X		
187	X	X		
188	X	X		
189	X	X		
190	X	Could not find		
191	X	Could not find		
192	X	X		
193	X	X		
194	X	X		
195	X	X		
196	X	X		
197	X	X		
198	X	X		
190	X	X		
200	X	X		

Appendix 7.5 – Badger survey

Provided as a separate document on request.

Appendix 7.6 – Otter survey

Provided as a separate document on request.

Appendix 7.7 – Water vole survey

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Appendix A. Figure 7.7A Water Vole Survey Area Map

Appendix B. Water Vole Survey Results

Tables

Table 1-1 - Summary of Relevant Legislation

1. Introduction

1.1. Terms of Reference

1.1.1. Atkins, a member of the SNC Lavalin Group, was commissioned by Gloucestershire County Council (GCC) to undertake water vole (***Arvicola amphibius***) surveys to inform the Environmental Statement (ES) for the M5 Junction 10 Improvements Scheme (hereafter referred to as 'the Scheme').

1.1.2. The purpose of the water vole surveys was to determine whether water vole are present within the Scheme; provide recommendations to enable compliance with legislation and policy; and, if necessary, identify the need for avoidance, mitigation, compensation or enhancement measures.

1.1.3. This Technical Appendix summarises the results of the water vole surveys undertaken, including the methods used, results of the field surveys, and provides an evaluation of the nature conservation value of water vole and their habitats within the survey area.

1.1.4. This report provides factual information to support the ES, which will accompany the planning application for the Scheme.

1.2. Legislation

1.2.1. Relevant legislation in relation to water vole is provided in Table 1-1 below.

Table 1-1 - Summary of Relevant Legislation

Species/Habitat	Legislation	Offences	Licensing procedures and guidance
Water vole	Wildlife and Countryside Act 1981 (as amended) S.9	Intentionally kill, injure, or take water voles; intentionally or recklessly damage, destroy or obstruct access to any structure or place used for shelter or protection or disturb a water vole in such a place.	Conservation licences issued for trapping and translocation operations by Natural England. Certain displacement operations can be carried out under a class licence. Guidance documents: • The Water Vole Conservation Handbook (R. Strachan & T. Moorhouse, Wildlife Conservation Research Unit, 3rd Edition 2011); • Water voles and development licensing policy - NE Technical Information Note TIN042 2008; • NE Standing Advice for protected species 2013; • The Water Vole Mitigation Handbook (M. Dean, R. Strachan, D. Gow & R. Andrews 2016).

2. Methodology

2.1. Desk Study

2.1.1. The Magic website[1] was reviewed to identify Statutory designated nature conservation sites within 2 km of the Scheme citing water vole as a reason for designation. Desk study records of non-statutory designated sites for nature conservation within 1 km of the Scheme were requested from Gloucestershire Centre for Environmental Records (GCER) in September 2019 and again in April 2021, to identify those citing water vole as a reason for designation.

2.1.2. GCER also provided recent records[2] of water vole from within 1 km of the Scheme.

2.2. Survey Area Selection

2.2.1. All watercourses and water bodies within the Survey Area were identified from multiple mapping sources: Ordnance Survey (OS) mapping and publicly available aerial imagery, and data recorded during the extended Phase 1 habitat surveys carried out for the Scheme by Atkins (in May and September 2019).

2.2.2. Watercourses are defined as rivers and streams (where regularly flowing water was identified) and ditches/ drains (where it is assumed that the channels contain standing water during normal conditions, and/or regularly dry out).

2.2.3. Waterbodies are defined as ponds (man-made or natural standing water bodies less than 20,000 m^2 or 2 ha), lakes (man-made or natural standing water bodies greater than 20,000 m^2 or 2 ha), or canals (artificial waterway with standing water).

2.2.4. Watercourses and waterbodies have been considered for water vole field surveys where the habitat feature is located within 500 m of the Scheme (the Water Vole Survey Area).

2.2.5. The Water Vole Survey Area, including the habitat features which were surveyed in 2019, 2020 and 2021, is shown in Figure 7.7A in Appendix A.

2.3. Field Survey

2.3.1. The water vole surveys were carried out by suitably experienced ecologists and the methodology broadly follows good practice guidance[3,4] and Chartered Institute of Ecology and Environmental Management (CIEEM) competencies for undertaking water vole surveys[5].

Habitat suitability assessment

2.3.2. Water vole habitat suitability assessment surveys were carried out in July/ September/ November 2019, and March/ July 2021 (where access allowed). The exact date of surveys undertaken at each habitat feature is provided within Appendix B. Water Vole Survey Results

2.3.3. The habitat suitability assessments were undertaken for habitat features identified within the Water Vole Survey Area and to determine the scope of more detailed water vole surveys. The assessments considered the habitat preferences of water vole, specifically:

- Dry areas above water level for nesting (burrows or above ground nests);

[1] Defra. c2019. Magic Map Application. [Online]. [Accessed July 2021]. Available from: https://magic.defra.gov.uk/MagicMap.aspx
[2] Records of observations within the last 10 years.
[3] Strachan, R. and Moorhouse, T. (2011). Water Vole Conservation Handbook (3rd edition). Wildlife Conservation Research Unit, University of Oxford.
[4] Dean, M. et al The Water Vole Mitigation Handbook (2016). Mammal Society.
[5] CIEEM (April, 2013) Competencies for Species Survey: Water Vole.

- Bank profile (steep banks are preferred, though not essential, as water vole may exploit shallower profiles);
- Bank substrate suitable for burrowing;
- Presence, density, and type of vegetation on bank and in channel to provide food and cover;
- Shading of the watercourses (excessively shaded watercourses are of lower suitability);
- Water level and typical fluctuations;
- Water level as a means of escape from predators; and
- Connectivity to other suitable habitat (including potential barriers such as busy roads and large areas of hard standing which may affect water vole movement);

2.3.4. During the habitat suitability assessment, any habitat features that were considered to be unsuitable to support water voles were ruled out of further assessment. Where habitat was deemed suitable to support water vole, a detailed survey for field signs was undertaken (see below).

Presence/ likely absence surveys

2.3.5. Where habitat was considered suitable for water vole, a detailed search for signs of water vole presence was undertaken along the habitat feature where it lies within 500 m of the Scheme (the Water Vole Survey Area). The first surveys were carried out immediately following the habitat suitability assessment surveys undertaken in September 2019. A second presence/ likely absence survey at each suitable habitat feature was undertaken in June 2020 (where access allowed). The exact date of surveys undertaken at each habitat feature is provided within Appendix B. Water Vole Survey Results

2.3.6. Surveyors conducted a detailed search along the watercourse and waterbody banksides[6] (where access allowed) for field signs of water vole including;

- Burrows;
- Runs;
- Droppings;
- Latrines;
- Prints;
- Hearing distinctive sound of water vole entering water;
- Feeding remains; and
- Direct observation.

2.3.7. In addition, field signs of American Mink (a significant predator of water vole) were recorded if encountered within the Water Vole Survey Area, including footprints and droppings (scat).

2.3.8. Water vole presence/ likely absence surveys were scheduled to be carried out during dry weather with no heavy rainfall recorded within the previous two days, in order to avoid conditions where positive field signs have been washed away.

2.4. Assessment

2.4.1. The water vole population has been valued in a geographical context following the framework provided in LA 108[7]. The evaluation is based on the information gathered from

[6] The strip of marginal vegetation at the toe of the watercourses bank extending at least 1 m out into the water and at least 1 m up the bank.
[7] Highways England. March 2020. LA 108 Biodiversity [Online]. [Accessed October 2020]. Available from: https://www.standardsforhighways.co.uk/dmrb/search?discipline=SUSTAINABILITY_AND_ENVIRONMENT

the desk study and field surveys, using a combination of professional judgement and accepted criteria[8] (e.g. diversity, rarity and naturalness).

2.5. Limitations

2.5.1. The following limitations were encountered:

- GCER do not hold exhaustive records of all the species that occur within a given area. Therefore, the absence of records for a particular species does not demonstrate that the species is absent. These limitations have been factored into the assessment, which does not rely solely on desk study data;
- The desk study search for waterbodies (including ponds and wet ditches) within 500 m of the Scheme was undertaken by using Ordnance Survey plans and aerial photographs only. These sources may not show all waterbodies and therefore some waterbodies may not have been identified and have not been included in the surveys. These limitations have been factored into the assessment, which does not rely solely on desk study data;
- Ecological surveys are limited by factors which affect the presence of plants and animals such as the time of year, migration patterns and behaviour. Therefore, the absence of evidence of any particular species including water vole should not be taken as conclusive proof that the species is not present or that it will not be present in the future;
- There were several habitat features within the Water Vole Survey Area which could not be accessed during the water vole presence/ likely absence surveys due to no land access being granted by the landowner; Pond 18, Pond 19, Pond 20, Pond 25, and Pond 39. These waterbodies will not be impacted by the Scheme, and there is limited suitable habitat providing connectivity to the proposed working areas. On this basis, impacts to water vole are considered unlikely;
- The section of Piff's Elm ditch (Drain 22) to the east of the M5 could not be accessed due to no land access being granted by the landowner. However, the section of the ditch to the west of the M5 was fully surveyed and a review of aerial imagery and mapping has been completed to make an assessment of likely habitat suitability for water vole on the eastern side (including likely shading by adjacent woodland, and connectivity to other suitable habitats);
- Sections of the River Chelt channel could not be accessed during the water vole presence/ likely absence surveys due to steep riverbanks and high-water levels. In addition, dense vegetation prevented full access to survey some habitat features including Leigh Brook, MW5, Pond 17, Pond 22, Pond 23, Pond 24, and Pond 30. However, these habitats were surveyed using binoculars from accessible points and therefore this is not considered to be a significant limitation;
- During the water vole presence/ likely absence surveys, access was not permitted by the landowners to MW1, Drain 1, Drain 2, Pond 1, Pond 2, Pond 3, Pond 4, Pond 5, Pond 6, Pond 28 and Pond 29. Steep riverbanks, high water levels and dense vegetation on the banks restricted access into sections of the River Swilgate channel. Dense vegetation and adjacent fencing/walls also prevented full access to survey Pond 7, Pond 9, Pond 10, and Pond 21. However, following a change in the Scheme footprint, these habitat features are no longer within the Water Vole Survey Area and they are not discussed further within the assessment.

2.5.2. Note that specific limitations encountered during the water vole presence/ likely absence surveys are provided for each habitat feature in Appendix B. Water Vole Survey Results

2.5.3. Assuming planning submission in summer 2022, the water vole survey data from 2019 will be three years old. It is proposed to undertake update extended Phase 1 Habitat Surveys in targeted areas in order to determine whether any of the baseline conditions have changed significantly, and validate, or otherwise, the results described in this report.

[8] Set out in Ratcliffe, D.A (1977). A Nature Conservation Review. Cambridge University Press.

This report will be updated to include these surveys, and will be submitted as part of the ES.

3. Results

3.1. Desk Study

3.1.1. GCER provided no records of water vole within 1 km of the Scheme.

3.1.2. There are no designated sites citing water vole as a reason for designation located within 2 km of the Scheme.

3.2. Field Survey

Habitat Suitability Assessment

3.2.1. Habitat suitability assessments for all habitat features surveyed within the Water Vole Survey Area are provided in full in Appendix B. Water Vole Survey ResultsNote that some habitat features surveyed are no longer within the Water Vole Survey Area (following a change in the Scheme footprint), and therefore these features will not be discussed further in this assessment.

3.2.2. Suitable riparian habitats for water vole have been recorded within the Water Vole Survey Area, along the River Chelt and connecting minor watercourses MW4. Therefore, water vole presence/ likely absence surveys were carried out for these habitat features (see results below).

3.2.3. Many of the ditches and ponds located within the Water Vole Survey Area are not considered to provide suitable habitat for water vole or have been scoped out due to their isolated location (Appendix B. Water Vole Survey Results). No further surveys were undertaken in relation to water vole at these habitat features.

3.2.4. In addition, there were several habitat features within the Water Vole Survey Area which could not be accessed to undertake a habitat suitability assessment due to no land access being granted by the landowner; these comprise Pond 18, Pond 19, Pond 20, Pond 25 and Pond 39.

Presence/ likely absence surveys

3.2.5. The findings of the presence/ likely absence surveys carried out for habitat features surveyed within the Water Vole Survey Area are provided in full in Appendix B. Water Vole Survey Results

3.2.6. During the water vole presence/likely absence surveys carried out September/ November 2019 and June/ July 2020, no positive evidence of water vole was recorded within the habitat features surveyed (River Chelt and MW4).

4. Evaluation

4.1.1. No evidence of water vole has been recorded within the Water Vole Survey Area.

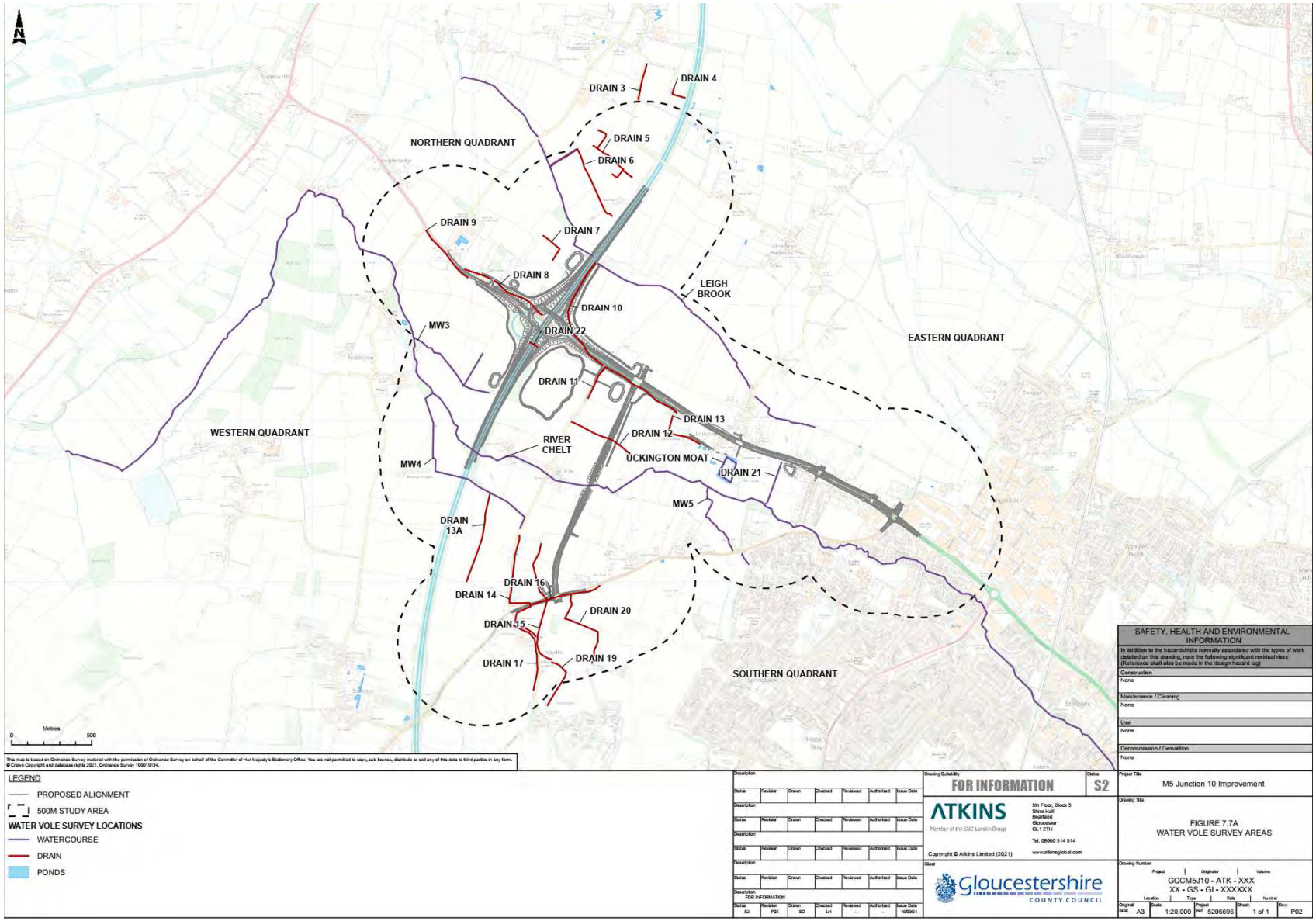
4.1.2. There are five ponds (Pond 18, Pond 19, Pond 20, Pond 25 and Pond 39) which could not be accessed to carry out a habitat suitability assessment for water vole. However, none of these ponds will be directly affected by the Scheme. Pond 18, Pond 19 and Pond 20 are located over 400 m from the Scheme. Pond 39 is located approximately 80 m to the north of the nearest proposed works on the A4019 (west of the M5). Pond 25 is located approximately 50 m to the south of the nearest proposed works on the A4019 and Moat Lane (east of the M5). There is limited suitable habitat providing connectivity between these ponds and the Scheme. In addition, other habitat features located within 500 m of these ponds (within the Water Vole Survey Area) had no positive water vole evidence recorded or were scoped out of the assessment, and therefore it is considered unlikely that isolated water vole populations will be present within these ponds.

4.1.3. Following the water vole surveys and asessment, and considering the lack of water vole records within the surrounding area, it is considered that water vole are **likely absent** from the study area. Therefore, no impacts to water vole are anticipated as a result of the proposed works.

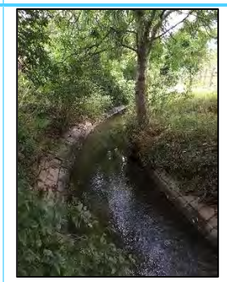
Appendices to Appendix 7.7

- Appendix A
- Appendix B

Appendix A. Figure 7.7A Water Vole Survey Area Map

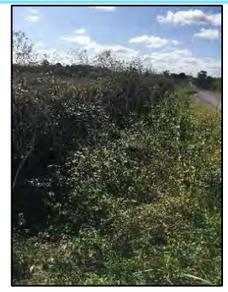

DRAIN 3
DRAIN 4
NORTHERN QUADRANT
DRAIN 5
DRAIN 6
DRAIN 9
DRAIN 7
DRAIN 8
LEIGH BROOK
DRAIN 10
MW3
DRAIN 22
EASTERN QUADRANT
DRAIN 11
DRAIN 13
WESTERN QUADRANT
RIVER CHELT
DRAIN 12
UCKINGTON MOAT
MW4
DRAIN 21
MW5
DRAIN 13A
DRAIN 16
DRAIN 14
DRAIN 20
DRAIN 15
DRAIN 17
DRAIN 19
SOUTHERN QUADRANT
Metres
0
500
LEGEND
PROPOSED ALIGNMENT
500M STUDY AREA
WATER VOLE SURVEY LOCATIONS
WATERCOURSE
DRAIN
PONDS
SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION
In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log)
Construction
None
Maintenance / Cleaning
None
Use
None
Decommission / Demolition
None
FOR INFORMATION
S2
M5 Junction 10 Improvement
FIGURE 7.7A
WATER VOLE SURVEY AREAS
ATKINS
5th Floor, Block 5
Shire Hall
Bearland
Gloucester
GL1 2TH
Tel: 08000 514 514
www.atkinsglobal.com
Copyright © Atkins Limited (2021)
Gloucestershire COUNTY COUNCIL
GCCM5J10 - ATK - XXX
XX - GS - GI - XXXXXX
Original Size: A3
Scale: 1:20,000
Project No: 5206696
Sheet: 1 of 1
Rev: P02

Appendix B. Water Vole Survey Results

Habitat Feature	Date surveyed	Survey Limitations	Habitat Description	Water Vole Survey Results	Site Photographs	Further surveys proposed?
River Swilgate	-06/09/2019 (east of M5) -04/11/2019 (west of M5)	Access into the River Swilgate channel was restricted along sections of this watercourse due to steep banks, high water levels and dense vegetation. Where possible, these habitats were surveyed using binoculars from safe, accessible locations, and this is therefore not considered to be a significant limitation.	The River Swilgate is a river which flows in a north-westerly direction through agricultural fields and beneath the M5. The channel width varies within the survey area, and moderate water levels (slow-moving) were recorded during the September and November 2019 surveys. The riverbanks comprise stone walls on both approaches to the M5 culvert. There are some gaps in the stonework although these could not be inspected in more detail. The remaining earth banks are mostly steep, although these become shallower at the meanders. The river passes beneath the M5 through a large box culvert which is at an angle (resulting in poor visibility through the culvert). To the east of the M5 and on the western approach to the M5, the river channel is mostly heavily shaded by areas of woodland and dense scrub vegetation along both banks of the river. There are short sections of open unshaded banks further east and west from the M5 which are vegetated with grasses and tall ruderal species including nettles, willowherb, teasel, cow parsley, and extensive Himalayan balsam. No emergent vegetation was recorded within the channel. Adjacent land use comprises open fields (pasture and arable). Poor water quality was recorded within the river.	**Possible presence (surveys incomplete).** No water vole signs were recorded during the 2019 survey. The earth banks provide suitable substrate for burrow creation. One burrow was seen in the northern bank to the east of the M5, however, this was very high above the water level on a steep bank and is considered more likely that this is a kingfisher burrow. The majority of the channel is considered to provide poor foraging habitat for water vole, although the sections of open unshaded banks offer higher suitability.	  	N/A – no longer within survey area.
River Chelt	-11/09/2019 (east of M5 to Withybridge lane, east of Withybridge lane) -12/09/2019 (west of M5) -20/09/2019 (east of M5 within Cheltenham) -15/06/2020 (M5 east to Withybridge lane, east of Withybridge	Access into the River Chelt channel was restricted along sections of this watercourse due to steep banks, high water levels and dense vegetation. Where possible, these sections were surveyed using binoculars from safe, accessible locations, and this is therefore not considered to be a significant limitation.	The River Chelt is a river which flows in a westerly direction through Cheltenham, agricultural fields (pasture and arable) and beneath the M5. The channel varied significantly across the sections within the survey area: • West of M5 – high and fast-flowing water levels were recorded along this section in 2019 and 2020. The earth and clay banks are tall and steep facing, and generally open and unshaded. The banks are vegetated with grasses and tall ruderal species including extensive Himalayan balsam, with scattered scrub and trees. There are patches of emergent vegetation along the toe of the bank including yellow flag iris, reeds, and sedges. There are areas of woodland adjacent to this section of the River Chelt. The River Chelt passes beneath the M5 in a westerly direction through a large straight-sided box culvert. It should be noted that an additional box culvert is located south of the M5	**Likely absent.** No water vole signs were recorded during the 2019 or 2020 survey. The River Chelt provides good foraging opportunities for water vole (in channel and on the banks), although these areas are patchy due to areas of heavy shading. The bank substrate varies and there are stretches of steep earth banks which provide suitable substrate for burrow creation. However, there are sections of the bank where the riverbed and bank toe are formed of clay which would not be suitable for burrow creation. It is noted that the River Chelt floods regularly and water levels and velocity were noted to increase significantly during spate conditions, which is considered to reduce the suitability of the habitat for water vole. Surveys have been completed and it is considered that water vole are likely absent along this watercourse.		No further surveys proposed.

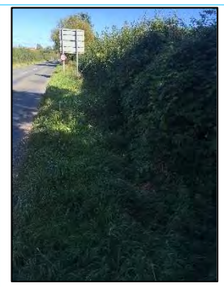
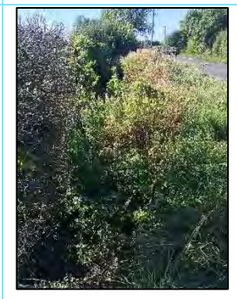
Habitat Feature	Date surveyed	Survey Limitations	Habitat Description	Water Vole Survey Results	Site Photographs	Further surveys proposed?
	lane including sections within Cheltenham) -16/06/2020 (west of M5 and section east of Withybridge lane) -17/06/2020 (section east of Withybridge lane)		culvert and very fast-flowing water was recorded being dispelled into the River Chelt during the 2019 and 2020 surveys. The source of this water is not known, and no watercourse is shown on OS mapping at this location. • East of M5 (M5 to Withybridge Lane) – moderate and slower-moving water levels were recorded along this section in 2019 and 2020. The earth and clay banks are tall and steep facing and generally open and unshaded. The banks are vegetated with grasses and tall ruderal species including extensive Himalayan balsam, with scattered scrub and trees. There are dense areas of emergent vegetation along the toe of the bank including sedges, reeds, yellow flag iris, and watercress. There are areas of woodland on either side of the River Chelt on the approach to the M5 crossing. • East of M5 (east of Withybridge Lane) – low and slower-moving water levels were recorded along this section in 2019 and 2020. The earth and clay banks are tall and steep facing with increased tree/ scrub cover which increases shading within the channel. The banks are largely vegetated with grasses. The river meanders in several places, leaving stony and mud beaches within the channel. Emergent vegetation is sparse within the channel but there are patches including sedges and common water crowfoot. On the approach towards Cheltenham, a section of the river has tall and steep artificial stone banks. • East of M5 (within Cheltenham) – water levels varied along this section but were mostly low and fast-flowing in 2019 and 2020. Sections of the banks and adjacent embankments are modified where the river passes beneath several roads and runs alongside residential and commercial properties. The banks are mostly heavily vegetated with trees and scrub, resulting in heavy shading and a sparse vegetation present within the channel. There are patches of emergent vegetation including reeds, yellow flag-iris, and common water crowfoot.		   	
Unnamed minor watercourse 1 (MW1)	N/A	No survey access (landowner permission not agreed).	The confluence where MW1 meets the River Swilgate could be observed from the opposite bank, and the banks were seen to be densely vegetated with scrub and trees.	N/A	N/A	N/A – no longer within survey area.

Leigh Brook	-02/09/2019 (west of M5) -06/09/2019 (section east of M5) -18/09/2019 (section east of M5)	Dense scrub vegetation restricted access along short sections of the banks of this watercourse (to the east and west of the M5). Where possible, these sections were surveyed using binoculars from safe, accessible locations, and this is therefore not considered to be a significant limitation.	Leigh Brook comprises a minor watercourse/ stream which flows in a north-westerly direction through agricultural fields (pasture and arable) and passes beneath the M5. To the east of the M5, the channel comprises a field-side ditch which was found to be largely dry during the 2019 survey. The earth banks are mostly shallow, although there is a short section where the banks are taller and steeper. The channel is heavily shaded by adjacent hedgerows and trees. The channel and banks are densely vegetated by ruderal species including nettle and willowherb; however, no aquatic species were recorded. To the west of the M5, the stream channel is heavily shaded by adjacent dense scrub and woodland. The earth banks are shallow sloping and sparsely vegetated, and no vegetation was recorded within the channel. The channel was almost dry with some pools of standing water. The area of woodland adjacent to the stream to the west of the M5 is heavily cattle-poached with sparse understory vegetation.	**Likely absent.** This watercourse is not considered to be suitable to support water vole.	 	No further surveys proposed.
Unnamed minor watercourse 3 (MW3)	12/09/2019	N/A	This minor watercourse was found to comprise a shallow ditch running alongside a hedgerow at the boundary between two agricultural fields (arable). During the 2019 survey, the channel was completely dry. No aquatic vegetation was recorded although the ditch had been recently managed with all vegetation in the channel and on the bank.	**Likely absent.** This watercourse is not considered to be suitable to support water vole.		No further surveys proposed.
Unnamed minor watercourse 4 (MW4)	-11/09/2019 (east of M5) -12/09/2019 (west of M5) 16/06/2020 (east and west of M5)	N/A	This is a minor watercourse which runs in a north-westerly direction through agricultural fields (arable) and passes underneath the M5 carriageway through two small tunnel culverts (approximately 1 m in width). The watercourse joins the River Chelt approximately 420 m to the north-west of the M5. To the east of the M5, the channel comprises a field-side ditch with short but steep earth banks. The channel is partially shaded by the adjacent woodland and hedgerow, and it was found to be mostly dry during the 2019 and 2020 survey. There are reeds present within the channel and the banks are vegetated with grasses, nettles, hemlock, and docks. To the west of the M5, the channel widens, and the earth banks are steeper. There was no water present at the time of the 2019 survey and shallow water was present during the 2020 survey. There are reeds and bulrush present within the channel and the banks are largely vegetated by grasses and nettles. This section of the channel is also partially shaded by an adjacent hedgerow and there are areas of woodland within close proximity to the watercourse.	**Likely absent.** No water vole signs were recorded during the 2019 or 2020 survey. The channel provides good foraging habitat for water vole. In addition, the banks are considered to provide a suitable substrate for burrow creation. However, the low water levels are considered to reduce the likelihood of this watercourse supporting a water vole population. Surveys have been completed and it is considered that water vole are likely absent along this watercourse.	  	No further surveys proposed.

Drain 1	N/A	No survey access (landowner permission not agreed).	N/A	N/A	N/A	N/A – no longer within survey area.
Drain 2	18/09/2019	A section of this ditch is located with a field where no access was permitted by the landowner and therefore this section was not surveyed. However, binoculars were used to confirm that the habitat characteristics were similar to the section which was surveyed.	This comprises a road-side drainage ditch which continues into an adjacent field. The channel was found to be largely dry with pools of shallow water (likely surface run-off) during the 2019 survey. It is shaded by an adjacent field boundary hedgerow. The shallow earth banks comprised managed grassland, and no aquatic species were recorded in the channel.	**Likely absent.** This ditch is not considered to be suitable to support water vole.	No photograph available.	N/A – no longer within survey area.
Unnamed minor watercourse 5 (MW5)	11/09/2019	Dense scrub vegetation restricted access along short sections of the banks. Where possible, these sections were surveyed using binoculars from safe, accessible locations, and this is therefore not considered to be a significant limitation.	This is a minor watercourse which runs in a northerly direction to join the River Chelt. There is a small farm access bridge which crosses this stream. The stream had low water levels (no obvious flow) at the time of the 2019 survey. The channel is heavily shaded by adjacent scrub vegetation and trees with no aquatic vegetation recorded and sparse vegetation on the earth banks (which are steeply sloping).	**Likely absent.** This watercourse is not considered to be suitable to support water vole.		No further surveys proposed.
Drain 3	17/09/2019	N/A	This comprises a road-side drainage ditch which was found to be largely dry with pools of shallow water (likely surface run-off) during the 2019 survey. Poor water quality (pollution) was noted. It is shaded by an adjacent field boundary hedgerow. The shallow earth banks and the channel are vegetated with grasses and tall ruderal species including nettles, with no aquatic species recorded.	**Likely absent.** This ditch is not considered to be suitable to support water vole.		No further surveys proposed.
Drain 4	17/09/2019	N/A	This is located within a grassland field (pasture), however, no ground depression, standing water or aquatic species were found at this location.	**Likely absent.** This ditch is not considered to be suitable to support water vole.	No photograph available.	No further surveys proposed.
Drain 5	02/09/2019	N/A	This comprises a ditch with very shallow earth banks which runs beneath a hedgerow at the boundary of agricultural fields (pasture and arable). The ditch was completely dry during the 2019 survey. The channel is heavily shaded and there is sparse vegetation on the banks, with no aquatic vegetation recorded.	**Likely absent.** This ditch is not considered to be suitable to support water vole.	No photograph available.	No further surveys proposed.
Drain 6	02/09/2019	N/A	This comprises a ditch with shallow earth banks which runs alongside a hedgerow at the boundary of agricultural fields (pasture). The ditch was completely dry during the 2019 survey. The channel is shaded and there is sparse vegetation on the banks, with no aquatic vegetation recorded.	**Likely absent.** This ditch is not considered to be suitable to support water vole.	No photograph available.	No further surveys proposed.

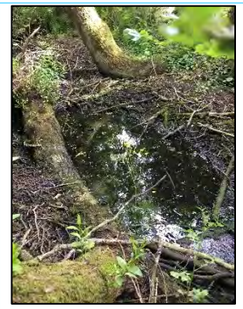
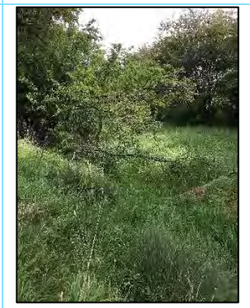
Drain 7	02/09/2019	N/A	This is located within a grassland field (pasture), however, no ground depression, standing water or aquatic species were found at this location.	**Likely absent.** This ditch is not considered to be suitable to support water vole.	No photograph available.	No further surveys proposed.
Drain 8	06/09/2019	N/A	This comprises a ditch at the bottom of a wooded embankment between the A4019 and a minor road. There was shallow water present within the ditch during the 2019 survey, although poor water quality (pollution) was noted. The channel is heavily shaded resulting in sparse vegetation on the banks. Vegetation recorded within the channel includes watercress and nettles.	**Likely absent.** This ditch is not considered to be suitable to support water vole.		No further surveys proposed.
Drain 9	06/09/2019	N/A	This comprises a road-side drainage ditch which was found to be completely dry during the 2019 survey. It is shaded by an adjacent field boundary hedgerow and trees. The road-side earth bank is steep and vegetated with grasses and tall ruderal species including nettles, cow parsley, and willowherb.	**Likely absent.** This ditch is not considered to be suitable to support water vole.		No further surveys proposed.
Drain 10	23/07/2019 (north of A4019) 05/09/2019 (south of A4019)	Dense scrub vegetation restricted access along the banks of the ditch to the north of the A4019.	This comprises a road-side drainage ditch which is culverted beneath the A4019 (however, this culvert was not found during the survey). To the south of the A4019, the ditch is also culverted beneath the minor roads Withybridge Lane and Withybridge Gardens. The ditch had shallow patches of standing water during the 2019 survey. Very poor water quality was noted and there is a large amount of dumped material within the channel, particularly where the ditch runs adjacent to a parking lay-by. The earth banks are shallow and heavily shaded along the majority of the channel by adjacent hedgerows and trees. There are dense patches of tall ruderal species growing on the banks including nettles and willowherb, although no aquatic species were recorded in the channel. To the north of the A4019, the ditch runs alongside a section of the m5 and the M5 J10 southbound off-slip road. There is dense scrub and trees along the banks of the ditch, resulting in heavy shading. The ditch continues north (parallel to the M5) and joins Leigh Brook at the location where this watercourse flows beneath the M5.	**Likely absent.** This ditch is not considered to be suitable to support water vole.	 	No further surveys proposed.
Drain 11	05/09/2019	N/A	This comprises a road-side drainage ditch which was found to be completely dry during the 2019 survey. It is shaded by an adjacent field boundary hedgerow. The shallow earth banks and channel are vegetated with grasses and tall ruderal species including nettles and no aquatic species were recorded.	**Likely absent.** This ditch is not considered to be suitable to support water vole.	No photograph available.	No further surveys proposed.

Drain 12	18/09/2019	N/A	This comprises a ditch with shallow earth banks which runs alongside a hedgerow at the boundary of agricultural fields (pasture). The ditch was completely dry during the 2019 survey. The channel is shaded and there is sparse vegetation on the banks, with no aquatic vegetation recorded.	**Likely absent.** This ditch is not considered to be suitable to support water vole.	No photograph available.	No further surveys proposed.
Drain 13	04/11/2019	N/A	This comprises a ditch which runs along the boundary of two open grassland fields (pasture) and alongside the back of residential houses/gardens. The channel has shallow earth banks and there was shallow water present during the 2019 survey. The channel is partially shaded by adjacent trees and scrub, resulting in sparse vegetation on the bank and no aquatic vegetation was noted within the channel.	**Likely absent.** This ditch is not considered to be suitable to support water vole.	 	No further surveys proposed.
Drain 13a	11/09/2019	N/A	This comprises a ditch with shallow earth banks which runs alongside a hedgerow at the boundary of agricultural fields (arable). The ditch was completely dry during the 2019 survey. The channel is shaded and there is sparse vegetation on the banks, with no aquatic vegetation recorded.	**Likely absent.** This ditch is not considered to be suitable to support water vole.		No further surveys proposed.
Drain 14	09/09/2019	N/A	This comprises a road-side drainage ditch which runs alongside Hayden Lane, beneath the B4634 road and continues north alongside Withybridge Lane. The ditch was found to be completely dry during the 2019 survey. It is shaded by adjacent field boundary hedgerows. The shallow earth banks and channel are vegetated with grasses and tall ruderal species including nettles and no aquatic species were recorded.	**Likely absent.** This ditch is not considered to be suitable to support water vole.	No photograph available.	No further surveys proposed.

Drain 15	18/09/2019 19/09/2019	N/A	This comprises a ditch with very shallow earth banks which runs alongside Hayden Lane, beneath a hedgerow at the boundary of an arable field, beneath the B4634 (culverted) and north beneath a hedgerow at the boundary of agricultural fields (pasture). The ditch has very shallow earth banks and it was completely dry during the 2019 survey. The channel is heavily shaded and there is sparse vegetation on the banks, with no aquatic vegetation recorded.	**Likely absent.** This ditch is not considered to be suitable to support water vole.	 	No further surveys proposed.
Drain 16	18/09/2019	N/A	This comprises a road-side drainage ditch which was found to be completely dry during the 2019 survey. It is shaded by an adjacent field boundary hedgerow. The road-side earth bank is vegetated with grasses and tall ruderal species including nettles, with no aquatic vegetation recorded.	**Likely absent.** This ditch is not considered to be suitable to support water vole.		No further surveys proposed.
Drain 17	18/09/2019	N/A	This comprises a road-side drainage ditch which was found to be completely dry during the 2019 survey. It is shaded by an adjacent field boundary hedgerow. The road-side earth bank is steep and vegetated with grasses and tall ruderal species including nettles, thistles, and cow parsley, with no aquatic vegetation recorded.	**Likely absent.** This ditch is not considered to be suitable to support water vole.		No further surveys proposed.

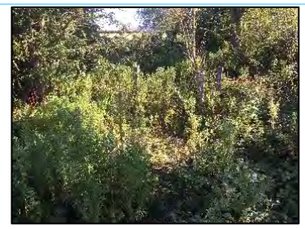
Drain 19	18/09/2019	N/A	This comprises a road-side drainage ditch which was found to be completely dry during the 2019 survey. It is shaded by an adjacent field boundary hedgerow and trees. The road-side earth bank is steep and vegetated with grasses and tall ruderal species including nettles, with no aquatic vegetation recorded.	**Likely absent.** This ditch is not considered to be suitable to support water vole.		No further surveys proposed.
Drain 20	18/09/2019	N/A	This comprises a ditch with very shallow earth banks which runs beneath a hedgerow at the boundary of agricultural fields (pasture and arable). The ditch was completely dry during the 2019 survey. The channel is heavily shaded and there is sparse vegetation on the banks, with no aquatic vegetation recorded.	**Likely absent.** This ditch is not considered to be suitable to support water vole.	No photograph available.	No further surveys proposed.
Drain 21	30/03/2021	N/A	This comprises a ditch with very shallow earth banks which runs beneath a hedgerow at the boundary of agricultural fields (pasture). The ditch was almost dry with patches of shallow standing water. The channel is heavily shaded and there is sparse vegetation on the banks, with no aquatic vegetation recorded.	**Likely absent.** This ditch is not considered to be suitable to support water vole.		No further surveys proposed.
Drain 22 (Piff's Elm)	28/07/2021	No survey access to ditch on eastern side of M5 (landowner permission not agreed)	This comprises a ditch which passes beneath the M5 through a corrugated metal culvert just south of Junction 10. On the western side of the M5, the ditch runs parallel to the A4019 before passing through an area of woodland alongside the M5 J10 northbound on-slip. The channel was found to be almost dry with pools of standing water. There is dense duckweed covering the pools of water, however, no other aquatic vegetation was recorded in the channel. The earth banks are steep in places which provide some opportunity for burrow creation. The woodland provides heavy shading and there is limited suitable vegetation on the banks to provide foraging habitat for water vole. The ditch has connectivity to Drain 9 which was assessed as providing poor habitat for water vole and has been scoped out of further assessments. There was no permitted access to survey Piff's Elm to the east of the M5. The ditch does not appear on OS mapping, however, from a review of online mapping and aerial imagery, the ditch likely continues through an area of woodland and residential gardens. The ditch also does not appear to be connected to other suitable habitat for water vole. Drain 10 and Drain 11 are located in close proximity to the likely route of Piff's Elm ditch on the eastern side of the	**Likely absent.** This ditch is not considered to be suitable to support water vole.	 	No further surveys proposed.

			M5, however, these ditches were assessed as providing poor habitat for water vole and have been scoped out of further assessments.			
Pond 1	N/A	No survey access (landowner permission not agreed)	N/A	N/A	N/A	N/A – no longer within survey area.
Pond 2	N/A	No survey access (landowner permission not agreed)	N/A	N/A	N/A	N/A – no longer within survey area.
Pond 3	N/A	No survey access (landowner permission not agreed)	N/A	N/A	N/A	N/A – no longer within survey area.
Pond 4	N/A	No survey access (landowner permission not agreed)	N/A	N/A	N/A	N/A – no longer within survey area.
Pond 5	N/A	No survey access (landowner permission not agreed)	N/A	N/A	N/A	N/A – no longer within survey area.
Pond 6	N/A	No survey access (landowner permission not agreed)	N/A	N/A	N/A	N/A – no longer within survey area.
Pond 7	06/09/2019	Access around the banks of this pond was restricted by dense bankside scrub, however, binoculars were used to aid the survey.	This pond is located at the edge of a grassland field (pasture) and adjacent to a residential house and garden. The pond has shallow earth banks, and it is heavily shaded by adjacent scrub vegetation and willow trees. There is a lack of aquatic vegetation.	**Likely absent.** This pond is not considered to be suitable to support water vole.		N/A – no longer within survey area.
Pond 8	04/11/2019	N/A	This pond is located within an open grassland field (pasture). The earth banks are very shallow. There is duckweed within the pond but otherwise there is a lack of vegetation within the pond and on the banks.	**Likely absent.** This pond is not considered to be suitable to support water vole.		N/A – no longer within survey area.
Pond 9	04/11/2019	Access around the banks of this pond was restricted by the adjacent wall, however, binoculars were used to aid the survey.	This pond is located within a residential garden. The pond is partly surrounded by a brick wall and there are shallow areas of earth bank. The pond is partially shaded by adjacent trees and scrub. There is extensive duckweed within the pond, alongside small patches of yellow flag iris.	**Likely absent.** This pond is not considered to be suitable to support water vole.		N/A – no longer within survey area.

Pond 10	06/09/2019	Access around the banks of this pond was restricted by dense bankside scrub and a barbed-wire fence, however, binoculars were used to aid the survey.	This comprises a large waterbody at the corner of agricultural fields (arable). There is dense bramble scrub and trees around the edge of the pond, resulting in partial shading. There are patches of bulrush within the pond. The banks of the pond were not visible due to the bankside vegetation.	**Possible presence (surveys incomplete).** It was not possible to access the banks of this pond to complete a sufficient survey.		N/A – no longer within survey area.
Pond 11	02/09/2019	N/A	This pond comprises a shallow ground depression which was completely dry at the time of the 2019 survey. The pond is heavily shaded by adjacent scrub and trees, and no aquatic species were present within the pond. Adjacent land use comprises open grassland fields (pasture).	**Likely absent.** This pond is not considered to be suitable to support water vole.		N/A – no longer within survey area.
Pond 12	02/09/2019	N/A	This pond comprises a shallow ground depression which had shallow water present during the 2019 survey. The pond is heavily shaded by adjacent scrub and trees, and no aquatic species were present within the pond. Adjacent land use comprises open grassland fields (pasture).	**Likely absent.** This pond is not considered to be suitable to support water vole.		No further surveys proposed.
Pond 13	02/09/2019	N/A	This pond comprises a shallow ground depression which was completely dry at the time of the 2019 survey. The pond is heavily shaded by adjacent scrub and trees, and no aquatic species were present within the pond. Adjacent land use comprises open grassland fields (pasture).	**Likely absent.** This pond is not considered to be suitable to support water vole.		No further surveys proposed.
Pond 14	02/09/2019	N/A	This pond comprises a shallow ground depression which was completely dry at the time of the 2019 survey. The pond is heavily shaded by adjacent trees, and no aquatic species were present within the pond. Adjacent land use comprises open grassland fields (pasture).	**Likely absent.** This pond is not considered to be suitable to support water vole.		No further surveys proposed.

Pond 14a	02/09/2019	N/A	This pond comprises a shallow ground depression which had shallow water present during the 2019 survey. The pond is heavily shaded by adjacent scrub and trees, and no aquatic species were present within the pond. Adjacent land use comprises open grassland fields (pasture).	**Likely absent.** This pond is not considered to be suitable to support water vole.		No further surveys proposed.
Pond 15	02/09/2019	N/A	This pond comprises a shallow ground depression within an open grassland field (pasture) which was completely dry at the time of the 2019 survey. The pond is partially shaded by an adjacent hedgerow, and no aquatic species were present within the pond.	**Likely absent.** This pond is not considered to be suitable to support water vole.		No further surveys proposed.
Pond 16	02/09/2019	N/A	This pond comprises a shallow ground depression which had shallow water present during the 2019 survey. The pond is heavily shaded by adjacent scrub and trees, and no aquatic species were present within the pond. Adjacent land use comprises open grassland fields (pasture).	**Likely absent.** This pond is not considered to be suitable to support water vole.		No further surveys proposed.
Pond 17	02/09/2019	Access around a section of the banks of this pond was restricted by dense bankside scrub, however, binoculars were used to aid the survey.	This pond is located at the corner of an open grassland field (pasture). There is dense bramble scrub around approximately 50% of the pond edge. The scrub and adjacent trees result in partial shading of the pond. There are patches of common reed within the pond. The earth banks are mostly shallow, although some sections of the banks are not visible due to the dense bankside vegetation.	**Likely absent.** This pond is not considered to be suitable to support water vole.		No further surveys proposed.
Pond 17a	02/09/2019	N/A	This pond is located within the corner of an open rough grassland field. The earth banks are tall although shallow-sloping and vegetated with grasses and scattered scrub/trees, which results in partial shading of the pond. There is extensive duckweed within the pond with a lack of other aquatic vegetation.	**Likely absent.** This pond is not considered to be suitable to support water vole.		No further surveys proposed.
Pond 18	N/A	No survey access (landowner permission not agreed).	N/A	N/A	N/A	No further surveys proposed.

Pond 19	N/A	No survey access (landowner permission not agreed).	N/A	N/A	N/A	No further surveys proposed.
Pond 20	N/A	No survey access (landowner permission not agreed).	N/A	N/A	N/A	N/A – no longer within survey area.
Pond 21	06/09/2019	Access around the banks of this pond was restricted by dense bankside scrub, however, binoculars were used to aid the survey.	This pond is located at the corner of open grassland fields (pasture) and there was shallow water present during the 2019 survey. The pond is heavily shaded by adjacent scrub and trees, and no aquatic species were present within the pond. The earth banks are shallow.	**Likely absent.** This pond is not considered to be suitable to support water vole.		N/A – no longer within survey area.
Pond 22	04/11/2019	Access around the banks of this pond was restricted by dense bankside scrub, however, binoculars were used to aid the survey.	This pond is located at the border between open grassland fields (pasture) and residential housing/ gardens. The banks of this pond are densely vegetated with bramble scrub and trees resulting in heavy shading. There is extensive duckweed within the pond with a lack of other aquatic vegetation. The banks were mostly not visible due to the dense bramble.	**Likely absent.** This pond is not considered to be suitable to support water vole.		No further surveys proposed.
Pond 23	04/11/2019	Access around the banks of this pond was restricted by dense bankside scrub, however, binoculars were used to aid the survey.	This pond is located at the border between open grassland fields (pasture) and residential housing/ gardens. The earth banks are shallow and bankside trees and scrub vegetation results in partial shading of the pond. There is a high coverage of duckweed within this pond and a lack of other aquatic species.	**Likely absent.** This pond is not considered to be suitable to support water vole.		No further surveys proposed.
Pond 24	04/11/2019	Access around the banks of this pond was restricted by fencing, however, binoculars were used to aid the survey from adjacent land.	This is a large pond located at the corner of open grassland fields (pasture) and residential housing/ gardens. The earth banks are very shallow sloping. There are trees and scrub vegetation on the banks resulting in sparse vegetation on the banks. There is a high coverage of duckweed within this pond and a lack of other aquatic species.	**Likely absent.** This pond is not considered to be suitable to support water vole.		No further surveys proposed.
Pond 25	N/A	No survey access (landowner permission not agreed).	N/A	N/A	N/A	No further surveys proposed.

Pond 26	18/09/2019	N/A	This pond comprises a shallow ground depression adjacent to a hedgerow and area of dense scrub adjacent to open grassland fields. The pond was completely dry at the time of the 2019 survey. The pond is heavily shaded, and no aquatic species were present within the pond.	**Likely absent.** This pond is not considered to be suitable to support water vole.		No further surveys proposed.
Pond 27	18/09/2019	N/A	This pond comprises a shallow ground depression within an area of dense scrub adjacent to open grassland fields. The pond was completely dry at the time of the 2019 survey. The pond is heavily shaded, and no aquatic species were present within the pond.	**Likely absent.** This pond is not considered to be suitable to support water vole.	No photograph available.	No further surveys proposed.
Pond 28	N/A	No survey access (landowner permission not agreed).	N/A	N/A	N/A	No further surveys proposed.
Pond 29	N/A	No survey access (landowner permission not agreed).	N/A	N/A	N/A	No further surveys proposed.
Pond 30	18/09/2019	Access around the banks of this pond was restricted by dense bankside scrub.	This pond was found to be surrounded and covered by dense bramble scrub and therefore it could not be accessed to survey. However, it is assumed that the pond has sparse vegetation due to the heavy shading.	**Likely absent.** This pond is not considered to be suitable to support water vole.		No further surveys proposed.
Pond 31	09/09/2019	N/A	This pond comprises a shallow ground depression within an open grassland field (pasture) which was completely dry at the time of the 2019 survey. The pond is partially shaded by an adjacent bramble scrub and no aquatic species were present within the pond.	**Likely absent.** This pond is not considered to be suitable to support water vole.		No further surveys proposed.
Pond 39	N/A	No survey access (landowner permission not agreed).	N/A	N/A	N/A	No further surveys proposed.

Appendix 7.8 – Breeding birds survey

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1. Introduction

1.1. Terms of Reference

1.1.1. Atkins, a member of the SNC Lavalin Group, was commissioned by Gloucestershire County Council (GCC) to undertake breeding bird surveys to inform the Environmental Statement (ES) for the M5 Junction 10 Improvements Scheme (hereafter referred to as the Scheme).

1.1.2. The purpose of the breeding bird surveys was to determine the species and numbers of breeding birds present within the Scheme and where possible the breeding status; provide recommendations to enable compliance with legislation and policy; and, if necessary, identify the need for avoidance, mitigation, compensation, or enhancement measures.

1.1.3. This Technical Appendix summarises the results of the breeding bird surveys undertaken, including the methods used, results of the field surveys, and provides an evaluation of the nature conservation value of breeding birds within the survey area.

1.1.4. This report provides information to support the ES, which will accompany the planning application for the Scheme.

1.2. Legislative and Conservation Concern Status

Legislation

1.2.1. Relevant legislation in relation to breeding birds is provided in Table 1-1 below

Table 1-1 - Summary of Relevant Legislation

Species	Legislation	Offences	Licensing Procedures and Guidance
Birds	Wildlife and Countryside Act 1981 (as amended)	Intentionally kill, injure, or take any wild bird; intentionally take, damage, or destroy the nest of any wild bird while that nest is in use or being built; intentionally take or destroy the nest or eggs of any wild bird. Intentionally or recklessly disturb a Schedule 1 species while it is building a nest or is in, on or near a nest containing eggs or young; intentionally or recklessly disturb dependent young of such a species.	No licences are available to disturb any birds in regard to development. Licences are available in certain circumstances to damage or destroy nests, but these only apply to the list of licensable activities in the Act and do not cover development. General licences are available in respect of 'pest species' but only for certain very specific purposes e.g. public health, public safety, air safety. Guidance documents: NE Standing Advice for protected species 2013.
Birds	The Birds Directive 79/409/EEC Annex 1	N/A	Bird species listed under Annex 1 of the Birds Directive 79/409/EEC are considered endangered or important migratory species in Europe. These species have been protected by the establishment of a coherent network of Special Protection Areas (SPAs).

Species	Legislation	Offences	Licensing Procedures and Guidance
			Regulation 8 of the Conservation of Habitats and Species Regulations 2017 (as amended)1 defines these SPAs as European Sites. SPAs are designated based on populations of Annex 1 species that they support, and thus comprise the most suitable habitats to ensure the survival and/or reproduction of these species in their area of distribution.
Birds	Ramsar Designation	N/A	Ramsar sites are wetlands of international importance designated under the Ramsar Convention. The majority of UKs sites are established for internationally important populations of non-breeding waterfowl though some sites have no qualifying ornithological interest

Conservation Concern Status

1.2.2. The UK's leading bird conservation organisations have worked together on the latest review of the status of the birds that occur regularly in the UK (Eaton et al., 2015[1]). Bird species have been assessed against a set of objective criteria to place each on one of three lists – green, amber, and red – indicating an increasing level of conservation concern. The criteria used in assessments are intended to ensure that Birds of Conservation Concern (BoCC) listings reflect each species' global and European status as well as that within the UK, and additionally measure the importance of the UK population in international terms.

1.2.3. Section 41 of the Natural Environment and Rural Communities (NERC) Act 2006 requires the Secretary of State to publish a list of habitats and species which are of principal importance for the conservation of biodiversity in England; this is known as England Biodiversity List[2].

1.2.4. The UK Biodiversity Action Plan (UK BAP), as updated by the UK Biodiversity Partnership in 2007, was used to draw up the England Biodiversity List. The UK BAP has been succeeded by the UK Post-2010 Biodiversity Framework in 2012, due to a change in government strategy by all UK countries, focusing on managing the environment as a whole rather than dealing with different aspects of biodiversity and environment separately[3]. However, the UK BAP list of priority habitats and species continue to be regarded as conservation priorities in the UK Post-2010 Biodiversity Framework.

1.2.5. Forty-nine bird Species of Principal Importance (SPI) are included on the England Biodiversity List. These include 48 of the 53 bird species listed for England in the UK BAP[4], with the addition of hen harrier whose population in England is at very low levels and is unlikely to increase without continued conservation action. The England Biodiversity List is used as a guide for decision makers such as public bodies, including local and regional authorities, in implementing their duty under Section 40 of the NERC

[1] Eaton, MA, Aebischer NJ, Brown AF, Hearn RD, Lock L, Musgrove AJ, Noble DG, Stroud DA and Gregory RD (2015) Birds of Conservation Concern 4: the population status of birds in the United Kingdom, Channel Islands, and Isle of Man. British Birds 108, pp708–746.
[2] Natural England (2012) Habitats and species of principal importance. (http://www.naturalengland.org.uk/ourwork/conservation/biodiversity/protectandmanage/habsandspeciesimportance.aspx: accessed 13 November 2013).
[3] JNCC and Defra (on behalf of the Four Countries' Biodiversity Group). 2012. UK Post-2010 Biodiversity Framework. (http://jncc.defra.gov.uk/pdf/UK_Post2010_Bio-Fwork.pdf: accessed 13 November 2013).
[4] Arctic skua, black-throated diver, red-backed shrike, red-necked phalarope, and wryneck are listed for England in the UK BAP but are not included in the England biodiversity list

Act 2006 to have regard to the conservation of biodiversity in England when carrying out their normal functions.

2. Methodology

2.1. Desk Study

2.1.1. The geographical area for obtaining ecological data through desk studies has been determined using professional judgement. Baseline data has been gathered from a range of sources through data requests and using online resources as outlined below. This includes data gathering in relation to statutory and non-statutory designated sites and protected and priority species.

2.1.2. In 2018, Ecus undertook a Preliminary Ecological Appraisal (PEA) for the M5 J10 Improvements Scheme[5]. Although the PEA did not cover large parts of the current study area and was undertaken at a sub-optimal time of year for habitat classification (late October), it was reviewed to obtain any information relevant tothe current assessment.

2.1.3. The MAGIC website[6] was reviewed to identify:

- Relevant statutory designated nature conservation sites within 2 km of the Scheme or with a direct hydrological connection; and
- Priority habitats and ancient woodland within 1 km of the Scheme.

2.1.4. The Woodland Trust's Ancient Tree Inventory website[7] was reviewed to locate records of ancient and veteran trees within 250 m of the Scheme.

2.1.5. Species of principal importance for the conservation of biodiversity listed under Section 41 of the Natural Environment & Rural Communities Act (NERC) 2006[8], the Red and Amber lists of Birds of Conservation Concern 4 (BoCC4)[9] and the Gloucestershire Local Biodiversity Action Plan[10] were reviewed as part of the datagathering exercise to identify relevant bird species considered to be important for biodiversity at the site. The Gloucestershire Bird Report[11] and Gloucestershire Breeding Bird Atlas[12] were reviewed to ascertain the population status of certainspecies within the county.

2.1.6. Gloucestershire Centre for Environmental Records (GCER) was contacted in September 2019 and again in April 2021 to obtain recent records[13] of:

- Non-statutory designated nature conservation sites within 1 km of the Scheme; and
- Protected and notable species within 1 km of the Scheme.

2.2. Field Surveys

2.2.1. Surveys were led by suitably experienced ecologists (considered competent to undertake breeding bird surveys in accordance with the Chartered Institute of Ecology and

[5] Ecus (2019). M5 J10 Preliminary Ecological Appraisal. Report prepared for Amey OW PLC, December 2018
[6] Defra. c2019. Magic Map Application. [Online]. [Accessed 5th September 2019]. Available from: https://magic.defra.gov.uk/MagicMap.aspx
[7] Woodland Trust. 2019. Ancient Tree Inventory - Woodland Trust. [Online]. [Accessed 20th May 2021]. Available from: https://ati.woodlandtrust.org.uk/
[8] Section 40 of the NERC Act 2006 sets out the duty for public authorities to conserve biodiversity in England. Habitats and species of principal importance for the conservation of biodiversity as identified by the Secretary of State for England, in consultation with Natural England, are referred to in Section 41 of the NERC Act 2006 for England. The list of habitats and species was updated in 2008 and is known as the England Biodiversity List.
[9] Eaton MA, Aebischer NJ, Brown AF, Hearn RD, Lock L, Musgrove AJ, Noble DG, Stroud DA and Gregory RD (2015) Birds of Conservation Concern 4: the population status of birds in the United Kingdom, Channel Islands, and Isle of Man. British Birds 108, 708–746. Available at: britishbirds.co.uk/wp-content/uploads/2014/07/BoCC4.pdf
[10] Gloucestershire Local Nature Partnership (2000) Biodiversity Action Plan for Gloucestershire Available from: https://www.gloucestershirenature.org.uk/biodiversity-action-plan-bap
[11] Goodhall, R., Kirk, G. and Petrek, S. (2020) Gloucestershire Bird Report 2014-16. Gloucestershire Ornithological Co-ordinating Committee
[12] Kirk, G. and Phillips, J. (2013) The Birds of Gloucestershire. Liverpool University Press
[13] Records of observations within the last 10 years

Environmental Management (CIEEM)[14]). In this case, the lead surveyor was an experienced ornithologist with over 15 years of professional bird survey and assessment experience.

2.2.2. The method employed for breeding bird surveys broadly conformed to that used for the Common Bird Census (CBC) survey, devised, and run between 1962 and 2000 by the British Trust for Ornithology (BTO) as detailed in in Gilbert et al. (1998)[15] and Bibby et al. (2000)[16]. CBC uses a mapping method in which a series of visits are made to a site during the breeding season, and observations of birds, by sight or sound, are recorded on a map during a walked transect.

2.2.3. Four survey visits were carried out (June and July 2019, May 2020, and April 2021), which was considered proportionate for a relatively localised road improvement Scheme, allowing sufficient observations of birds to produce clusters of registrations, and minimising the risk of overlooking scarce and/ or priority species. A total of nine representative transects of varying lengths were surveyed, which gave suitable coverage of the study area. This was reduced to six transects in May 2020 and April 2021 due to the reduction in the number of route options taken forward for the Scheme. The direction in which the transect was walked was varied between visits to optimise detection and minimise recording bias. Transects are shown on Figures 7.8A to 7.8D in Appendix A.

2.2.4. Walked transects generally commenced between 45 to 90 minutes after dawn and finished by 11 am to coincide with peak bird activity. Surveys were not carried out in heavy rain, poor visibility or strong wind as birds are under-recorded in such conditions. Dates and times of each survey visit are shown in Appendix B along with weather conditions.

2.2.5. The surveyor, with the aid of binoculars, recorded all observations of birds by either sight or sound by walking through the Survey Area at a slow and steady pace. The positions of the recorded birds were plotted as accurately as possible on a suitably scaled base map, i.e. a 'visit map'. Standard BTO codes and symbols[17] were used for mapping species (including sex and age, e.g. juvenile, immature, or adult) and bird activity where relevant (including singing, alarm calling, nest-building, carrying food and faecal sacs, territorial disputes and aggressive interactions, copulation, foraging, loafing and in flight).

2.2.6. The Breeding Bird Survey Area comprised all areas within the Scheme boundary and accessible land within 250 m of the Scheme. The Survey Area was designed to ensure that the assessment considered all potential impacts on all species present in the area within which an impact may occur, i.e. the Ecological Zone of Influence (EZoI), as well as those impacts which could occur within the footprint of the Scheme. This included species which may be sensitive to disturbance over large distances during the breeding season, such as certain raptor species. The extent of the Survey Area also allowed for some degree of design changes to the Scheme to be accommodated.

2.3. Assessment

Breeding Status

2.3.1. Registrations of birds during the surveys were judged to be 'breeding', 'probable breeding', 'possible breeding', or 'non-breeding' according to the criteria in Table 2-1 below. Breeding behaviour includes displaying, singing, territorial activity, agitated or defensive behaviour or pairs of adults together.

[14] https://cieem.net/resource/competencies-for-species-survey-css/
[15] Gilbert, G., Gibbon, D.W. and Evans J. (1998). Bird Monitoring Methods: A Manual of Techniques for Key UK Species. Royal Society for the Protection of Birds, The Lodge, Sandy, Bedfordshire
[16] Bibby C.J. Burgess, N.D. Hill D.A. Mustoe S. and Lambton S. (2000). Bird Census Techniques. Academic Press London
[17] BTO (2009) BTO Species Codes. BTO, Thetford

Table 2-1 - Breeding Criteria

Category	Criteria
Breeding	Adults observed at nest. Nest with eggs. Unfledged young. Carrying nest material, food, or faecal sac. Present in one location (within normal territory range) on at least two occasions in one breeding season and displaying behaviour indicative of breeding on at least one occasion.
Probable Breeding	Present in suitable breeding habitat in the same location (within normal territory range) in one breeding season on more than one occasion. Displaying breeding behaviour on one occasion only.
Possible Breeding	Present in suitable breeding habitat on one occasion.
Non-Breeding	Present in non-suitable habitat for breeding Immature birds.

2.3.2. The data captured during the survey visits were analysed to provide an estimate of the number of pairs of priority species within the Survey Area. The EZoI was considered to be up to 250 m for all species including those deemed to be susceptible to disturbance at greater distances during the breeding season such as raptors.

Defining Important Bird Species

2.3.3. For the purpose of this assessment, priority bird species are defined as those which are listed as species of principal importance (SPI) for the conservation of biodiversity in England, those identified as Red or Amber on The Birds of Conservation Concern 4 (BoCC4)[18], Annex I listed species on Directive 2009/147/EC (the Birds Directive), species listed on Schedule 1 of the Wildlife and Countryside Act 1981 (as amended), species listed on the Gloucestershire Local Biodiversity Action Plan, qualifying features of the Severn Estuary Special Protection Area (SPA) and/ or features of interests of the Severn Estuary Ramsar site, and qualifying features of Walmore Common SPA.

Determination of Bird Community Importance

2.3.4. The priority populations of breeding birds have been valued in a geographical context following the framework provided in LA 108[19]. The evaluation is based on the information gathered from the desk study and field surveys, using a combination of professional judgement and accepted criteria[20] (e.g. diversity, rarity, and naturalness).

2.4. Limitations

2.4.1. Due to the late commissioning of the surveys, the field work started in early June 2019 with subsequent visits undertaken in July 2019, May 2020, and April 2021. Visits were not

[18] Eaton, M.A., Aebischer, N.J., Brown, A.F., Hearn, R.D., Lock, L., Musgrove, A.J., Noble, D.G., Stroud, D.A. and Gregory, R.D. (2015) Birds of Conservation Concern 4: the population status of birds in the United Kingdom, Channel Islands and Isle of Man. British Birds 108, pp 708–746.
[19] Highways England. March 2020. LA 108 Biodiversity [Online]. [Accessed October 2020]. Available from: https://www.standardsforhighways.co.uk/dmrb/search?discipline=SUSTAINABILITY_AND_ENVIRONMENT
[20] Set out in Ratcliffe, D.A (1977). A Nature Conservation Review. Cambridge University Press.

undertaken during March or April 2020 due to the Coronavirus pandemic. Surveys undertaken in May 2020 and April 2021 started later than recommended due to health and safety restrictions including not being able to stay overnight close to the survey location as a result of the Coronavirus pandemic.

2.4.2. Territorial analysis of priority species could not be undertaken as only two visits were undertaken in any one year. A minimum of four visits during the breeding season in one year is recommended[21],[22],[23] to obtain sufficient registrations so that an approximate estimation of the numbers and distribution of breeding bird territories within the survey area can be established.

2.4.3. The breeding status of some species may have classified at a lower level, e.g. classified as probable breeding as opposed to breeding, than if three or four visits were undertaken in one year.

2.4.4. The M5 and A4019 was subject to a high volume of traffic towards the end of each survey visit due to increases in commuter traffic volume, which resulted in significant noise pollution surrounding the road network. Birds are generally sensitive to noise pollution; therefore, it is not considered that any significant assemblages of priority species would be present in the areas of vegetation immediately surrounding the road network that were subject to the highest levels of noise pollution during the surveys.

2.4.5. Access to all land parcels within 250 m of the Scheme was not granted by the time the surveys were undertaken. As such, surveys of certain areas, particularly at the north east extent of the Scheme, could only be undertaken from Public Rights of Way (PRoWs), which were up to 250 m from the Scheme in places.

2.4.6. Ornithological surveys are affected by a variety of factors which affect the presence of birds such as season, weather, climate, migration patterns, food availability, species behaviour and the presence of predators. Therefore, bird surveys for this Scheme may not have produced a complete bird list and the absence of evidence of any particular species within the Survey Area (or a part of the Survey Area), should not be taken as conclusive proof that the species is not present or that it will not be present in the future.

2.4.7. However, the results of these bird surveys and the subsequent assessment provide an indication of the use of the EZoI by breeding bird species during the survey period. The results can therefore be used with confidence during the analysis of potential impacts resulting from the Scheme.

2.4.8. Assuming submission in summer 2022, the bird survey data from 2019 will be three years old. It is proposed to undertake update extended Phase 1 Habitat Surveys in targeted areas in order to determine whether any of the baseline conditions have changed significantly, and validate, or otherwise, the results described in this report. This report will be updated to include these surveys and will be submitted as part of the ES.

[21] Hill, D., Fasham, M., Tucker, G., Shewry, M. and Shaw, P. (2005) Handbook of biodiversity methods: survey, evaluation and monitoring. Cambridge University Press: Cambridge
[22] Hinsley, S.A., Bellamy, P.E., Newton, I., and Sparks, T.H. (1995) Habitat and landscape factors influencing the presence of individual species in woodland fragments. Journal of Avian Biology: 26, 94-104.
[23] Amar, A., Hewson, C., Thewlis, R.M., Smith, K.W., Fuller, R. J., Lindsell, J. A., Conway, G., Butler, S. And MacDonald, M. A. (2008) What's happening to our woodland birds? BTO Research Report Number 169.

3. Results

3.1. Desk Study

Designated Sites

3.1.1. The closest statutory designated sites that have been specifically designated with respect to their ornithological importance are Walmore Common SPA and Ramsar site, and the Severn Estuary SPA and Ramsar site, located approximately 17.5 km and 22.7 km to the south west of the Site respectively. Walmore Common SPA is designated under Articles 4.1 of the EC Directive 79/409/EEC for regularly supporting populations of European importance of Bewick's swan (***Cygnus columbianus***) over winter; and Severn Estuary SPA is designated under Article 4.1 of the EC Directive 79/409/EEC for supporting populations of European importance of wintering wildfowl and waders and under Article 4.2 for regularly supporting at least 20,000 waterfowl over winter.

3.1.2. There is one statutory designated site with birds as a feature of interest within 2 km of the Scheme. This is Coombe Hill Canal SSSI, located approximately 1.9 km to the north west, designated partly for its diverse breeding bird assemblage, particularly resident and migrant warblers which make use of the scrub and withy bed habitats and waders such as curlew (***Numenius arquata***) and snipe (***Gallinago gallinago***) which frequent the wetter areas of the fen and ditch margins.

3.1.3. There are no non-statutory designated sites within 2 km of the Scheme.

3.1.4. There are no recorded ancient woodlands within 1 km of the Scheme.

3.1.5. Priority habitat records identified during the desk study within 1 km of the Scheme include:

- Deciduous woodland and traditional orchards within the Scheme
- Good Quality Semi-Improved Grassland (Lowland Meadows and Pastures) approximately 640 m west of the Scheme
- Coastal and Floodplain Grazing Marsh approximately 680 m west of the Scheme

3.1.6. Other habitats present within the Survey Area, including semi-natural and plantation woodland, scrub, agricultural habitats, and built-up areas provide suitable habitat to support an assemblage of priority and common bird species.

Biological Records

3.1.7. The Gloucestershire Local Biodiversity Action Plan comprises action plans for 13 bird species in total, namely bittern (***Botaurus stellaris***), nightjar (***Caprimulgus europaeus***), woodlark (***Lullula arborea***), spotted flycatcher (***Muscicapa striata***) and 'farmland birds' (bullfinch (***Pyrrhula pyrrhula***), corn bunting (***Emberiza calandra***), grey partridge (***Perdix perdix***), linnet (***Linaria cannabina***) , reed bunting (***Emberiza schoeniclus***), skylark (***Alauda arvensis***), song thrush (***Turdus philomelos***), tree sparrow (***Passer montanus***) and turtle dove (***Streptopelia turtur***)).

3.1.8. The desk study identified recent records (i.e., since 2010) of 34 priority bird species[24] within 1 km of the Scheme, of which 25 species were recorded within the breeding season (i.e., March to August inclusive). This includes:

[24] In this context, priority birds include those listed as species of principal importance for the conservation of biodiversity in England, those identified as Red or Amber on BoCC4, Annex I listed species on Directive 2009/147/EC (the Birds Directive), those listed on Schedule 1 of the Wildlife and Countryside Act 1981 (as amended), species listed on the Gloucestershire Biodiversity Action Plan, qualifying features of the Severn Estuary SPA and/or features of interests of the Severn Estuary Ramsar site, qualifying features of Walmore Common SPA.

- Three species on Schedule 1 of the Wildlife and Countryside Act 1981 (barn owl (***Tyto alba***), kingfisher (***Alcedo atthis***) and red kite (***Milvus milvus***)).
- Eleven species on the Red List (cuckoo (***Cuculus canorus***), grey wagtail (***Motacilla cinerea***), herring gull (***Larus argentatus***), house sparrow (***Passer domesticus***), linnet, mistle thrush (***Turdus viscivorus***), skylark, song thrush, starling (***Sturnus vulgaris***), yellowhammer (***Emberiza citronella***) and lapwing (***Vanellus vanellus***)) and 13 species on the Amber List of the BoCC4 species (black-headed gull (***Chroicocephalus ridibundus***), common gull (***Larus canus***), dunnock (***Prunella modularis***), great black-backed gull (***Larus marinus***), house martin (***Delichon urbicum***), kestrel (***Falco tinnunculus***), kingfisher, lesser black-backed gull (***Larus fuscus***), mallard (***Anas platyrhynchos***), redstart (***Phoenicurus phoenicurus***), stock dove (***Columba oenas***), swift (***Apus apus***) and willow warbler (***Phylloscopus trochilus***)).
- Ten species are listed as species of principal importance for the conservation of biodiversity in England (cuckoo, dunnock, herring gull, house sparrow, lapwing, linnet, skylark, song thrush, starling, and yellowhammer);
- Two species listed on Annex 1 of the Birds Directive (kingfisher and red kite);
- Three species listed on the Gloucestershire Local Biodiversity Action Plan (linnet, skylark, and song thrush);
- Two qualifying species of the Severn Estuary SPA (mallard and lapwing); and
- Two species identified on the Severn Estuary Ramsar Information Sheet (herring gull, identified as noteworthy fauna and lesser-back backed gull, identified as a species subsequent to designation for possible future consideration under criterion 6).

3.2. Field Survey

3.2.1. A total of 62 species were recorded within the Survey Area, of which 26 are priority species. The full survey species list, peak counts (i.e., the maximum number recorded within one month) and conservation status are provided in Appendix C and the results are shown on Figures 7.8A to 7.8D in Appendix A. This priority species recorded includes:

- Three species are listed on Schedule 1 of the Wildlife and Countryside Act 1981 (as amended) (hobby (***Falco Subbuteo***), kingfisher and red kite);
- Ten species on the Red List (grey wagtail, herring gull, house sparrow, linnet, mistle thrush, skylark, song thrush, starling, yellow wagtail (***Motacilla flava***) and yellowhammer) and 13 species on the Amber List of the BoCC4 species (black-headed gull, bullfinch, dunnock, house martin, kestrel, kingfisher, lesser black-backed gull, mallard, meadow pipit (***Anthus pratensis***), reed bunting, stock dove, swift and willow warbler).
- Eleven species listed as species of principal importance for the conservation of biodiversity in England (bullfinch, dunnock, herring gull, house sparrow, linnet, reed bunting, skylark, song thrush, starling, yellow wagtail, and yellowhammer);
- Three species listed on Annex 1 of the Birds Directive (kingfisher, little egret (***Egretta garzetta***) and red kite);
- Five species listed on the Gloucestershire Local Biodiversity Action Plan (bullfinch, linnet, reed bunting, skylark, and song thrush);
- One qualifying feature of the Severn Estuary SPA (mallard); and
- Three species identified on the Severn Estuary Ramsar Information Sheet have been recorded. Herring gull and little egret are identified as noteworthy fauna and lesser-black backed gull is identified as a species subsequent to designation for possible future consideration under criterion 6.

3.2.2. Of the 62 species recorded, 33 species are confirmed as breeding or considered to have bred, 15 species are probable breeders, and 10 species are possible breeders within the Survey Area. Four species are considered to be non-breeders

3.2.3. All priority species recorded, along with peak counts within the EZoI, legal protection and conservation status, are set out in Table 3-1 to Table 3-3 below according to their breeding status. The full survey results are provided in Appendix C

Table 3-1 - Breeding Priority Species

Species	Number/ peak count	Location	Status
Dunnock	5	Recorded throughout the Survey Area, associated with hedgerows, scrub and woodland.	Amber List BoCC, SPI
Grey Wagtail	7	Generally associated with the River Chelt near Butler's Court and Millhouse Farm.	Red List BoCC
House Martin	36	Recorded breeding in Hardwicke and foraging throughout the Survey Area.	Amber List BoCC
House Sparrow	116	Associated with urban areas, residential properties, and farmyards (e.g., Uckington and Butler's Court)	Red List BoCC, SPI
Kestrel	3	Recorded in low numbers, at or near Colmans Farm, Butlers' Court and Millhouse Farm.	Amber List BoCC
Song Thrush	15	Breeding birds were recorded throughout the Survey Area associated with semi-natural and plantation woodland, hedgerows, scattered trees, and gardens	Red List BoCC, SPI
Starling	50	Generally associated with urban areas, residential properties, and farmyards, and foraging throughout the Survey Area on improved grassland.	Red List BoCC, SPI
Stock Dove	47	Recorded breeding in a mature tree in a hedgerow at Millhouse Farm. Recorded foraging, loafing and in flight throughout the survey area in agricultural habitats.	Amber List BoCC
Yellow Wagtail	10	Generally associated with arable habitat, particularly at Butler's Court and north of Withybridge.	Red List BoCC, SPI
Yellowhammer	18	Breeding birds were recorded throughout the Survey Area, generally associated with hedgerows and scrub in agricultural areas.	Red List BoCC, SPI

Table 3-2 - Probable Breeding Priority Species

Species	Number/peak count	Location	Status
Bullfinch	2	One pair recorded in scrub at Stanboro.	Amber List BoCC
Lesser Black- backed Gull	57	Gallagher retail park.	Amber List BoCC
Linnet	7	Recorded in low numbers in agricultural areas throughout most of the Survey Area.	Red List BoCC, SPI
Mallard	13	Recorded in low numbers in flight, and at the moat at Moat House and the River Chelt.	Amber List BoCC
Mistle Thrush	4	Recorded in low numbers, particularly at or near Boddington Manor Farm, Butlers' Court and Millhouse Farm.	Red List BoCC
Reed bunting	1	One individual recorded in tall ruderal vegetation north of Withybridge.	Amber List BoCC, SPI
Skylark	31	Arable and pasture throughout the Survey Area.	Red List BoCC, SPI
Swift	13	Recorded foraging in low numbers over agricultural areas throughout most of the Survey Area.	Amber List BoCC

Table 3-3 - Possible Breeding Priority Species

Species	Number/peak count	Location	Status
Herring Gull	18	Gallagher retail park.	Red List BoCC, SPI
Hobby	1	Recorded in flight at Hayden Hill Fruit Farm. Possibly breeding in a mature tree at any location within the Survey Area or the wider area but likely within a woodland or copse.	Schedule 1
Kingfisher	3	River Chelt at Butlers' Court and Millhouse Farm.	Schedule 1, Annex 1, Amber List BoCC

Species	Number/peak count	Location	Status
Meadow pipit	30	Generally low numbers recorded foraging in on grasslands and arable fields throughout most of the Survey Area, with larger numbers recorded at Pilgrove Farm.	Amber List BoCC
Red Kite	1	Recorded in flight at Barn Farm. Possibly breeding in a large mature tree at any location within the Survey Area or the wider area, but likely within a woodland or copse.	Schedule 1, Annex 1
Willow warbler	1	One individual recorded in gardens at the west of Uckington.	Amber List BoCC

3.3. Incidental Records

3.3.1. Two additional species, barn owl and tawny owl (***Strix aluco***), were recorded during other ecology surveys undertaken during the breeding period (March to August inclusive) that were not observed during the Breeding Bird Surveys.

3.3.2. Barn owl was observed on six separate occasions during 2019 to 2021 inclusive. This species was observed at the same location on two separate occasions in the same breeding season (June and July 2020), and is therefore considered to be probably breeding.

3.3.3. Tawny owl was observed on one occasion in suitable breeding habitat during the breeding season and is considered to be possibly breeding.

3.4. Description of Bird Assemblages

3.4.1. The assemblage of breeding birds is considered to be largely typical of agricultural areas, woodland and scrub and built-up areas within Gloucestershire.

3.4.2. The presence of agricultural habitats such as arable fields, hedgerows and improved grassland within the Survey Area has resulted in the recording of associated priority species including grey wagtail, kestrel, linnet, skylark, starling, stock dove, yellow wagtail, and yellowhammer.

3.4.3. Notable species associated with semi-natural broadleaved woodland include mistle thrush, song thrush and tawny owl; and those associated with built-up areas include house martin, house sparrow, swallow (***Hirundo rustica***) and starling.

4. Evaluation

4.1.1. Five species are identified in a county or equivalent authority area plans or strategies, i.e. within the Gloucestershire Local Biodiversity Action Plan (under 'farmland birds'): bullfinch (peak count of two), linnet (peak count of seven), reed bunting (peak count of one), skylark (peak count of 31) and song thrush (peak count of 15).

4.1.2. Fifty-six of the 62 species recorded during the Breeding Bird Survey or as an incidental observation have a Gloucestershire breeding population status that is abundant (i.e. breeding numbers of 10000+), common (i.e. breeding numbers of 1000 to 9999), or fairly common (i.e. breeding numbers of 100 to 999)[25].

4.1.3. Seven species recorded during the Breeding Bird Survey or as an incidental observation have a Gloucestershire breeding population status that is uncommon (i.e. breeding numbers of 10-99), or scarce (i.e. breeding numbers of one to nine)[26], i.e.:

- Barn owl (uncommon or scarce breeding resident). Incidental observations of one or two individuals (two separate observations on the same date at locations approximately 1 km apart) were recorded in June 2020;
- Grey wagtail (uncommon breeding resident). Peak count of five individuals recorded in May 2020;
- Herring gull (uncommon breeding resident). Peak count of 18 individuals recorded in May 2020;
- Hobby (uncommon breeding resident). One individual recorded in June 2019;
- Lesser whitethroat (***Curruca curruca***) (uncommon breeding summer visitor). Peak count of four individuals recorded in June 2019.;
- Red kite (uncommon but increasing visitor, now breeding in the County). One individual recorded in July 2019;
- Yellow wagtail (uncommon breeding summer visitor). Peak count of 10 individuals recorded in June 2019.

4.1.4. One qualifying species of the Severn Estuary SPA has been recorded; i.e. mallard (peak count of ten). Given the low numbers of mallard recorded, they are unlikely to be a significant component of the SPA population. Furthermore, at this distance from the SPA (located over 20 km south west of the Scheme at the nearest point), it is considered highly unlikely that the individuals recorded within the study area are part of the SPA qualifying feature population. This is supported by a recent study[27] which identifies functionally linked land associated with the Severn Estuary SPA. The maps which accompany this study do not identify that this species regularly move between the SPA and the study area.

4.1.5. Two features identified on the Severn Estuary Ramsar Information Sheet have been recorded. Herring gull (identified as noteworthy fauna) and lesser black-backed gull (identified as a species subsequent to designation for possible future consideration under criterion 6) were generally recorded in low numbers (peak counts of 18 and 57 respectively). It is considered that these individuals are likely to be breeding within urban areas such as Cheltenham and/ or Gloucester, as opposed to the Ramsar site breeding colonies at Steep Holm and Flat Holm[28] (located approximately 90 km south west). Cheltenham Borough Council states that "Herring Gulls and Lesser Black-Backed Gulls

[25] Goodhall, R., Kirk, G. and Petrek, S. (2020) Gloucestershire Bird Report 2014-16. Gloucestershire Ornithological Co-ordinating Committee
[26] Goodhall, R., Kirk, G. and Petrek, S. (2020) Gloucestershire Bird Report 2014-16. Gloucestershire Ornithological Co-ordinating Committee
[27] Link Ecology Ltd (September 2020) Identification of land with proven or possible functional linkages with the Severn Estuary SSSI/SPA Phase 5 (Gloucestershire and Worcestershire) A report to Natural England.

[28] Burton, N.H.K., Musgrove, A.J., Rehfisch, M.M., and Clark N.A. (2010) Birds of the Severn Estuary and Bristol Channel: Their current status and key environmental issues. Marine Pollution Bulletin 61 (2010) 115–123

nest in the residential areas of Cheltenham and on industrial units in the Kingsditch area"[29]. The JNCC Seabird Monitoring Programme online database states that the Gloucestershire Urban Gulls Cheltenham site (85627) supported 46 herring gulls apparently occupied territories and 273 lesser black-backed gulls apparently occupied territories in 2011 (year of last count) and the Gloucester City: Gloucester site (86737) supported 657 herring gulls apparently occupied nests and 2230 lesser black-backed gull apparently occupied nests in 2009 (year of last count)[30].

4.1.6. The habitats within the Survey Area are not considered to provide a role in maintaining the SPA or Ramsar populations or functionally linked to any SPAs or Ramsar sites.

4.1.7. Although five species are listed on the GBAP, these species are currently listed as either common or fairly common resident breeders within Gloucestershire. The peak counts for these species (see section 3.1) within the survey area are not considered to be of county importance in relation to breeding numbers for Gloucestershire.

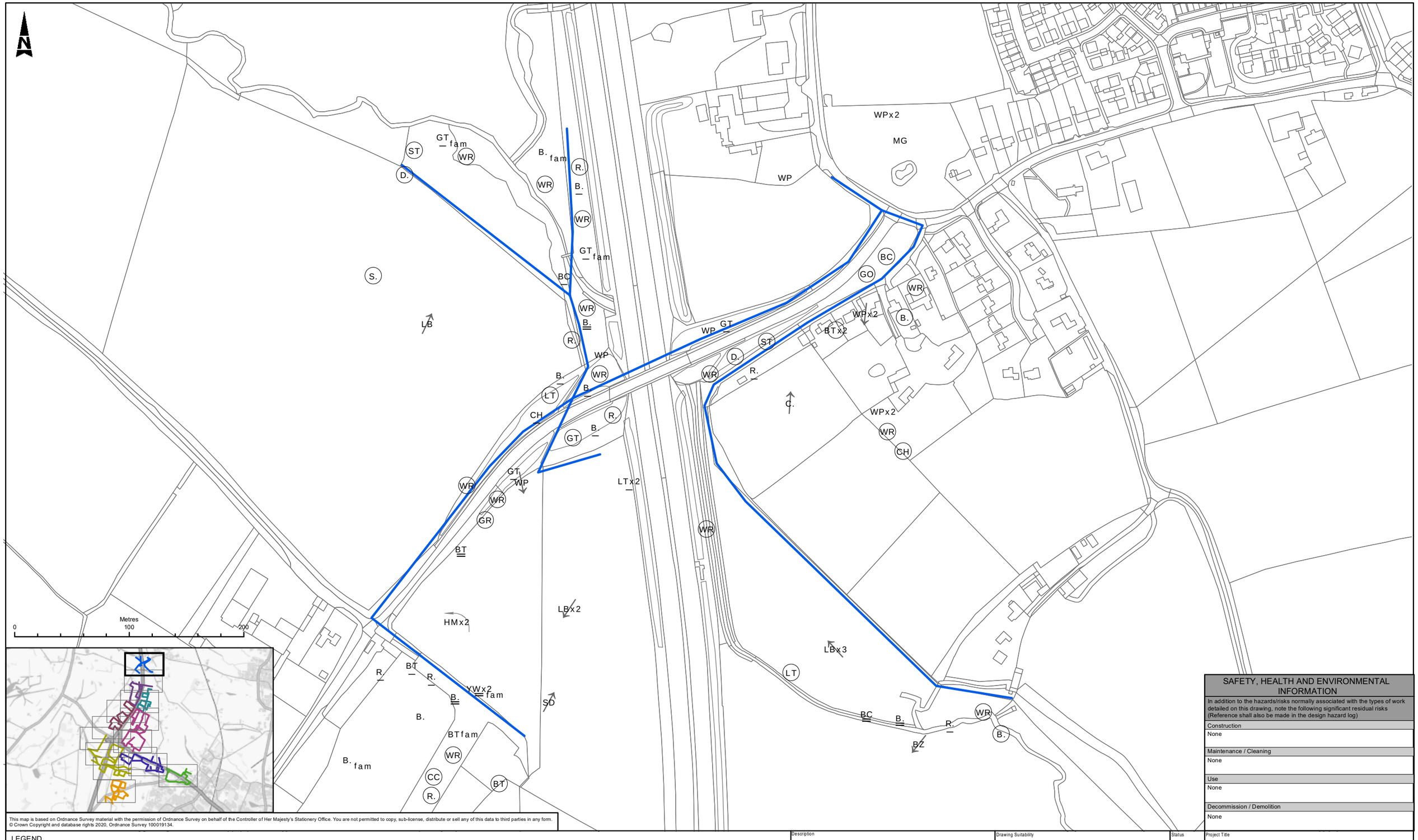
4.1.8. Therefore, taken as a whole, the breeding bird assemblage is considered to appreciably enrich the habitat resource within the local context. The assemblage of breeding birds is therefore considered to be of Local value for biodiversity.

[29] Cheltenham Borough Council (2018) Urban Gulls Scrutiny Task Group Report. Available at https://democracy.cheltenham.gov.uk/documents/s27390/2018_12_04_CAB_Urban_Gulls_scrutiny_report.pdf
[30] Available at https://app.bto.org/seabirds/public/index.jsp

Appendices to Appendix 7.8

- Appendix A
- Appendix B
- Appendix C

Appendix A. Figures 7.8A – 7.8D Breeding bird survey results



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SPECIES (BTO CODES)

B.	BLACKBIRD	C.	CARRION CROW	GL	GREY WAGTAIL	HS	HOUSE SPARROW	LW	LESSER WHITETHROAT	SI	SWIFT
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		GC	GOLDCREST					SH	SPARROWHAWK		

Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
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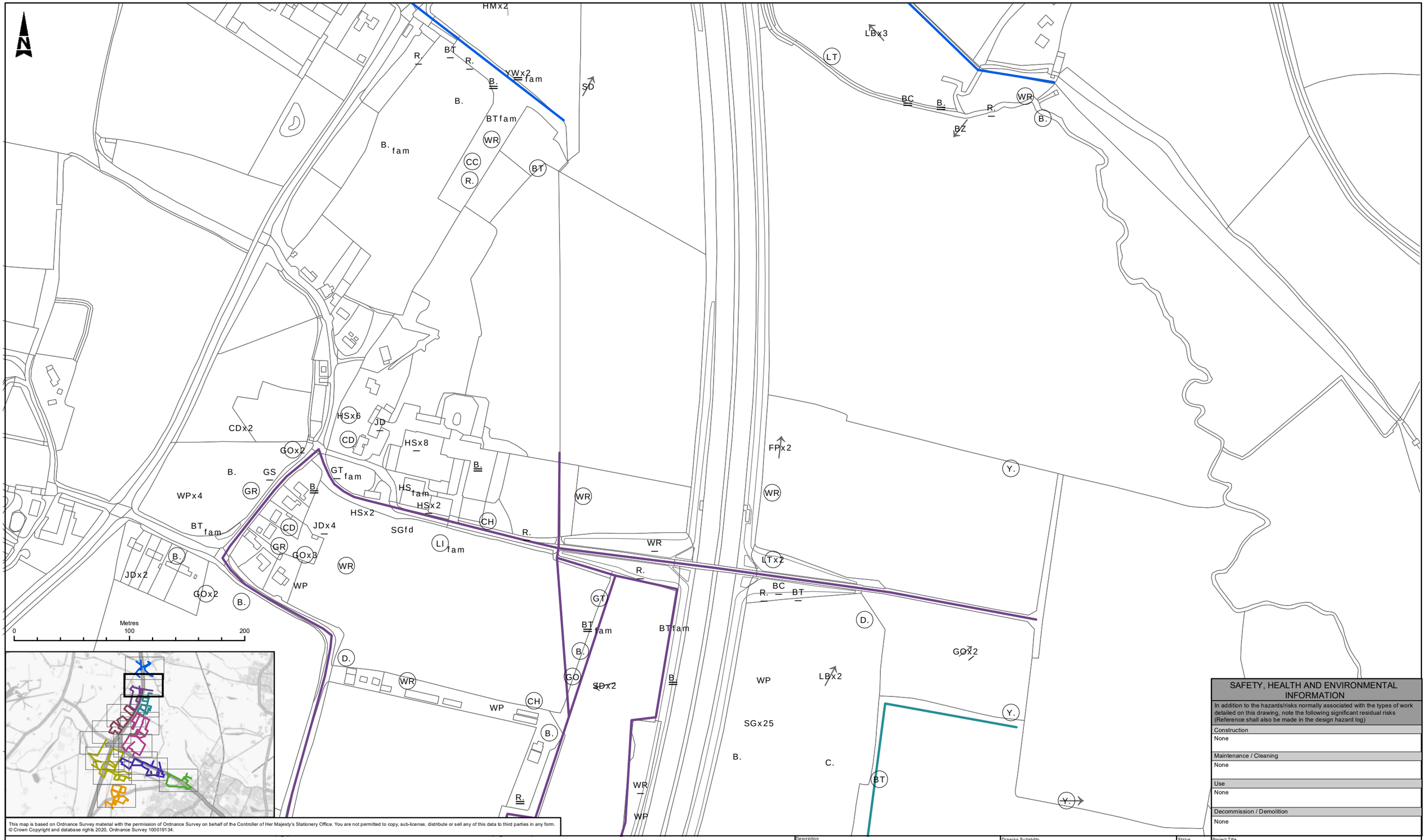
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Drawing Title: FIGURE 7.8A
BREEDING BIRD SURVEY RESULTS
JUNE 2019

Drawing Number: Project | Originator | Volume
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Location | Type | Number

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R.	ROBIN
S.	SKYLARK
SD	STOCK DOVE
SG	STARLING
SH	SPARROWHAWK
SI	SWIFT
SL	SWALLOW
ST	SONG THRUSH
WP	WOOD PIGEON
WH	WHITETHROAT
WR	WREN
Y.	YELLOWHAMMER
YW	YELLOW WAGTAIL

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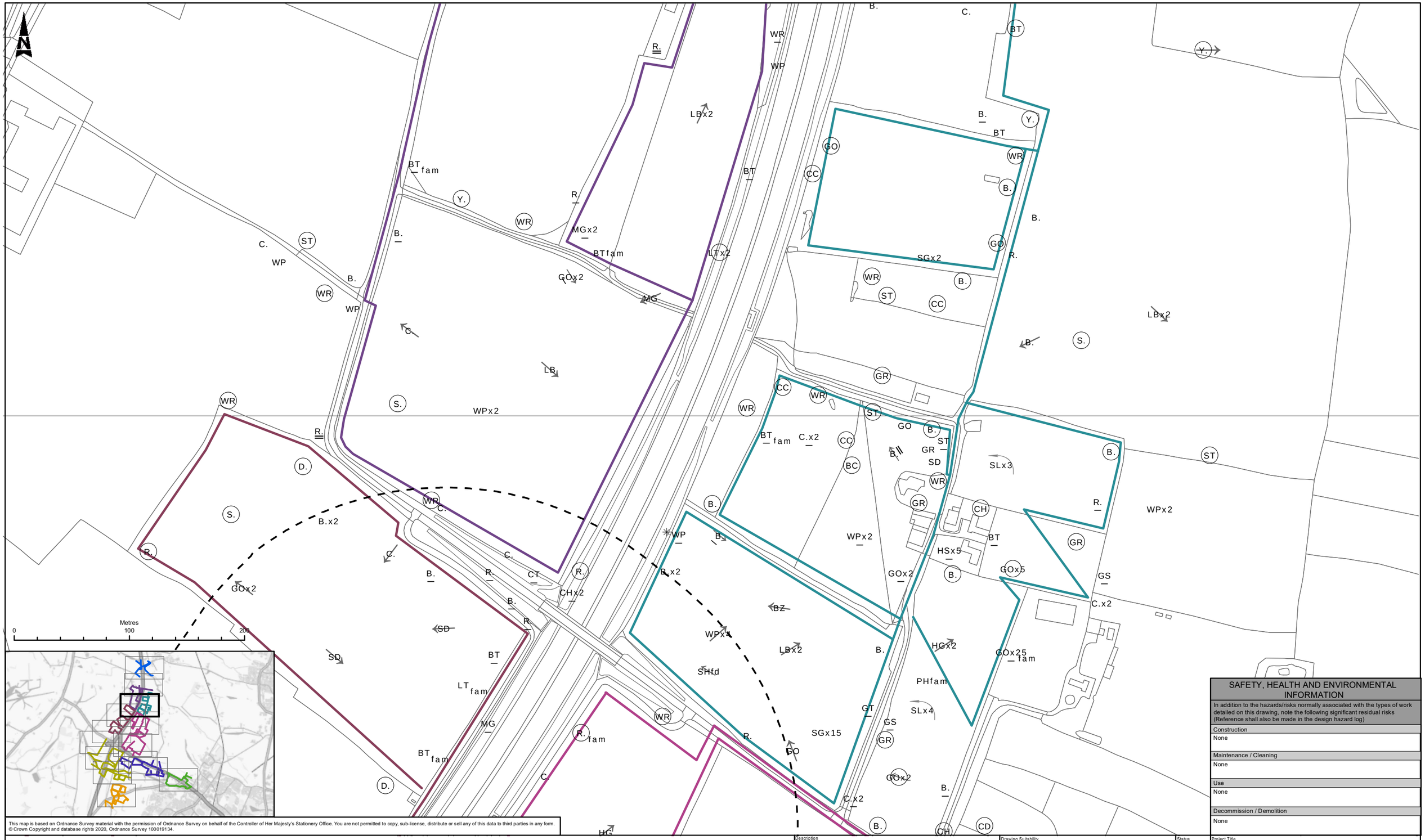
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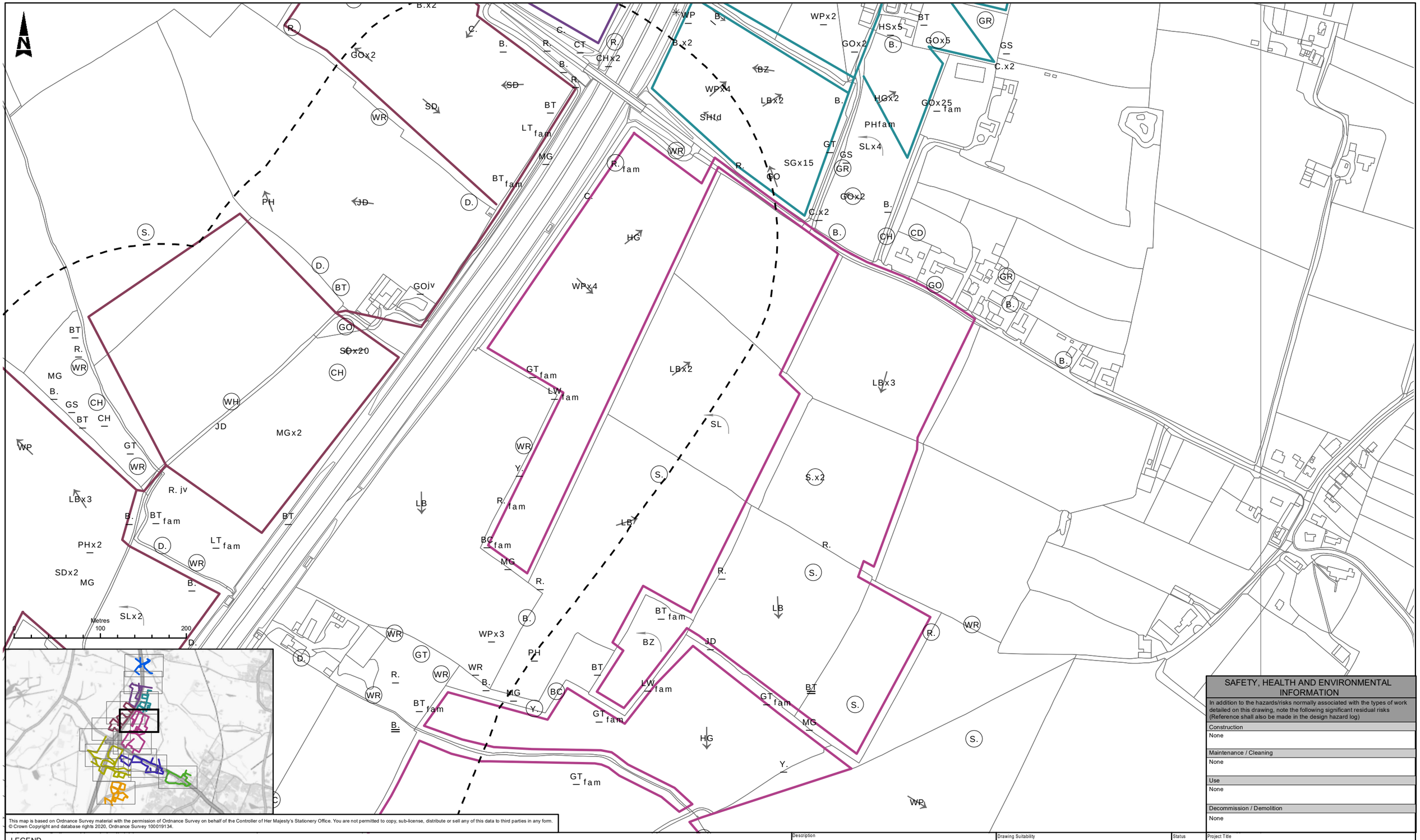
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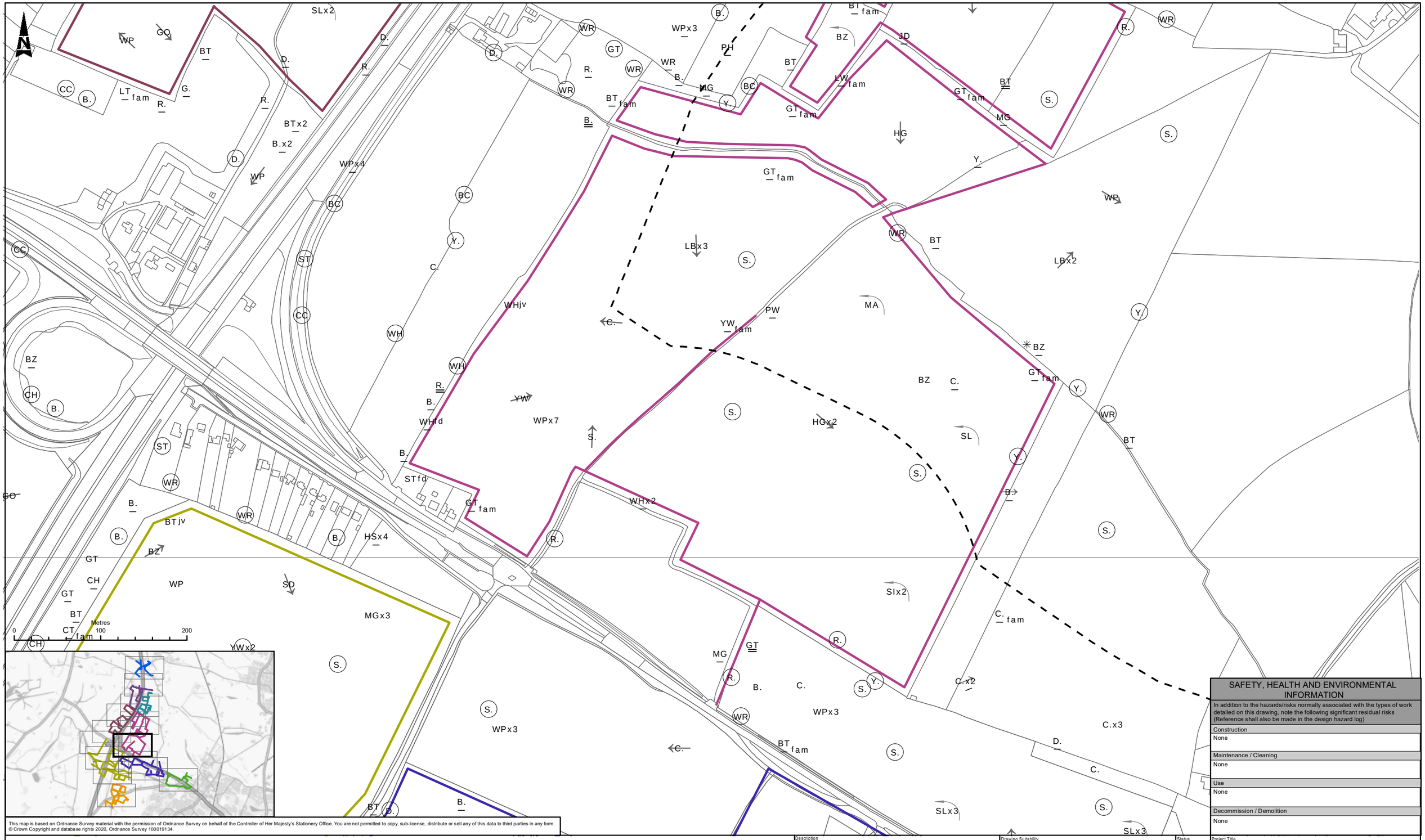
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Drawing Number: Project | Originator | Volume
GCCM5J10 - ATK - EBD
XX - GS - GI - 000017
Location | Number

Original Size: A3 | Scale: 1:4,000 | Project Ref: 5197035 | Sheet: 4 of 14 | Rev: P01



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LEGEND

- 250M STUDY AREA
- TRANSECT 1
- TRANSECT 2
- TRANSECT 3
- TRANSECT 4
- TRANSECT 5
- TRANSECT 6
- TRANSECT 7
- TRANSECT 8
- TRANSECT 9

BEHAVIOURS

- = ALARM CALL
- _ CALLING
- fd CARRYING FOOD
- mat CARRYING NEST MATERIAL
- fam FAMILY
- → FLYING
- FORAGING IN FLIGHT
- jv JUVENILE
- ✳ OCCUPIED NEST
- ◯ SINGING

SPECIES (BTO CODES)

B.	BLACKBIRD	C.	CARRION CROW	GL	GREY WAGTAIL	HS	HOUSE SPARROW	LW	LESSER WHITETHROAT
BC	BLACKCAP	CC	CHIFFCHAFF	GO	GOLDFINCH	HY	HOBBY	MG	MAGPIE
BT	BLUE TIT	CD	COLLARED DOVE	GR	GREENFINCH	J.	JAY	PW	PIED WAGTAIL
BZ	BUZZARD	CH	CHAFFINCH	GS	GREAT SPOTTED WOODPECKER	JD	JACKDAW	PH	PHEASANT
		CT	COAL TIT	GT	GREAT TIT	LB	LESSER BLACK-BACKED GULL	R.	ROBIN
		D.	DUNNOCK	H.	GREY HERON			S.	SKYLARK
		FP	FERAL PIGEON	HG	HERRING GULL	LI	LINNET	SD	STOCK DOVE
		G.	GREEN WOODPECKER	HM	HOUSE MARTIN	LT	LONG-TAILED TIT	SG	STARLING
		GC	GOLDCREST					SH	SPARROWHAWK

SI	SWIFT
SL	SWALLOW
ST	SONG THRUSH
WP	WOOD PIGEON
WH	WHITETHROAT
WR	WREN
Y.	YELLOWHAMMER
YW	YELLOW WAGTAIL

Description

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date

Description

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date

Description

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date

Description

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date

Description
FOR INFORMATION

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
S2	P01	SD	LH	--	--	24/09/21

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log)

Construction
None

Maintenance / Cleaning
None

Use
None

Decommission / Demolition
None

Drawing Suitability: FOR INFORMATION
Status: S2

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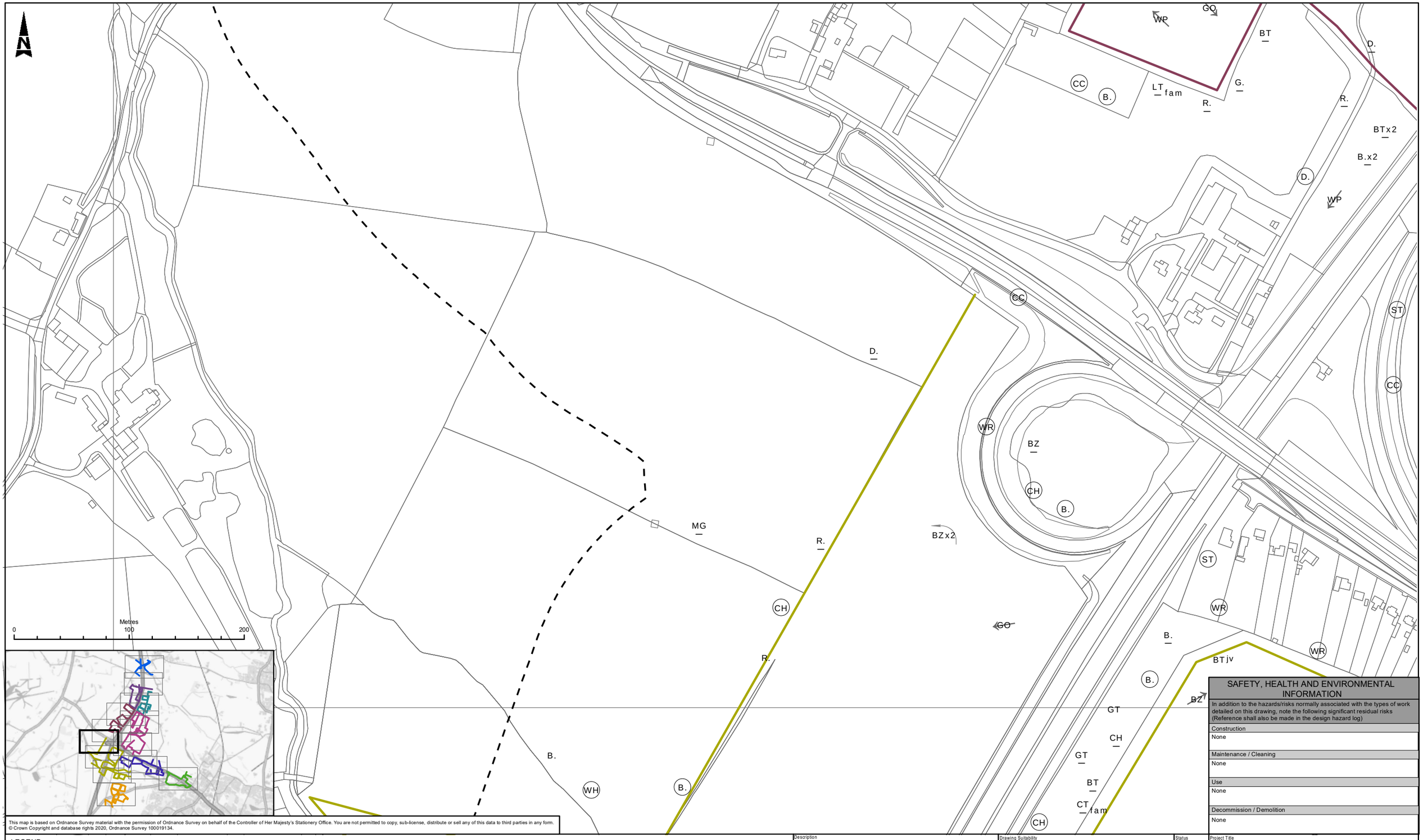
Client: Gloucestershire County Council

Project Title: M5 Junction 10 Improvement

Drawing Title: FIGURE 7.8A
BREEDING BIRD SURVEY RESULTS
JUNE 2019

Drawing Number
Project | Originator | Volume
GCCM5J10 - ATK - EBD
Location | Type | Number
XX - GS - GI - 000017

Original Size:	Scale	Project Ref:	Sheet:	Rev:
A3	1:4,000	5197035	5 of 14	P01



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LEGEND

- 250M STUDY AREA
- TRANSECT 1
- TRANSECT 2
- TRANSECT 3
- TRANSECT 4
- TRANSECT 5
- TRANSECT 6
- TRANSECT 7
- TRANSECT 8
- TRANSECT 9

BEHAVIOURS

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- _ CALLING
- fd CARRYING FOOD
- mat CARRYING NEST MATERIAL
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- → FLYING
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- jv JUVENILE
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SPECIES (BTO CODES)

B.	BLACKBIRD	C.	CARRION CROW	GL	GREY WAGTAIL	HS	HOUSE SPARROW
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BZ	BUZZARD	CH	CHAFFINCH	GS	GREAT SPOTTED WOODPECKER	JD	JACKDAW
		CT	COAL TIT	GT	GREAT TIT	LB	LESSER BLACK-BACKED GULL
		D.	DUNNOCK	H.	GREY HERON	LI	LINNET
		FP	FERAL PIGEON	HG	HERRING GULL	LT	LONG-TAILED TIT
		G.	GREEN WOODPECKER	HM	HOUSE MARTIN		
		GC	GOLDCREST				

LW	LESSER WHITETHROAT	SI	SWIFT
MG	MAGPIE	SL	SWALLOW
PW	PIED WAGTAIL	ST	SONG THRUSH
PH	PHEASANT	WP	WOOD PIGEON
R.	ROBIN	WH	WHITETHROAT
S.	SKYLARK	WR	WREN
SD	STOCK DOVE	Y.	YELLOWHAMMER
SG	STARLING	YW	YELLOW WAGTAIL
SH	SPARROWHAWK		

Description

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date

Description

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date

Description

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date

Description

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date

Description FOR INFORMATION

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
S2	P01	SD	LH	--	--	24/09/21

Drawing Suitability: FOR INFORMATION

Status: S2

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log)

Construction
None

Maintenance / Cleaning
None

Use
None

Decommission / Demolition
None

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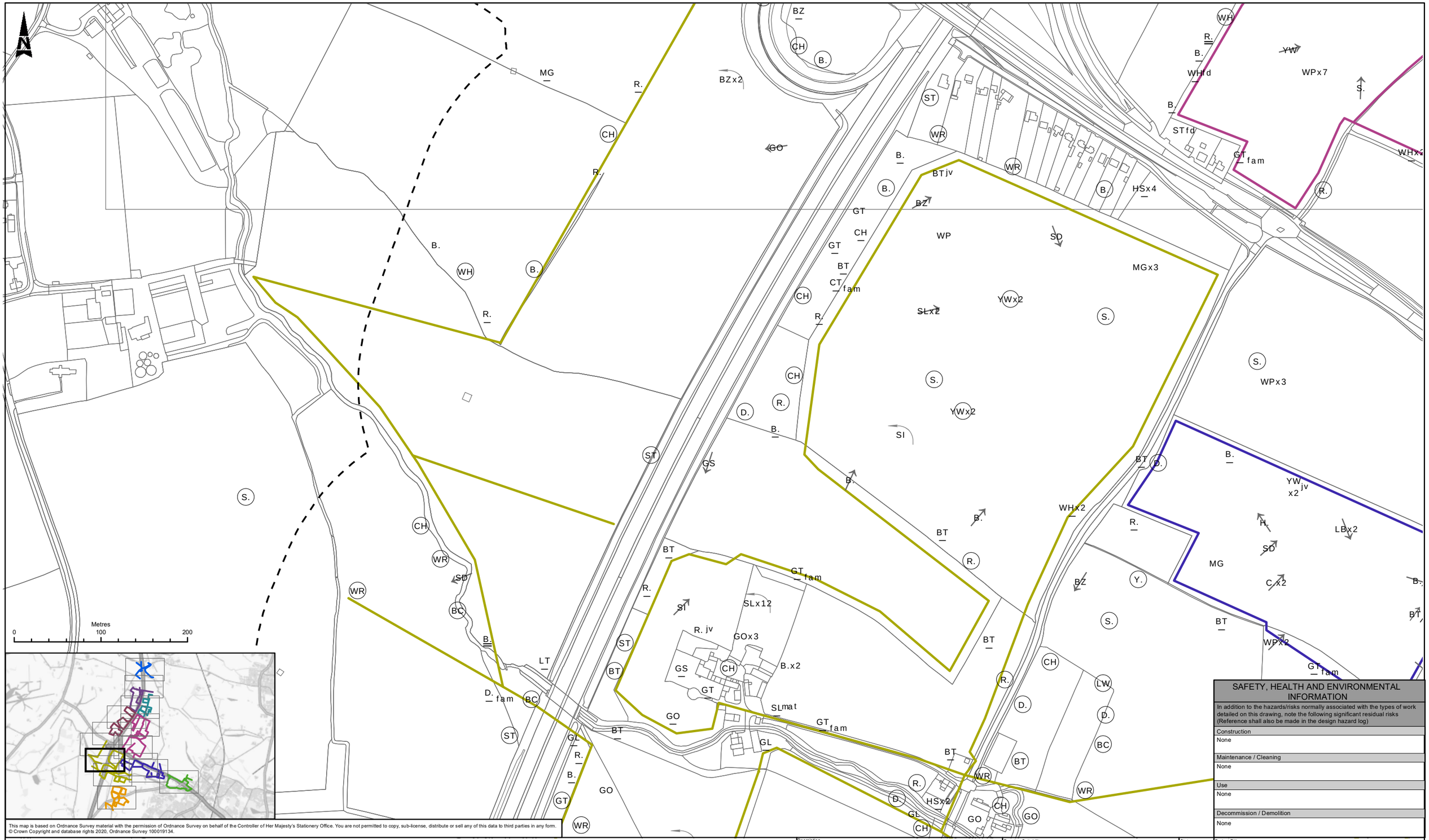
Client: Gloucestershire County Council

Project Title: M5 Junction 10 Improvement

Drawing Title: FIGURE 7.8A
BREEDING BIRD SURVEY RESULTS
JUNE 2019

Drawing Number: Project | Originator | Volume
GCCM5J10 - ATK - EBD
XX - GS - GI - 000017
Location | Number

Original Size:	Scale	Project Ref:	Sheet:	Rev:
A3	1:3,000	5197035	6 of 14	P01



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LEGEND

- 250M STUDY AREA
- TRANSECT 1
- TRANSECT 2
- TRANSECT 3
- TRANSECT 4
- TRANSECT 5
- TRANSECT 6
- TRANSECT 7
- TRANSECT 8
- TRANSECT 9

BEHAVIOURS

- = ALARM CALL
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- fd CARRYING FOOD
- mat CARRYING NEST MATERIAL
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SPECIES (BTO CODES)

B.	BLACKBIRD	C.	CARRION CROW	GL	GREY WAGTAIL	HS	HOUSE SPARROW	LW	LESSER WHITETHROAT	SI	SWIFT
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GC	GOLDCREST	CT	COAL TIT	GT	GREAT TIT	LB	LESSER BLACK-BACKED GULL	R.	ROBIN	WH	WHITETHROAT
		D.	DUNNOCK	H.	GREY HERON			S.	SKYLARK	WR	WREN
		FP	FERAL PIGEON	HG	HERRING GULL	LI	LINNET	SD	STOCK DOVE	Y.	YELLOWHAMMER
		G.	GREEN WOODPECKER	HM	HOUSE MARTIN	LT	LONG-TAILED TIT	SG	STARLING	YW	YELLOW WAGTAIL
								SH	SPARROWHAWK		

Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
FOR INFORMATION	S2	P01	SD	LH	--	--	24/09/21

Drawing Suitability: FOR INFORMATION

Status: S2

Project Title: M5 Junction 10 Improvement

Drawing Title: FIGURE 7.8A BREEDING BIRD SURVEY RESULTS JUNE 2019

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Client: Gloucestershire County Council

Drawing Number: Project | Originator | Volume
GCCM5J10 - ATK - EBD - XX - GS - GI - 000017
Location | Type | Number

Original Size: A3 | Scale: 1:4,000 | Project Ref: 5197035 | Sheet: 7 of 14 | Rev: P01

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

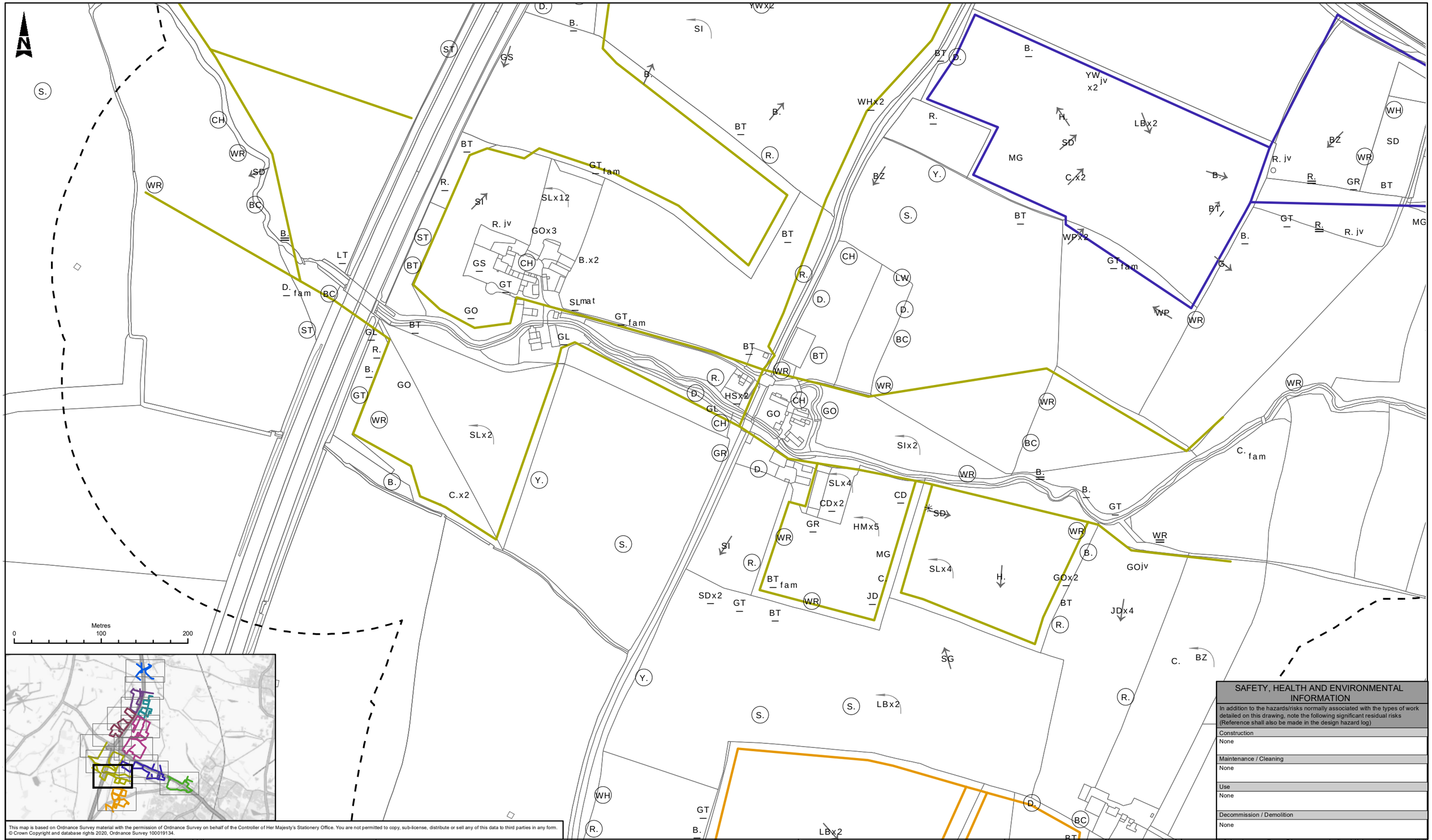
In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log)

Construction
None

Maintenance / Cleaning
None

Use
None

Decommission / Demolition
None



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LEGEND

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- TRANSECT 1
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BEHAVIOURS

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- ◯ SINGING

SPECIES (BTO CODES)

- B. BLACKBIRD
- BC BLACKCAP
- BT BLUE TIT
- BZ BUZZARD
- C. CARRION CROW
- CC CHIFFCHAFF
- CD COLLARED DOVE
- CH CHAFFINCH
- CT COAL TIT
- D. DUNNOCK
- FP FERAL PIGEON
- G. GREEN WOODPECKER
- GC GOLDCREST
- GL GREY WAGTAIL
- GO GOLDFINCH
- GR GREENFINCH
- GS GREAT SPOTTED WOODPECKER
- GT GREAT TIT
- H. GREY HERON
- HG HERRING GULL
- HM HOUSE MARTIN
- HS HOUSE SPARROW
- HY HOBBY
- J. JAY
- JD JACKDAW
- LB LESSER BLACK-BACKED GULL
- LI LINNET
- LT LONG-TAILED TIT
- LW LESSER WHITETHROAT
- MG MAGPIE
- PW PIED WAGTAIL
- PH PHEASANT
- R. ROBIN
- S. SKYLARK
- SD STOCK DOVE
- SG STARLING
- SH SPARROWHAWK
- SI SWIFT
- SL SWALLOW
- ST SONG THRUSH
- WP WOOD PIGEON
- WH WHITETHROAT
- WR WREN
- Y. YELLOWHAMMER
- YW YELLOW WAGTAIL

Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
FOR INFORMATION	S2	P01	SD	LH	--	--	24/09/21

Drawing Suitability: FOR INFORMATION
Status: S2

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Client: Gloucestershire County Council

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log)

Construction
None

Maintenance / Cleaning
None

Use
None

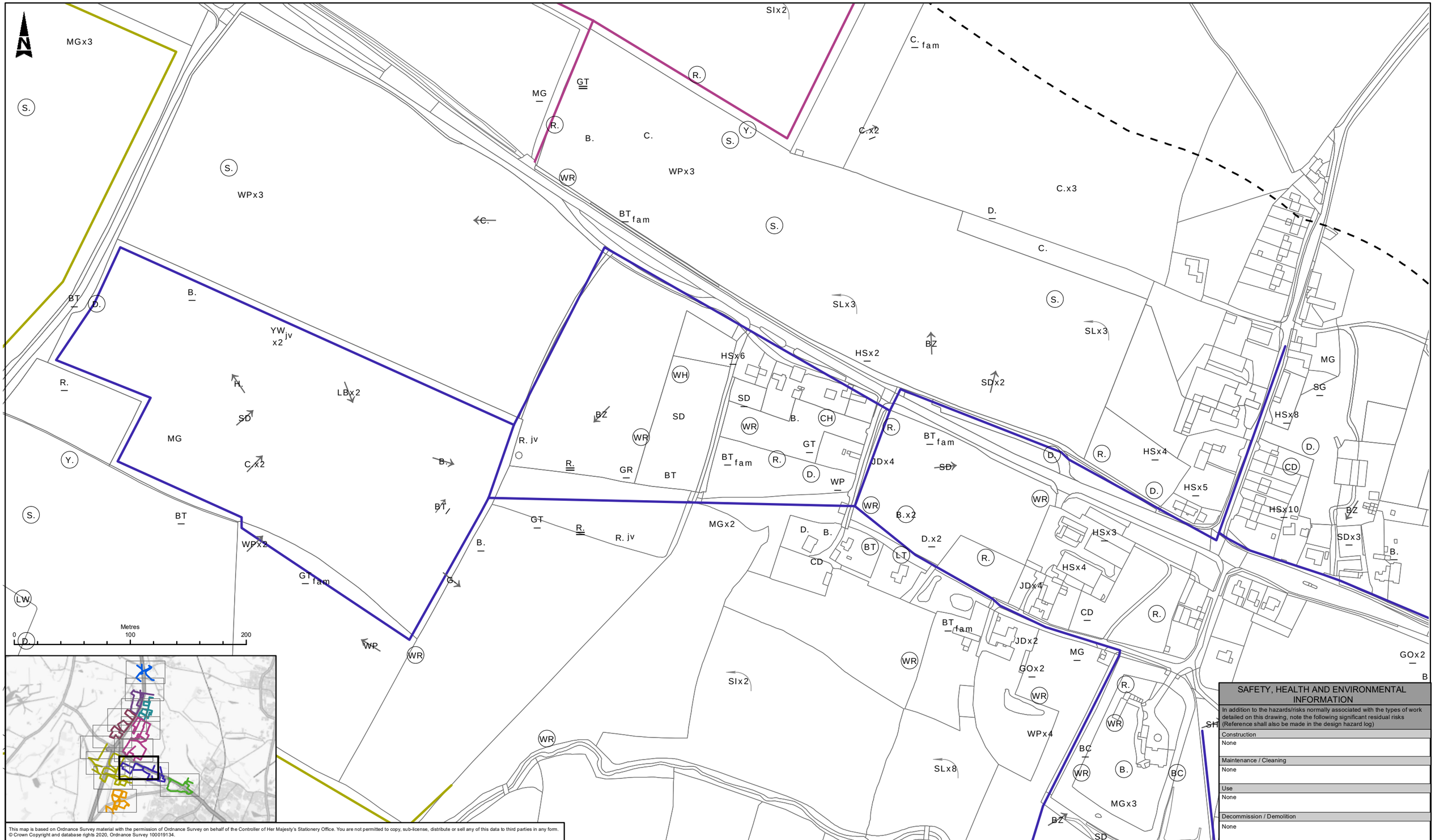
Decommission / Demolition
None

Project Title: M5 Junction 10 Improvement

Drawing Title: FIGURE 7.8A
BREEDING BIRD SURVEY RESULTS
JUNE 2019

Drawing Number: Project | Originator | Volume
GCCM5J10 - ATK - EBD
XX - GS - GI - 000017
Location | Type | Number

Original Size:	Scale	Project Ref:	Sheet:	Rev:
A3	1:4,000	5197035	8 of 14	P01



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LEGEND

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BEHAVIOURS

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- jv JUVENILE
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SPECIES (BTO CODES)

B.	BLACKBIRD	C.	CARRION CROW	GL	GREY WAGTAIL	HS	HOUSE SPARROW	LW	LESSER WHITETHROAT	SI	SWIFT
BC	BLACKCAP	CC	CHIFFCHAFF	GO	GOLDFINCH	HY	HOBBY	MG	MAGPIE	SL	SWALLOW
BT	BLUE TIT	CD	COLLARED DOVE	GR	GREENFINCH	J.	JAY	PW	PIED WAGTAIL	ST	SONG THRUSH
BZ	BUZZARD	CH	CHAFFINCH	GS	GREAT SPOTTED WOODPECKER	JD	JACKDAW	PH	PHEASANT	WP	WOOD PIGEON
		CT	COAL TIT	GT	GREAT TIT	LB	LESSER BLACK-BACKED GULL	R.	ROBIN	WH	WHITETHROAT
		D.	DUNNOCK	H.	GREY HERON			S.	SKYLARK	WR	WREN
		FP	FERAL PIGEON	HG	HERRING GULL	LI	LINNET	SD	STOCK DOVE	Y.	YELLOWHAMMER
		G.	GREEN WOODPECKER	HM	HOUSE MARTIN	LT	LONG-TAILED TIT	SG	STARLING	YW	YELLOW WAGTAIL
		GC	GOLDCREST					SH	SPARROWHAWK		

Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
FOR INFORMATION	S2	P01	SD	LH	--	--	24/09/21

Drawing Suitability: FOR INFORMATION — Status: S2

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log)

Construction: None

Maintenance / Cleaning: None

Use: None

Decommission / Demolition: None

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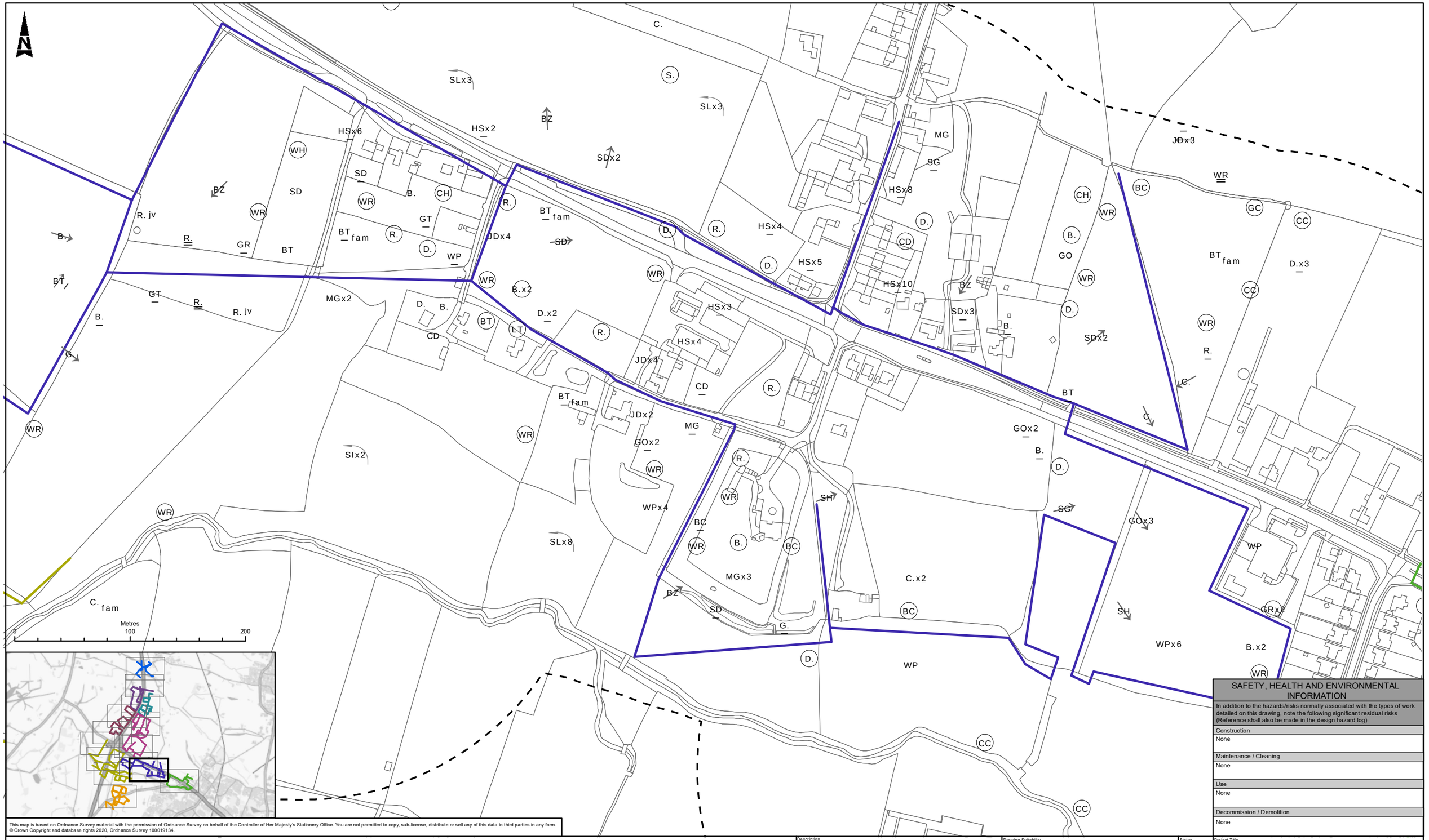
Client: Gloucestershire County Council

Project Title: M5 Junction 10 Improvement

Drawing Title: FIGURE 7.8A BREEDING BIRD SURVEY RESULTS JUNE 2019

Drawing Number: Project | Originator | Volume — GCCM5J10 - ATK - EBD XX - GS - GI - 000017 — Location | Type | Number

Original Size:	Scale	Project Ref:	Sheet:	Rev:
A3	1:3,000	5197035	9 of 14	P01



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LEGEND

- 250M STUDY AREA
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BEHAVIOURS

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SPECIES (BTO CODES)

B.	BLACKBIRD	C.	CARRION CROW	GL	GREY WAGTAIL	HS	HOUSE SPARROW	LW	LESSER WHITETHROAT	SI	SWIFT
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BT	BLUE TIT	CD	COLLARED DOVE	GR	GREENFINCH	J.	JAY	PW	PIED WAGTAIL	ST	SONG THRUSH
BZ	BUZZARD	CH	CHAFFINCH	GS	GREAT SPOTTED WOODPECKER	JD	JACKDAW	PH	PHEASANT	WP	WOOD PIGEON
		CT	COAL TIT	GT	GREAT TIT	LB	LESSER BLACK-BACKED GULL	R.	ROBIN	WH	WHITETHROAT
		D.	DUNNOCK	H.	GREY HERON			S.	SKYLARK	WR	WREN
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		G.	GREEN WOODPECKER	HM	HOUSE MARTIN	LT	LONG-TAILED TIT	SG	STARLING	YW	YELLOW WAGTAIL
		GC	GOLDCREST					SH	SPARROWHAWK		

Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
FOR INFORMATION	S2	P01	SD	LH	--	--	24/09/21

Drawing Suitability: FOR INFORMATION
Status: S2

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www.atkinsglobal.com

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Client: Gloucestershire County Council

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

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Construction
None

Maintenance / Cleaning
None

Use
None

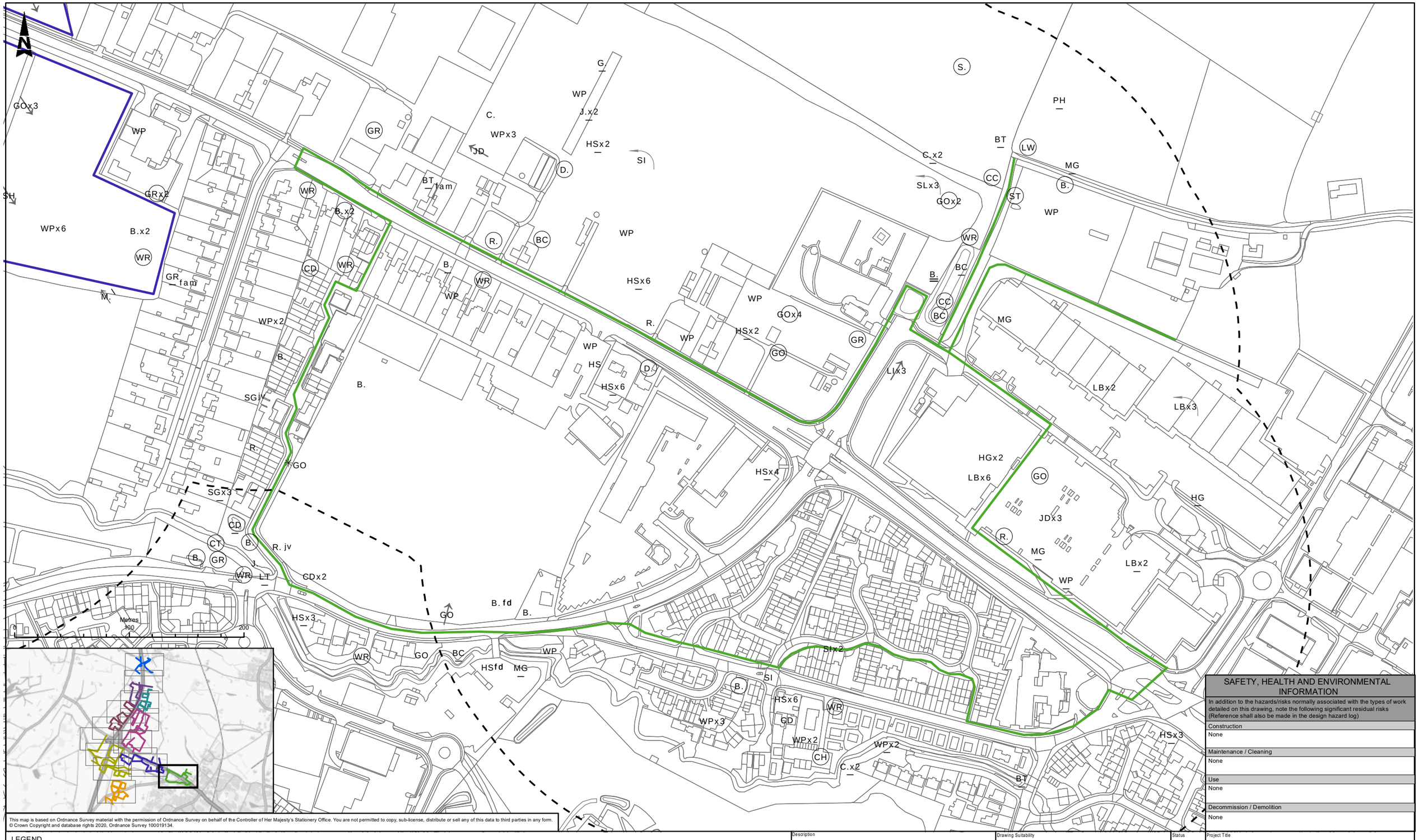
Decommission / Demolition
None

Project Title: M5 Junction 10 Improvement

Drawing Title: FIGURE 7.8A
BREEDING BIRD SURVEY RESULTS
JUNE 2019

Drawing Number: Project | Originator | Volume
GCCM5J10 - ATK - EBD
XX - GS - GI - 000017
Location | Type | Number

Original Size:	Scale	Project Ref:	Sheet:	Rev:
A3	1:3,000	5197035	10 of 14	P01



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LEGEND

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BEHAVIOURS

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BZ	BUZZARD	CH	CHAFFINCH	GS	GREAT SPOTTED WOODPECKER	JD	JACKDAW	PH	PHEASANT	WP	WOOD PIGEON
		CT	COAL TIT	GT	GREAT TIT	LB	LESSER BLACK-BACKED GULL	R.	ROBIN	WH	WHITETHROAT
		D.	DUNNOCK	H.	GREY HERON			S.	SKYLARK	WR	WREN
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		G.	GREEN WOODPECKER	HM	HOUSE MARTIN	LT	LONG-TAILED TIT	SG	STARLING	YW	YELLOW WAGTAIL
		GC	GOLDCREST					SH	SPARROWHAWK		

Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
FOR INFORMATION	S2	P01	SD	LH	--	--	24/09/21

Drawing Suitability: FOR INFORMATION

Status: S2

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log)

Construction: None

Maintenance / Cleaning: None

Use: None

Decommission / Demolition: None

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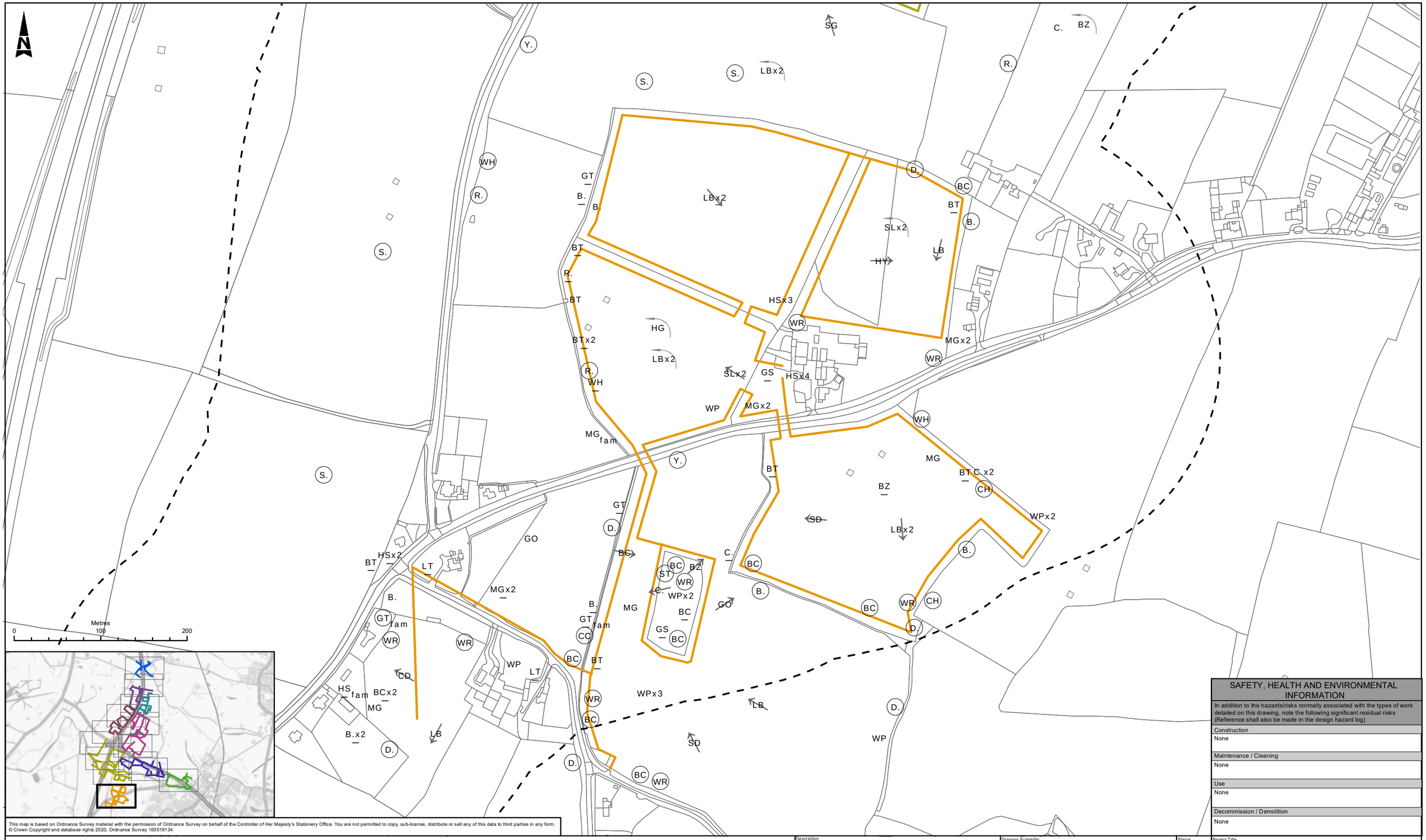
Client: Gloucestershire County Council

Project Title: M5 Junction 10 Improvement

Drawing Title: FIGURE 7.8A
BREEDING BIRD SURVEY RESULTS
JUNE 2019

Drawing Number: Project | Originator | Volume
GCCM5J10 - ATK - EBD
XX - GS - GI - 000017
Location | Type | Number

Original Size:	Scale	Project Ref:	Sheet:	Rev:
A3	1:3,000	5197035	11 of 14	P01



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LEGEND

- 250M STUDY AREA
- TRANSECT 1
- TRANSECT 2
- TRANSECT 3
- TRANSECT 4
- TRANSECT 5
- TRANSECT 6
- TRANSECT 7
- TRANSECT 8
- TRANSECT 9

BEHAVIOURS

- = ALARM CALL
- _ CALLING
- fd CARRYING FOOD
- mat CARRYING NEST MATERIAL
- fam FAMILY
- → FLYING
- FORAGING IN FLIGHT
- jv JUVENILE
- ✳ OCCUPIED NEST
- ◯ SINGING

SPECIES (BTO CODES)

B.	BLACKBIRD	C.	CARRION CROW	GL	GREY WAGTAIL	HS	HOUSE SPARROW	LW	LESSER WHITETHROAT
BC	BLACKCAP	CC	CHIFFCHAFF	GO	GOLDFINCH	HY	HOBBY	MG	MAGPIE
BT	BLUE TIT	CD	COLLARED DOVE	GR	GREENFINCH	J.	JAY	PW	PIED WAGTAIL
BZ	BUZZARD	CH	CHAFFINCH	GS	GREAT SPOTTED WOODPECKER	JD	JACKDAW	PH	PHEASANT
		CT	COAL TIT	GT	GREAT TIT	LB	LESSER BLACK-BACKED GULL	R.	ROBIN
		D.	DUNNOCK	H.	GREY HERON	LI	LINNET	S.	SKYLARK
		FP	FERAL PIGEON	HG	HERRING GULL	LT	LONG-TAILED TIT	SD	STOCK DOVE
		G.	GREEN WOODPECKER	HM	HOUSE MARTIN			SG	STARLING
		GC	GOLDCREST					SH	SPARROWHAWK

SI	SWIFT								
SL	SWALLOW								
ST	SONG THRUSH								
WP	WOOD PIGEON								
WH	WHITETHROAT								
WR	WREN								
Y.	YELLOWHAMMER								
YW	YELLOW WAGTAIL								

Description

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date

Description

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date

Description

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date

Description

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date

Description
FOR INFORMATION

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
S2	P01	SD	LH	--	--	24/09/21

Drawing Suitability: FOR INFORMATION

Status: S2

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Client: Gloucestershire COUNTY COUNCIL

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log)

Construction
None

Maintenance / Cleaning
None

Use
None

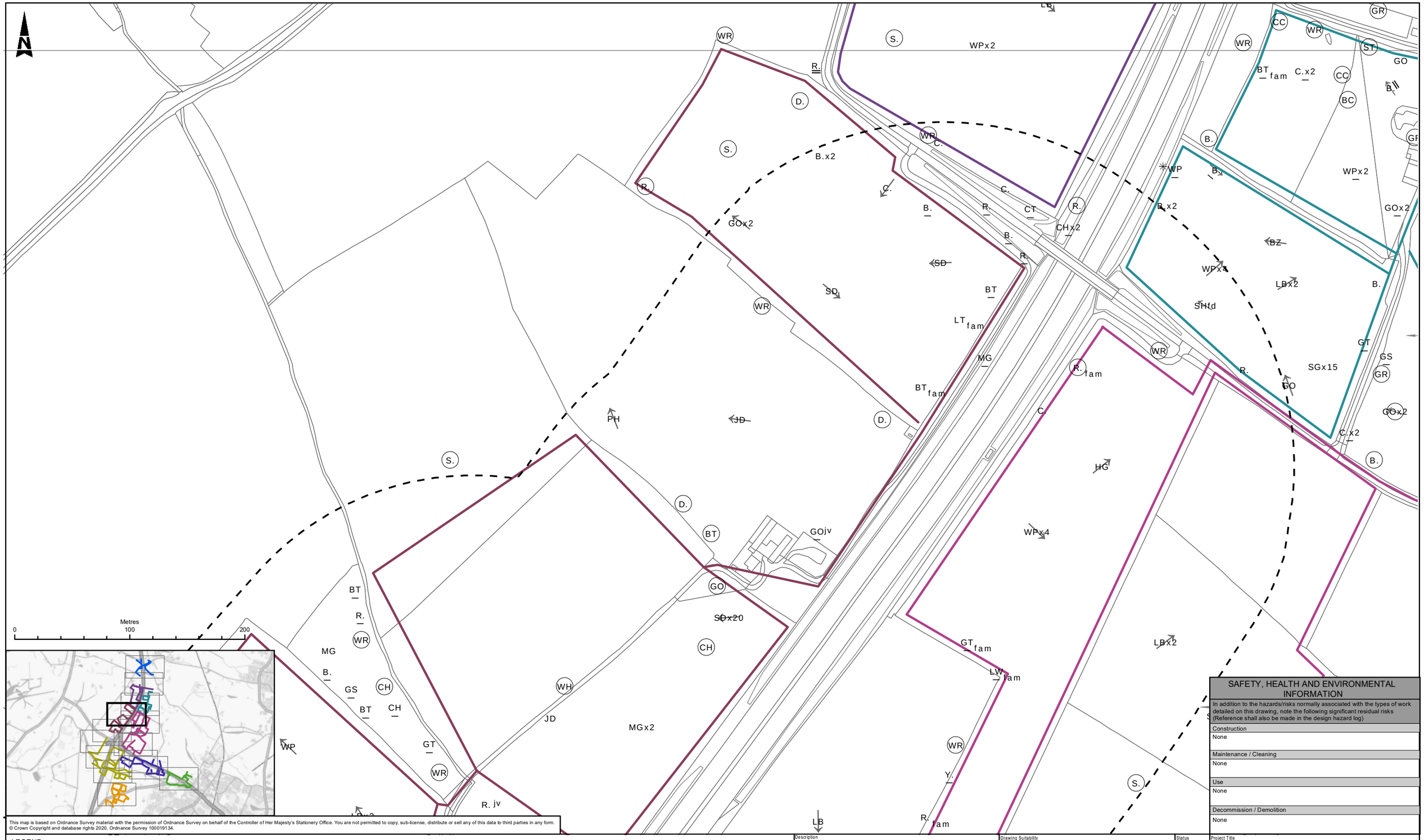
Decommission / Demolition
None

Project Title: M5 Junction 10 Improvement

Drawing Title:
FIGURE 7.8A
BREEDING BIRD SURVEY RESULTS
JUNE 2019

Drawing Number
Project | Originator | Volume | Location | Type | Number
GCCM5J10 - ATK - EBD | XX - GS - GI - 000017

Original Size:	Scale	Project Ref:	Sheet:	Rev:
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LEGEND

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- TRANSECT 1
- TRANSECT 2
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BEHAVIOURS

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SPECIES (BTO CODES)

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BT	BLUE TIT	CD	COLLARED DOVE	GR	GREENFINCH	J.	JAY	PW	PIED WAGTAIL	ST	SONG THRUSH
BZ	BUZZARD	CH	CHAFFINCH	GS	GREAT SPOTTED WOODPECKER	JD	JACKDAW	PH	PHEASANT	WP	WOOD PIGEON
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		D.	DUNNOCK	H.	GREY HERON			S.	SKYLARK	WR	WREN
		F P	FERAL PIGEON	HG	HERRING GULL	LI	LINNET	SD	STOCK DOVE	Y.	YELLOWHAMMER
		G.	GREEN WOODPECKER	HM	HOUSE MARTIN	LT	LONG-TAILED TIT	SG	STARLING	YW	YELLOW WAGTAIL
		GC	GOLDCREST					SH	SPARROWHAWK		

Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
FOR INFORMATION	S2	P01	SD	LH	--	--	24/09/21

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log)

Construction
None

Maintenance / Cleaning
None

Use
None

Decommission / Demolition
None

Drawing Suitability: FOR INFORMATION
Status: S2

Project Title: M5 Junction 10 Improvement

Drawing Title: FIGURE 7.8A
BREEDING BIRD SURVEY RESULTS
JUNE 2019

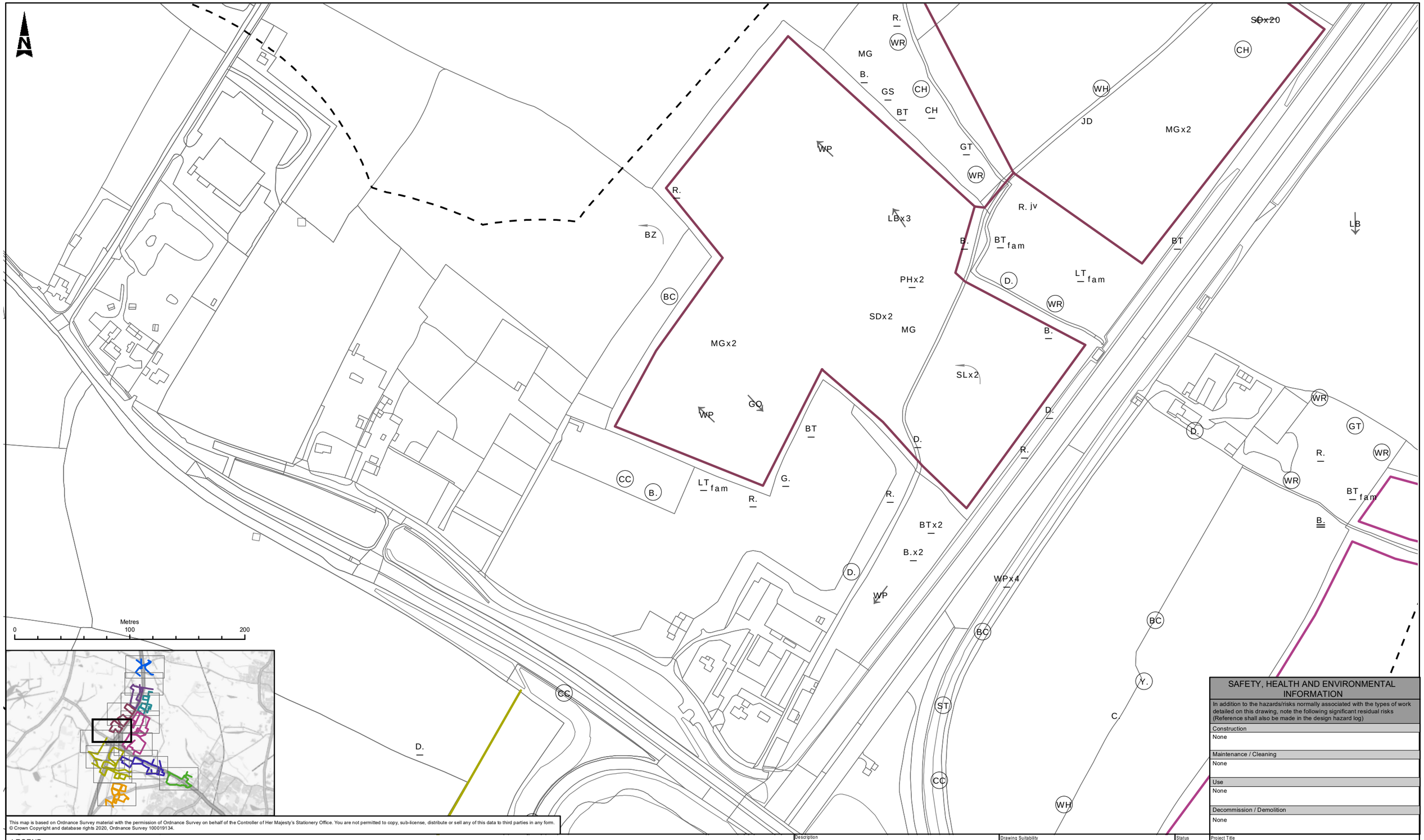
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Drawing Number: Project | Originator | Volume | Location | Type | Number
GCCM5J10 - ATK - EBD
XX - GS - GI - 000017

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LEGEND

- 250M STUDY AREA
- TRANSECT 1
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BEHAVIOURS

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BZ	BUZZARD	CH	CHAFFINCH	GS	GREAT SPOTTED WOODPECKER	JD	JACKDAW
		CT	COAL TIT	GT	GREAT TIT	LB	LESSER BLACK-BACKED GULL
		D.	DUNNOCK	H.	GREY HERON	LI	LINNET
		FP	FERAL PIGEON	HG	HERRING GULL	LT	LONG-TAILED TIT
		G.	GREEN WOODPECKER	HM	HOUSE MARTIN	LW	LESSER WHITETHROAT
		GC	GOLDCREST			MG	MAGPIE
						PW	PIED WAGTAIL
						PH	PHEASANT
						R.	ROBIN
						S.	SKYLARK
						SD	STOCK DOVE
						SG	STARLING
						SH	SPARROWHAWK
						SI	SWIFT
						SL	SWALLOW
						ST	SONG THRUSH
						WP	WOOD PIGEON
						WH	WHITETHROAT
						WR	WREN
						Y.	YELLOWHAMMER
						YW	YELLOW WAGTAIL

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log)

Construction
None

Maintenance / Cleaning
None

Use
None

Decommission / Demolition
None

Description

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date

Description

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date

Description

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date

Description

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date

Description
FOR INFORMATION

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
S2	P01	SD	LH	--	--	24/09/21

Drawing Suitability: FOR INFORMATION
Status: S2

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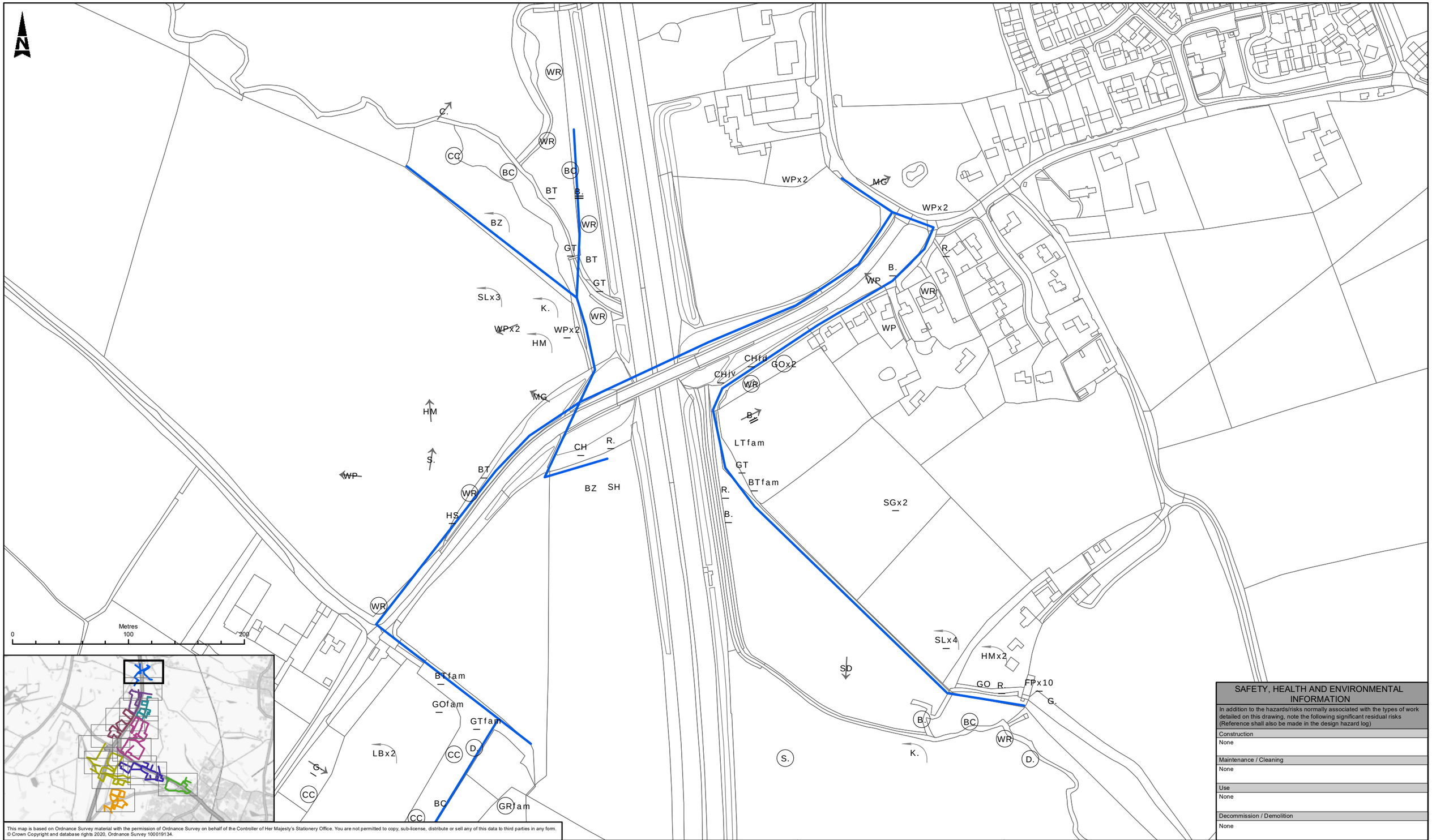
Client: Gloucestershire County Council

Project Title: M5 Junction 10 Improvement

Drawing Title: FIGURE 7.8A
BREEDING BIRD SURVEY RESULTS
JUNE 2019

Drawing Number: GCCM5J10 - ATK - EBD - XX - GS - GI - 000017

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LEGEND

- 250M STUDY AREA
- TRANSECT 1
- TRANSECT 2
- TRANSECT 3
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- TRANSECT 5
- TRANSECT 6
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- TRANSECT 8
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BEHAVIOURS

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SPECIES (BTO CODES)

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BC	BLACKCAP	BZ	BUZZARD	GR	GREENFINCH	LB	LESSER BLACK-BACKED GULL	PW	PIED WAGTAIL
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		CC	CHIFFCHAFF	GT	GREAT TIT	LT	LONG-TAILED TIT	R.	ROBIN
		CD	COLLARED DOVE	HG	HERRING GULL	LW	LESSER WHITETHROAT	RO	ROOK
		CH	CHAFFINCH	HM	HOUSE MARTIN	M.	MISTLE THRUSH	S.	SKYLARK
		D.	DUNNOCK	HS	HOUSE SPARROW	MA	MALLARD	SD	STOCK DOVE
		FP	FERAL PIGEON	JD	JACKDAW	MG	MAGPIE	SG	STARLING
		G.	GREEN WOODPECKER					SH	SPARROWHAWK
								SI	SWIFT

SL	SWALLOW
ST	SONG THRUSH
WH	WHITETHROAT
WP	WOOD PIGEON
WR	WREN
YW	YELLOW WAGTAIL
Y.	YELLOWHAMMER

Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
FOR INFORMATION	S2	P01	SD	LH	--	--	24/09/21

Drawing Suitability: FOR INFORMATION
Status: S2

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Client: Gloucestershire COUNTY COUNCIL

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log)

Construction
None

Maintenance / Cleaning
None

Use
None

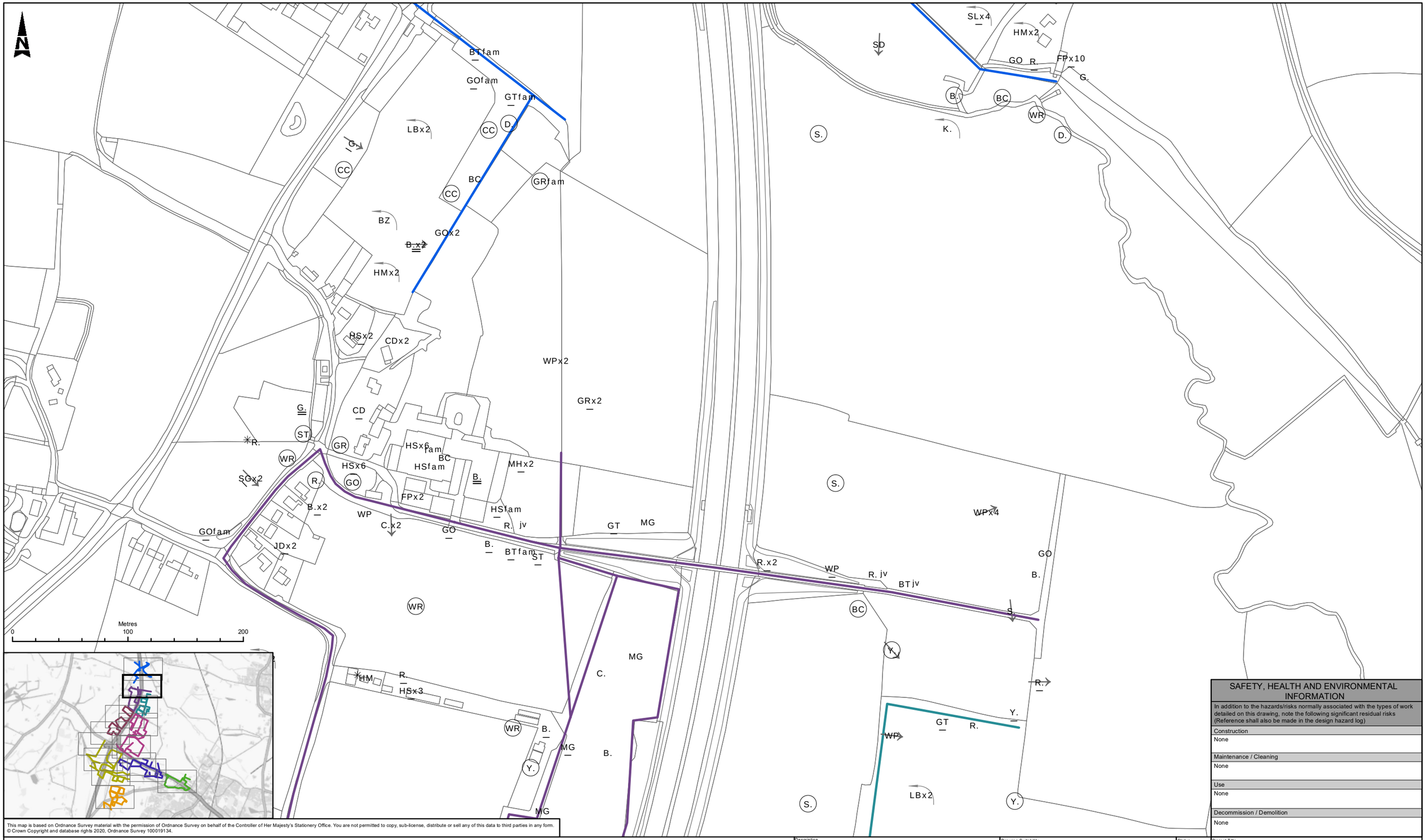
Decommission / Demolition
None

Project Title: M5 Junction 10 Improvement

Drawing Title: FIGURE 7.8B
BREEDING BIRD SURVEY RESULTS
JULY 2019

Drawing Number: GCCM5J10 - ATK - EBD - XX - GS - GI - 000018

Original Size:	Scale	Project Ref:	Sheet:	Rev:
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LEGEND

- 250M STUDY AREA
- TRANSECT 1
- TRANSECT 2
- TRANSECT 3
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- TRANSECT 5
- TRANSECT 6
- TRANSECT 7
- TRANSECT 8
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BEHAVIOURS

- = ALARM CALL
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- fd CARRYING FOOD
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- ✳ OCCUPIED NEST
- ◯ SINGING

SPECIES (BTO CODES)

B.	BLACKBIRD	BT	BLUE TIT	GO	GOLDFINCH	KT	RED KITE	MH	MOORHEN	SL	SWALLOW
BC	BLACKCAP	BZ	BUZZARD	GR	GREENFINCH	LB	LESSER BLACK-BACKED GULL	PW	PIED WAGTAIL	ST	SONG THRUSH
BH	BLACK-HEADED GULL	C.	CARRION CROW	GS	GREAT SPOTTED WOODPECKER			PH	PHEASANT	WH	WHITETHROAT
		CC	CHIFFCHAFF			LI	LINNET	R.	ROBIN	WP	WOOD PIGEON
		CD	COLLARED DOVE	GT	GREAT TIT	LT	LONG-TAILED TIT	RO	ROOK	WR	WREN
		CH	CHAFFINCH	HG	HERRING GULL	LW	LESSER WHITETHROAT	S.	SKYLARK	YW	YELLOW WAGTAIL
		D.	DUNNOCK	HM	HOUSE MARTIN	M.	MISTLE THRUSH	SD	STOCK DOVE	Y.	YELLOWHAMMER
		FP	FERAL PIGEON	HS	HOUSE SPARROW	MA	MALLARD	SG	STARLING		
		G.	GREEN WOODPECKER	JD	JACKDAW	MG	MAGPIE	SH	SPARROWHAWK		
								SI	SWIFT		

Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
FOR INFORMATION	S2	P01	SD	LH	--	--	24/09/21

Drawing Suitability: FOR INFORMATION

Status: S2

Project Title: M5 Junction 10 Improvement

Drawing Title: FIGURE 7.8B BREEDING BIRD SURVEY RESULTS JULY 2019

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Client: Gloucestershire County Council

Drawing Number: Project | Originator | Volume: GCCM5J10 - ATK - EBD; Location | Type | Number: XX - GS - GI - 000018

Original Size: A3 | Scale: 1:3,000 | Project Ref: 5197035 | Sheet: 2 of 14 | Rev: P01

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

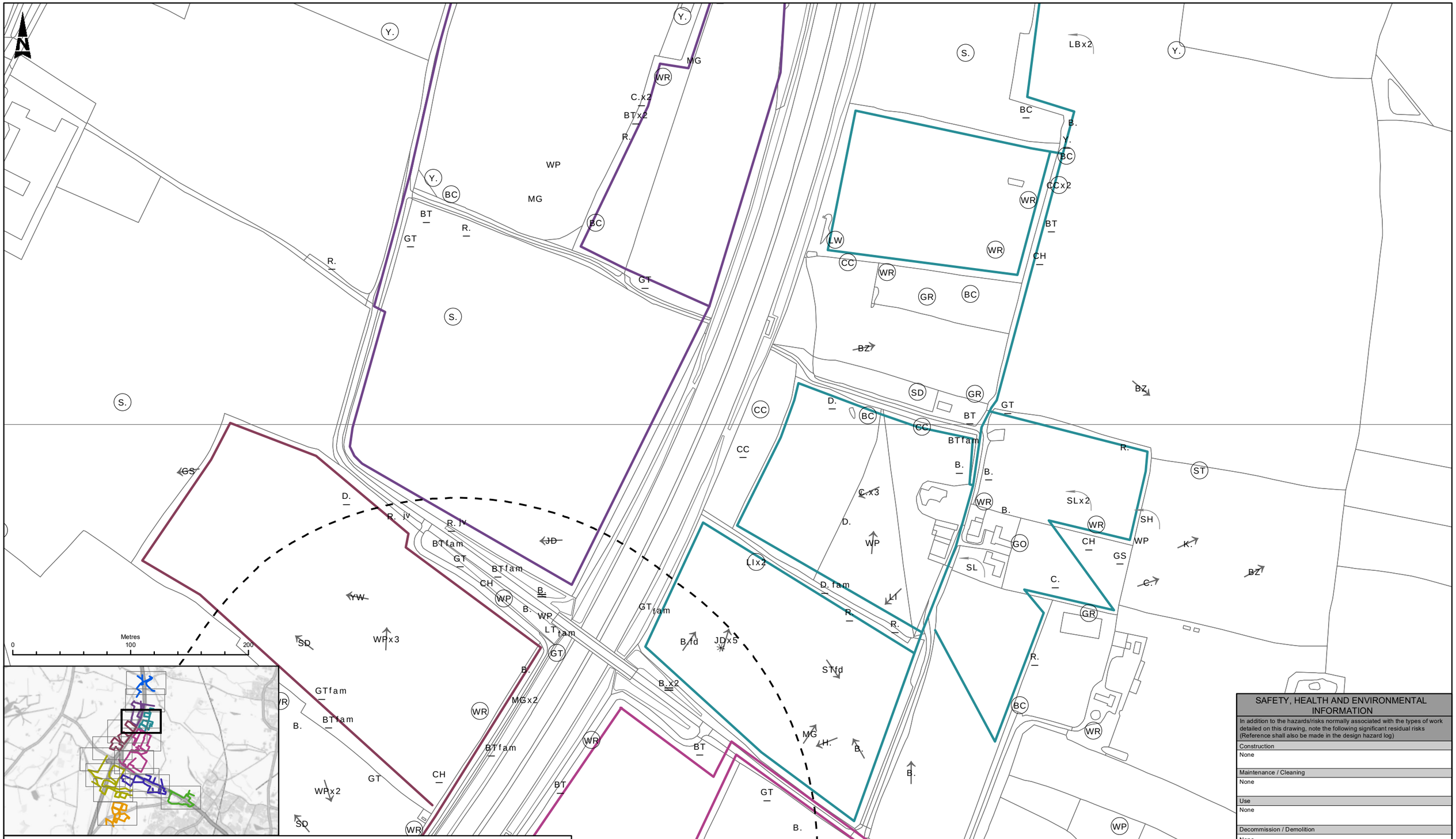
In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log)

Construction: None

Maintenance / Cleaning: None

Use: None

Decommission / Demolition: None



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LEGEND

- 250M STUDY AREA
- TRANSECT 1
- TRANSECT 2
- TRANSECT 3
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- TRANSECT 5
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BEHAVIOURS

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BH	BLACK-HEADED GULL	C.	CARRION CROW	GS	GREAT SPOTTED WOODPECKER	LI	LINNET	PH	PHEASANT
		CC	CHIFFCHAFF	GT	GREAT TIT	LT	LONG-TAILED TIT	R.	ROBIN
		CD	COLLARED DOVE	HG	HERRING GULL	LW	LESSER WHITETHROAT	RO	ROOK
		CH	CHAFFINCH	HM	HOUSE MARTIN	M.	MISTLE THRUSH	S.	SKYLARK
		D.	DUNNOCK	HS	HOUSE SPARROW	MA	MALLARD	SD	STOCK DOVE
		FP	FERAL PIGEON	JD	JACKDAW	MG	MAGPIE	SG	STARLING
		G.	GREEN WOODPECKER					SH	SPARROWHAWK
								SI	SWIFT

SL	SWALLOW					
ST	SONG THRUSH					
WH	WHITETHROAT					
WP	WOOD PIGEON					
WR	WREN					
YW	YELLOW WAGTAIL					
Y.	YELLOWHAMMER					

Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
FOR INFORMATION	S2	P01	SD	LH	--	--	24/09/21

Drawing Suitability: FOR INFORMATION
Status: S2

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log)

Construction
None

Maintenance / Cleaning
None

Use
None

Decommission / Demolition
None

Project Title: M5 Junction 10 Improvement

Drawing Title: FIGURE 7.8B
BREEDING BIRD SURVEY RESULTS
JULY 2019

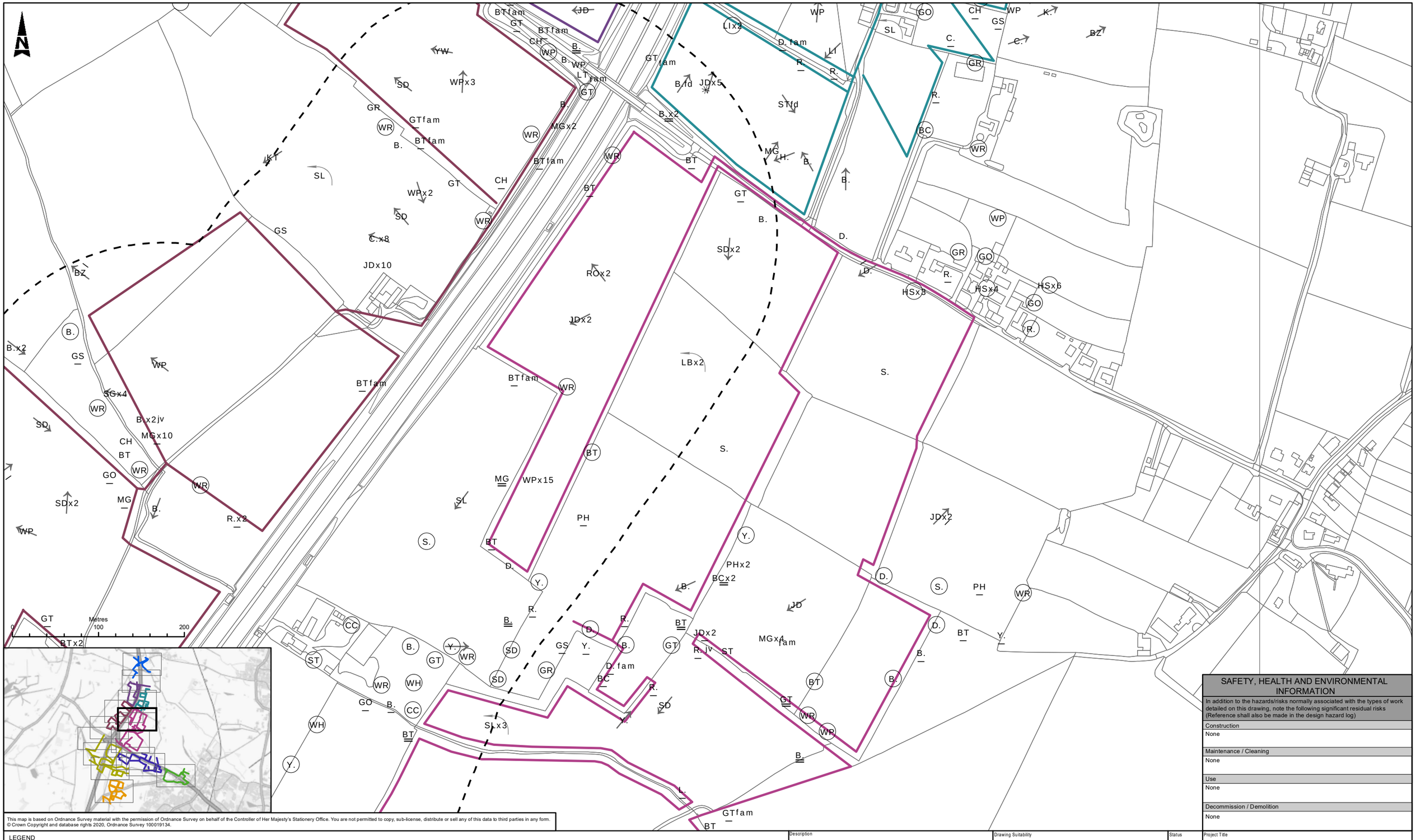
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Client: Gloucestershire County Council

Drawing Number: Project | Originator | Volume | Location | Type | Number
GCCM5J10 - ATK - EBD
XX - GS - GI - 000018

Original Size:	Scale	Project Ref:	Sheet:	Rev:
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LEGEND

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G.	GREEN WOODPECKER	CC	CHIFFCHAFF	GT	GREAT TIT	LT	LONG-TAILED TIT	R.	ROBIN
J D	JACKDAW	CD	COLLARED DOVE	HG	HERRING GULL	LW	LESSER WHITETHROAT	RO	ROOK
		CH	CHAFFINCH	HM	HOUSE MARTIN	M.	MISTLE THRUSH	S.	SKYLARK
		D.	DUNNOCK	HS	HOUSE SPARROW	MA	MALLARD	SD	STOCK DOVE
		F P	FERAL PIGEON	J D	JACKDAW	MG	MAGPIE	SG	STARLING
		G.	GREEN WOODPECKER					SH	SPARROWHAWK
								S I	SWIFT
								S L	SWALLOW
								S T	SONG THRUSH
								WH	WHITETHROAT
								WP	WOOD PIGEON
								WR	WREN
								YW	YELLOW WAGTAIL
								Y.	YELLOWHAMMER

Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
FOR INFORMATION	S2	P01	SD	LH	--	--	24/09/21

Drawing Suitability: FOR INFORMATION

Status: S2

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

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Construction
None

Maintenance / Cleaning
None

Use
None

Decommission / Demolition
None

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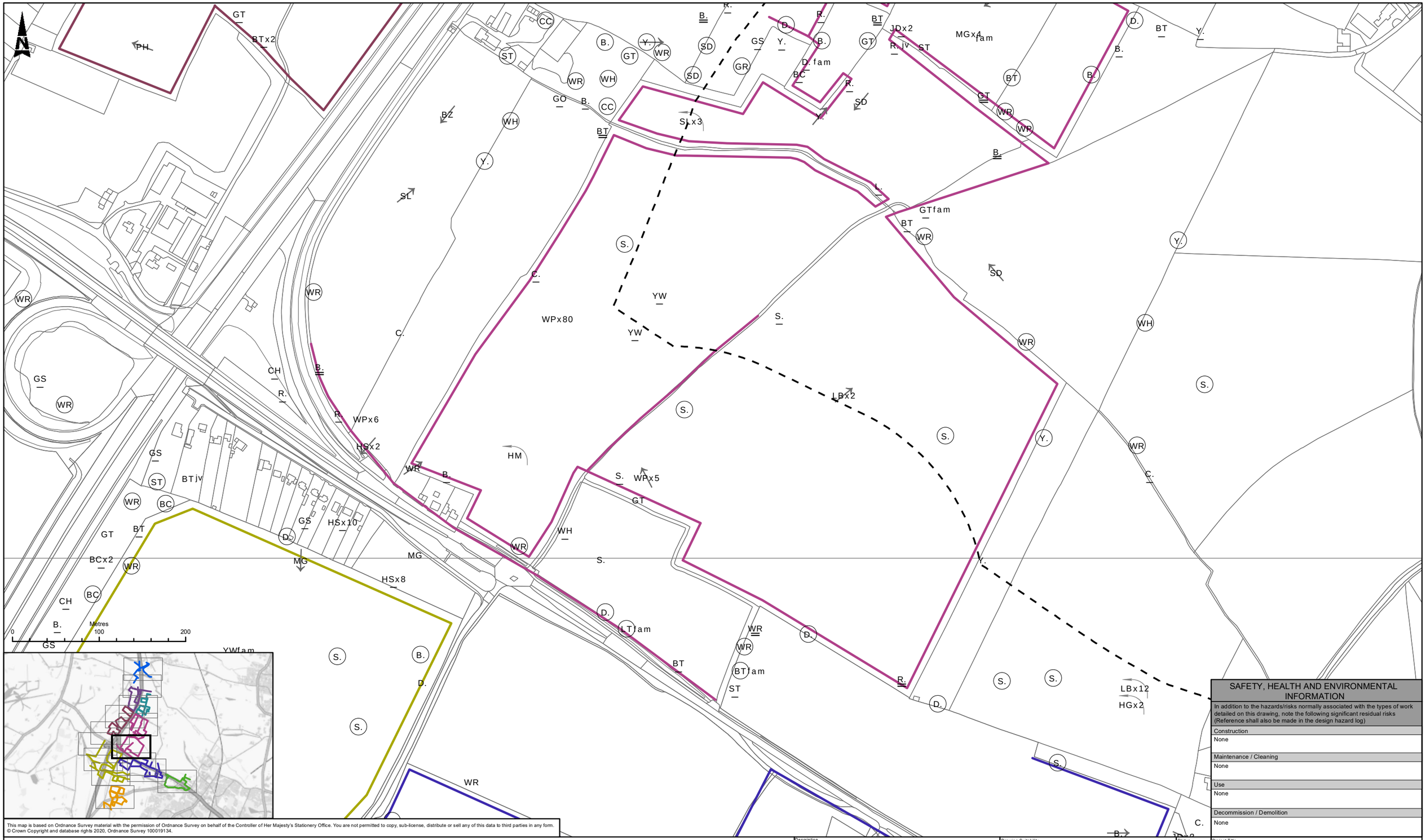
Client: Gloucestershire County Council

Project Title: M5 Junction 10 Improvement

Drawing Title: FIGURE 7.8B
BREEDING BIRD SURVEY RESULTS
JULY 2019

Drawing Number: GCCM5J10 - ATK - EBD | XX - GS - GI - 000018 (Project | Originator | Volume | Location | Type | Number)

Original Size:	Scale	Project Ref:	Sheet:	Rev:
A3	1:4,000	5197035	4 of 14	P01



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LEGEND

- 250M STUDY AREA
- TRANSECT 1
- TRANSECT 2
- TRANSECT 3
- TRANSECT 4
- TRANSECT 5
- TRANSECT 6
- TRANSECT 7
- TRANSECT 8
- TRANSECT 9

BEHAVIOURS

- FORAGING IN FLIGHT
- jv JUVENILE
- OCCUPIED NEST
- SINGING
- fd CARRYING FOOD
- mat CARRYING NEST MATERIAL
- fam FAMILY
- FLYING

SPECIES (BTO CODES)

B.	BLACKBIRD	BT	BLUE TIT	GO	GOLDFINCH	KT	RED KITE	MH	MOORHEN
BC	BLACKCAP	BZ	BUZZARD	GR	GREENFINCH	LB	LESSER BLACK-BACKED GULL	PW	PIED WAGTAIL
BH	BLACK-HEADED GULL	C.	CARRION CROW	GS	GREAT SPOTTED WOODPECKER	LI	LINNET	PH	PHEASANT
G.	GREEN WOODPECKER	CC	CHIFFCHAFF	GT	GREAT TIT	LT	LONG-TAILED TIT	R.	ROBIN
JD	JACKDAW	CD	COLLARED DOVE	HG	HERRING GULL	LW	LESSER WHITETHROAT	RO	ROOK
		CH	CHAFFINCH	HM	HOUSE MARTIN	M.	MISTLE THRUSH	S.	SKYLARK
		D.	DUNNOCK	HS	HOUSE SPARROW	MA	MALLARD	SD	STOCK DOVE
		FP	FERAL PIGEON			MG	MAGPIE	SG	STARLING
								SH	SPARROWHAWK
								SI	SWIFT
								SL	SWALLOW
								ST	SONG THRUSH
								WH	WHITETHROAT
								WP	WOOD PIGEON
								WR	WREN
								YW	YELLOW WAGTAIL
								Y.	YELLOWHAMMER

Description

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
FOR INFORMATION						
S2	P01	SD	LH	--	--	24/09/21

Drawing Suitability: FOR INFORMATION

Status: S2

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GL1 2TH

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Client: Gloucestershire County Council

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log)

Construction
None

Maintenance / Cleaning
None

Use
None

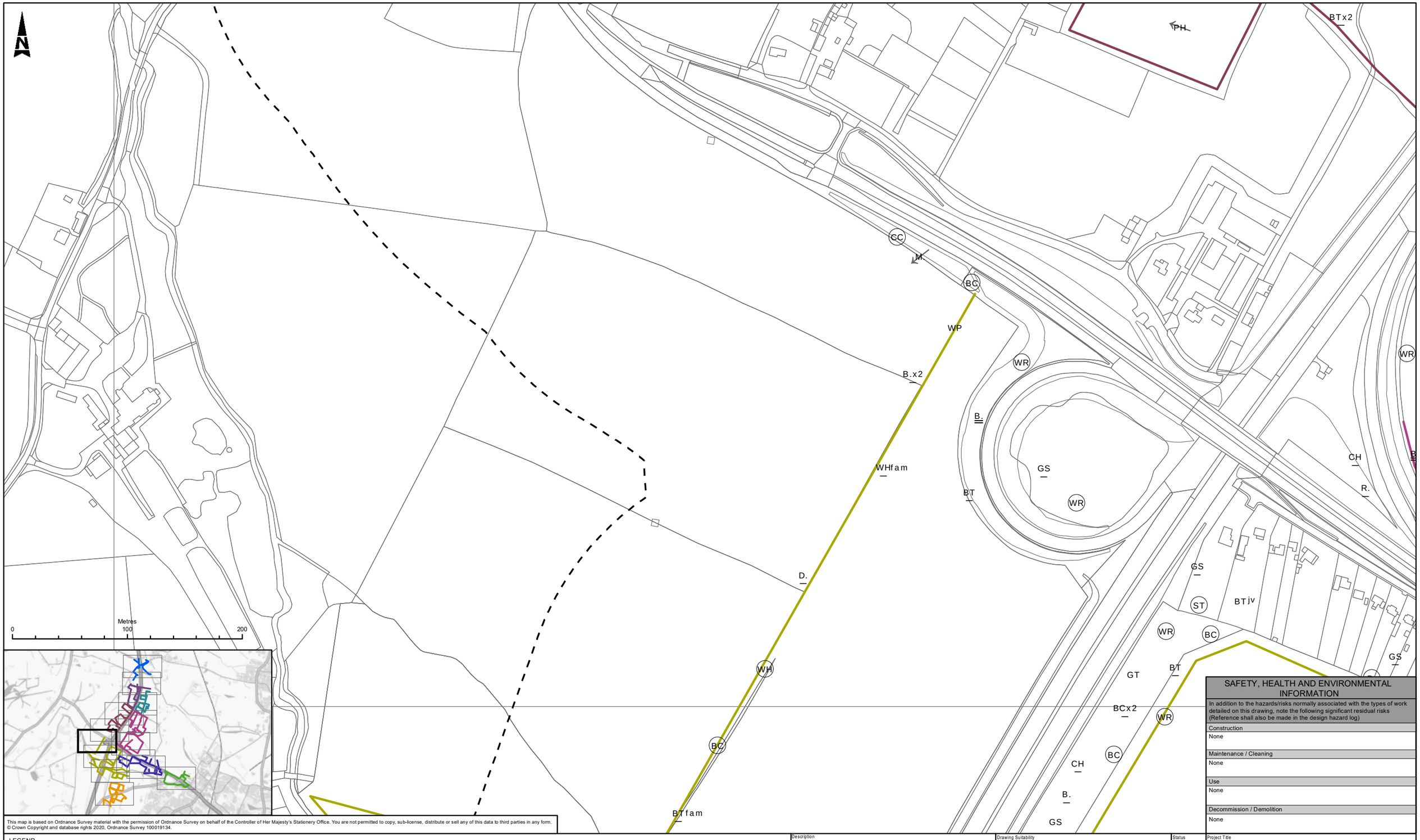
Decommission / Demolition
None

Project Title: M5 Junction 10 Improvement

Drawing Title: FIGURE 7.8B
BREEDING BIRD SURVEY RESULTS
JULY 2019

Drawing Number: Project | Originator | Volume
GCCM5J10 - ATK - EBD
XX - GS - GI - 000018
Location | Type | Number

Original Size:	Scale	Project Ref:	Sheet:	Rev:
A3	1:4,000	5197035	5 of 14	P01



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LEGEND

- 250M STUDY AREA
- TRANSECT 1
- TRANSECT 2
- TRANSECT 3
- TRANSECT 4
- TRANSECT 5
- TRANSECT 6
- TRANSECT 7
- TRANSECT 8
- TRANSECT 9

BEHAVIOURS

- = ALARM CALL
- _ CALLING
- fd CARRYING FOOD
- mat CARRYING NEST MATERIAL
- fam FAMILY
- → FLYING
- FORAGING IN FLIGHT
- jv JUVENILE
- ✳ OCCUPIED NEST
- ◯ SINGING

SPECIES (BTO CODES)

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BH	BLACK-HEADED GULL	C.	CARRION CROW	GS	GREAT SPOTTED WOODPECKER	LI	LINNET	PH	PHEASANT	WH	WHITETHROAT
		CC	CHIFFCHAFF	GT	GREAT TIT	LT	LONG-TAILED TIT	R.	ROBIN	WP	WOOD PIGEON
		CD	COLLARED DOVE	HG	HERRING GULL	LW	LESSER WHITETHROAT	RO	ROOK	WR	WREN
		CH	CHAFFINCH	HM	HOUSE MARTIN	M.	MISTLE THRUSH	S.	SKYLARK	YW	YELLOW WAGTAIL
		D.	DUNNOCK	HS	HOUSE SPARROW	MA	MALLARD	SD	STOCK DOVE	Y.	YELLOWHAMMER
		FP	FERAL PIGEON	JD	JACKDAW	MG	MAGPIE	SG	STARLING		
		G.	GREEN WOODPECKER					SH	SPARROWHAWK		
								SI	SWIFT		

Description

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
FOR INFORMATION						
S2	P01	SD	LH	--	--	24/09/21

Drawing Suitability: FOR INFORMATION

Status: S2

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log)

Construction
None

Maintenance / Cleaning
None

Use
None

Decommission / Demolition
None

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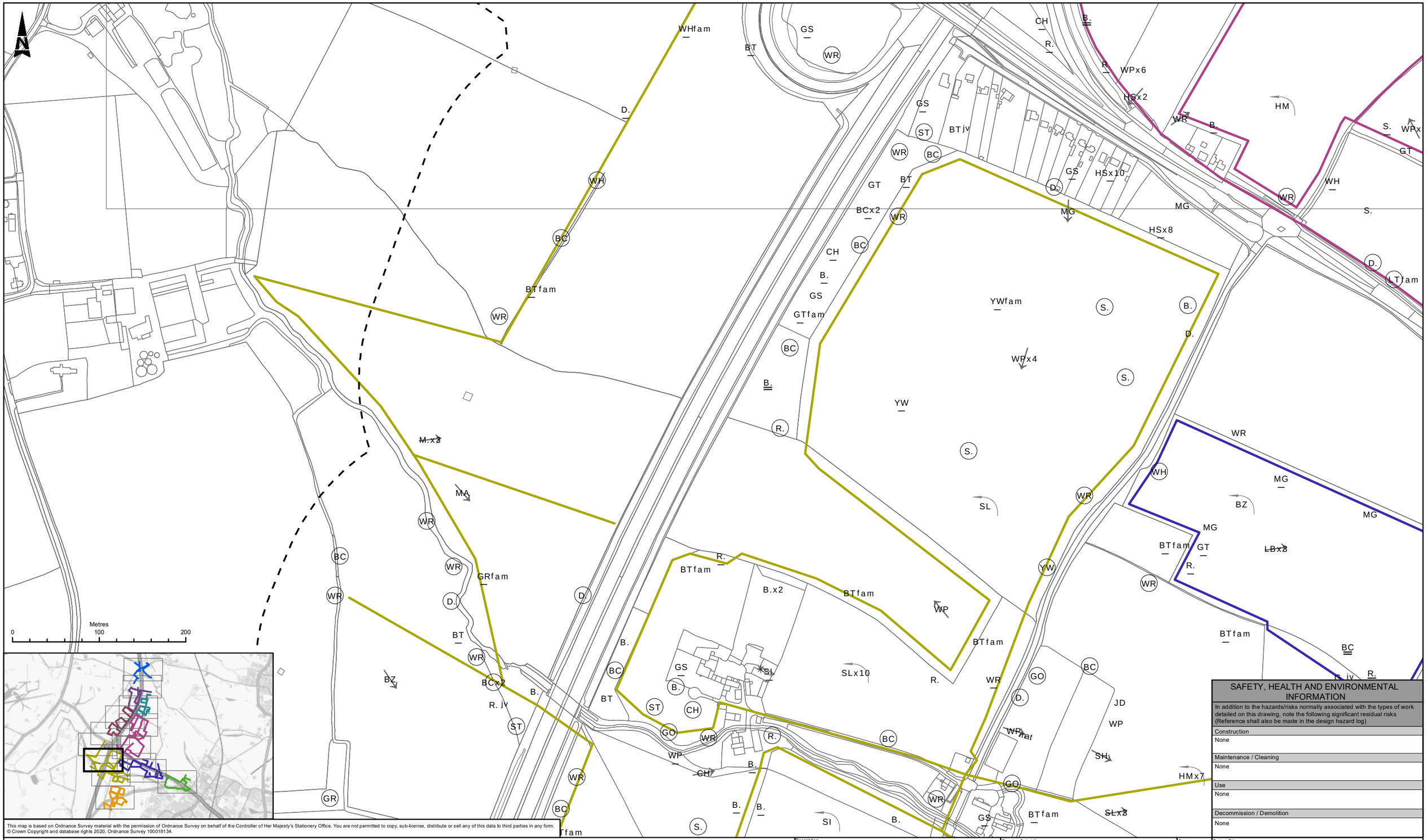
Client: Gloucestershire County Council

Project Title: M5 Junction 10 Improvement

Drawing Title: FIGURE 7.8B
BREEDING BIRD SURVEY RESULTS
JULY 2019

Drawing Number: GCCM5J10 - ATK - EBD | XX - GS - GI - 000018
(Project | Originator | Volume; Location | Type | Number)

Original Size:	Scale	Project Ref:	Sheet:	Rev:
A3	1:3,000	5197035	6 of 14	P01



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LEGEND

250M STUDY AREA

TRANSECT 1
TRANSECT 2
TRANSECT 3
TRANSECT 4
TRANSECT 5
TRANSECT 6
TRANSECT 7
TRANSECT 8
TRANSECT 9

BEHAVIOURS

= ALARM CALL
_ CALLING
fd CARRYING FOOD
mat CARRYING NEST MATERIAL
fam FAMILY
→ FLYING
FORAGING IN FLIGHT
jv JUVENILE
✳ OCCUPIED NEST
◯ SINGING

SPECIES (BTO CODES)

B. BLACKBIRD
BC BLACKCAP
BH BLACK-HEADED GULL
BT BLUE TIT
BZ BUZZARD
C. CARRION CROW
CC CHIFFCHAFF
CD COLLARED DOVE
CH CHAFFINCH
D. DUNNOCK
FP FERAL PIGEON
G. GREEN WOODPECKER
GO GOLDFINCH
GR GREENFINCH
GS GREAT SPOTTED WOODPECKER
GT GREAT TIT
HG HERRING GULL
HM HOUSE MARTIN
HS HOUSE SPARROW
JD JACKDAW
KT RED KITE
LB LESSER BLACK-BACKED GULL
LI LINNET
LT LONG-TAILED TIT
LW LESSER WHITETHROAT
M. MISTLE THRUSH
MA MALLARD
MG MAGPIE
MH MOORHEN
PW PIED WAGTAIL
PH PHEASANT
R. ROBIN
RO ROOK
S. SKYLARK
SD STOCK DOVE
SG STARLING
SH SPARROWHAWK
SI SWIFT
SL SWALLOW
ST SONG THRUSH
WH WHITETHROAT
WP WOOD PIGEON
WR WREN
YW YELLOW WAGTAIL
Y. YELLOWHAMMER

Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
FOR INFORMATION	S2	P01	SD	LH	--	--	24/09/21

Drawing Suitability: FOR INFORMATION
Status: S2

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log)

Construction: None
Maintenance / Cleaning: None
Use: None
Decommission / Demolition: None

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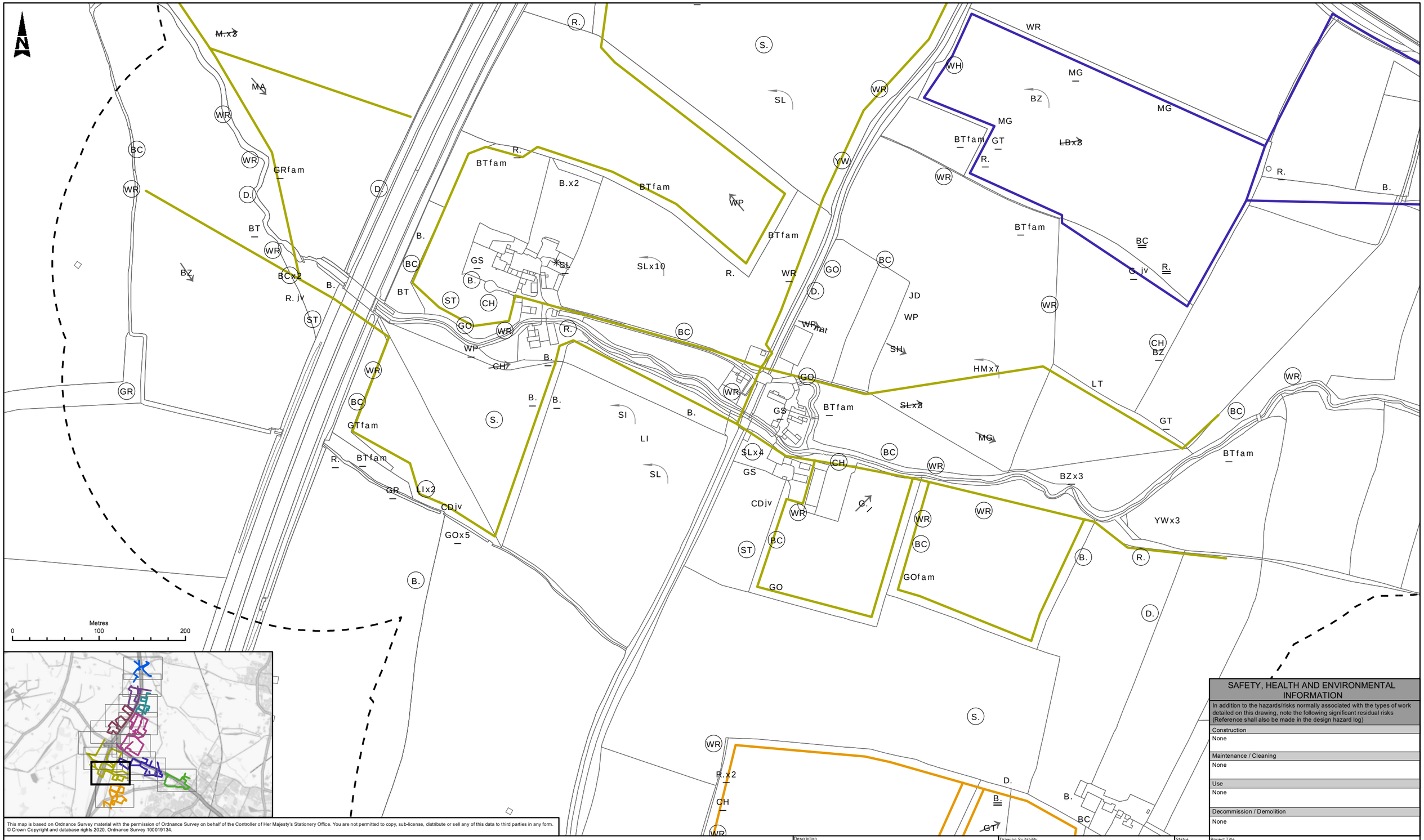
Client: Gloucestershire County Council

Project Title: M5 Junction 10 Improvement

Drawing Title: FIGURE 7.8B
BREEDING BIRD SURVEY RESULTS
JULY 2019

Drawing Number: GCCM5J10 - ATK - EBD - XX - GS - GI - 000018

Original Size: A3 | Scale: 1:4,000 | Project Ref: 5197035 | Sheet: 7 of 14 | Rev: P01



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LEGEND

- 250M STUDY AREA
- TRANSECT 1
- TRANSECT 2
- TRANSECT 3
- TRANSECT 4
- TRANSECT 5
- TRANSECT 6
- TRANSECT 7
- TRANSECT 8
- TRANSECT 9

BEHAVIOURS

- = ALARM CALL
- _ CALLING
- fd CARRYING FOOD
- mat CARRYING NEST MATERIAL
- fam FAMILY
- → FLYING
- FORAGING IN FLIGHT
- jv JUVENILE
- ✳ OCCUPIED NEST
- ◯ SINGING

SPECIES (BTO CODES)

B.	BLACKBIRD	BT	BLUE TIT	GO	GOLDFINCH	KT	RED KITE
BC	BLACKCAP	BZ	BUZZARD	GR	GREENFINCH	LB	LESSER BLACK-BACKED GULL
BH	BLACK-HEADED GULL	C.	CARRION CROW	GS	GREAT SPOTTED WOODPECKER	LI	LINNET
		CC	CHIFFCHAFF	GT	GREAT TIT	LT	LONG-TAILED TIT
		CD	COLLARED DOVE	HG	HERRING GULL	LW	LESSER WHITETHROAT
		CH	CHAFFINCH	HM	HOUSE MARTIN	M.	MISTLE THRUSH
		D.	DUNNOCK	HS	HOUSE SPARROW	MA	MALLARD
		FP	FERAL PIGEON	JD	JACKDAW	MG	MAGPIE
		G.	GREEN WOODPECKER				

MH	MOORHEN	SL	SWALLOW	YW	YELLOW WAGTAIL		
PW	PIED WAGTAIL	ST	SONG THRUSH	Y.	YELLOWHAMMER		
PH	PHEASANT	WH	WHITETHROAT				
R.	ROBIN	WP	WOOD PIGEON				
RO	ROOK	WR	WREN				
S.	SKYLARK						
SD	STOCK DOVE						
SG	STARLING						
SH	SPARROWHAWK						
SI	SWIFT						

Description

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date

Description

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date

Description

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date

Description

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date

Description: FOR INFORMATION

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
S2	P01	SD	LH	--	--	24/09/21

Drawing Suitability: FOR INFORMATION

Status: S2

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log)

Construction
None

Maintenance / Cleaning
None

Use
None

Decommission / Demolition
None

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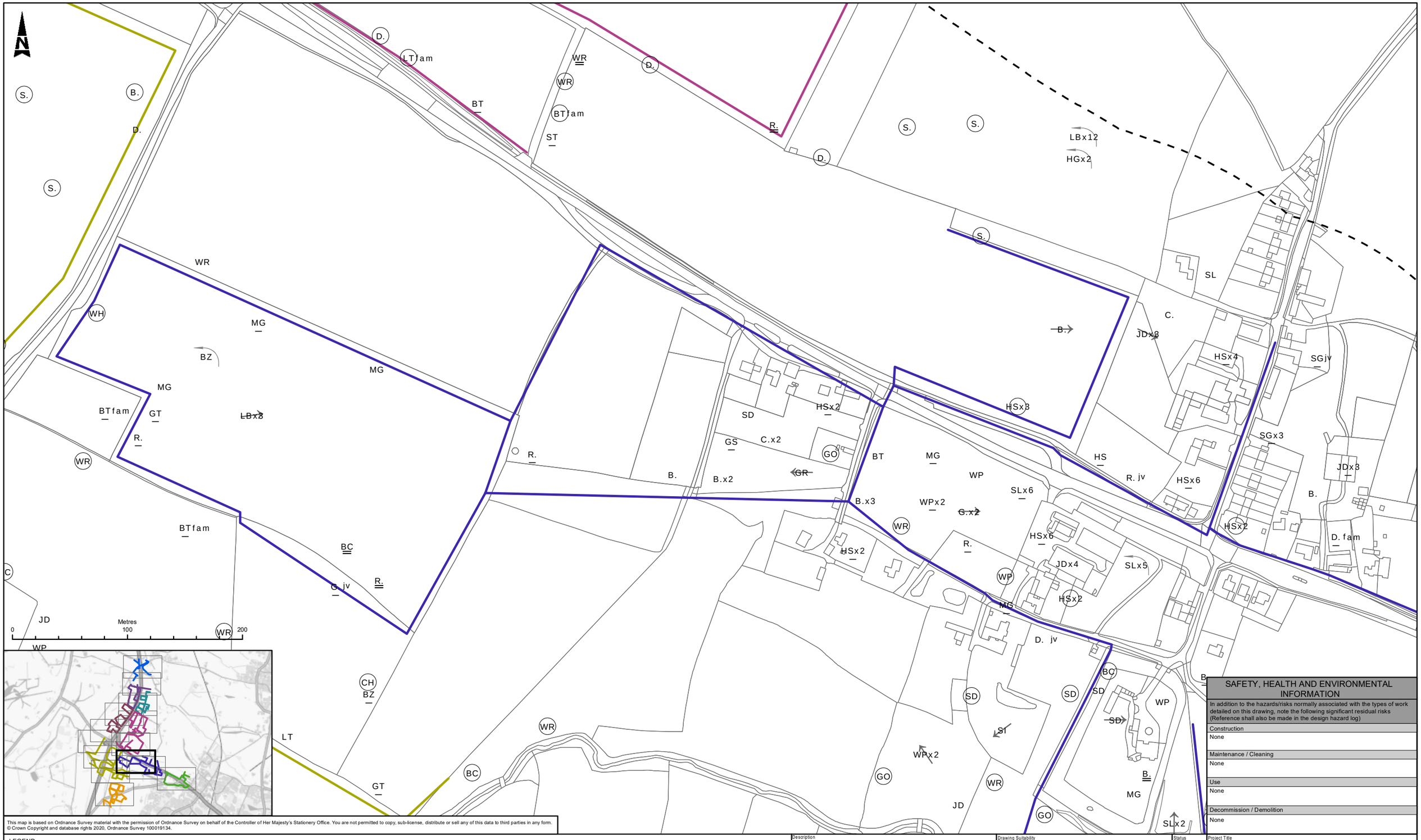
Client: Gloucestershire County Council

Project Title: M5 Junction 10 Improvement

Drawing Title: FIGURE 7.8B
BREEDING BIRD SURVEY RESULTS
JULY 2019

Drawing Number: GCCM5J10 - ATK - EBD - XX - GS - GI - 000018
(Project | Originator | Volume | Location | Type | Number)

Original Size:	Scale	Project Ref:	Sheet:	Rev:
A3	1:4,000	5197035	8 of 14	P01



SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log)

Construction
None

Maintenance / Cleaning
None

Use
None

Decommission / Demolition
None

Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
FOR INFORMATION	S2	P01	SD	LH	--	--	24/09/21

Drawing Suitability: FOR INFORMATION
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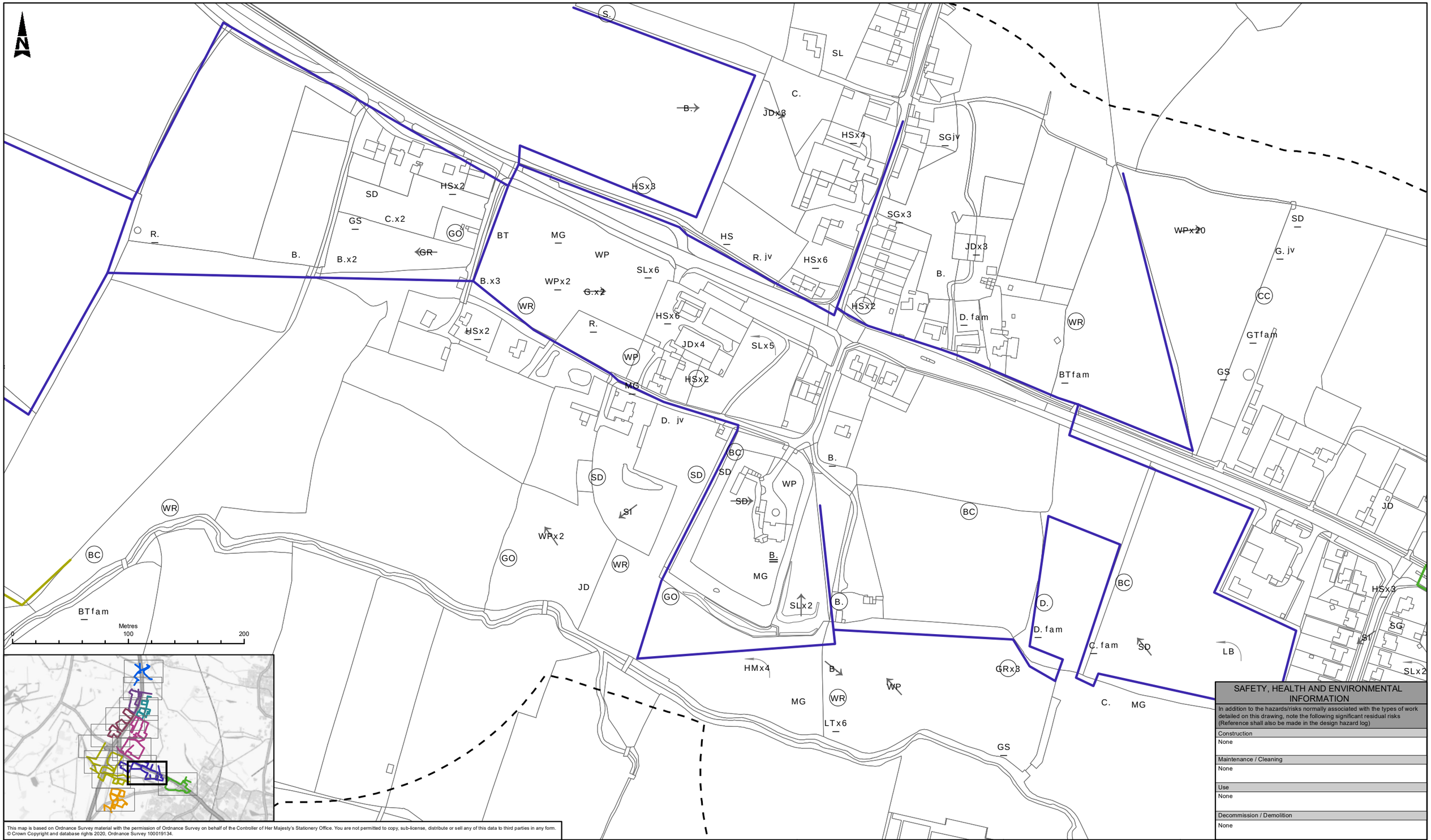
Client: Gloucestershire County Council

Project Title: M5 Junction 10 Improvement

Drawing Title: FIGURE 7.8B
BREEDING BIRD SURVEY RESULTS
JULY 2019

Drawing Number: GCCM5J10 - ATK - EBD - XX - GS - GI - 000018
(Project | Originator | Volume | Location | Type | Number)

Original Size:	Scale	Project Ref:	Sheet:	Rev:
A3	1:3,000	5197035	9 of 14	P01



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LEGEND

- 250M STUDY AREA
- TRANSECT 1
- TRANSECT 2
- TRANSECT 3
- TRANSECT 4
- TRANSECT 5
- TRANSECT 6
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- TRANSECT 8
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BEHAVIOURS

- = ALARM CALL
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SPECIES (BTO CODES)

B.	BLACKBIRD
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MA	MALLARD
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Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
FOR INFORMATION	S2	P01	SD	LH	--	--	24/09/21

Drawing Suitability: FOR INFORMATION

Status: S2

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SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

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Construction
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Maintenance / Cleaning
None

Use
None

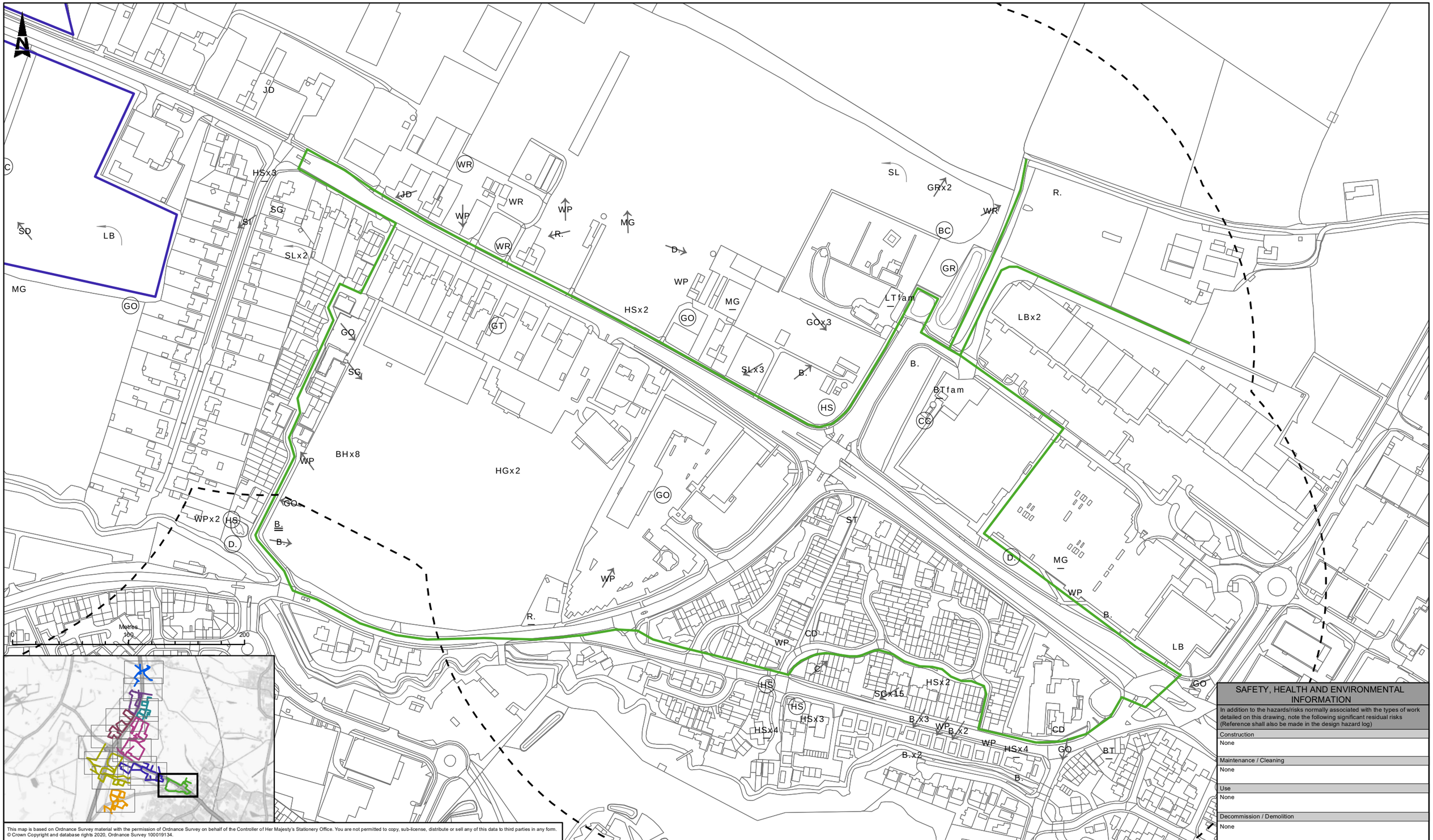
Decommission / Demolition
None

Project Title: M5 Junction 10 Improvement

Drawing Title: FIGURE 7.8B
BREEDING BIRD SURVEY RESULTS
JULY 2019

Drawing Number: Project | Originator | Volume
GCCM5J10 - ATK - EBD
XX - GS - GI - 000018
Location | Type | Number

Original Size:	Scale	Project Ref:	Sheet:	Rev:
A3	1:3,000	5197035	10 of 14	P01



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LEGEND

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- TRANSECT 1
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BEHAVIOURS

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KT	RED KITE
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LI	LINNET
LT	LONG-TAILED TIT
LW	LESSER WHITETHROAT
M.	MISTLE THRUSH
MA	MALLARD
MG	MAGPIE
MH	MOORHEN
PW	PIED WAGTAIL
PH	PHEASANT
R.	ROBIN
RO	ROOK
S.	SKYLARK
SD	STOCK DOVE
SG	STARLING
SH	SPARROWHAWK
SI	SWIFT
SL	SWALLOW
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WH	WHITETHROAT
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Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
FOR INFORMATION	S2	P01	SD	LH	--	--	24/09/21

Drawing Suitability: FOR INFORMATION

Status: S2

Project Title: M5 Junction 10 Improvement

Drawing Title: FIGURE 7.8B BREEDING BIRD SURVEY RESULTS JULY 2019

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Original Size: A3 | Scale: 1:3,000 | Project Ref: 5197035 | Sheet: 11 of 14 | Rev: P01

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

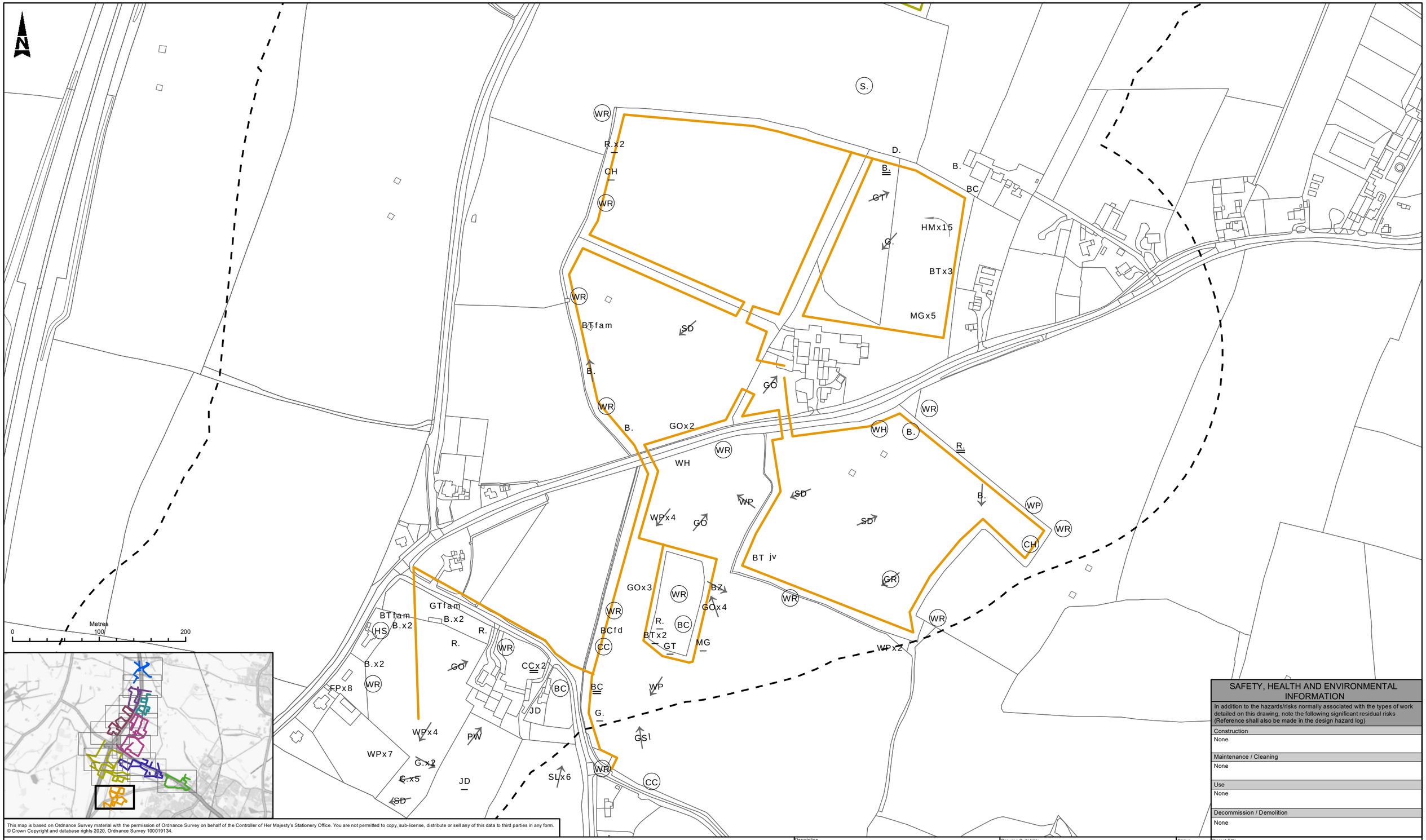
In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log)

Construction: None

Maintenance / Cleaning: None

Use: None

Decommission / Demolition: None



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LEGEND

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- fd CARRYING FOOD
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- FORAGING IN FLIGHT
- jv JUVENILE
- ✳ OCCUPIED NEST
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		CD	COLLARED DOVE	HG	HERRING GULL	LW	LESSER WHITETHROAT	RO	ROOK
		CH	CHAFFINCH	HM	HOUSE MARTIN	M.	MISTLE THRUSH	S.	SKYLARK
		D.	DUNNOCK	HS	HOUSE SPARROW	MA	MALLARD	SD	STOCK DOVE
		FP	FERAL PIGEON	JD	JACKDAW	MG	MAGPIE	SG	STARLING
		G.	GREEN WOODPECKER					SH	SPARROWHAWK
								SI	SWIFT

SL	SWALLOW
ST	SONG THRUSH
WH	WHITETHROAT
WP	WOOD PIGEON
WR	WREN
YW	YELLOW WAGTAIL
Y.	YELLOWHAMMER

Description

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
FOR INFORMATION						
S2	P01	SD	LH	--	--	24/09/21

Drawing Suitability: FOR INFORMATION

Status: S2

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log)

Construction
None

Maintenance / Cleaning
None

Use
None

Decommission / Demolition
None

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Client: Gloucestershire County Council

Project Title: M5 Junction 10 Improvement

Drawing Title: FIGURE 7.8B
BREEDING BIRD SURVEY RESULTS
JULY 2019

Drawing Number: Project | Originator | Volume
GCCM5J10 - ATK - EBD
XX - GS - GI - 000018
Location | Type | Number

Original Size:	Scale	Project Ref:	Sheet:	Rev:
A3	1:4,000	5197035	12 of 14	P01



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LEGEND

- 250M STUDY AREA
- TRANSECT 1
- TRANSECT 2
- TRANSECT 3
- TRANSECT 4
- TRANSECT 5
- TRANSECT 6
- TRANSECT 7
- TRANSECT 8
- TRANSECT 9

BEHAVIOURS

- ALARM CALL
- CALLING
- fd CARRYING FOOD
- mat CARRYING NEST MATERIAL
- fam FAMILY
- FLYING
- FORAGING IN FLIGHT
- jv JUVENILE
- OCCUPIED NEST
- SINGING

SPECIES (BTO CODES)

- B. BLACKBIRD
- BC BLACKCAP
- BH BLACK-HEADED GULL
- BT BLUE TIT
- BZ BUZZARD
- C. CARRION CROW
- CC CHIFFCHAFF
- CD COLLARED DOVE
- CH CHAFFINCH
- D. DUNNOCK
- FP FERAL PIGEON
- G. GREEN WOODPECKER
- GO GOLDFINCH
- GR GREENFINCH
- GS GREAT SPOTTED WOODPECKER
- GT GREAT TIT
- HG HERRING GULL
- HM HOUSE MARTIN
- HS HOUSE SPARROW
- JD JACKDAW
- KT RED KITE
- LB LESSER BLACK-BACKED GULL
- LI LINNET
- LT LONG-TAILED TIT
- LW LESSER WHITETHROAT
- M. MISTLE THRUSH
- MA MALLARD
- MG MAGPIE
- MH MOORHEN
- PW PIED WAGTAIL
- PH PHEASANT
- R. ROBIN
- RO ROOK
- S. SKYLARK
- SD STOCK DOVE
- SG STARLING
- SH SPARROWHAWK
- SI SWIFT
- SL SWALLOW
- ST SONG THRUSH
- WH WHITETHROAT
- WP WOOD PIGEON
- WR WREN
- YW YELLOW WAGTAIL
- Y. YELLOWHAMMER

Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
Description							
Description							
Description							
Description							
FOR INFORMATION	S2	P01	SD	LH	--	--	24/09/21

Drawing Suitability: FOR INFORMATION

Status: S2

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log)

Construction
None

Maintenance / Cleaning
None

Use
None

Decommission / Demolition
None

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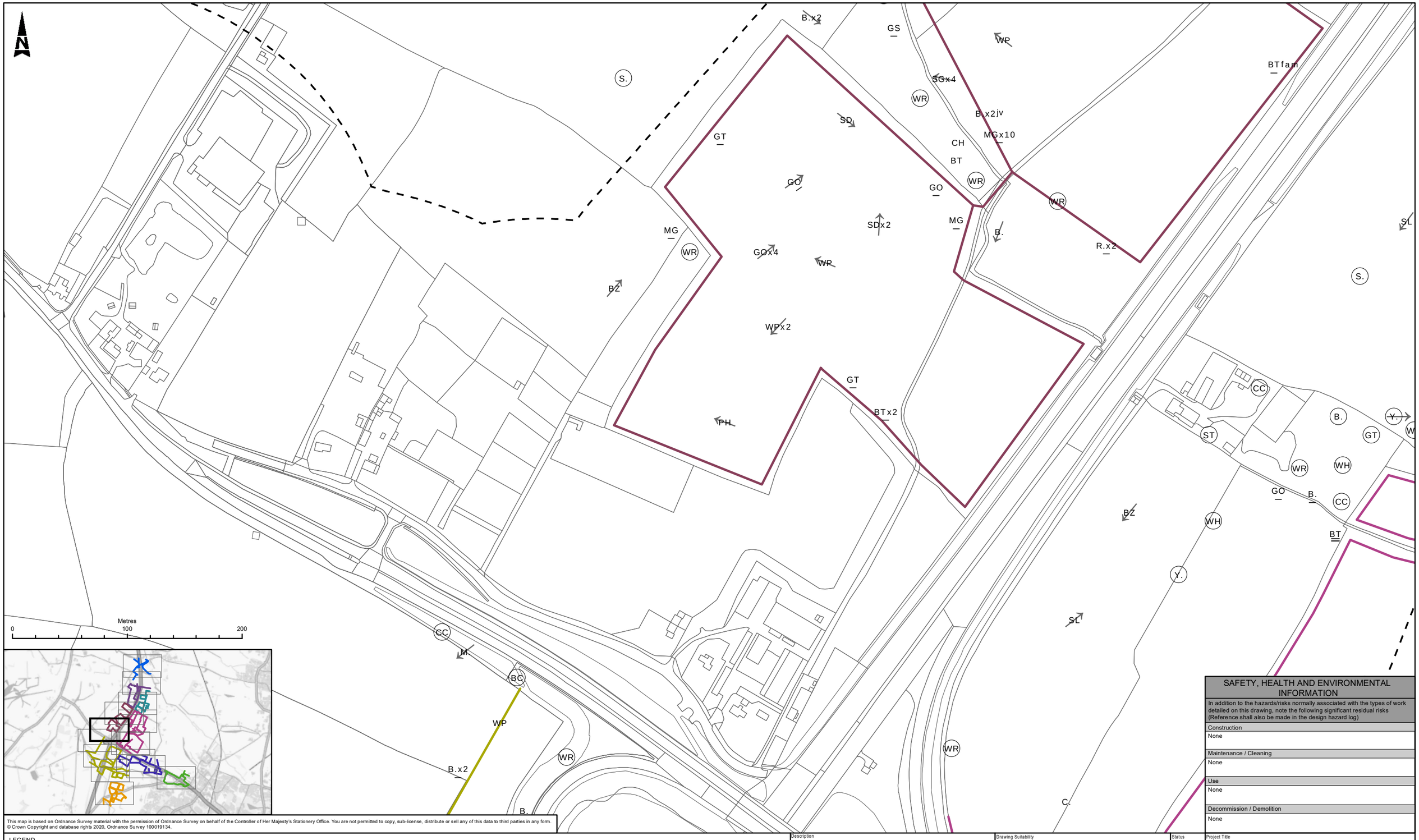
Client: Gloucestershire County Council

Project Title: M5 Junction 10 Improvement

Drawing Title: FIGURE 7.8B
BREEDING BIRD SURVEY RESULTS
JULY 2019

Drawing Number: GCCM5J10 - ATK - EBD | XX - GS - GI - 000018
(Project | Originator | Volume | Location | Type | Number)

Original Size:	Scale	Project Ref:	Sheet:	Rev:
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LEGEND

- 250M STUDY AREA
- TRANSECT 1
- TRANSECT 2
- TRANSECT 3
- TRANSECT 4
- TRANSECT 5
- TRANSECT 6
- TRANSECT 7
- TRANSECT 8
- TRANSECT 9

BEHAVIOURS

- = ALARM CALL
- _ CALLING
- fd CARRYING FOOD
- mat CARRYING NEST MATERIAL
- fam FAMILY
- → FLYING
- FORAGING IN FLIGHT
- jv JUVENILE
- ✳ OCCUPIED NEST
- ◯ SINGING

SPECIES (BTO CODES)

B.	BLACKBIRD	BT	BLUE TIT	GO	GOLDFINCH	KT	RED KITE	MH	MOORHEN	SL	SWALLOW
BC	BLACKCAP	BZ	BUZZARD	GR	GREENFINCH	LB	LESSER BLACK-BACKED GULL	PW	PIED WAGTAIL	ST	SONG THRUSH
BH	BLACK-HEADED GULL	C.	CARRION CROW	GS	GREAT SPOTTED WOODPECKER	LI	LINNET	PH	PHEASANT	WH	WHITETHROAT
G.	GREEN WOODPECKER	CC	CHIFFCHAFF	GT	GREAT TIT	LT	LONG-TAILED TIT	R.	ROBIN	WP	WOOD PIGEON
J D	JACKDAW	CD	COLLARED DOVE	HG	HERRING GULL	LW	LESSER WHITETHROAT	RO	ROOK	WR	WREN
		CH	CHAFFINCH	HM	HOUSE MARTIN	M.	MISTLE THRUSH	S.	SKYLARK	YW	YELLOW WAGTAIL
		D.	DUNNOCK	HS	HOUSE SPARROW	MA	MALLARD	SD	STOCK DOVE	Y.	YELLOWHAMMER
		FP	FERAL PIGEON			MG	MAGPIE	SG	STARLING		
								SH	SPARROWHAWK		
								SI	SWIFT		

Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
FOR INFORMATION	S2	P01	SD	LH	--	--	24/09/21

Drawing Suitability: FOR INFORMATION
Status: S2

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Client: Gloucestershire County Council

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log)

Construction
None

Maintenance / Cleaning
None

Use
None

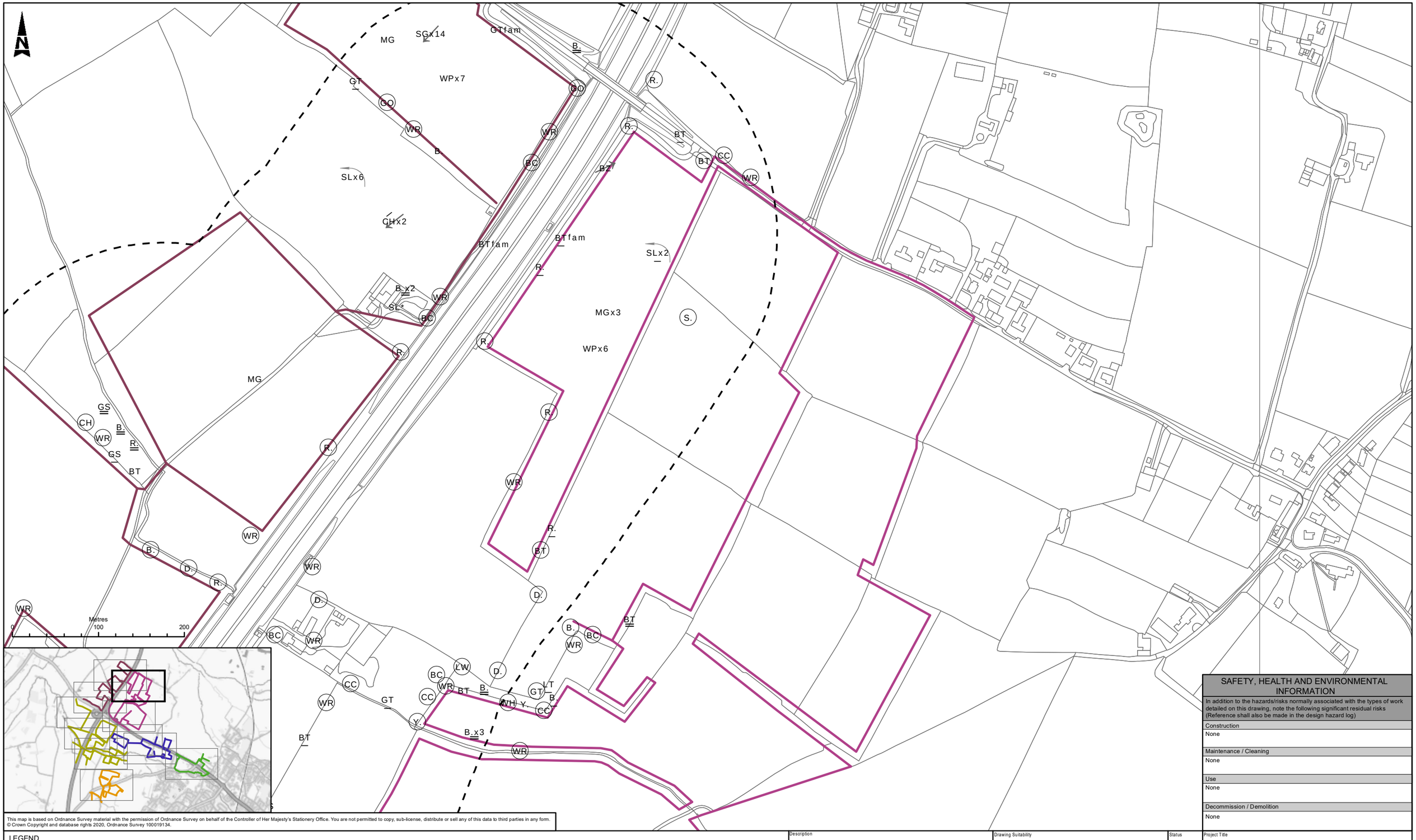
Decommission / Demolition
None

Project Title: M5 Junction 10 Improvement

Drawing Title: FIGURE 7.8B
BREEDING BIRD SURVEY RESULTS
JULY 2019

Drawing Number: GCCM5J10 - ATK - EBD - XX - GS - GI - 000018

Original Size:	Scale	Project Ref:	Sheet:	Rev:
A3	1:3,000	5197035	14 of 14	P01



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LEGEND

- 250M STUDY AREA
- TRANSECT 4
- TRANSECT 5
- TRANSECT 6
- TRANSECT 7
- TRANSECT 8
- TRANSECT 9

BEHAVIOURS

- ALARM CALL
- CALLING

fd	CARRYING FOOD
mat	CARRYING NEST MATERIAL
(d)	DEAD
fam	FAMILY
→	FLYING
⌒	FORAGING IN FLIGHT
jv	JUVENILE
✳	OCCUPIED NEST
◯	SINGING

SPECIES (BTO CODES)

B.	BLACKBIRD
BC	BLACKCAP
BT	BLUE TIT
BZ	BUZZARD
C.	CARRION CROW
CC	CHIFFCHAFF
CD	COLLARED DOVE
CG	CANADA GOOSE
CH	CHAFFINCH
CT	COAL TIT
D.	DUNNOCK
G.	GREEN WOODPECKER
GC	GOLDCREST
GL	GREY WAGTAIL
GO	GOLDFINCH
GR	GREENFINCH
GS	GREAT SPOTTED WOODPECKER
GT	GREAT TIT
HG	HERRING GULL
HM	HOUSE MARTIN
HS	HOUSE SPARROW
JD	JACKDAW
KF	KINGFISHER
LB	LESSER BLACK-BACKED GULL
LI	LINNET
LO	LITTLE OWL
LT	LONG-TAILED TIT
LW	LESSER WHITETHROAT
M.	MISTLE THRUSH
MA	MALLARD
MG	MAGPIE
MH	MOORHEN
PW	PIED WAGTAIL
PH	PHEASANT
R.	ROBIN
RN	RAVEN
S.	SKYLARK
SD	STOCK DOVE
SG	STARLING
SL	SWALLOW
ST	SONG THRUSH
SW	SEDGE WARBLER
WP	WOOD PIGEON
WH	WHITETHROAT
WR	WREN
Y.	YELLOWHAMM...
YW	YELLOW WAGTAIL

Description

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date

Description

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date

Description

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date

Description

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date

Description
FOR INFORMATION

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
S2	P01	SD	LH	CC	MT	24/09/21

Drawing Suitability: FOR INFORMATION
Status: S2

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SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

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Construction
None

Maintenance / Cleaning
None

Use
None

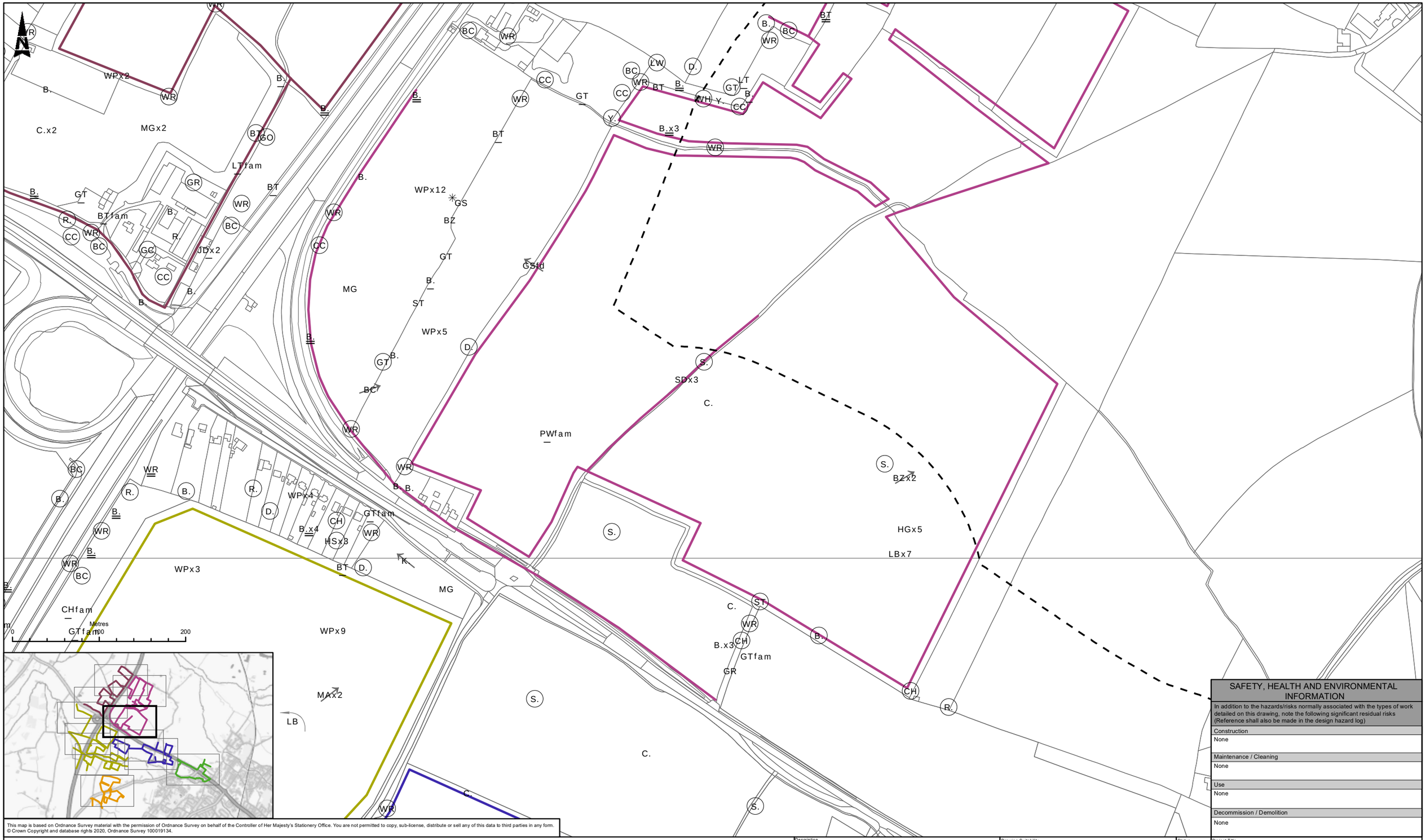
Decommission / Demolition
None

Project Title: M5 Junction 10 Improvement

Drawing Title: FIGURE 7.8C
BREEDING BIRD SURVEY RESULTS
MAY 2020

Drawing Number
Project | Originator | Volume
GCCM5J10 - ATK - EBD
XX - GS - GI - 000026
Location | Type | Number

Original Size:	Scale	Project Ref:	Sheet:	Rev:
A3	1:4,000	5197035	1 of 11	P01



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LEGEND

- 250M STUDY AREA
- TRANSECT 4
- TRANSECT 5
- TRANSECT 6
- TRANSECT 7
- TRANSECT 8
- TRANSECT 9

BEHAVIOURS

- = ALARM CALL
- _ CALLING
- fd CARRYING FOOD
- mat CARRYING NEST MATERIAL
- (d) DEAD
- fam FAMILY
- → FLYING
- ⌒ FORAGING IN FLIGHT
- jv JUVENILE
- ✳ OCCUPIED NEST
- ◯ SINGING

SPECIES (BTO CODES)

B.	BLACKBIRD
BC	BLACKCAP
BT	BLUE TIT
BZ	BUZZARD
C.	CARRION CROW
CC	CHIFFCHAFF
CD	COLLARED DOVE
CG	CANADA GOOSE
CH	CHAFFINCH
CT	COAL TIT
D.	DUNNOCK
G.	GREEN WOODPECKER
GC	GOLDCREST
GL	GREY WAGTAIL
GO	GOLDFINCH
GR	GREENFINCH
GS	GREAT SPOTTED WOODPECKER
GT	GREAT TIT
HG	HERRING GULL
HM	HOUSE MARTIN
HS	HOUSE SPARROW
JD	JACKDAW
KF	KINGFISHER
LB	LESSER BLACK-BACKED GULL
LI	LINNET
LO	LITTLE OWL
LT	LONG-TAILED TIT
LW	LESSER WHITETHROAT
M.	MISTLE THRUSH
MA	MALLARD
MG	MAGPIE
MH	MOORHEN
PW	PIED WAGTAIL
PH	PHEASANT
R.	ROBIN
RN	RAVEN
S.	SKYLARK
SD	STOCK DOVE
SG	STARLING
SL	SWALLOW
ST	SONG THRUSH
SW	SEDGE WARBLER
WP	WOOD PIGEON
WH	WHITETHROAT
WR	WREN
Y.	YELLOWHAMM...
YW	YELLOW WAGTAIL

Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
FOR INFORMATION	S2	P01	SD	LH	CC	MT	24/09/21

Drawing Suitability: FOR INFORMATION
Status: S2

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Client: Gloucestershire County Council

Project Title: M5 Junction 10 Improvement

Drawing Title: FIGURE 7.8C
BREEDING BIRD SURVEY RESULTS
MAY 2020

Drawing Number: Project | Originator | Volume
GCCM5J10 - ATK - EBD
XX - GS - GI - 000026
Location | Type | Number

Original Size:	Scale	Project Ref:	Sheet:	Rev:
A3	1:4,000	5197035	2 of 11	P01

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

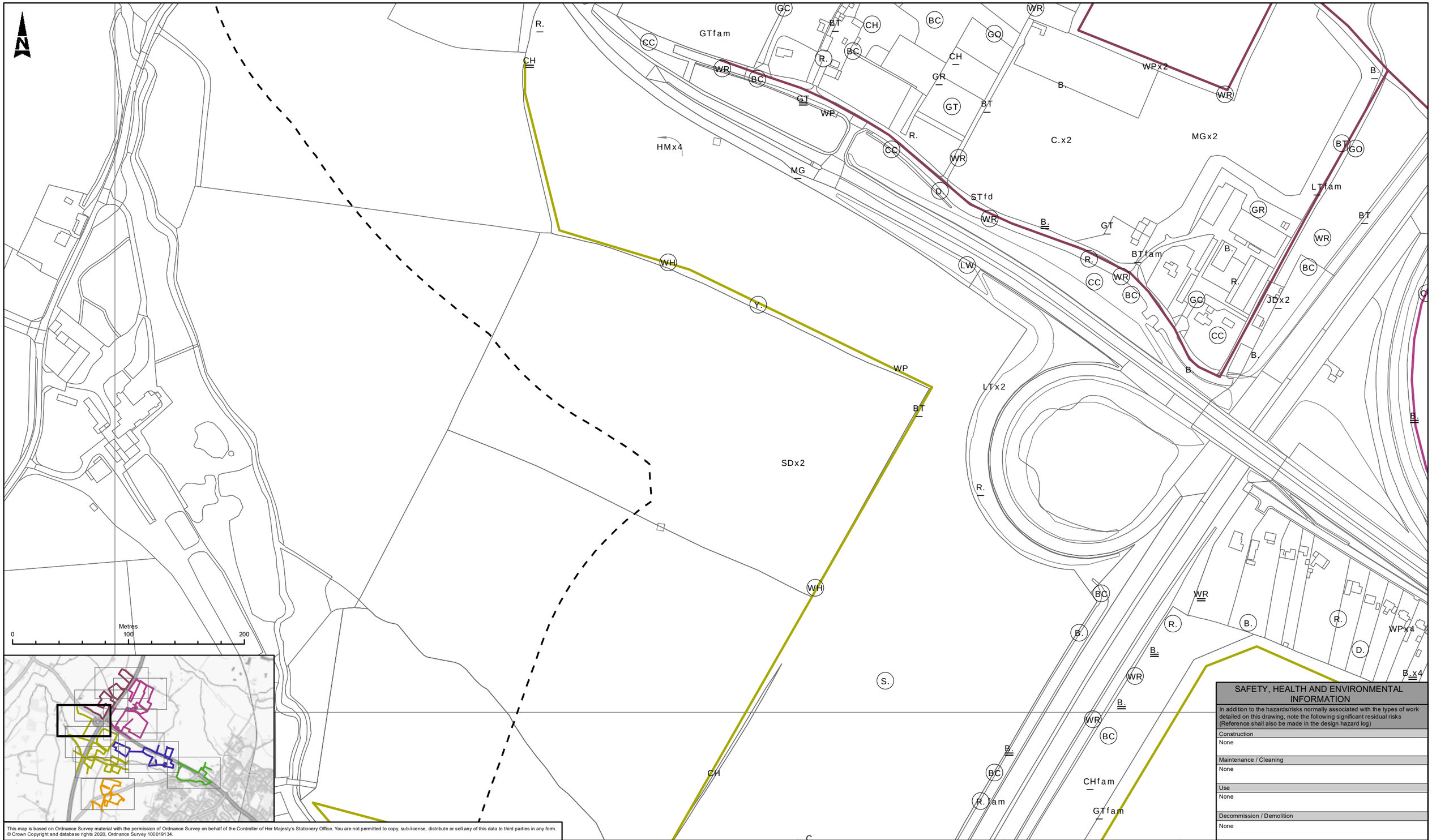
In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log)

Construction
None

Maintenance / Cleaning
None

Use
None

Decommission / Demolition
None



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LEGEND

- 250M STUDY AREA
- TRANSECT 4
- TRANSECT 5
- TRANSECT 6
- TRANSECT 7
- TRANSECT 8
- TRANSECT 9

BEHAVIOURS

- ALARM CALL
- CALLING
- fd CARRYING FOOD
- mat CARRYING NEST MATERIAL
- (d) DEAD
- fam FAMILY
- FLYING
- FORAGING IN FLIGHT
- jv JUVENILE
- OCCUPIED NEST
- SINGING

SPECIES (BTO CODES)

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G.	GREEN WOODPECKER
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GL	GREY WAGTAIL
GO	GOLDFINCH
GR	GREENFINCH
GS	GREAT SPOTTED WOODPECKER
GT	GREAT TIT
HG	HERRING GULL
HM	HOUSE MARTIN
HS	HOUSE SPARROW
JD	JACKDAW
KF	KINGFISHER
LB	LESSER BLACK-BACKED GULL
LI	LINNET
LO	LITTLE OWL
LT	LONG-TAILED TIT
LW	LESSER WHITETHROAT
M.	MISTLE THRUSH
MA	MALLARD
MG	MAGPIE
MH	MOORHEN
PW	PIED WAGTAIL
PH	PHEASANT
R.	ROBIN
RN	RAVEN
S.	SKYLARK
SD	STOCK DOVE
SG	STARLING
SL	SWALLOW
ST	SONG THRUSH
SW	SEDGE WARBLER
WP	WOOD PIGEON
WH	WHITETHROAT
WR	WREN
Y.	YELLOWHAMM...
YW	YELLOW WAGTAIL

Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
FOR INFORMATION	S2	P01	SD	LH	CC	MT	24/09/21

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

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Construction
None

Maintenance / Cleaning
None

Use
None

Decommission / Demolition
None

Drawing Suitability: FOR INFORMATION
Status: S2

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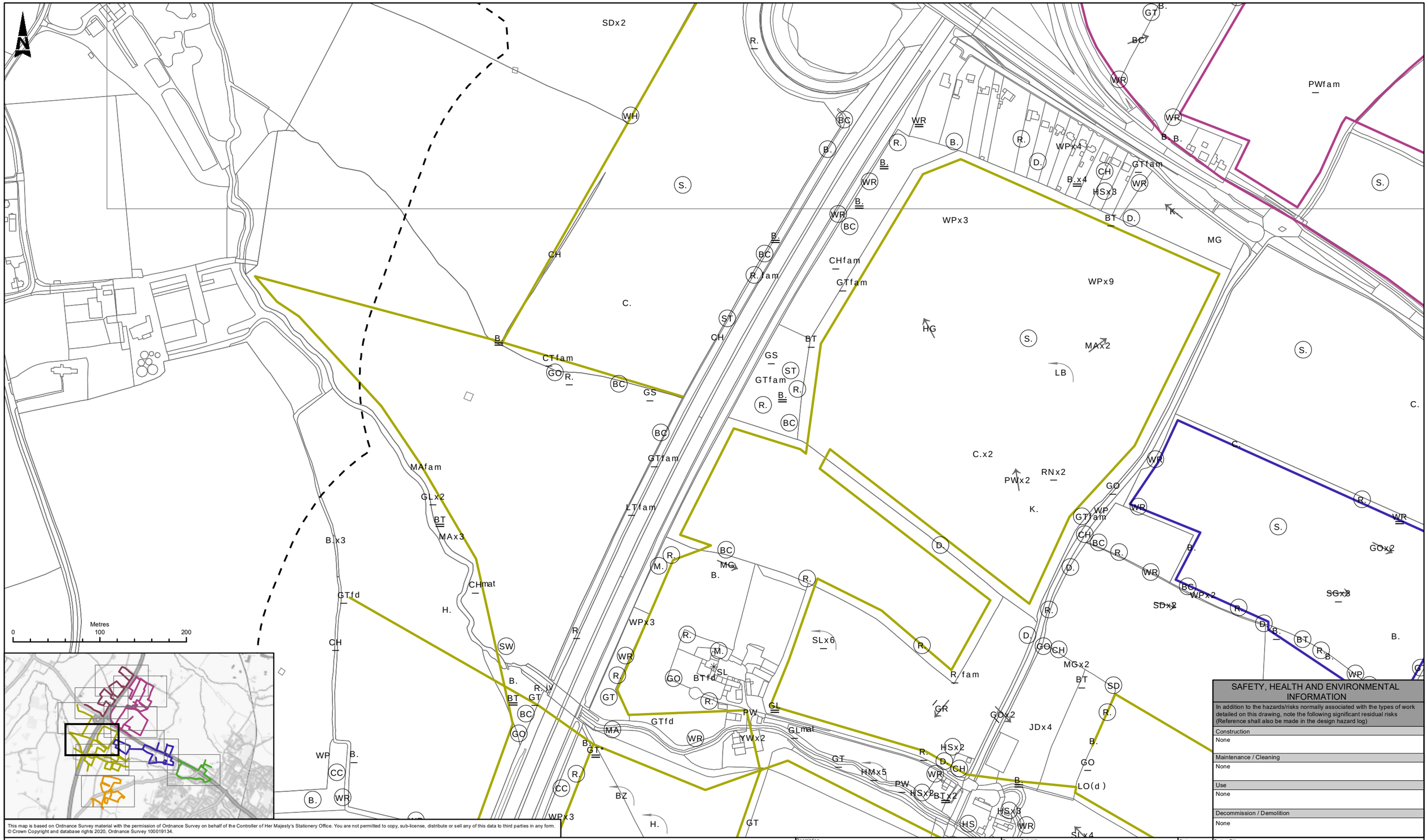
Client: Gloucestershire County Council

Project Title: M5 Junction 10 Improvement

Drawing Title: FIGURE 7.8C
BREEDING BIRD SURVEY RESULTS
MAY 2020

Drawing Number: Project | Originator | Volume
GCCM5J10 - ATK - EBD
XX - GS - GI - 000026
Location | Type | Number

Original Size:	Scale	Project Ref:	Sheet:	Rev:
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LEGEND

- 250M STUDY AREA
- TRANSECT 4
- TRANSECT 5
- TRANSECT 6
- TRANSECT 7
- TRANSECT 8
- TRANSECT 9

BEHAVIOURS

- = ALARM CALL
- _ CALLING

- fd CARRYING FOOD
- mat CARRYING NEST MATERIAL
- (d) DEAD
- fam FAMILY
- → FLYING
- FORAGING IN FLIGHT
- jv JUVENILE
- ✳ OCCUPIED NEST
- ◯ SINGING

SPECIES (BTO CODES)

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GT	GREAT TIT
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KF	KINGFISHER
LB	LESSER BLACK-BACKED GULL
LI	LINNET
LO	LITTLE OWL
LT	LONG-TAILED TIT
LW	LESSER WHITETHROAT
M.	MISTLE THRUSH
MA	MALLARD
MG	MAGPIE
MH	MOORHEN
PW	PIED WAGTAIL
PH	PHEASANT
R.	ROBIN
RN	RAVEN
S.	SKYLARK
SD	STOCK DOVE
SG	STARLING
SL	SWALLOW
ST	SONG THRUSH
SW	SEDGE WARBLER
WP	WOOD PIGEON
WH	WHITETHROAT
WR	WREN
Y.	YELLOWHAMM...
YW	YELLOW WAGTAIL

Description

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date

Description

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date

Description

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date

Description

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date

Description FOR INFORMATION

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
S2	P01	SD	LH	CC	MT	24/09/21

Drawing Suitability: FOR INFORMATION

Status: S2

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

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Construction
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Maintenance / Cleaning
None

Use
None

Decommission / Demolition
None

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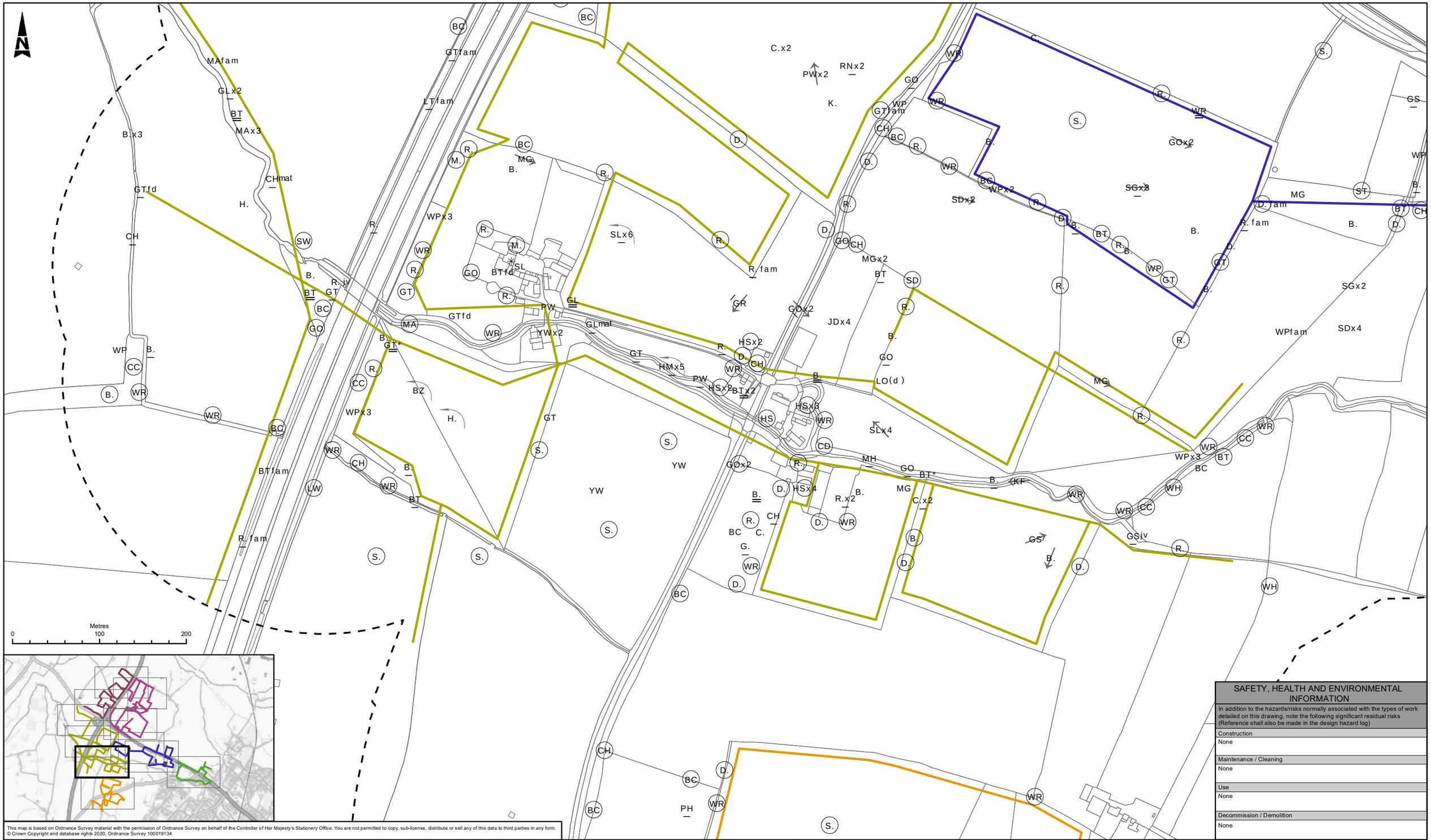
Client: Gloucestershire County Council

Project Title: M5 Junction 10 Improvement

Drawing Title: FIGURE 7.8C
BREEDING BIRD SURVEY RESULTS
MAY 2020

Drawing Number: GCCM5J10 - ATK - EBD - XX - GS - GI - 000026

Original Size:	Scale	Project Ref:	Sheet:	Rev:
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LEGEND

- 250M STUDY AREA
- TRANSECT 4
- TRANSECT 5
- TRANSECT 6
- TRANSECT 7
- TRANSECT 8
- TRANSECT 9

BEHAVIOURS

- ALARM CALL
- CALLING

fd	CARRYING FOOD
mat	CARRYING NEST MATERIAL
(d)	DEAD
fam	FAMILY
→	FLYING
⌒	FORAGING IN FLIGHT
jv	JUVENILE
✳	OCCUPIED NEST
◯	SINGING

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GC	GOLDCREST
GL	GREY WAGTAIL
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GS	GREAT SPOTTED WOODPECKER
GT	GREAT TIT
HG	HERRING GULL
HM	HOUSE MARTIN
HS	HOUSE SPARROW
JD	JACKDAW
KF	KINGFISHER
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M.	MISTLE THRUSH
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MH	MOORHEN
PW	PIED WAGTAIL
PH	PHEASANT
R.	ROBIN
RN	RAVEN
S.	SKYLARK
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ST	SONG THRUSH
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WH	WHITETHROAT
WR	WREN
Y.	YELLOWHAMM...
YW	YELLOW WAGTAIL

Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
FOR INFORMATION	S2	P01	SD	LH	CC	MT	24/09/21

Drawing Suitability: FOR INFORMATION

Status: S2

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Client: Gloucestershire County Council

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log)

Construction
None

Maintenance / Cleaning
None

Use
None

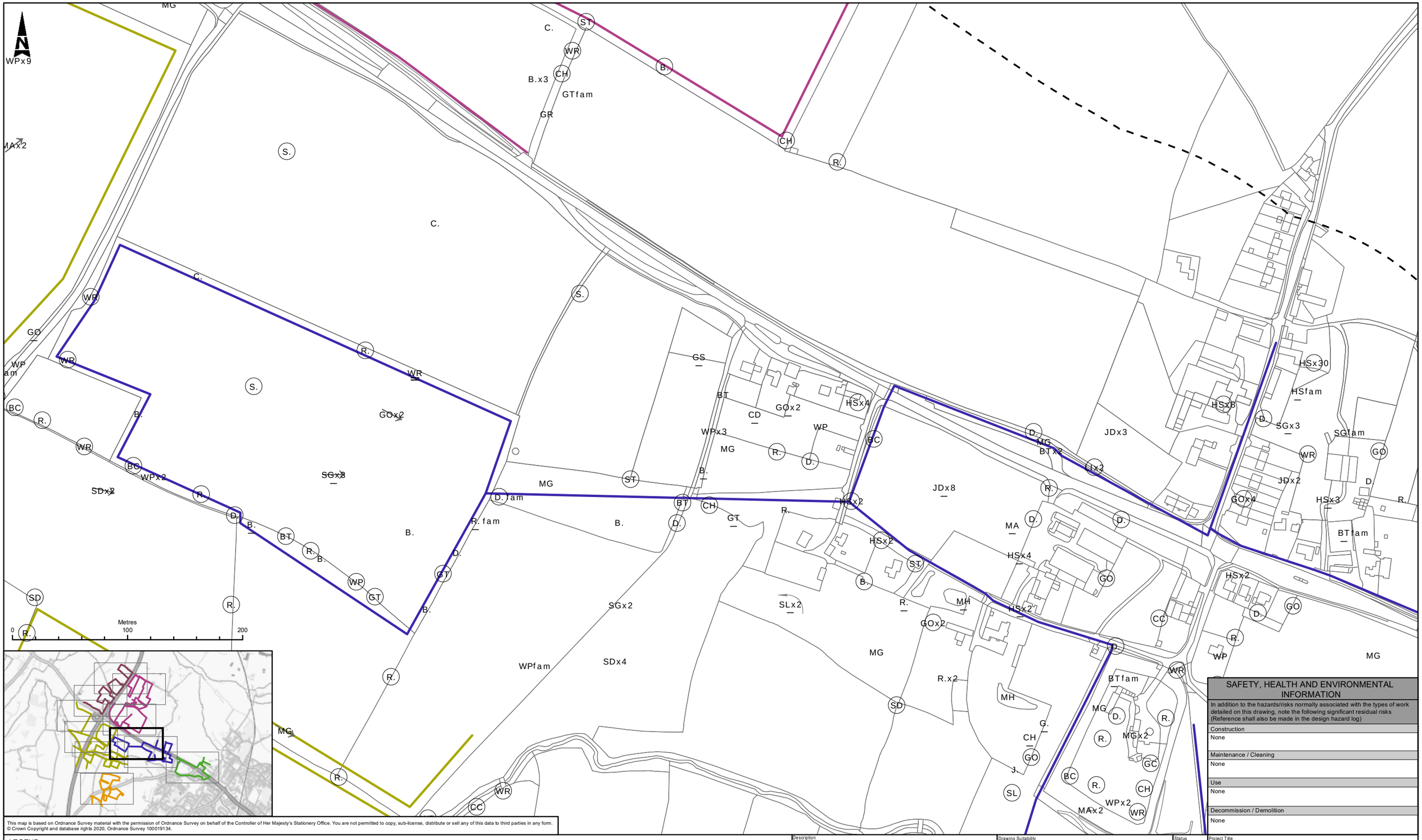
Decommission / Demolition
None

Project Title: M5 Junction 10 Improvement

Drawing Title: FIGURE 7.8C
BREEDING BIRD SURVEY RESULTS
MAY 2020

Drawing Number: Project | Originator | Volume
GCCM5J10 - ATK - EBD
XX - GS - GI - 000026
Location | Type | Number

Original Size:	Scale	Project Ref:	Sheet:	Rev:
A3	1:4,000	5197035	5 of 11	P01



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LEGEND

250M STUDY AREA
TRANSECT 4
TRANSECT 5
TRANSECT 6
TRANSECT 7
TRANSECT 8
TRANSECT 9

BEHAVIOURS
= ALARM CALL
_ CALLING

fd CARRYING FOOD
mat CARRYING NEST MATERIAL
(d) DEAD
fam FAMILY
→ FLYING
⌒ FORAGING IN FLIGHT
jv JUVENILE
✳ OCCUPIED NEST
◯ SINGING

SPECIES (BTO CODES)

B.	BLACKBIRD
BC	BLACKCAP
BT	BLUE TIT
BZ	BUZZARD
C.	CARRION CROW
CC	CHIFFCHAFF
CD	COLLARED DOVE
CG	CANADA GOOSE
CH	CHAFFINCH
CT	COAL TIT
D.	DUNNOCK
G.	GREEN WOODPECKER
GC	GOLDCREST
GL	GREY WAGTAIL
GO	GOLDFINCH
GR	GREENFINCH
GS	GREAT SPOTTED WOODPECKER
GT	GREAT TIT
HG	HERRING GULL
HM	HOUSE MARTIN
HS	HOUSE SPARROW
JD	JACKDAW
KF	KINGFISHER
LB	LESSER BLACK-BACKED GULL
LI	LINNET
LO	LITTLE OWL
LT	LONG-TAILED TIT
LW	LESSER WHITETHROAT
M.	MISTLE THRUSH
MA	MALLARD
MG	MAGPIE
MH	MOORHEN
PW	PIED WAGTAIL
PH	PHEASANT
R.	ROBIN
RN	RAVEN
S.	SKYLARK
SD	STOCK DOVE
SG	STARLING
SL	SWALLOW
ST	SONG THRUSH
SW	SEDGE WARBLER
WP	WOOD PIGEON
WH	WHITETHROAT
WR	WREN
Y.	YELLOWHAMM...
YW	YELLOW WAGTAIL

Description

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
FOR INFORMATION						
S2	P01	SD	LH	CC	MT	24/09/21

Drawing Suitability: FOR INFORMATION
Status: S2

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Client: Gloucestershire County Council

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

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Construction
None

Maintenance / Cleaning
None

Use
None

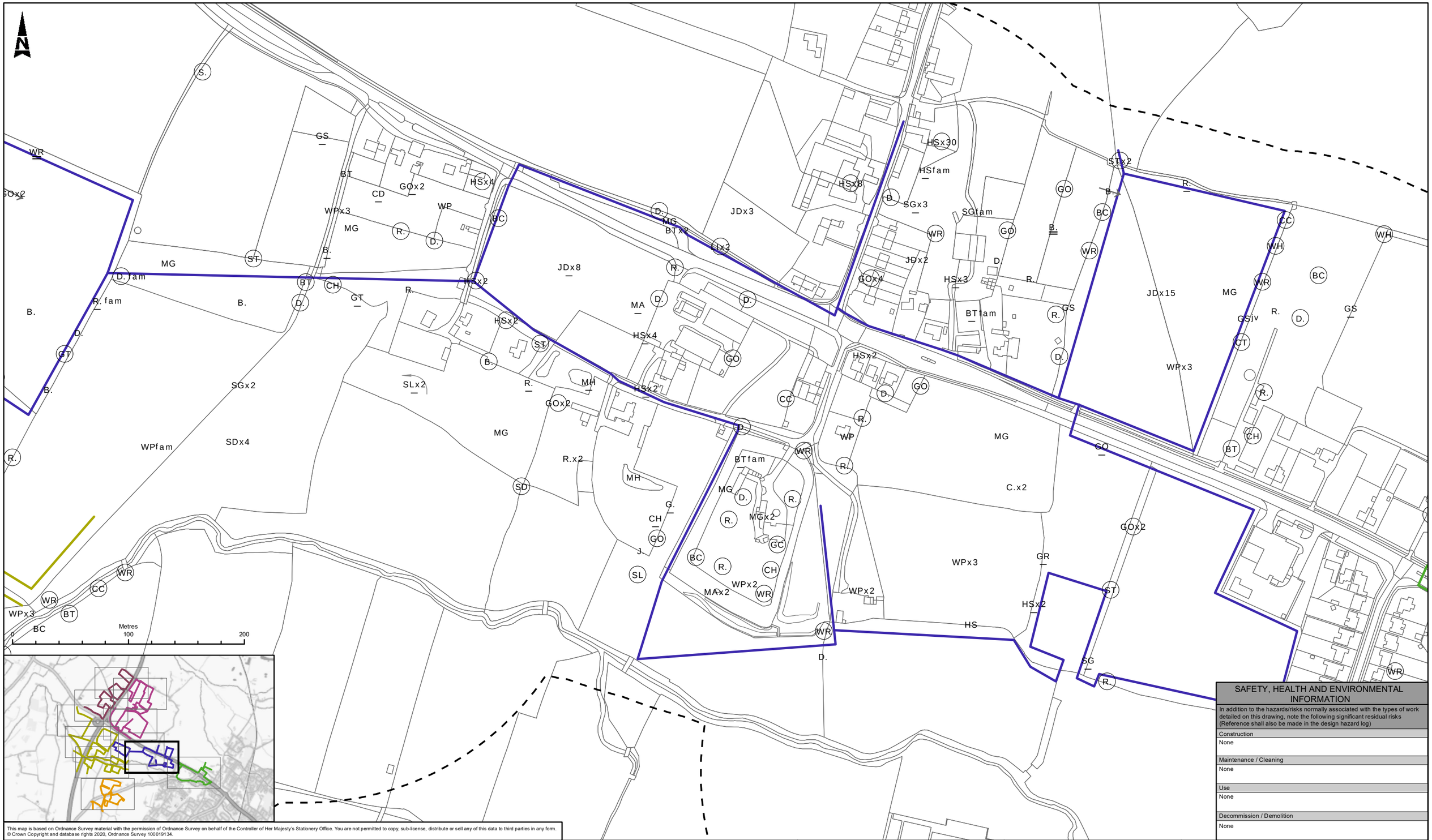
Decommission / Demolition
None

Project Title: M5 Junction 10 Improvement

Drawing Title: FIGURE 7.8C
BREEDING BIRD SURVEY RESULTS
MAY 2020

Drawing Number: Project | Originator | Volume
GCCM5J10 - ATK - EBD
Location | Type | Number
XX - GS - GI - 000026

Original Size:	Scale	Project Ref:	Sheet:	Rev:
A3	1:3,000	5197035	6 of 11	P01



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LEGEND

- 250M STUDY AREA
- TRANSECT 4
- TRANSECT 5
- TRANSECT 6
- TRANSECT 7
- TRANSECT 8
- TRANSECT 9

BEHAVIOURS

- = ALARM CALL
- _ CALLING
- fd CARRYING FOOD
- mat CARRYING NEST MATERIAL
- (d) DEAD
- fam FAMILY
- FLYING
- FORAGING IN FLIGHT
- jv JUVENILE
- OCCUPIED NEST
- SINGING

SPECIES (BTO CODES)

B.	BLACKBIRD
BC	BLACKCAP
BT	BLUE TIT
BZ	BUZZARD
C.	CARRION CROW
CC	CHIFFCHAFF
CD	COLLARED DOVE
CG	CANADA GOOSE
CH	CHAFFINCH
CT	COAL TIT
D.	DUNNOCK
G.	GREEN WOODPECKER
GC	GOLDCREST
GL	GREY WAGTAIL
GO	GOLDFINCH
GR	GREENFINCH
GS	GREAT SPOTTED WOODPECKER
GT	GREAT TIT
HG	HERRING GULL
HM	HOUSE MARTIN
HS	HOUSE SPARROW
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KF	KINGFISHER
LB	LESSER BLACK-BACKED GULL
LI	LINNET
LO	LITTLE OWL
LT	LONG-TAILED TIT
LW	LESSER WHITETHROAT
M.	MISTLE THRUSH
MA	MALLARD
MG	MAGPIE
MH	MOORHEN
PW	PIED WAGTAIL
PH	PHEASANT
R.	ROBIN
RN	RAVEN
S.	SKYLARK
SD	STOCK DOVE
SG	STARLING
SL	SWALLOW
ST	SONG THRUSH
SW	SEDGE WARBLER
WP	WOOD PIGEON
WH	WHITETHROAT
WR	WREN
Y.	YELLOWHAMM...
YW	YELLOW WAGTAIL

Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
FOR INFORMATION	S2	P01	SD	LH	CC	MT	24/09/21

Drawing Suitability: FOR INFORMATION
Status: S2

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Client: Gloucestershire COUNTY COUNCIL

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log)

Construction
None

Maintenance / Cleaning
None

Use
None

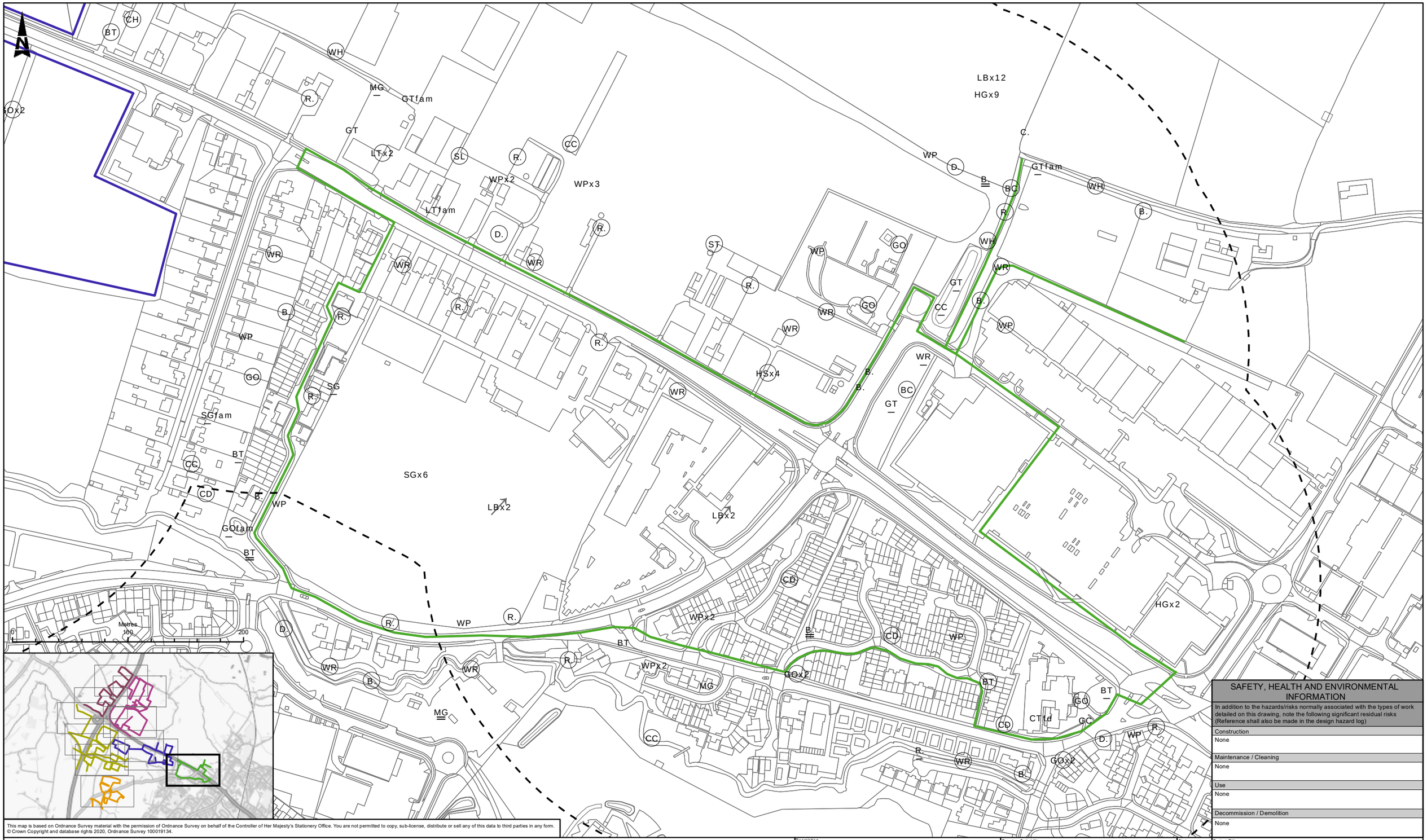
Decommission / Demolition
None

Project Title: M5 Junction 10 Improvement

Drawing Title: FIGURE 7.8C
BREEDING BIRD SURVEY RESULTS
MAY 2020

Drawing Number: Project | Originator | Volume
GCCM5J10 - ATK - EBD
XX - GS - GI - 000026
Location | Type | Number

Original Size:	Scale	Project Ref:	Sheet:	Rev:
A3	1:3,000	5197035	7 of 11	P01



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LEGEND

- 250M STUDY AREA
- TRANSECT 4
- TRANSECT 5
- TRANSECT 6
- TRANSECT 7
- TRANSECT 8
- TRANSECT 9

BEHAVIOURS

- ALARM CALL
- CALLING
- fd CARRYING FOOD
- mat CARRYING NEST MATERIAL
- (d) DEAD
- fam FAMILY
- FLYING
- FORAGING IN FLIGHT
- jv JUVENILE
- OCCUPIED NEST
- SINGING

SPECIES (BTO CODES)

B.	BLACKBIRD
BC	BLACKCAP
BT	BLUE TIT
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C.	CARRION CROW
CC	CHIFFCHAFF
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D.	DUNNOCK
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GC	GOLDCREST
GL	GREY WAGTAIL
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HS	HOUSE SPARROW
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LI	LINNET
LO	LITTLE OWL
LT	LONG-TAILED TIT
LW	LESSER WHITETHROAT
M.	MISTLE THRUSH
MA	MALLARD
MG	MAGPIE
MH	MOORHEN
PW	PIED WAGTAIL
PH	PHEASANT
R.	ROBIN
RN	RAVEN
S.	SKYLARK
SD	STOCK DOVE
SG	STARLING
SL	SWALLOW
ST	SONG THRUSH
SW	SEDGE WARBLER
WP	WOOD PIGEON
WH	WHITETHROAT
WR	WREN
Y.	YELLOWHAMM...
YW	YELLOW WAGTAIL

Description

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date

Description

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date

Description

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date

Description

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date

Description
FOR INFORMATION

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
S2	P01	SD	LH	CC	MT	24/09/21

Drawing Suitability: FOR INFORMATION

Status: S2

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log)

Construction
None

Maintenance / Cleaning
None

Use
None

Decommission / Demolition
None

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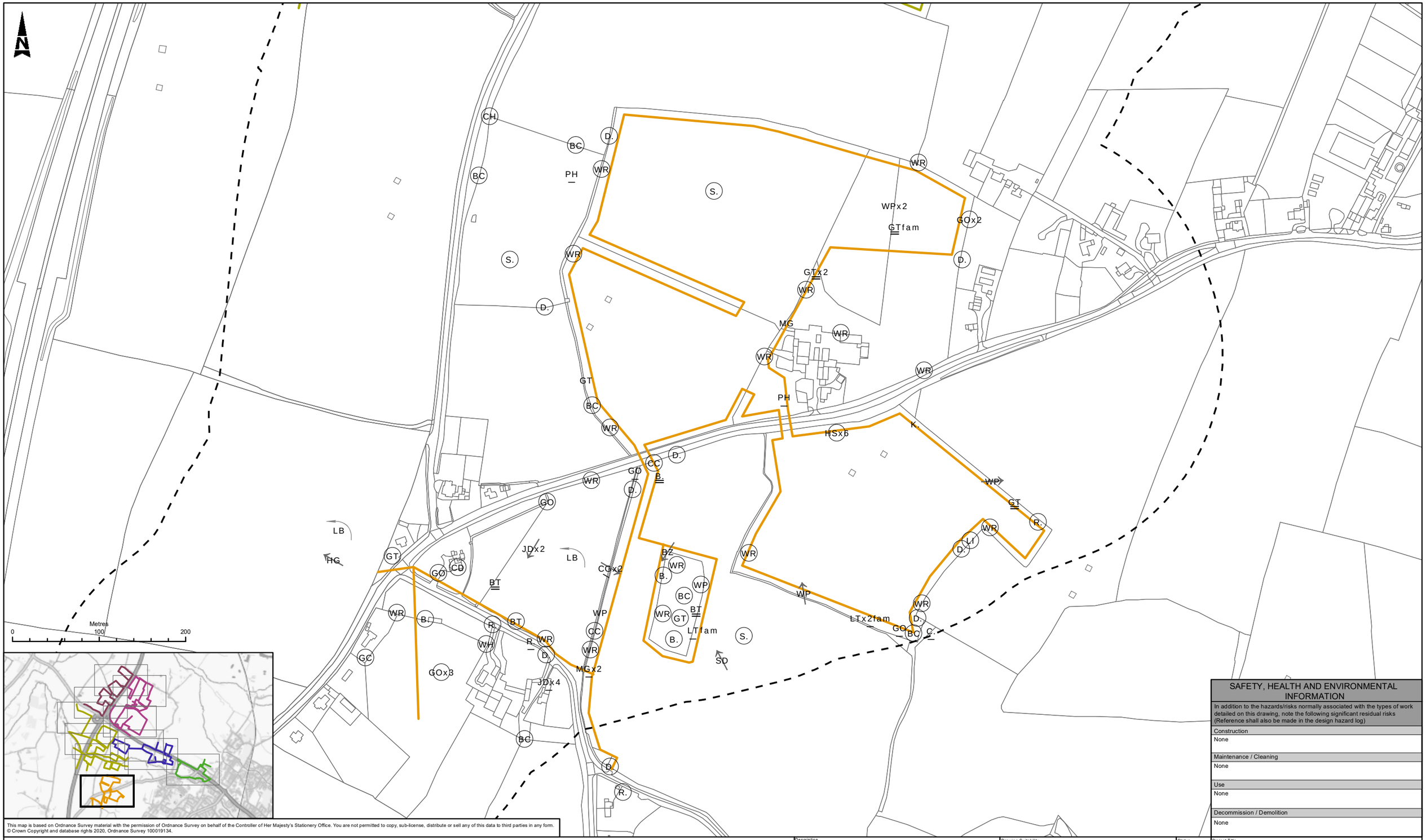
Client: Gloucestershire County Council

Project Title: M5 Junction 10 Improvement

Drawing Title: FIGURE 7.8C
BREEDING BIRD SURVEY RESULTS
MAY 2020

Drawing Number: Project | Originator | Volume
GCCM5J10 - ATK - EBD
Location | XX - GS - GI - 000026 | Number

Original Size:	Scale	Project Ref:	Sheet:	Rev:
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LEGEND

- 250M STUDY AREA
- TRANSECT 4
- TRANSECT 5
- TRANSECT 6
- TRANSECT 7
- TRANSECT 8
- TRANSECT 9

BEHAVIOURS

- = ALARM CALL
- _ CALLING
- fd CARRYING FOOD
- mat CARRYING NEST MATERIAL
- (d) DEAD
- fam FAMILY
- → FLYING
- FORAGING IN FLIGHT
- jv JUVENILE
- ✳ OCCUPIED NEST
- ◯ SINGING

SPECIES (BTO CODES)

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CC	CHIFFCHAFF
CD	COLLARED DOVE
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CT	COAL TIT
D.	DUNNOCK
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GC	GOLDCREST
GL	GREY WAGTAIL
GO	GOLDFINCH
GR	GREENFINCH
GS	GREAT SPOTTED WOODPECKER
GT	GREAT TIT
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HM	HOUSE MARTIN
HS	HOUSE SPARROW
JD	JACKDAW
KF	KINGFISHER
LB	LESSER BLACK-BACKED GULL
LI	LINNET
LO	LITTLE OWL
LT	LONG-TAILED TIT
LW	LESSER WHITETHROAT
M.	MISTLE THRUSH
MA	MALLARD
MG	MAGPIE
MH	MOORHEN
PW	PIED WAGTAIL
PH	PHEASANT
R.	ROBIN
RN	RAVEN
S.	SKYLARK
SD	STOCK DOVE
SG	STARLING
SL	SWALLOW
ST	SONG THRUSH
SW	SEDGE WARBLER
WP	WOOD PIGEON
WH	WHITETHROAT
WR	WREN
Y.	YELLOWHAMM...
YW	YELLOW WAGTAIL

Description

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
FOR INFORMATION						
S2	P01	SD	LH	CC	MT	24/09/21

Drawing Suitability: FOR INFORMATION

Status: S2

Project Title: M5 Junction 10 Improvement

Drawing Title: FIGURE 7.8C
BREEDING BIRD SURVEY RESULTS
MAY 2020

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Client: Gloucestershire County Council

Drawing Number: Project | Originator | Volume
GCCM5J10 - ATK - EBD
XX - GS - GI - 000026
Location | Type | Number

Original Size:	Scale	Project Ref:	Sheet:	Rev:
A3	1:4,000	5197035	9 of 11	P01

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log)

Construction
None

Maintenance / Cleaning
None

Use
None

Decommission / Demolition
None



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LEGEND

- 250M STUDY AREA
- TRANSECT 4
- TRANSECT 5
- TRANSECT 6
- TRANSECT 7
- TRANSECT 8
- TRANSECT 9

BEHAVIOURS

- = ALARM CALL
- _ CALLING
- fd CARRYING FOOD
- mat CARRYING NEST MATERIAL
- (d) DEAD
- fam FAMILY
- → FLYING
- FORAGING IN FLIGHT
- jv JUVENILE
- ✳ OCCUPIED NEST
- ◯ SINGING

SPECIES (BTO CODES)

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GO	GOLDFINCH
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HM	HOUSE MARTIN
HS	HOUSE SPARROW
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LO	LITTLE OWL
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LW	LESSER WHITETHROAT
M.	MISTLE THRUSH
MA	MALLARD
MG	MAGPIE
MH	MOORHEN
PW	PIED WAGTAIL
PH	PHEASANT
R.	ROBIN
RN	RAVEN
S.	SKYLARK
SD	STOCK DOVE
SG	STARLING
SL	SWALLOW
ST	SONG THRUSH
SW	SEDGE WARBLER
WP	WOOD PIGEON
WH	WHITETHROAT
WR	WREN
Y.	YELLOWHAMM...
YW	YELLOW WAGTAIL

Description

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date

Description

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date

Description

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date

Description

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date

Description FOR INFORMATION

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
S2	P01	SD	LH	CC	MT	24/09/21

Drawing Suitability: FOR INFORMATION

Status: S2

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

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Construction
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Maintenance / Cleaning
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Use
None

Decommission / Demolition
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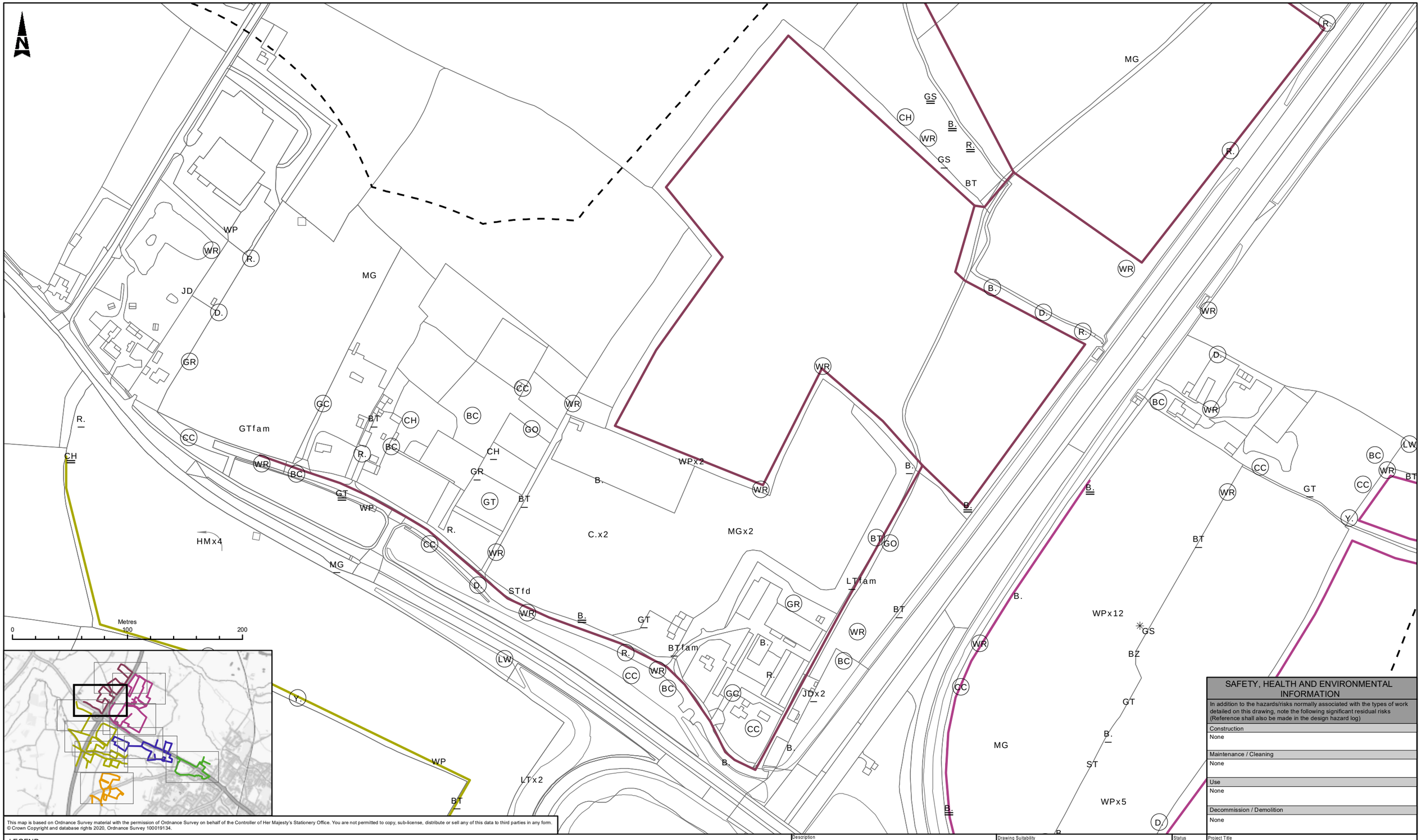
Client: Gloucestershire County Council

Project Title: M5 Junction 10 Improvement

Drawing Title: FIGURE 7.8C
BREEDING BIRD SURVEY RESULTS
MAY 2020

Drawing Number: Project | Originator | Volume | Location | Type | Number
GCCM5J10 - ATK - EBD
XX - GS - GI - 000026

Original Size:	Scale	Project Ref:	Sheet:	Rev:
A3	1:3,000	5197035	10 of 11	P01



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LEGEND

- 250M STUDY AREA
- TRANSECT 4
- TRANSECT 5
- TRANSECT 6
- TRANSECT 7
- TRANSECT 8
- TRANSECT 9

BEHAVIOURS

- = ALARM CALL
- _ CALLING
- fd CARRYING FOOD
- mat CARRYING NEST MATERIAL
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LO	LITTLE OWL
LT	LONG-TAILED TIT
LW	LESSER WHITETHROAT
M.	MISTLE THRUSH
MA	MALLARD
MG	MAGPIE
MH	MOORHEN
PW	PIED WAGTAIL
PH	PHEASANT
R.	ROBIN
RN	RAVEN
S.	SKYLARK
SD	STOCK DOVE
SG	STARLING
SL	SWALLOW
ST	SONG THRUSH
SW	SEDGE WARBLER
WP	WOOD PIGEON
WH	WHITETHROAT
WR	WREN
Y.	YELLOWHAMM...
YW	YELLOW WAGTAIL

Description

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date

Description

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date

Description

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date

Description

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date

Description FOR INFORMATION

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
S2	P01	SD	LH	CC	MT	24/09/21

Drawing Suitability: FOR INFORMATION

Status: S2

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Client: Gloucestershire County Council

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log)

Construction
None

Maintenance / Cleaning
None

Use
None

Decommission / Demolition
None

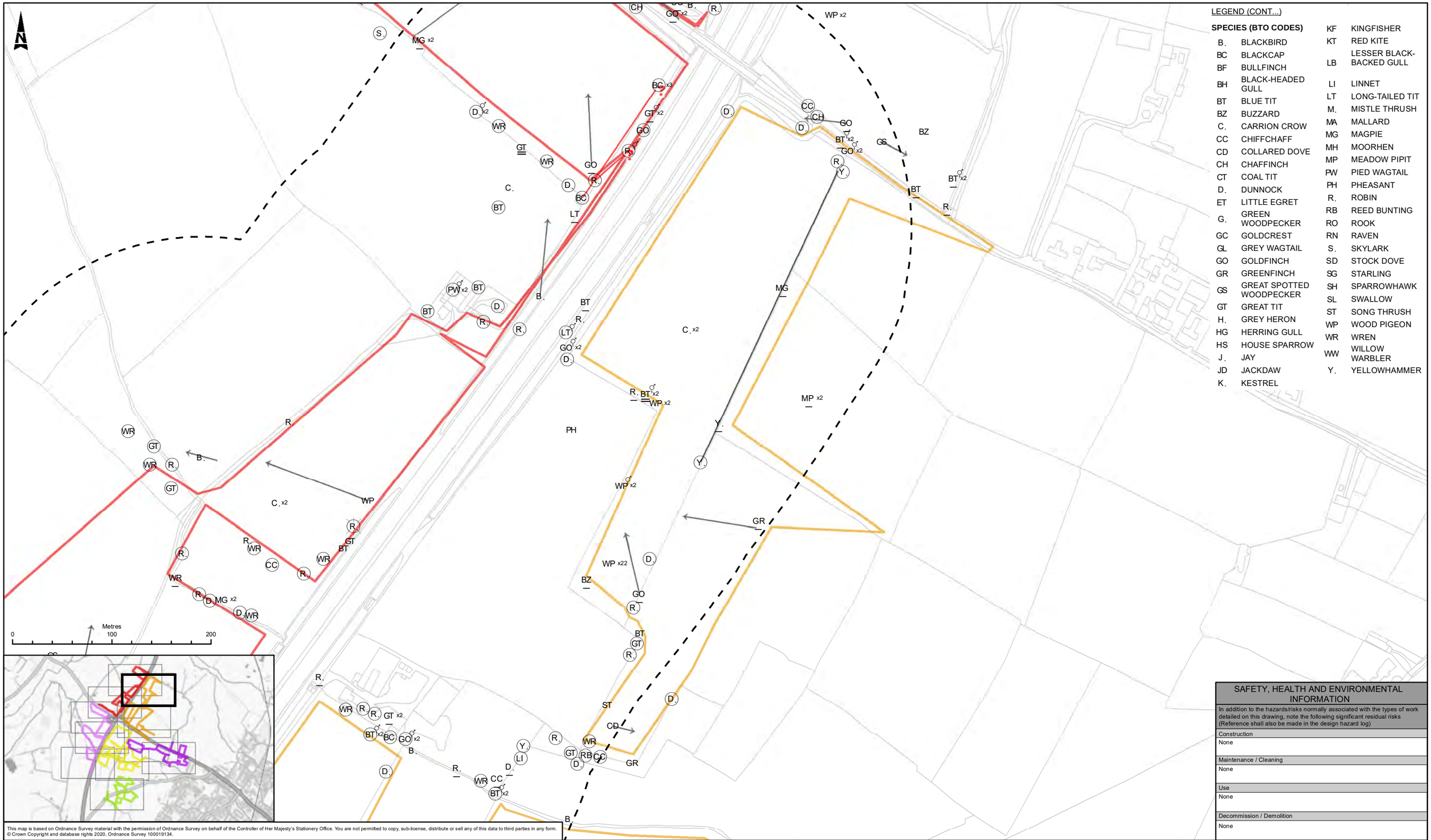
Project Title: M5 Junction 10 Improvement

Drawing Title: FIGURE 7.8C BREEDING BIRD SURVEY RESULTS MAY 2020

Drawing Number: GCCM5J10 - ATK - EBD XX - GS - GI - 000026

Project | Originator | Volume | Location | Type | Number

Original Size:	Scale	Project Ref:	Sheet:	Rev:
A3	1:3,000	5197035	11 of 11	P01



LEGEND (CONT...)

SPECIES (BTO CODES)

B.	BLACKBIRD	KF	KINGFISHER
BC	BLACKCAP	KT	RED KITE
BF	BULLFINCH	LB	LESSER BLACK-BACKED GULL
BH	BLACK-HEADED GULL	LI	LINNET
BT	BLUE TIT	LT	LONG-TAILED TIT
BZ	BUZZARD	M.	MISTLE THRUSH
C.	CARRION CROW	MA	MALLARD
CC	CHIFFCHAFF	MG	MAGPIE
CD	COLLARED DOVE	MH	MOORHEN
CH	CHAFFINCH	MP	MEADOW PIPIT
CT	COAL TIT	PW	PIED WAGTAIL
D.	DUNNOCK	PH	PHEASANT
ET	LITTLE EGRET	R.	ROBIN
G.	GREEN WOODPECKER	RB	REED BUNTING
GC	GOLDCREST	RO	ROOK
GL	GREY WAGTAIL	RN	RAVEN
GO	GOLDFINCH	S.	SKYLARK
GR	GREENFINCH	SD	STOCK DOVE
GS	GREAT SPOTTED WOODPECKER	SG	STARLING
GT	GREAT TIT	SH	SPARROWHAWK
H.	GREY HERON	SL	SWALLOW
HG	HERRING GULL	ST	SONG THRUSH
HS	HOUSE SPARROW	WP	WOOD PIGEON
J.	JAY	WR	WREN
JD	JACKDAW	WW	WILLOW WARBLER
K.	KESTREL	Y.	YELLOWHAMMER

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LEGEND

250M STUDY AREA

TRANSECT

- TRANSECT 4
- TRANSECT 5
- TRANSECT 6
- TRANSECT 8
- TRANSECT 9
- TRANSECT 10

BEHAVIOURS

- AGGRESSIVE INTERACTION
- = ALARM CALL
- _ CALLING
- ma t CARRYING NEST MATERIAL
- → FLYING
- ♀♂ PAIR
- ◯ SINGING

LINK

- DIFFERENT INDIVIDUAL
- SAME INDIVIDUAL
- –?– PROBABLY SAME INDIVIDUAL

Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
FOR INFORMATION	S2	P01	AD	SD	IH	-	14/10/21

Drawing Suitability: FOR INFORMATION

Status: S2

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log)

Construction
None

Maintenance / Cleaning
None

Use
None

Decommission / Demolition
None

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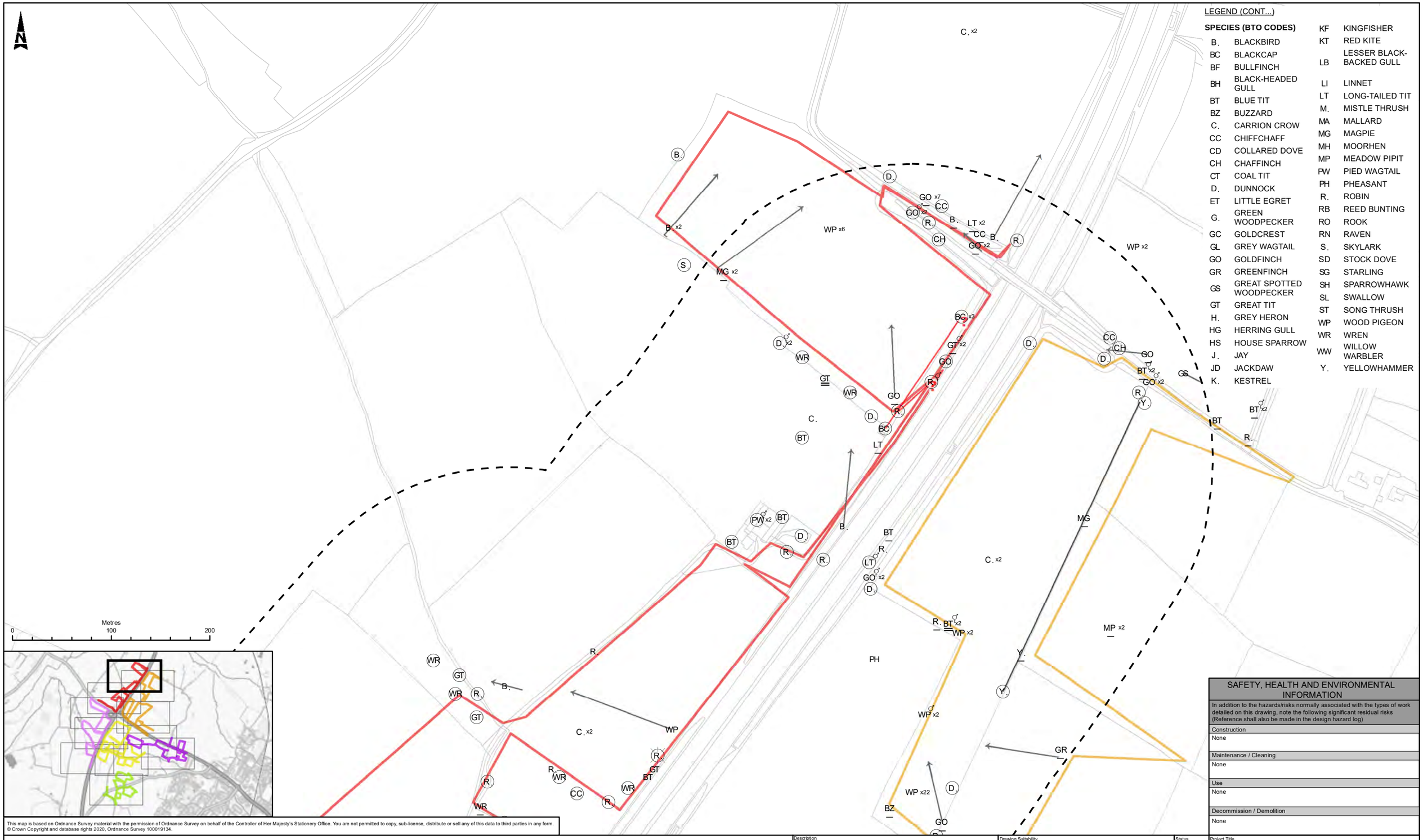
Client: Gloucestershire COUNTY COUNCIL

Project Title: M5 Junction 10 Improvement

Drawing Title: FIGURE 7.8D
BREEDING BIRD SURVEY RESULTS
APRIL 2021

Drawing Number: GCCM5J10 - ATK - EBD - XX - GS - GI - 000020

Original Size:	Scale	Project Ref:	Sheet:	Rev:
A3	1:3,500	5206696	1 of 11	P01



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LEGEND (CONT...)

SPECIES (BTO CODES)

B.	BLACKBIRD
BC	BLACKCAP
BF	BULLFINCH
BH	BLACK-HEADED GULL
BT	BLUE TIT
BZ	BUZZARD
C.	CARRION CROW
CC	CHIFFCHAFF
CD	COLLARED DOVE
CH	CHAFFINCH
CT	COAL TIT
D.	DUNNOCK
ET	LITTLE EGRET
G.	GREEN WOODPECKER
GC	GOLDCREST
GL	GREY WAGTAIL
GO	GOLDFINCH
GR	GREENFINCH
GS	GREAT SPOTTED WOODPECKER
GT	GREAT TIT
H.	GREY HERON
HG	HERRING GULL
HS	HOUSE SPARROW
J.	JAY
JD	JACKDAW
K.	KESTREL
KF	KINGFISHER
KT	RED KITE
LB	LESSER BLACK-BACKED GULL
LI	LINNET
LT	LONG-TAILED TIT
M.	MISTLE THRUSH
MA	MALLARD
MG	MAGPIE
MH	MOORHEN
MP	MEADOW PIPIT
PW	PIED WAGTAIL
PH	PHEASANT
R.	ROBIN
RB	REED BUNTING
RO	ROOK
RN	RAVEN
S.	SKYLARK
SD	STOCK DOVE
SG	STARLING
SH	SPARROWHAWK
SL	SWALLOW
ST	SONG THRUSH
WP	WOOD PIGEON
WR	WREN
WW	WILLOW WARBLER
Y.	YELLOWHAMMER

LEGEND

250M STUDY AREA

TRANSECT

- TRANSECT 4
- TRANSECT 5
- TRANSECT 6
- TRANSECT 8
- TRANSECT 9
- TRANSECT 10

BEHAVIOURS

- AGGRESSIVE INTERACTION
- ALARM CALL
- CALLING
- mat CARRYING NEST MATERIAL
- FLYING
- ♂♀ PAIR
- SINGING

LINK

- DIFFERENT INDIVIDUAL
- SAME INDIVIDUAL
- PROBABLY SAME INDIVIDUAL

Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
FOR INFORMATION	S2	P01	AD	SD	IH	-	14/10/21

Drawing Suitability: FOR INFORMATION — Status: S2

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

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Construction
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Maintenance / Cleaning
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Use
None

Decommission / Demolition
None

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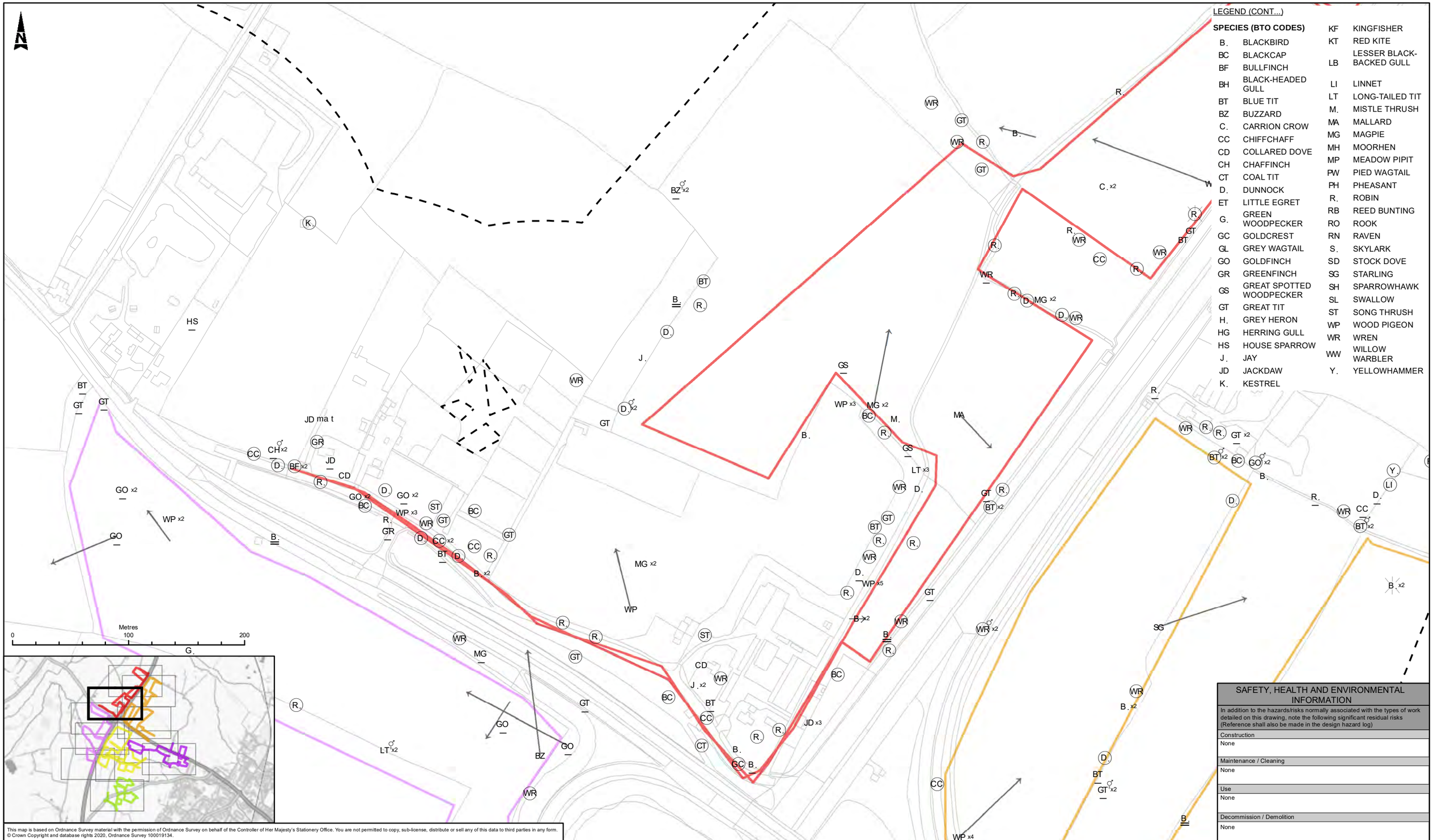
Client: Gloucestershire County Council

Project Title: M5 Junction 10 Improvement

Drawing Title: FIGURE 7.8D
BREEDING BIRD SURVEY RESULTS
APRIL 2021

Drawing Number: GCCM5J10 - ATK - EBD - XX - GS - GI - 000020

Original Size: A3 | Scale: 1:3,500 | Project Ref: 5206696 | Sheet: 2 of 11 | Rev: P01



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LEGEND

250M STUDY AREA

TRANSECT
- TRANSECT 4
- TRANSECT 5
- TRANSECT 6
- TRANSECT 8
- TRANSECT 9
- TRANSECT 10

BEHAVIOURS
- AGGRESSIVE INTERACTION
- = ALARM CALL
- _ CALLING
- ma t CARRYING NEST MATERIAL
- → FLYING
- ♀ PAIR
- ○ SINGING

LINK
- DIFFERENT INDIVIDUAL
- SAME INDIVIDUAL
- –?- PROBABLY SAME INDIVIDUAL

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log)

Construction: None

Maintenance / Cleaning: None

Use: None

Decommission / Demolition: None

Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
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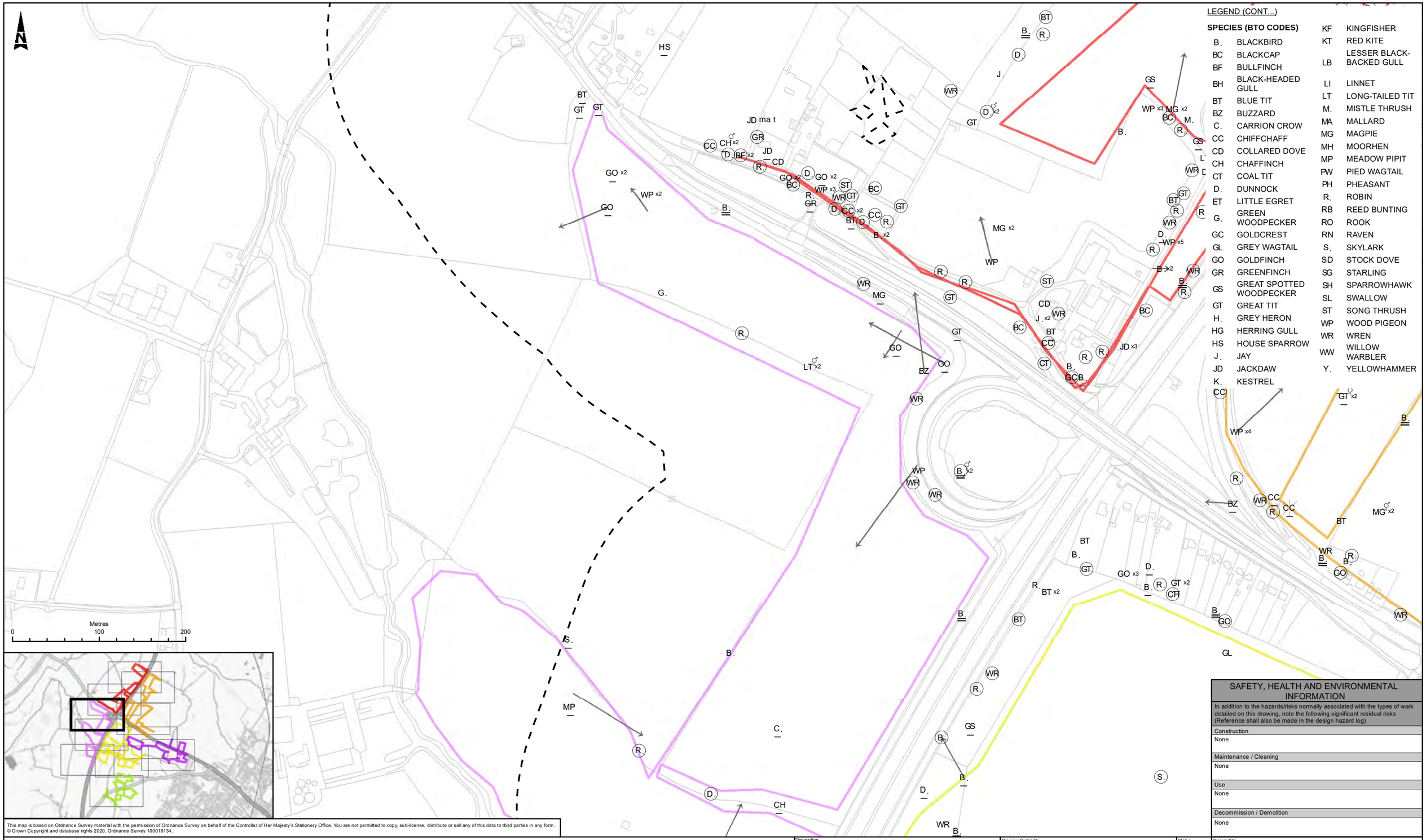
Client: Gloucestershire COUNTY COUNCIL

Project Title: M5 Junction 10 Improvement

Drawing Title: FIGURE 7.8D
BREEDING BIRD SURVEY RESULTS
APRIL 2021

Drawing Number: Project | Originator | Volume
GCCM5J10 - ATK - EBD
XX - GS - GI - 000020
Location | Type | Number

Original Size:	Scale	Project Ref:	Sheet:	Rev:
A3	1:3,000	5206696	3 of 11	P01



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LEGEND (CONT...)

SPECIES (BTO CODES)

B.	BLACKBIRD
BC	BLACKCAP
BF	BULLFINCH
BH	BLACK-HEADED GULL
BT	BLUE TIT
BZ	BUZZARD
C.	CARRION CROW
CC	CHIFFCHAFF
CD	COLLARED DOVE
CH	CHAFFINCH
CT	COAL TIT
D.	DUNNOCK
ET	LITTLE EGRET
G.	GREEN WOODPECKER
GC	GOLDCREST
GL	GREY WAGTAIL
GO	GOLDFINCH
GR	GREENFINCH
GS	GREAT SPOTTED WOODPECKER
GT	GREAT TIT
H.	GREY HERON
HG	HERRING GULL
HS	HOUSE SPARROW
J.	JAY
JD	JACKDAW
K.	KESTREL
KF	KINGFISHER
KT	RED KITE
LB	LESSER BLACK-BACKED GULL
LI	LINNET
LT	LONG-TAILED TIT
M.	MISTLE THRUSH
MA	MALLARD
MG	MAGPIE
MH	MOORHEN
MP	MEADOW PIPIT
PW	PIED WAGTAIL
PH	PHEASANT
R.	ROBIN
RB	REED BUNTING
RO	ROOK
RN	RAVEN
S.	SKYLARK
SD	STOCK DOVE
SG	STARLING
SH	SPARROWHAWK
SL	SWALLOW
ST	SONG THRUSH
WP	WOOD PIGEON
WR	WREN
WW	WILLOW WARBLER
Y.	YELLOWHAMMER

LEGEND

250M STUDY AREA

TRANSECT

- TRANSECT 4
- TRANSECT 5
- TRANSECT 6
- TRANSECT 8
- TRANSECT 9
- TRANSECT 10

BEHAVIOURS

- AGGRESSIVE INTERACTION
- ALARM CALL
- CALLING
- ma t — CARRYING NEST MATERIAL
- FLYING
- PAIR
- SINGING

LINK

- DIFFERENT INDIVIDUAL
- SAME INDIVIDUAL
- –?– PROBABLY SAME INDIVIDUAL

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log)

Construction
None

Maintenance / Cleaning
None

Use
None

Decommission / Demolition
None

Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
FOR INFORMATION	S2	P01	AD	SD	IH	-	14/10/21

Drawing Suitability: FOR INFORMATION — Status: S2

Project Title: M5 Junction 10 Improvement

Drawing Title: FIGURE 7.8D BREEDING BIRD SURVEY RESULTS APRIL 2021

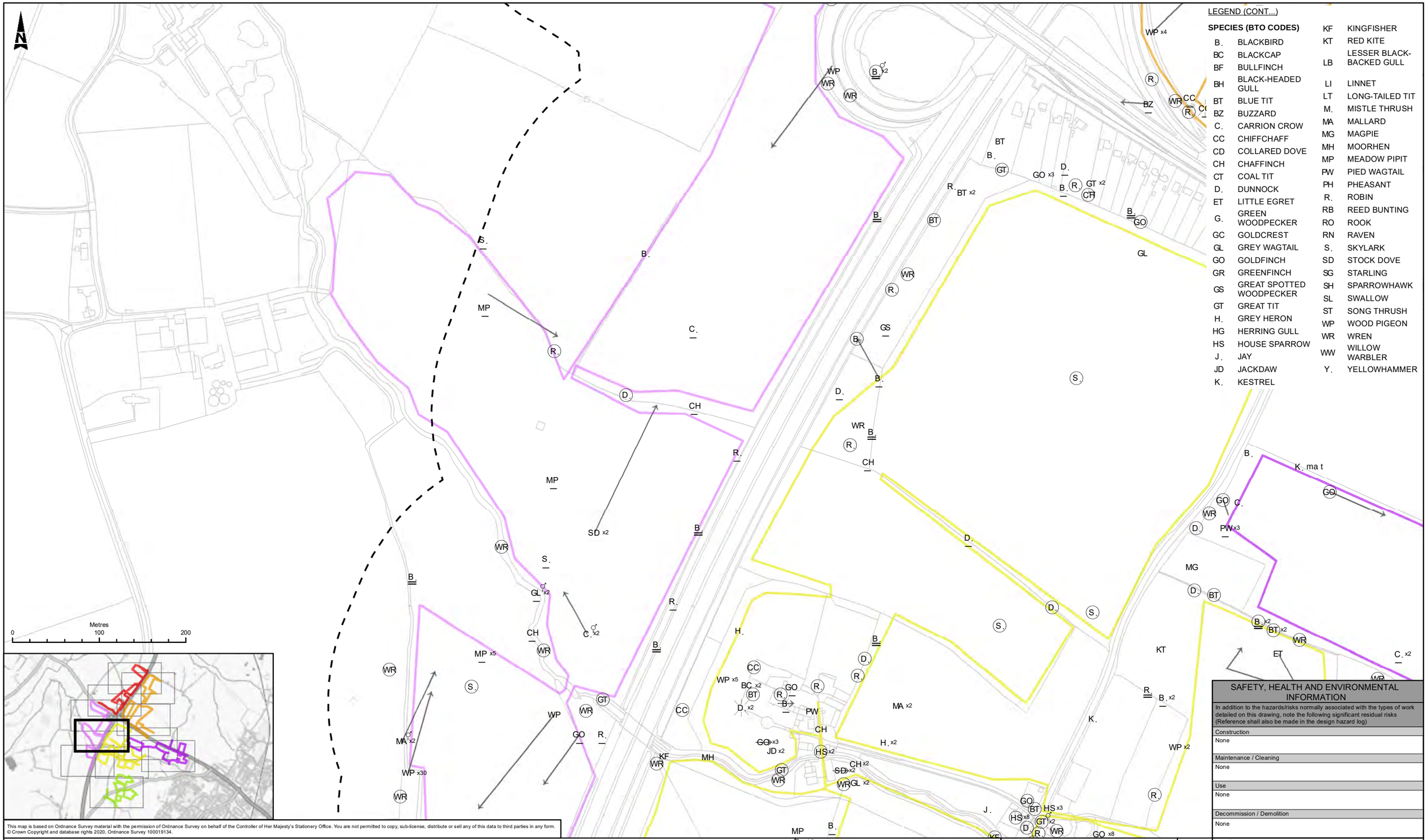
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A3	1:4,000	5206696	4 of 11	P01



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LEGEND

250M STUDY AREA

TRANSECT
- TRANSECT 4
- TRANSECT 5
- TRANSECT 6
- TRANSECT 8
- TRANSECT 9
- TRANSECT 10

BEHAVIOURS
- AGGRESSIVE INTERACTION
- ALARM CALL
- CALLING
- ma t CARRYING NEST MATERIAL
- FLYING
- ♂ PAIR
- SINGING

LINK
- DIFFERENT INDIVIDUAL
- SAME INDIVIDUAL
- PROBABLY SAME INDIVIDUAL

Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
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Project Title: M5 Junction 10 Improvement

Drawing Title: FIGURE 7.8D
BREEDING BIRD SURVEY RESULTS
APRIL 2021

Drawing Number: GCCM5J10 - ATK - EBD - XX - GS - GI - 000020

Original Size:	Scale	Project Ref:	Sheet:	Rev:
A3	1:4,000	5206696	5 of 11	P01

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

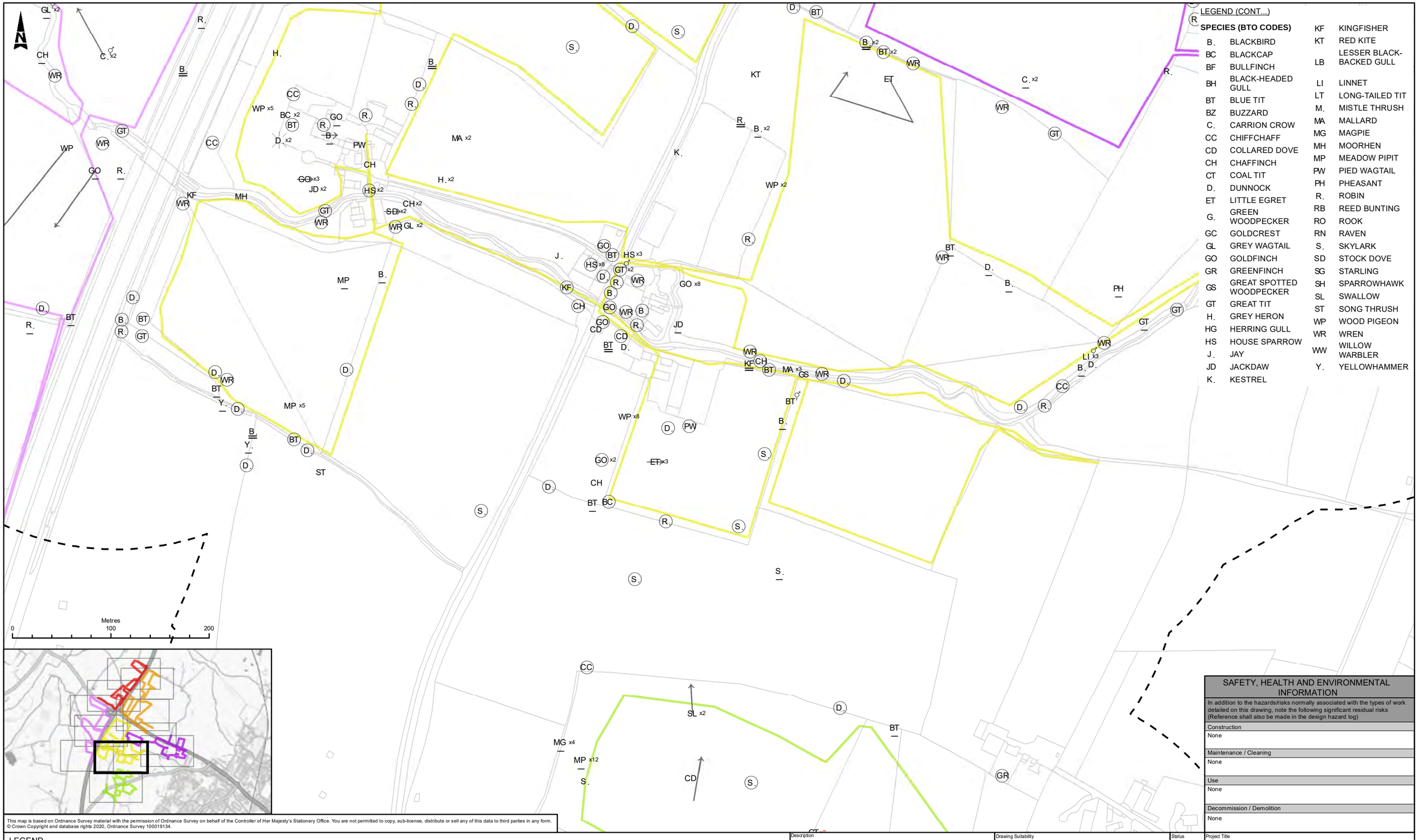
In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log)

Construction
None

Maintenance / Cleaning
None

Use
None

Decommission / Demolition
None



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LEGEND

250M STUDY AREA

TRANSECT

- TRANSECT 4
- TRANSECT 5
- TRANSECT 6
- TRANSECT 8
- TRANSECT 9
- TRANSECT 10

BEHAVIOURS

- AGGRESSIVE INTERACTION
- = ALARM CALL
- _ CALLING
- ma t CARRYING NEST MATERIAL
- → FLYING
- ♂ PAIR
- ◯ SINGING

LINK

- DIFFERENT INDIVIDUAL
- SAME INDIVIDUAL
- –?– PROBABLY SAME INDIVIDUAL

LEGEND (CONT...)

SPECIES (BTO CODES)

B.	BLACKBIRD	KF	KINGFISHER
BC	BLACKCAP	KT	RED KITE
BF	BULLFINCH	LB	LESSER BLACK-BACKED GULL
BH	BLACK-HEADED GULL	LI	LINNET
BT	BLUE TIT	LT	LONG-TAILED TIT
BZ	BUZZARD	M.	MISTLE THRUSH
C.	CARRION CROW	MA	MALLARD
CC	CHIFFCHAFF	MG	MAGPIE
CD	COLLARED DOVE	MH	MOORHEN
CH	CHAFFINCH	MP	MEADOW PIPIT
CT	COAL TIT	PW	PIED WAGTAIL
D.	DUNNOCK	PH	PHEASANT
ET	LITTLE EGRET	R.	ROBIN
G.	GREEN WOODPECKER	RB	REED BUNTING
GC	GOLDCREST	RO	ROOK
GL	GREY WAGTAIL	RN	RAVEN
GO	GOLDFINCH	S.	SKYLARK
GR	GREENFINCH	SD	STOCK DOVE
GS	GREAT SPOTTED WOODPECKER	SG	STARLING
GT	GREAT TIT	SH	SPARROWHAWK
H.	GREY HERON	SL	SWALLOW
HG	HERRING GULL	ST	SONG THRUSH
HS	HOUSE SPARROW	WP	WOOD PIGEON
J.	JAY	WR	WREN
JD	JACKDAW	WW	WILLOW WARBLER
K.	KESTREL	Y.	YELLOWHAMMER

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log)

Construction
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Maintenance / Cleaning
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Use
None

Decommission / Demolition
None

Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
FOR INFORMATION	S2	P01	AD	SD	IH	-	14/10/21

Drawing Suitability: FOR INFORMATION
Status: S2

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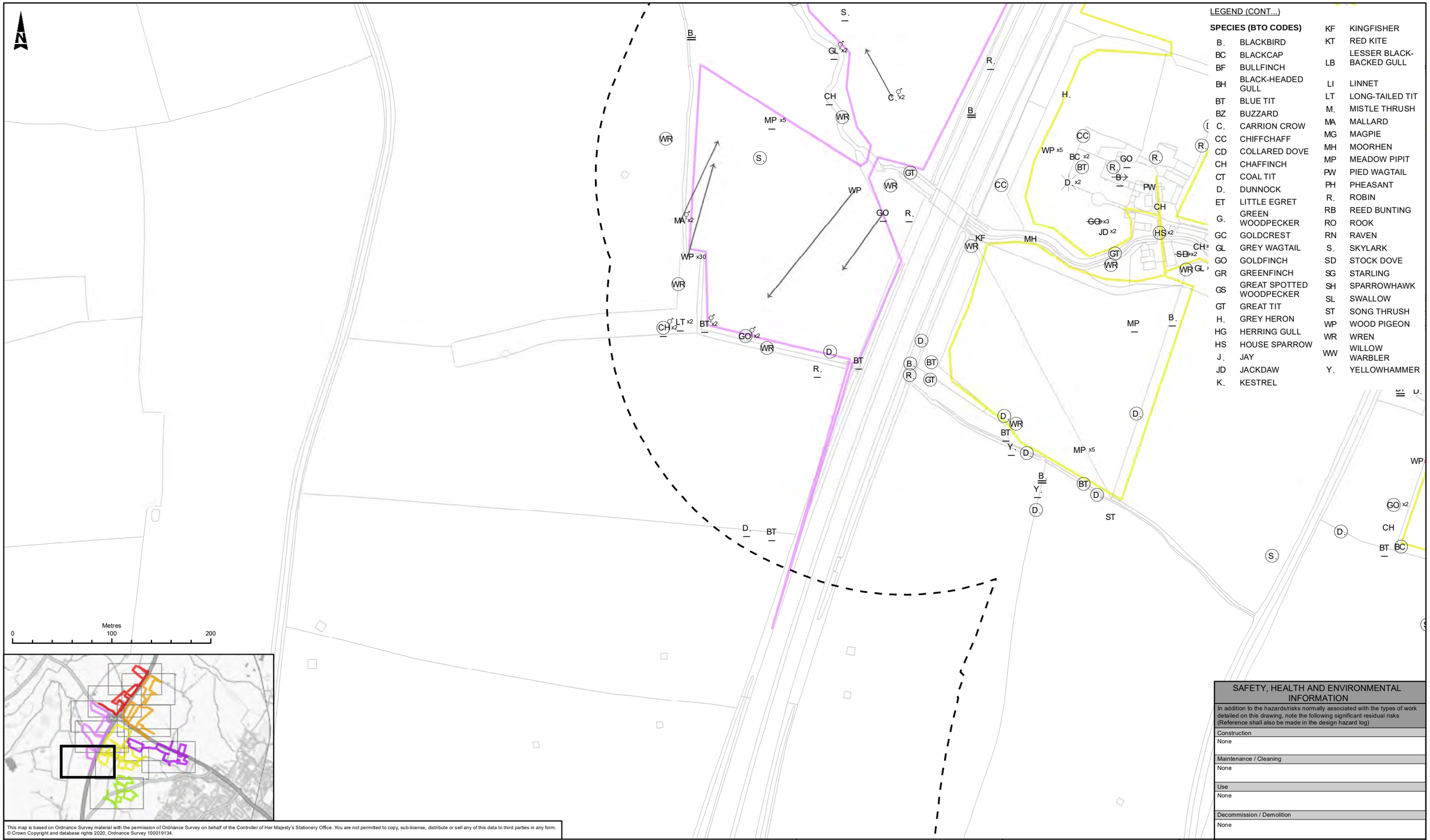
Client: Gloucestershire County Council

Project Title: M5 Junction 10 Improvement

Drawing Title: FIGURE 7.8D
BREEDING BIRD SURVEY RESULTS
APRIL 2021

Drawing Number: Project | Originator | Volume | Location | Type | Number
GCCM5J10 - ATK - EBD
XX - GS - GI - 000020

Original Size: A3 | Scale: 1:3,500 | Project Ref: 5206696 | Sheet: 6 of 11 | Rev: P01



LEGEND (CONT...)

SPECIES (BTO CODES)

B.	BLACKBIRD
BC	BLACKCAP
BF	BULLFINCH
BH	BLACK-HEADED GULL
BT	BLUE TIT
BZ	BUZZARD
C.	CARRION CROW
CC	CHIFFCHAFF
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K.	KESTREL
KF	KINGFISHER
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LT	LONG-TAILED TIT
M.	MISTLE THRUSH
MA	MALLARD
MG	MAGPIE
MH	MOORHEN
MP	MEADOW PIPIT
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R.	ROBIN
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RO	ROOK
RN	RAVEN
S.	SKYLARK
SD	STOCK DOVE
SG	STARLING
SH	SPARROWHAWK
SL	SWALLOW
ST	SONG THRUSH
WP	WOOD PIGEON
WR	WREN
WW	WILLOW WARBLER
Y.	YELLOWHAMMER

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LEGEND

250M STUDY AREA

TRANSECT

- TRANSECT 4
- TRANSECT 5
- TRANSECT 6
- TRANSECT 8
- TRANSECT 9
- TRANSECT 10

BEHAVIOURS

- AGGRESSIVE INTERACTION
- = ALARM CALL
- _ CALLING
- mat CARRYING NEST MATERIAL
- → FLYING
- ♂ PAIR
- ○ SINGING

LINK

- DIFFERENT INDIVIDUAL
- SAME INDIVIDUAL
- –?– PROBABLY SAME INDIVIDUAL

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

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Maintenance / Cleaning
None

Use
None

Decommission / Demolition
None

Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
FOR INFORMATION	S2	P01	AD	SD	IH	-	14/10/21

Drawing Suitability: FOR INFORMATION
Status: S2

Project Title: M5 Junction 10 Improvement

Drawing Title: FIGURE 7.8D
BREEDING BIRD SURVEY RESULTS
APRIL 2021

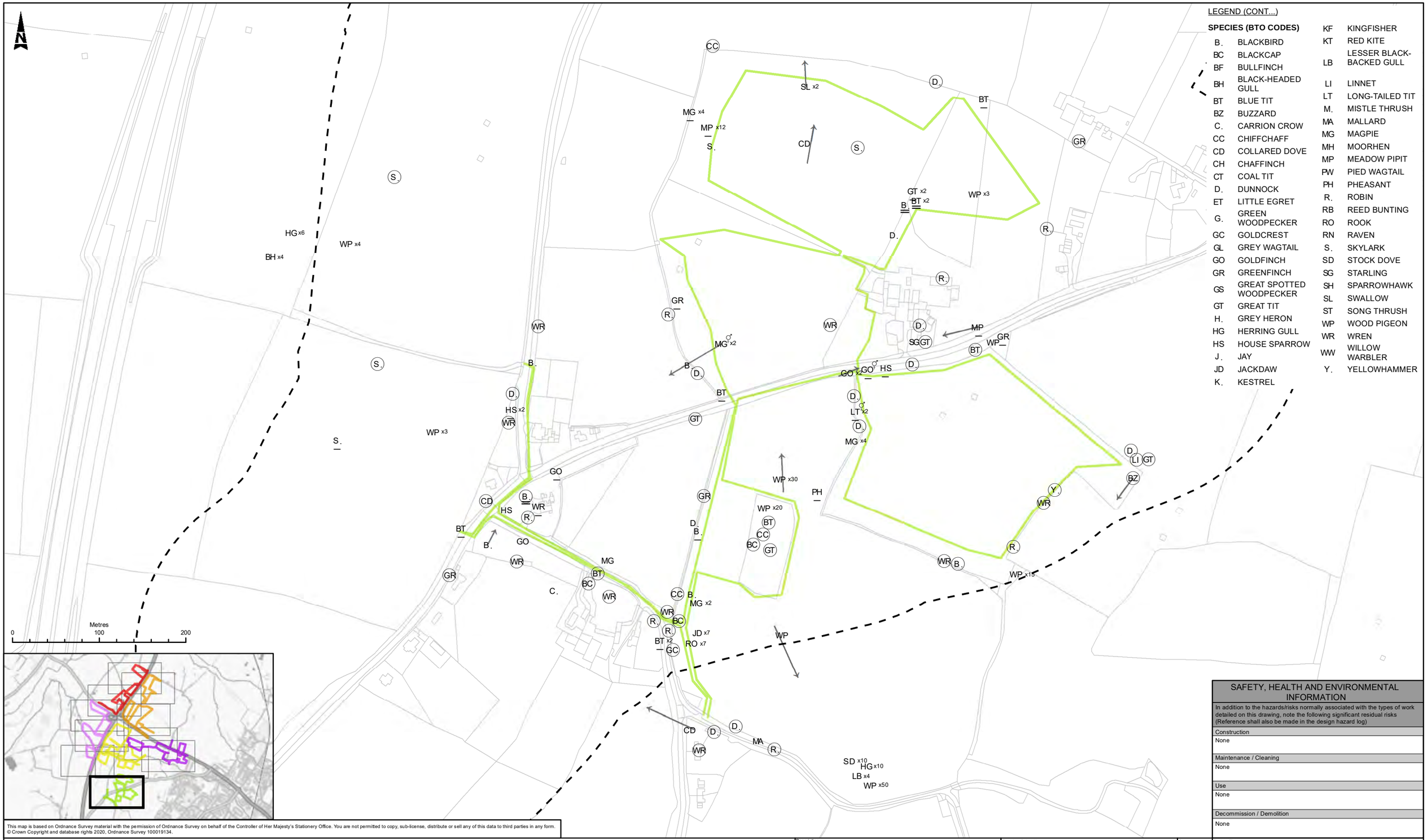
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XX - GS - GI - 000020
Location | Type | Number

Original Size:	Scale	Project Ref:	Sheet:	Rev:
A3	1:3,500	5206696	7 of 11	P01



LEGEND (CONT...)

SPECIES (BTO CODES)

B.	BLACKBIRD	KF	KINGFISHER
BC	BLACKCAP	KT	RED KITE
BF	BULLFINCH	LB	LESSER BLACK-BACKED GULL
BH	BLACK-HEADED GULL	LI	LINNET
BT	BLUE TIT	LT	LONG-TAILED TIT
BZ	BUZZARD	M.	MISTLE THRUSH
C.	CARRION CROW	MA	MALLARD
CC	CHIFFCHAFF	MG	MAGPIE
CD	COLLARED DOVE	MH	MOORHEN
CH	CHAFFINCH	MP	MEADOW PIPIT
CT	COAL TIT	PW	PIED WAGTAIL
D.	DUNNOCK	PH	PHEASANT
ET	LITTLE EGRET	R.	ROBIN
G.	GREEN WOODPECKER	RB	REED BUNTING
GC	GOLDCREST	RO	ROOK
GL	GREY WAGTAIL	RN	RAVEN
GO	GOLDFINCH	S.	SKYLARK
GR	GREENFINCH	SD	STOCK DOVE
GS	GREAT SPOTTED WOODPECKER	SG	STARLING
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H.	GREY HERON	SL	SWALLOW
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HS	HOUSE SPARROW	WP	WOOD PIGEON
J.	JAY	WR	WREN
JD	JACKDAW	WW	WILLOW WARBLER
K.	KESTREL	Y.	YELLOWHAMMER

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LEGEND

250M STUDY AREA

TRANSECT

- TRANSECT 4
- TRANSECT 5
- TRANSECT 6
- TRANSECT 8
- TRANSECT 9
- TRANSECT 10

BEHAVIOURS

- AGGRESSIVE INTERACTION
- ALARM CALL
- CALLING
- ma t CARRYING NEST MATERIAL
- FLYING
- PAIR
- SINGING

LINK

- DIFFERENT INDIVIDUAL
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Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
FOR INFORMATION	S2	P01	AD	SD	IH	-	14/10/21

Drawing Suitability: FOR INFORMATION

Status: S2

Project Title: M5 Junction 10 Improvement

Drawing Title: FIGURE 7.8D
BREEDING BIRD SURVEY RESULTS
APRIL 2021

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Client: Gloucestershire County Council

Drawing Number: Project | Originator | Volume
GCCM5J10 - ATK - EBD
XX - GS - GI - 000020
Location | Type | Number

Original Size:	Scale	Project Ref:	Sheet:	Rev:
A3	1:4,000	5206696	8 of 11	P01

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

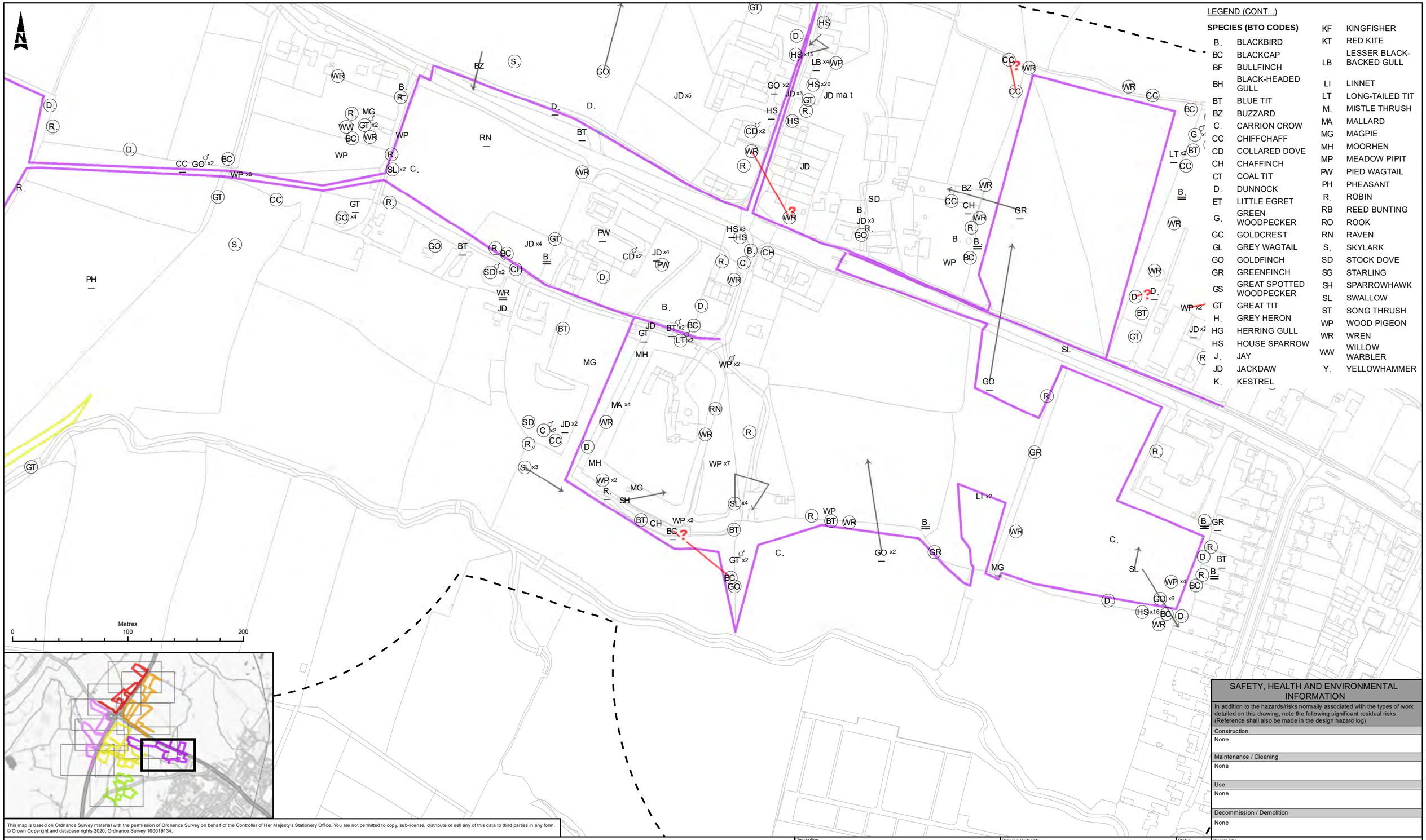
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Construction
None

Maintenance / Cleaning
None

Use
None

Decommission / Demolition
None



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LEGEND

250M STUDY AREA

TRANSECT
- TRANSECT 4
- TRANSECT 5
- TRANSECT 6
- TRANSECT 8
- TRANSECT 9
- TRANSECT 10

BEHAVIOURS
- AGGRESSIVE INTERACTION
- ALARM CALL
- CALLING
- ma t CARRYING NEST MATERIAL
- FLYING
- PAIR
- SINGING

LINK
- DIFFERENT INDIVIDUAL
- SAME INDIVIDUAL
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Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
FOR INFORMATION	S2	P01	AD	SD	IH	-	14/10/21

Drawing Suitability: FOR INFORMATION

Status: S2

Project Title: M5 Junction 10 Improvement

Drawing Title: FIGURE 7.8D BREEDING BIRD SURVEY RESULTS APRIL 2021

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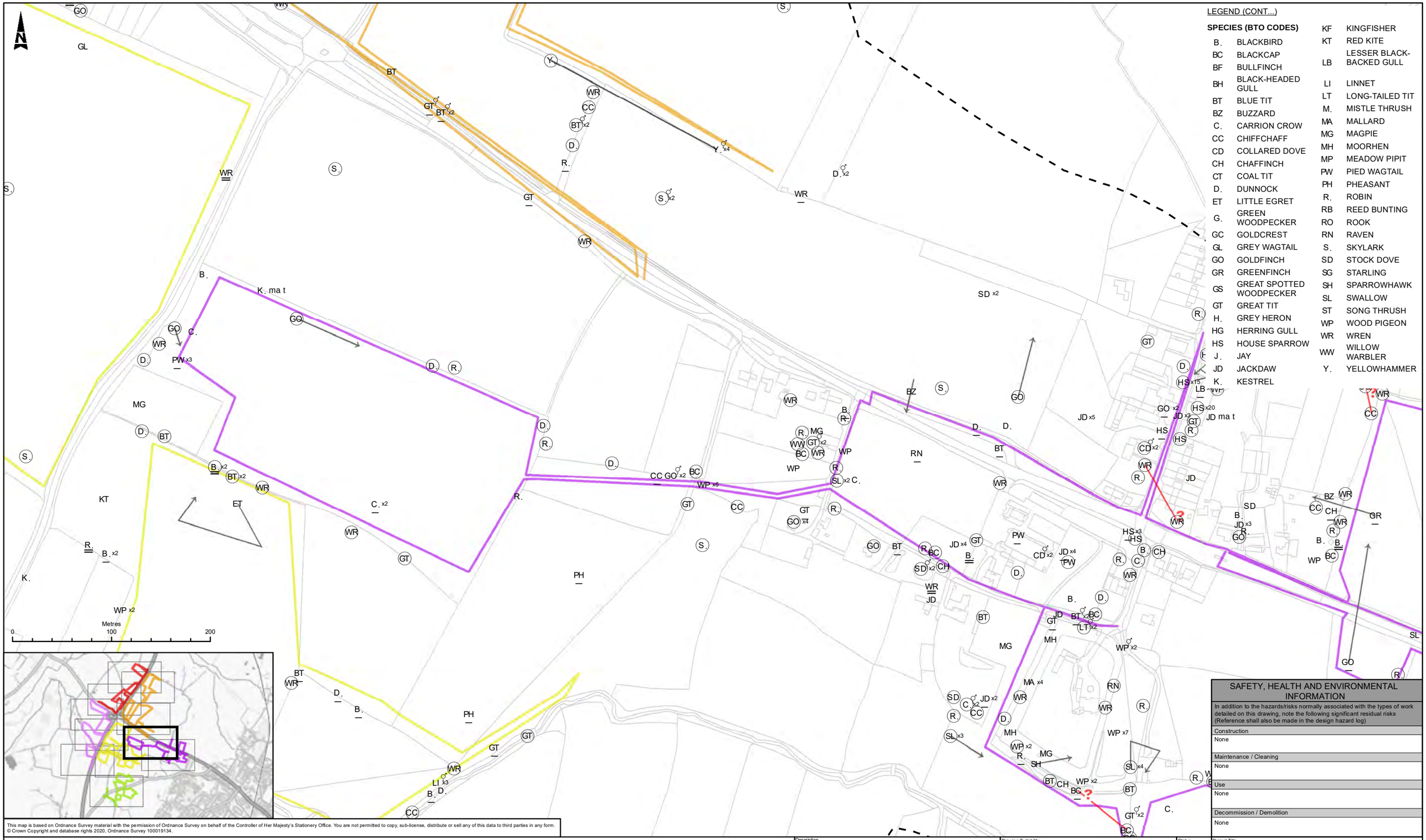
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LEGEND

250M STUDY AREA

TRANSECT
- TRANSECT 4
- TRANSECT 5
- TRANSECT 6
- TRANSECT 8
- TRANSECT 9
- TRANSECT 10

BEHAVIOURS
- AGGRESSIVE INTERACTION
- ALARM CALL
- CALLING
- ma t CARRYING NEST MATERIAL
- FLYING
- ♂ PAIR
- SINGING

LINK
- DIFFERENT INDIVIDUAL
- SAME INDIVIDUAL
- –?- PROBABLY SAME INDIVIDUAL

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

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None

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None

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None

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FOR INFORMATION	S2	P01	AD	SD	IH	-	14/10/21

Drawing Suitability: FOR INFORMATION
Status: S2

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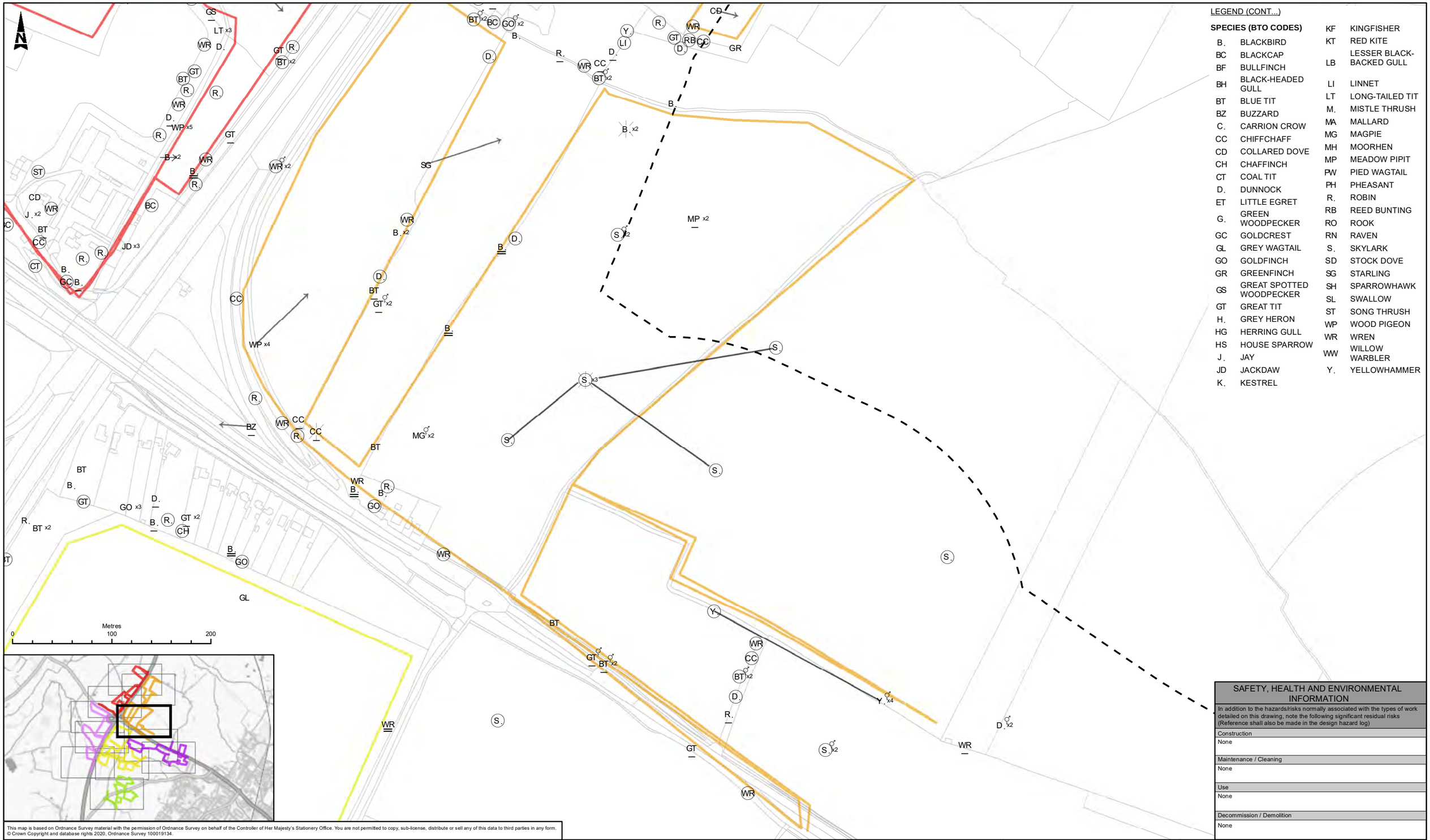
Client: Gloucestershire County Council

Project Title: M5 Junction 10 Improvement

Drawing Title: FIGURE 7.8D
BREEDING BIRD SURVEY RESULTS
APRIL 2021

Drawing Number: Project | Originator | Volume
GCCM5J10 - ATK - EBD
XX - GS - GI - 000020
Location | Type | Number

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A3	1:3,500	5206696	10 of 11	P01



LEGEND (CONT...)

SPECIES (BTO CODES)

B.	BLACKBIRD	KF	KINGFISHER
BC	BLACKCAP	KT	RED KITE
BF	BULLFINCH	LB	LESSER BLACK-BACKED GULL
BH	BLACK-HEADED GULL	LI	LINNET
BT	BLUE TIT	LT	LONG-TAILED TIT
BZ	BUZZARD	M.	MISTLE THRUSH
C.	CARRION CROW	MA	MALLARD
CC	CHIFFCHAFF	MG	MAGPIE
CD	COLLARED DOVE	MH	MOORHEN
CH	CHAFFINCH	MP	MEADOW PIPIT
CT	COAL TIT	PW	PIED WAGTAIL
D.	DUNNOCK	PH	PHEASANT
ET	LITTLE EGRET	R.	ROBIN
G.	GREEN WOODPECKER	RB	REED BUNTING
GC	GOLDCREST	RO	ROOK
GL	GREY WAGTAIL	RN	RAVEN
GO	GOLDFINCH	S.	SKYLARK
GR	GREENFINCH	SD	STOCK DOVE
GS	GREAT SPOTTED WOODPECKER	SG	STARLING
GT	GREAT TIT	SH	SPARROWHAWK
H.	GREY HERON	SL	SWALLOW
HG	HERRING GULL	ST	SONG THRUSH
HS	HOUSE SPARROW	WP	WOOD PIGEON
J.	JAY	WR	WREN
JD	JACKDAW	WW	WILLOW WARBLER
K.	KESTREL	Y.	YELLOWHAMMER

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LEGEND

250M STUDY AREA

TRANSECT

- TRANSECT 4
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- TRANSECT 9
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BEHAVIOURS

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Project Title: M5 Junction 10 Improvement

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Appendix B. Survey dates, time, and weather

Date	Start/endtime	Temperature (°C)	Wind (Beaufort)[31]	Rain[32]	Cloud (Octas)[33]
June 2019					
11/06/2019	06:45-11:00	7-9	4	0-1	8
12/06/2019	06:15-10:20	10-13	3	1	8
18/06/2019	05:50-10:15	11	1	0	0-1
19/06/2019	06:25-11:00	13-19	0-1	0	4-8
20/06/2019	05:50-10:30	19	2	0	0-2
21/06/2019	06:25-08:05	9	0	0	0
July 2019					
02/07/2019	05:45-07:50	10	2	0	0-1
03/07/2019	05:40-10:10	10-17	2	0	0-1
04/07/2019	05:45-10:35	8-25	1	0	0
05/07/2019	05:45-10:20	13	2	0	2
09/07/2019	05:50-10:30	15-17	2	0	8
10/07/2019	05:45-07:45	15-17	0	0	7
May 2020					
20/05/2020	06:30-10:00	11-19	2	0	8
21/05/2020	06:30-10:40	12-18	2	0	6
22/05/2020	06:30-10:10	14-15	3-4	0-1	4-7
27/05/2020	06:30-10:15	14-16	2	0	6
April 2021					
06/04/2021	07:30-11:30	3-7	2	0	1
07/04/2021	07:30-10:30	1-3	1-2	0	7
09/04/2021	07:30-10:45	1-5	2-3	0	2
13/04/2021	07:30-10:15	3-6	0	0	1
21/04/2021	07:20-10:20	9-11	2	0	4

[31] Wind speed score of 0-12 against Beaufort scale: 0 = calm, 2 = light breeze, 4 = Moderate breeze, 6 = strong breeze, 7 = High wind, 9 = Strong gale, 12 = Hurricane
[32] Precipitation intensity on scale of 0-5: 0 = Dry, 1 = Light drizzle, 2 = Light rain, 3 = Moderate rain, 4 = Heavy rain, 5 = Torrential rain.
[33] Cloud cover on a scale of 0-8: 0 = Sky completely clear, 4 = Sky half cloudy, 8 = Sky completely cloudy

Appendix C. Survey Results

Species	Conservation/legal status	Number per visit				Peak Count
		June 2019	July 2019	May 2020	April 2021	
Blackbird (Turdus merula)		101	109	81	109	109
Blackcap (***Sylvia atricapilla***)		34	44	37	44	44
Black-headed gull (***Chroicocephalus ridibundus***)	Amber List BoCC		8		8	8
Blue tit (***Cyanistes caeruleus***)		68	59	43	68	68
Bullfinch (***Pyrrhula pyrrhula***)	Amber List BoCC, SPI				2	2
Buzzard (***Buteo buteo***)		18	16	6	18	18
Canada goose (***Branta canadensis***)				2	2	2
Carrion crow (***Corvus corone***)		46	33	16	46	46
Chaffinch (***Fringilla coelebs***)		26	16	24	26	26
Chiffchaff (***Phylloscopus collybita***)		15	19	23	26	26
Coal tit (***Periparus ater***)		3		3	3	3
Collared dove (***Streptopelia decaocto***)		17	7	7	17	17
Dunnock (***Prunella modularis***)	Amber List BoCC, SPI	42	31	47	85	85
Feral pigeon (***Columba livia***)		2	20		20	20
Goldcrest (***Regulus regulus***)		1	0	5	5	5
Goldfinch (***Carduelis carduelis***)		89	55	51	89	89

Species	Conservation/legal status	Number per visit				Peak Count
		June 2019	July 2019	May 2020	April 2021	
Great spotted woodpecker (***Dendrocopos major***)		8	16	12	16	16
Great tit (***Parus major***)		32	32	38	54	54
Green woodpecker (***Picus viridis***)		4	12	2	12	12
Greenfinch (***Chloris chloris***)		18	21	6	21	21
Grey heron (***Ardea cinerea***)		2	1	2	3	3
Grey wagtail (***Motacilla cinerea***)	Red List BoCC	3		4	7	7
Herring gull (***Larus argentatus***)	Red List BoCC, SPI, RAM nf	10	4	18	32	32
Hobby (***Falco subbuteo***)	Schedule 1	1			1	1
House martin (***Delichon urbicum***)	Amber List BoCC	7	36	9	36	36
House sparrow (***Passer domesticus***)	Red List BoCC, SPI	116	104	86	116	116
Jackdaw (***Coloeus monedula***)		32	41	41	49	49
Jay (***Garrulus glandarius***)		3		1	4	4
Kestrel (***Falco tinnunculus***)	Amber List BoCC		3	3	3	3
Kingfisher (***Alcedo atthis***)	Schedule 1, Annex 1, Amber List BoCC			1	3	3
Lesser black-backed gull (***Larus fuscus***)	Amber List BoCC, RAM fc	57	27	26	57	57
Lesser whitethroat (***Curruca curruca***)		4	1	3	4	4
Linnet (***Linaria cannabina***)	Red List BoCC, SPI, GBAP	4	6	3	7	7
Little egret (***Egretta garzetta***)	Annex 1				4	4
Little owl (***Athene noctua***)				1	1	1

Species	Conservation/legal status	Number per visit				Peak Count
		June 2019	July 2019	May 2020	April 2021	
Long-tailed tit (***Aegithalos caudatus***)		16	11	11	22	21
Magpie (***Pica pica***)		42	47	31	47	47
Mallard (***Anas platyrhynchos***)	Amber List BoCC, SPA	1	1	10	16	16
Meadow pipit (***Anthus pratensis***)	Amber List BoCC				46	46
Mistle thrush (***Turdus viscivorus***)	Red List BoCC	1	4	2	4	4
Moorhen (***Gallinula chloropus***)			2	3	3	3
Pheasant (***Phasianus colchicus***)		6	5	4	6	6
Pied wagtail (***Motacilla alba***)		1	1	5	9	9
Raven (***Corvus corax***)				2	2	2
Red kite (***Milvus milvus***)	Schedule 1, Annex 1		1		1	1
Reed bunting (***Emberiza schoeniclus***)	Amber List BoCC, SPI				1	1
Robin (***Erithacus rubecula***)		72	54	86	95	95
Rook (***Corvus frugilegus***)			2		14	2
Sedge warbler (***Acrocephalus schoenobaenus***)				1	1	1
Skylark (***Alauda arvensis***)	Red List BoCC, SPI, GBAP	31	27	17	31	31
Song thrush (***Turdus philomelos***)	Red List BoCC, SPI, GBAP	15	12	11	15	15
Sparrowhawk (***Accipiter nisus***)		3	3		3	3
Starling (***Sturnus vulgaris***)	Red List BoCC, SPI	50	29	32	50	50
Stock dove (***Columba oenas***)	Amber List BoCC	47	24	14	47	47
Swallow (***Hirundo rustica***)		57	62	24	62	62
Swift (***Apus apus***)	Amber List BoCC	13	3		13	13

Species	Conservation/legal status	Number per visit				Peak Count
		June 2019	July 2019	May 2020	April 2021	
Common whitethroat (***Curruca communis***)		14	10	11	14	14
Willow warbler (***Phylloscopus trochilus***)	Amber List BoCC				1	1
Wood pigeon (***Columba palumbus***)		138	221	104	387	387
Wren (***Troglodytes troglodytes***)		86	84	82	92	92
Yellow wagtail (***Motacilla flava***)	Red List BoCC, SPI	10	9	4	10	10
Yellowhammer (***Emberiza citronella***)	Red List BoCC, SPI	17	18	3	18	18

Key:

Annex I: species listed on Annex I of the Directive 2009/147/EC (the Birds Directive)
Red List BoCC: species on the Red List of Birds of Conservation Concern 4
Amber List BoCC: species on the Amber List of Birds of Conservation Concern 4
SPI: species of principal importance for the conservation of biodiversity in England
GBAP: Species listed on the Gloucestershire Biodiversity Action Plan
SPA: Severn Estuary SPA qualifying feature (wintering assemblage species)
Ram: Severn Estuary Ramsar site feature of interest
fc: species/populations identified subsequent to designation for possible future consideration under criterion 6
nf: noteworthy fauna

Appendix 7.9 – Wintering birds survey

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Appendix A. Figures 7.9A – 7.9G Wintering bird survey results

Appendix B. Dates, times, and weather conditions of each survey

Appendix C. Survey Results

Tables

Table 1-1 - Summary of relevant legislation

1. Introduction

1.1. Terms of Reference

1.1.1. Atkins, a member of the SNC Lavalin Group was commissioned by Gloucestershire County Council (GCC) to undertake wintering and passage bird surveys to inform the Environmental Statement (ES) for the M5 Junction 10 Improvements Scheme (hereafter referred to as 'the Scheme').

1.1.2. The purpose of the wintering and passage bird surveys was to determine the species and numbers of wintering and passage birds present within the Scheme; provide recommendations to enable compliance with legislation and policy; and, if necessary, identify the need for avoidance, mitigation, compensation, or enhancement measures.

1.1.3. This Technical Appendix summarises the results of the wintering and passage bird surveys undertaken, including the methods used, results of the field surveys, and provides an evaluation of the nature conservation value of wintering and passage birds within the survey area.

1.1.4. This report provides factual information to support the ES, which will accompany the planning application for the Scheme.

1.2. Legislation

1.2.1. Relevant legislation in relation to wintering and passage birds is provided in Table 1-1 below.

Table 1-1 - Summary of relevant legislation

Species	Legislation	Licensing procedures and guidance
Birds	The Birds Directive 79/409/EEC Annex 1	Birds species listed under Annex 1 of the Birds Directive 79/409/EEC are considered endangered or important migratory species in Europe. These species have been protected by the establishment of a coherent network of Special Protection Areas (SPAs). Regulation 8 of the Conservation of Habitats and Species Regulations 2017 (as amended)[1] defines these SPAs as European Sites. SPAs are designated based on populations of Annex 1 species that they support, and thus comprise the most suitable habitats to ensure the survival and/or reproduction of these species in their area of distribution.
Birds	Ramsar Designation	Ramsar sites are wetlands of international importance designated under the Ramsar Convention. The majority of UKs sites are established for internationally important populations of non-breeding waterfowl though some sites have no qualifying ornithological interest.

[1] As amended by The Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019.

2. Methodology

2.1. Desk Study

2.1.1. The geographical area for obtaining ecological data through desk studies has been determined using professional judgement. Baseline data has been gathered from a range of sources through data requests, consultation, and using online resources as outlined below. This included data gathering in relation to statutory and non-statutory designated sites and protected and priority species.

2.1.2. In 2018, Ecus undertook a Preliminary Ecological Appraisal (PEA) for the M5 J10 Improvements Scheme[2]. Although the PEA did not cover large parts of the current study area and was undertaken at a sub-optimal time of year for habitat classification (late October), it was reviewed to obtain any information relevant to the current assessment.

2.1.3. The Magic website[3] was reviewed to identify:

- Relevant statutory designated nature conservation sites within 2 km of the Scheme or with a direct hydrological connection; and
- Priority habitats and ancient woodland within 1 km of the Scheme.

2.1.4. The Woodland Trust's Ancient Tree Inventory website[4] was reviewed to locate records of ancient and veteran trees within 250 m of the Scheme.

2.1.1. Species of principal importance for the conservation of biodiversity listed under Section 41 of the Natural Environment & Rural Communities Act (NERC) 2006[5], the Red and Amber lists of Birds of Conservation Concern 4 (BoCC4)[6] and the Gloucestershire Local Biodiversity Action Plan[7] were reviewed as part of the data gathering exercise to identify relevant bird species considered to be important for biodiversity at the site. The Gloucestershire Bird Report[8] and Gloucestershire Breeding Bird Atlas[9] were reviewed to ascertain the population status of certain species within the county.

2.1.2. Gloucestershire Centre for Environmental Records (GCER) was contacted to obtain recent records[10] of:

- Non-statutory designated nature conservation sites within 1 km of the Scheme; and
- Protected and notable species within 1 km of the Scheme.

2.2. Field Survey

2.2.1. Surveys were led by suitably experienced ecologists (considered competent to undertake wintering and passage bird surveys in accordance with the Chartered Institute of Ecology and Environmental Management (CIEEM)[11]), who are members of CIEEM. In this case,

[2] Ecus (2019). M5 J10 Preliminary Ecological Appraisal. Report prepared for Amey OW PLC, December 2018.
[3] Defra. c2019. Magic Map Application. [Online]. [Accessed 5th September 2019]. Available from: https://magic.defra.gov.uk/MagicMap.aspx
[4] Woodland Trust. 2019. Ancient Tree Inventory - Woodland Trust. [Online]. [Accessed 20th May 2021]. Available from: https://ati.woodlandtrust.org.uk/
[5] Section 40 of the NERC Act 2006 sets out the duty for public authorities to conserve biodiversity in England. Habitats and species of principal importance for the conservation of biodiversity as identified by the Secretary of State for England, in consultation with Natural England, are referred to in Section 41 of the NERC Act 2006 for England. The list of habitats and species was updated in 2008 and is known as the England Biodiversity List.
[6] Eaton MA, Aebischer NJ, Brown AF, Hearn RD, Lock L, Musgrove AJ, Noble DG, Stroud DA and Gregory RD (2015) Birds of Conservation Concern 4: the population status of birds in the United Kingdom, Channel Islands and Isle of Man. British Birds 108, 708–746. Available at: britishbirds.co.uk/wp-content/uploads/2014/07/BoCC4.pdf
[7] Gloucestershire Local Nature Partnership (2000) Biodiversity Action Plan for Gloucestershire Available from: https://www.gloucestershirenature.org.uk/biodiversity-action-plan-bap
[8] Goodhall, R., Kirk, G. and Petrek, S. (2020) Gloucestershire Bird Report 2014-16. Gloucestershire Ornithological Co-ordinating Committee
[9] Kirk, G. and Phillips, J. (2013) The Birds of Gloucestershire. Liverpool University Press
[10] Records of observations within the last 10 years.
[11] https://cieem.net/resource/competencies-for-species-survey-css/

the lead surveyor is an experienced ornithologist with over 15 years of professional bird survey and assessment experience.

2.2.2. The method employed for wintering bird surveys broadly conformed to that used for the Common Bird Census (CBC) survey, devised and run between 1962 and 2000 by the British Trust for Ornithology (BTO) as detailed in in Gilbert et al. (1998)[12] and Bibby et al. (2000)[13]. CBC uses a mapping method in which a series of visits are made to a site during the wintering season, and observations of birds, by sight or sound, are recorded on a map during a walked transect.

2.2.3. Seven survey visits were carried out each month from September 2019 to March 2021. This was considered proportionate for a relatively localised road improvement Scheme, allowing sufficient observations of birds to produce clusters of registrations and minimising the risk of overlooking scarce and/or priority species. Eight representative transects of varying lengths were surveyed, which gave suitable coverage of the study area. Six of these transects are within the study area of the current Scheme. The direction in which the transect was walked was varied between visits to optimise detection and minimise recording bias. Transects are shown on Figures 7.9A to 7.9G in Appendix A.

2.2.4. Surveys were not carried out in heavy rain, poor visibility or strong wind as birds are under-recorded in such conditions. Dates of survey visits are shown in Appendix B along with weather conditions on each visit.

2.2.5. The surveyor, with the aid of binoculars, recorded all observations of birds by either sight or sound by walking through the Survey Area at a slow and steady pace. The positions of the recorded birds were plotted as accurately as possible on a suitably scaled base map, i.e. a 'visit map'. Standard BTO codes and symbols[14] were used for mapping species (including sex and age, e.g. juvenile, immature or adult) and bird activity where relevant (including foraging, loafing and in flight).

2.2.6. The Wintering and Passage Bird Survey Area comprised all areas within the Scheme boundary and accessible land within 250 m of the Scheme. The Survey Area was designed to ensure that the assessment considered all potential impacts on all species present in the area within which an impact may occur, i.e. the Ecological Zone of Influence (EZoI), as well as those impacts which could occur within the footprint of the Scheme. This included species which may be sensitive to disturbance over large distances during the wintering season, such as certain raptor species. The extent of the Survey Area also allowed for some degree of design changes to the Scheme to be accommodated.

2.3. Assessment

Defining Important Bird Species

2.3.1. For the purpose of this assessment, priority bird species are defined as those which are listed as species of principal importance for the conservation of biodiversity in England, those identified as Red or Amber on the Birds of Conservation Concern 4 (BoCC4)[15], Annex I listed species on Directive 2009/147/EC (the Birds Directive), species listed on Schedule 1 of the Wildlife and Countryside Act 1981 (as amended), species listed on the Gloucestershire Local Biodiversity Action Plan, qualifying features of the Severn Estuary SPA and/or features of interests of the Severn Estuary Ramsar site and qualifying features of Walmore Common SPA.

[12] Gilbert, G., Gibbon, D.W. and Evans J. (1998). Bird Monitoring Methods: A Manual of Techniques for Key UK Species. Royal Society for the Protection of Birds, The Lodge, Sandy, Bedfordshire
[13] Bibby C.J. Burgess, N.D. Hill D.A. Mustoe S. and Lambton S. (2000). Bird Census Techniques. Academic Press London
[14] BTO (2009) BTO Species Codes. BTO, Thetford
[15] Eaton, M.A., Aebischer, N.J., Brown, A.F., Hearn, R.D., Lock, L., Musgrove, A.J., Noble, D.G., Stroud, D.A. and Gregory, R.D. (2015) Birds of Conservation Concern 4: the population status of birds in the United Kingdom, Channel Islands and Isle of Man. British Birds 108, pp 708–746.

Determination of Bird Community Importance

2.3.2. The priority populations of wintering and passage birds have been valued in a geographical context following the framework provided in LA 108[16]. The evaluation is based on the information gathered from the desk study and field surveys, using a combination of professional judgement and accepted criteria[17] (e.g. diversity, rarity and naturalness).

2.4. Limitations

2.4.1. Ornithological surveys are affected by a variety of factors which affect the presence of birds such as season, weather, climate, migration patterns, food availability, species behaviour and the presence of predators. Therefore, bird surveys for this Scheme may not have produced a complete bird list and the absence of evidence of any particular species within the Survey Area (or a part of the Survey Area), should not be taken as conclusive proof that the species is not present or that it will not be present in the future.

2.4.2. The M5 and A4019 was subject to a high volume of traffic towards the end of each survey visit due to increases in commuter traffic volume, which resulted in significant noise pollution surrounding the road network. Birds are generally sensitive to noise pollution; therefore, it is not considered that any significant assemblages of priority species would be present in the areas of vegetation immediately surrounding the road network that were subject to the highest levels of noise pollution during the surveys.

2.4.3. Approximately half of the Survey Area was not visited during March 2020 due to the Coronavirus pandemic. However, due to the survey coverage and the number of repeated visits, it is considered that any wintering species regularly present within the EZoI would have been recorded, and that the survey results comprise an accurate account of the wintering species assemblage within the EZoI.

2.4.4. Access to all land parcels within 250 m of the Scheme was not granted by the time the surveys were undertaken. As such surveys of certain areas, particularly at the north east extent of the Scheme, could only be undertaken from Public Rights of Way (PRoWs), which were up to 250 m from the Scheme in places.

2.4.5. However, the results of these bird surveys and the subsequent assessment provide an indication of the use of the EZoI by wintering bird species during the survey period. The results can therefore be used with confidence during the analysis of potential impacts resulting from the Scheme.

2.4.6. Assuming submission in summer 2022, the bird survey data from 2019 will be three years old. It is proposed to undertake update extended Phase 1 Habitat Surveys in targeted areas in order to determine whether any of the baseline conditions have changed significantly, and validate, or otherwise, the results described in this report. This report will be updated to include these surveys, and will be submitted as part of the ES.

[16] Highways England. March 2020. LA 108 Biodiversity [Online]. [Accessed October 2020]. Available from: https://www.standardsforhighways.co.uk/dmrb/search?discipline=SUSTAINABILITY_AND_ENVIRONMENT
[17] Set out in Ratcliffe, D.A (1977). A Nature Conservation Review. Cambridge University Press.

3. Results

3.1. Desk Study

Designated Sites

3.1.1. There is one statutory designated site with birds as a feature of interest within 2 km of the Scheme. This is Coombe Hill Canal SSSI, located approximately 1.9 km north west, designated partly for its diverse breeding bird assemblage.

3.1.2. The closest statutory designated sites that have been specifically designated with respect to its ornithological importance are Walmore Common SPA and Ramsar site, and Severn Estuary SPA and Ramsar sit, located approximately 17.5 km and 22.7 km to the south west of the Site respectively. Walmore Common SPA is designated under Articles 4.1 of the EC Directive 79/409/EEC for regularly supporting populations of European importance of Bewick's swan (***Cygnus columbianus***) over winter; and Severn Estuary SPA is designated under Article 4.1 of the EC Directive 79/409/EEC for supporting populations of European importance of wintering wildfowl and waders and under Article 4.2 for regularly supporting at least 20,000 waterfowl over winter.

3.1.3. There are no non-statutory designated sites within 2 km of the Scheme.

3.1.4. There are no recorded ancient woodlands within 1 km of the Scheme. Priority habitat records identified during the desk study within 1 km of the Scheme include:

- Deciduous woodland and traditional orchards within the Scheme;
- Good Quality Semi-Improved Grassland (Lowland Meadows and Pastures) approximately 640 m west of the Scheme; and
- Coastal and Floodplain Grazing Marsh approximately 820 m west of the Scheme.

3.1.5. Other habitats present within the Survey Area, including semi-natural and plantation woodland, scrub, agricultural habitats and built-up areas provide suitable habitat to support an assemblage of priority and common bird species.

Biological Records

3.1.6. The Gloucestershire Local Biodiversity Action Plan comprises action plans for 13 species in total, which comprise bittern (***Botaurus stellaris***), nightjar (***Caprimulgus europaeus***), woodlark (***Lullula arborea***), spotted flycatcher (***Muscicapa striata***) and 'farmland birds' (skylark (***Alauda arvensis***), linnet (***Linaria cannabina***), reed bunting (***Emberiza schoeniclus***), corn bunting (***Emberiza calandra***), tree sparrow (***Passer montanus***), grey partridge (***Perdix perdix***), bullfinch (***Pyrrhula pyrrhula***), turtle dove (***Streptopelia turtur***) and song thrush (***Turdus philomelos***)).

3.1.7. The desk study identified recent records (i.e. since 2010) of 33 priority bird species[18] within 1 km of the Scheme, of which 27 species were recorded within the wintering season (i.e. September to March inclusive). This includes:

- Five species on Schedule 1 of the Wildlife and Countryside Act 1981 (fieldfare (***Turdus pilaris***), merlin (***Falco columbarius***), peregrine (***Falco peregrinus***), red kite (***Milvus milvus***) and redwing (***Turdus iliacus***));
- Thirteen species on the Red List of the BoCC4 species (fieldfare (***Turdus pilaris***), grey wagtail (***Motacilla cinerea***), herring gull (***Larus argentatus***), house sparrow, lapwing (***Vanellus vanellus***), linnet, merlin, mistle thrush (***Turdus viscivorus***), redwing, skylark, song thrush, starling (***Sturnus vulgaris***) and yellowhammer

[18] In this context, priority birds include those listed as species of principal importance for the conservation of biodiversity in England, those identified as Red or Amber on BoCC4, Annex I listed species on Directive 2009/147/EC (the Birds Directive), those listed on Schedule 1 of the Wildlife and Countryside Act 1981 (as amended), and/or species listed on the Gloucestershire Biodiversity Action Plan.

(***Emberiza citrinella***)) and 12 species on the Amber List of the BoCC4 species (black-headed gull (***Chroicocephalus ridibundus***), bullfinch, common gull (***Larus canus***), dunnock (***Prunella modularis***), house martin (***Delichon urbicum***), kestrel (***Falco tinnunculus***), lesser black-backed gull (***Larus fuscus***), meadow pipit (***Anthus pratensis***), snipe (***Gallinago gallinago***), stock dove (***Columba oenas***), swift (***Apus apus***) and tawny owl (***Strix aluco***));

- Ten species are listed as species of principal importance for the conservation of biodiversity in England (bullfinch, dunnock, herring gull, house sparrow (***Passer domesticus***), lapwing, linnet, skylark, song thrush, starling and yellowhammer);
- Three species listed on Annex 1 of the Birds Directive (merlin, peregrine and red kite);
- Four species listed on the Gloucestershire Local Biodiversity Action Plan (bullfinch, linnet, skylark and song thrush);
- Two qualifying species of the Severn Estuary SPA (lapwing and mallard (***Anas platyrhynchos***); and
- Two species identified on the Severn Estuary Ramsar Information Sheet (herring gull, identified as noteworthy fauna and lesser-back backed gull, identified as a species subsequent to designation for possible future consideration under criterion 6).

3.2. Field Survey

3.2.1. A total of 64 species were recorded within the Survey Area, of which 27 are priority species. The full survey species list, peak counts and conservation status can be seen in Appendix C and the results are shown on Figures 7.9A to 7.9G in Appendix A. This includes:

- Five species listed on Schedule 1 of the Wildlife and Countryside Act 1981 (as amended) (barn owl (***Tyto alba***), fieldfare, kingfisher (***Alcedo atthis***), red kite and redwing);
- Thirteen species on the Red List of the BoCC4 species (fieldfare, grey wagtail, herring gull, house sparrow, lapwing, linnet, mistle thrush, redwing, skylark, song thrush, spotted flycatcher, starling and yellowhammer) and 11 species on the Amber List of the BoCC4 species (black-headed gull, dunnock, house martin, kestrel, lesser black-backed gull, mallard, meadow pipit, redstart (***Phoenicurus phoenicurus***), reed bunting, stock dove and willow warbler (***Phylloscopus trochilus***)).
- Ten species listed as species of principal importance for the conservation of biodiversity in England (dunnock, herring gull, house sparrow, linnet, reed bunting, skylark, song thrush, starling, spotted flycatcher and yellowhammer);
- Three species listed on Annex 1 of the Birds Directive (merlin, peregrine and red kite);
- Five species listed on the Gloucestershire Local Biodiversity Action Plan (linnet, reed bunting, skylark, song thrush and spotted flycatcher);
- Two qualifying species of the Severn Estuary SPA (lapwing and mallard); and
- Two species identified on the Severn Estuary Ramsar Information Sheet (herring gull, identified as noteworthy fauna and lesser-back backed gull, identified as a species subsequent to designation for possible future consideration under criterion 6).

3.3. Incidental Records

3.3.1. Three additional species were recorded during other ecology surveys undertaken during the winter and passage period (September to March inclusive) that were not observed

during the wintering and passage bird surveys: little owl (***Athene noctua***), snipe and tawny owl.

3.4. Description of Bird Assemblages

3.4.1. The assemblage of wintering and passage birds is considered to be largely typical of agricultural areas, woodland and scrub and built-up areas within Gloucestershire.

3.4.2. The presence of agricultural habitats such as arable fields, hedgerows and improved grassland within the Survey Area has resulted in the recording of associated priority species including grey wagtail, kestrel, lapwing, linnet, meadow pipit, skylark, starling, stock dove, yellowhammer, wintering thrushes (fieldfare and redwing) and gulls (black-headed gull, herring gull and lesser-back backed gull).

3.4.3. Notable species associated with semi-natural broadleaved woodland include mistle thrush and song thrush; and those associated with built-up areas include house martin, house sparrow, swallow (***Hirundo rustica***) and starling.

4. Evaluation

4.1.1. Sixty of the 67 species recorded during the wintering and passage bird survey or as an incidental observation have a Gloucestershire resident, wintering or passage population status that is abundant, common or fairly common[19].

4.1.2. Five of these species are identified in a county or equivalent authority area plans or strategies, i.e. within the Gloucestershire Local Biodiversity Action Plan. This comprises three species listed under 'farmland birds': linnet (peak count of 34), reed bunting (peak count of 1), skylark (peak count of 37) and song thrush (peak count of 6); and spotted flycatcher (peak count of 1).

4.1.3. Seven species recorded during the Wintering and Passage Bird Survey or as an incidental observation have a Gloucestershire resident, wintering or passage population status that is uncommon or scarce[20], i.e.:

- Barn owl (uncommon or scarce resident). Individual birds were observed in October 2019 and September 2020, and a dead bird was recorded in September 2019;
- Chiffchaff (***Phylloscopus collybita***) (scarce but increasing winter visitor). A peak count of 17 was recorded during September 2019, with four individuals recorded in October 2019 and five in March 2020 which are considered likely to be on passage. One individual was recorded in November 2019 which was possibly over-wintering in the Survey Area;
- Kingfisher (uncommon). A peak count of two individuals were recorded in September 2019 (incidental records approximately 2.5 km apart, so as a precaution assumed to be different individuals). Individual birds were also recorded during the survey in October 2019, January 2020 and February 2020;
- Lesser whitethroat (***Curruca curruca***) (uncommon). One individual was recorded during September 2019 and probably a passage bird;
- Raven (***Corvus corax***) (uncommon). A peak count of five was recorded during February 2020;
- Red kite (uncommon). One individual was recorded during February 2020; and
- Stonechat (***Saxicola rubicola***) (uncommon). A peak count of one recorded during October and November 2019 and January 2020.

4.1.4. Two qualifying species of the Severn Estuary SPA have been recorded, i.e. lapwing (two individuals) and mallard (peak count of nine individuals). Given the low numbers recorded they are unlikely to be a significant component of the SPA populations. Furthermore, at this distance from the SPA (located over 20 km south west of the Scheme at the nearest point), it is considered highly unlikely that the individuals recorded within the study area are part of the SPA qualifying feature populations.

4.1.5. This is supported by a recent study[21] which identifies functionally linked land associated with the Severn Estuary SPA. The maps which accompany this study do not identify that these species regularly move between the SPA and the study area.

4.1.6. However, the study also indicates that lapwing have been recorded within the Survey Area (in the vicinity of Boddington Manor Farm, at the west of the Scheme) in numbers which reached or exceeded the equivalent of the 1% SPA population criterion for importance on at least one occasion. No lapwing were recorded at this location during the wintering and passage bird surveys, and as the study indicates that there are no regular

[19] Goodhall, R., Kirk, G. and Petrek, S. (2020) Gloucestershire Bird Report 2014-16. Gloucestershire Ornithological Co-ordinating Committee
[20] Goodhall, R., Kirk, G. and Petrek, S. (2020) Gloucestershire Bird Report 2014-16. Gloucestershire Ornithological Co-ordinating Committee
[21] Link Ecology Ltd (September 2020) Identification of land with proven or possible functional linkages with the Severn Estuary SSSI/SPA Phase 5 (Gloucestershire and Worcestershire) A report to Natural England.

movements between the SPA and this location it is therefore considered that this area is not regularly used by or of significant importance for lapwing.

4.1.7. Two species identified on the Severn Estuary Ramsar Information Sheet have been recorded. Herring gull (identified as noteworthy fauna occurring at levels of national importance during the breeding season) was recorded in reasonably high numbers on two occasions (September and December 2019, with a peak count of 306). Lesser black-backed gull (identified as a species subsequent to designation for possible future consideration under criterion 6) was recorded in reasonably high numbers on one occasion (a peak count of 148 in September 2019). It is considered that these individuals are likely to be from breeding populations within urban areas such as Cheltenham and/or Gloucester, which are closer to the Scheme than the Ramsar site breeding colonies at Steep Holm and Flat Holm[22] (approximately 90 km south west). Cheltenham Borough Council states that "Herring Gulls and Lesser Black-Backed Gulls nest in the residential areas of Cheltenham and on industrial units in the Kingsditch area"[23]. The JNCC Seabird Monitoring Programme online database states that the Gloucestershire Urban Gulls Cheltenham site (85627) supported 46 herring gulls apparently occupied territories and 273 lesser black-backed gulls apparently occupied territories in 2011 (year of last count) and the Gloucester City: Gloucester site (86737) supported 657 herring gulls apparently occupied nests and 2230 lesser black-backed gull apparently occupied nests in 2009 (year of last count)[24].

4.1.8. The habitats within the Survey Area are not considered to provide a role in maintaining the SPA or Ramsar populations or functionally linked to any SPAs or Ramsar sites.

4.1.9. Although five species are listed on the Gloucestershire Local Biodiversity Action Plan, these species are currently listed as either common, formerly common or fairly common within Gloucestershire. The peak counts for these species (see Appendix C) within the Survey Area are not considered to be of county importance in relation to Gloucestershire populations.

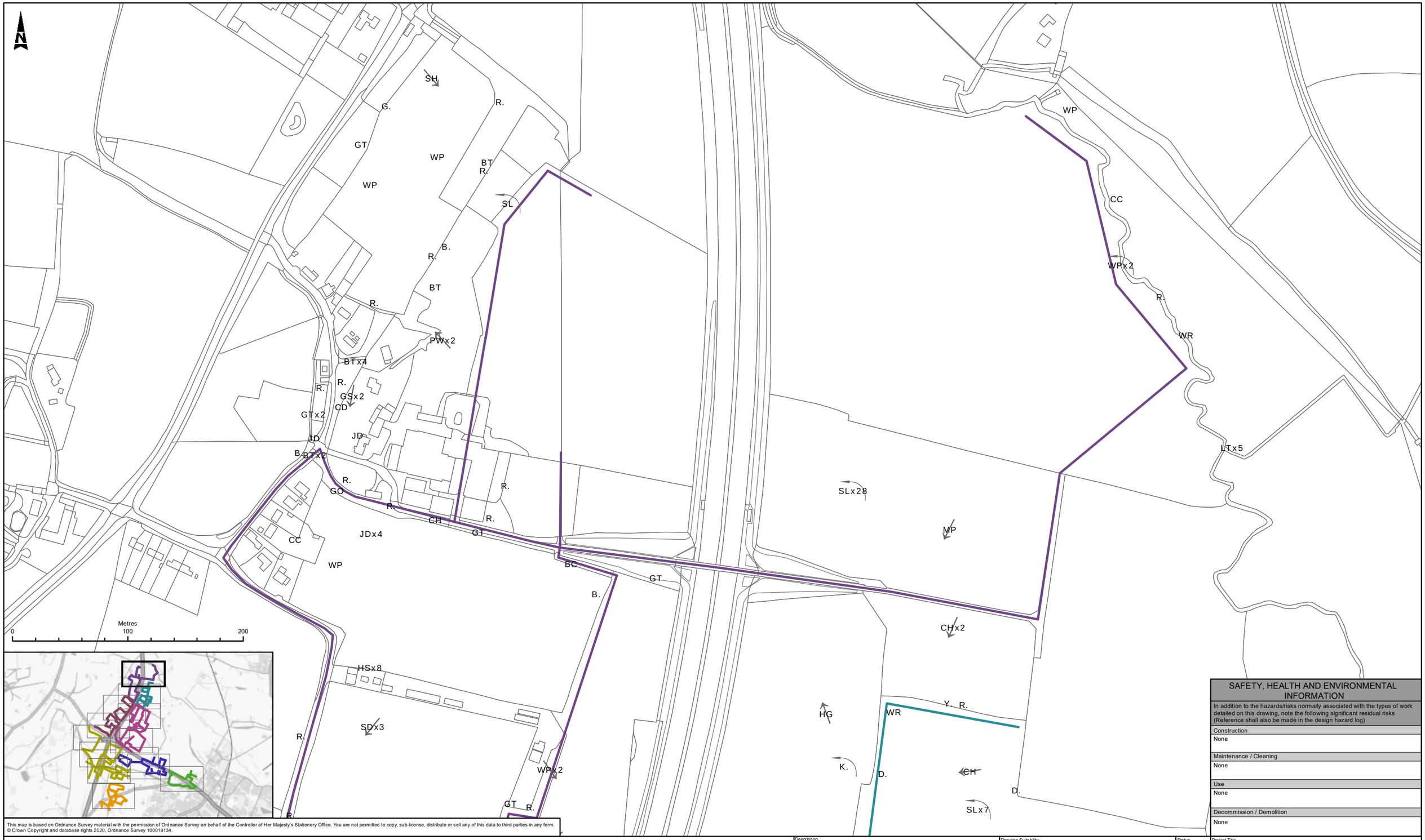
4.1.10. Therefore, taken as a whole, the wintering and passage bird assemblage is considered to appreciably enrich the habitat resource within the local context, which includes features of importance for migration. The assemblage of these wintering and passage birds is therefore considered to be of Local value for biodiversity.

[22] Burton, N.H.K., Musgrove, A.J., Rehfisch, M.M., and Clark N.A. (2010) Birds of the Severn Estuary and Bristol Channel: Their current status and key environmental issues. Marine Pollution Bulletin 61 (2010) 115–123
[23] Cheltenham Borough Council (2018) Urban Gulls Scrutiny Task Group Report. Available at https://democracy.cheltenham.gov.uk/documents/s27390/2018_12_04_CAB_Urban_Gulls_scrutiny_report.pdf
[24] Available at https://app.bto.org/seabirds/public/index.jsp

Appendices to Appendix 7.9

- Appendix A
- Appendix B
- Appendix C

Appendix A. Figures 7.9A – 7.9G Wintering bird survey results



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- TRANSECT 5
- TRANSECT 6
- TRANSECT 7
- TRANSECT 8
- TRANSECT 9

BEHAVIOURS

- FORAGING IN FLIGHT
- FLYING

SPECIES (BTO CODES)

B.	BLACKBIRD	BZ	BUZZARD	GC	GOLDCREST	J.	JAY	MG	MAGPIE	SD	STOCK DOVE
BT	BLUE TIT	C.	CARRION CROW	GL	GREY WAGTAIL	JD	JACKDAW	MP	MEADOW PIPIT	SG	STARLING
BH	BLACK-HEADED GULL	CD	COLLARED DOVE	GO	GOLDFINCH	K.	KESTREL	PW	PIED WAGTAIL	SH	SPARROWHAWK
G.	GREEN WOODPECKER	CH	CHAFFINCH	GS	GREAT SPOTTED WOODPECKER	LB	LESSER BLACK-BACKED GULL	PH	PHEASANT	ST	SONG THRUSH
		CT	COAL TIT	GT	GREAT TIT			R.	ROBIN	WP	WOOD PIGEON
		D.	DUNNOCK	HG	HERRING GULL	LT	LONG-TAILED TIT	RE	REDWING	WR	WREN
		FF	FIELDFARE	HS	HOUSE SPARROW	M.	MISTLE THRUSH	RO	ROOK	Y.	YELLOWHAMMER
						MA	MALLARD	S.	SKYLARK		

Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
FOR INFORMATION	S2	C01	SD	LH	--	--	08/10/21

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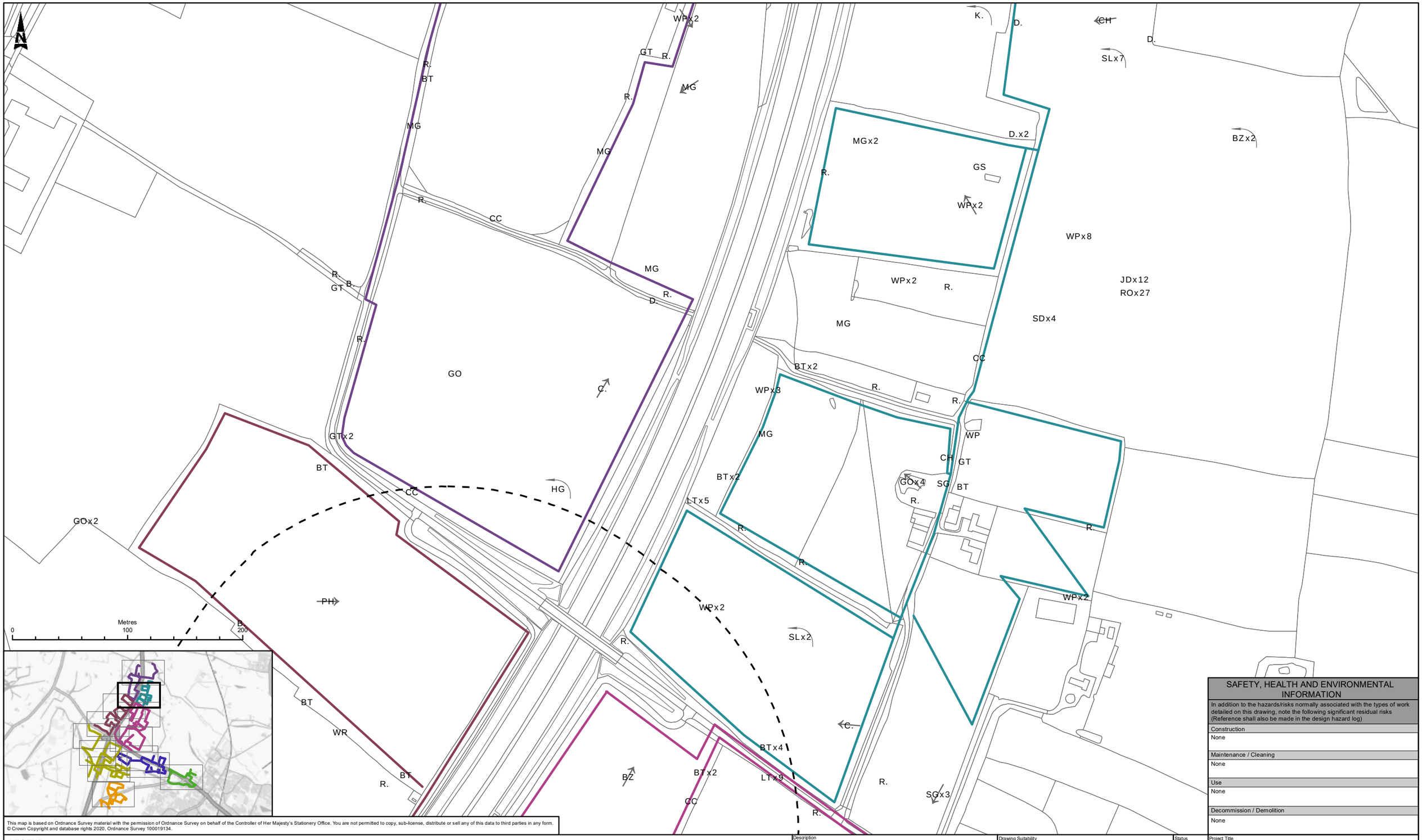
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Project Title: M5 Junction 10 Improvement

Drawing Title: FIGURE 7.9A
WINTERING BIRD SURVEY RESULTS
SEPTEMBER 2019

Drawing Number: Project | Originator | Volume
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Location | Type | Number

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RE	REDWING	WR	WREN				
RO	ROOK	Y.	YELLOWHAMMER				
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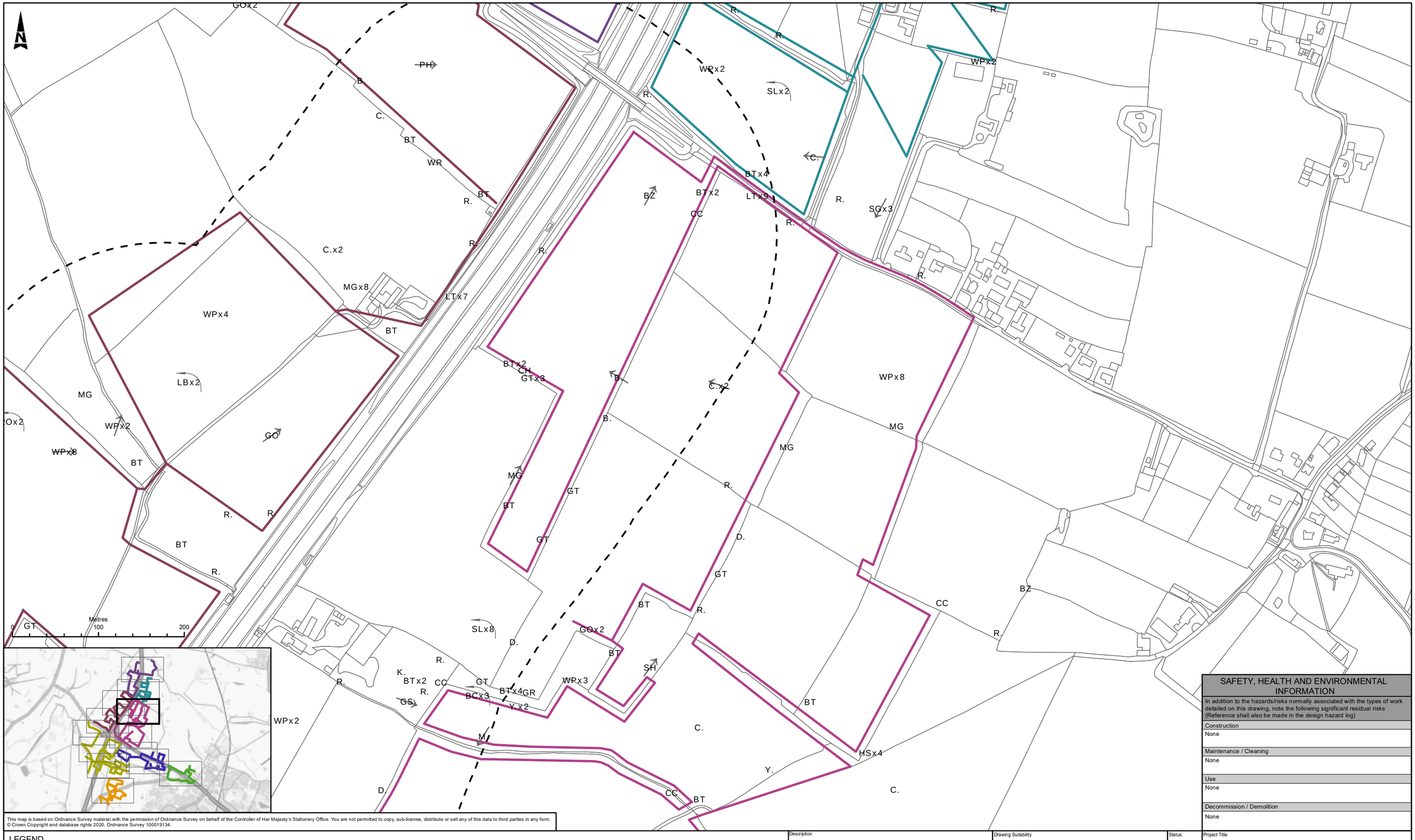
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Project Title: M5 Junction 10 Improvement

Drawing Title: FIGURE 7.9A
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SEPTEMBER 2019

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Description

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Description
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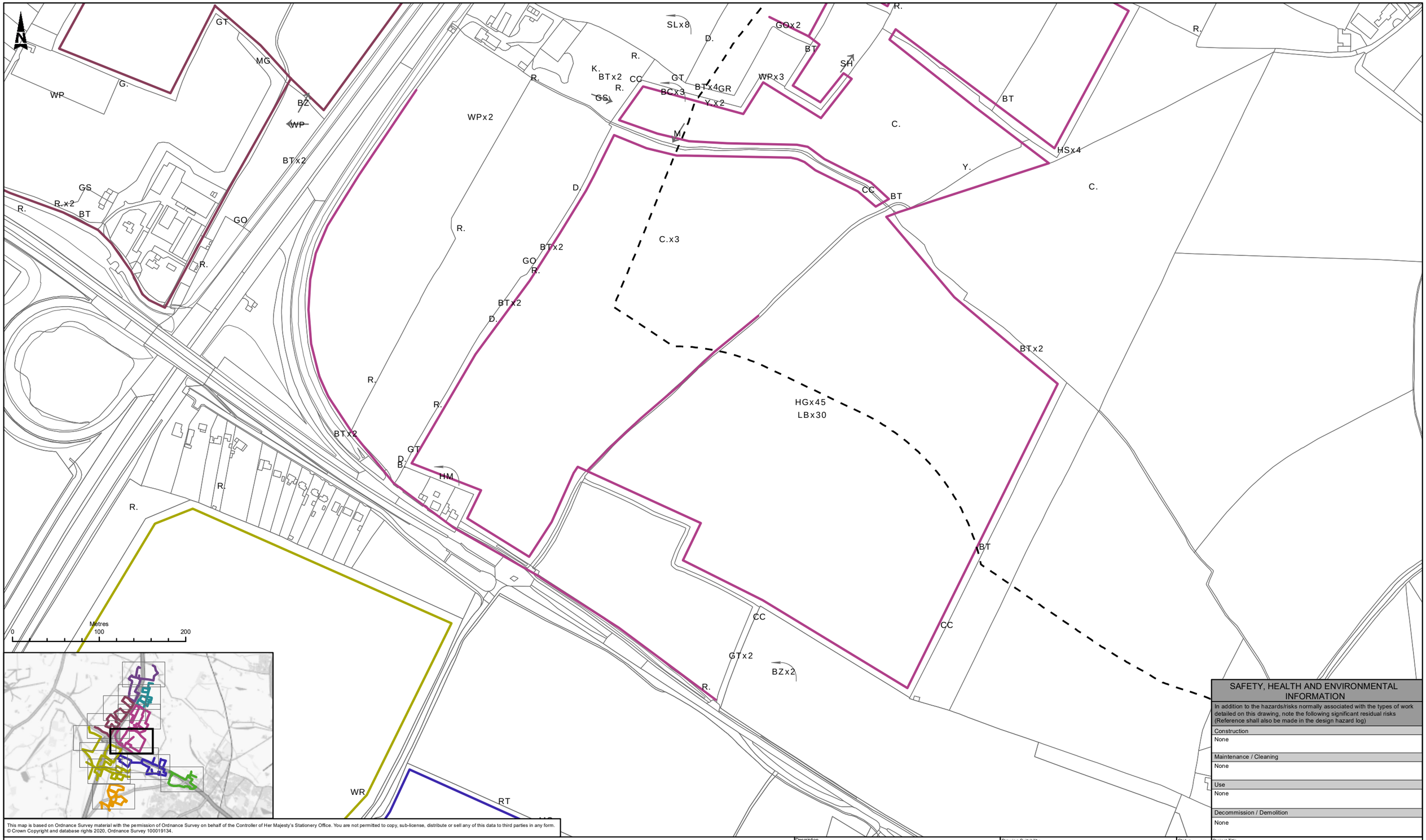
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WINTERING BIRD SURVEY RESULTS
SEPTEMBER 2019

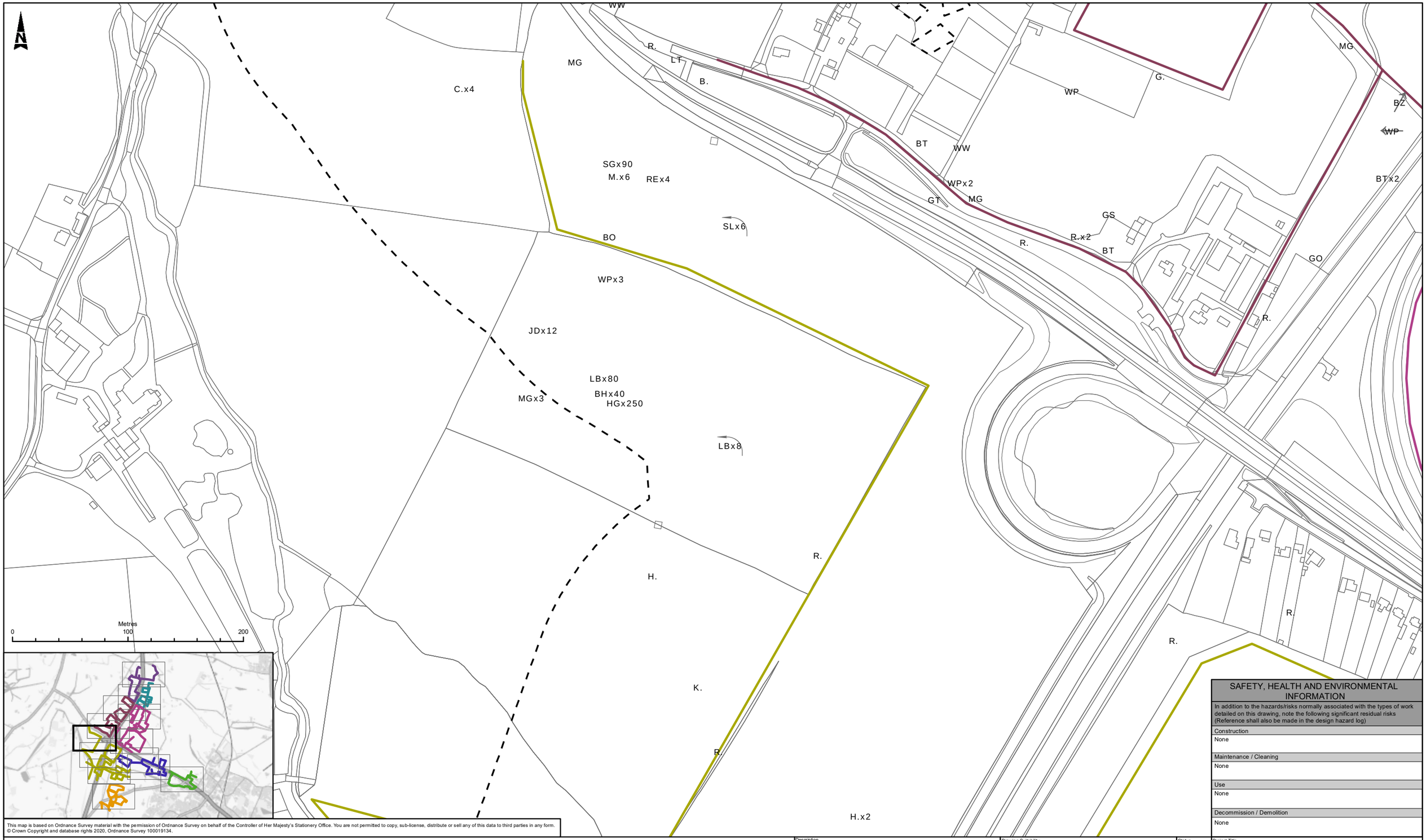
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Client: Gloucestershire County Council

Drawing Number: Project | Originator | Volume
GCCM5J10 - ATK - EBD
XX - GS - GI - 000020
Location | Type | Number

Original Size:	Scale	Project Ref:	Sheet:	Rev:
A3	1:4,000	5197035	1 of 1	C01



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LEGEND

- 250M STUDY AREA
- TRANSECT 2
- TRANSECT 3
- TRANSECT 4
- TRANSECT 5
- TRANSECT 6
- TRANSECT 7
- TRANSECT 8
- TRANSECT 9

BEHAVIOURS

- FORAGING IN FLIGHT
- FLYING

SPECIES (BTO CODES)

B.	BLACKBIRD
BT	BLUE TIT
BH	BLACK-HEADED GULL
BZ	BUZZARD
C.	CARRION CROW
CD	COLLARED DOVE
CH	CHAFFINCH
CT	COAL TIT
D.	DUNNOCK
FF	FIELDFARE
G.	GREEN WOODPECKER
GC	GOLDCREST
GL	GREY WAGTAIL
GO	GOLDFINCH
GS	GREAT SPOTTED WOODPECKER
GT	GREAT TIT
HG	HERRING GULL
HS	HOUSE SPARROW
J.	JAY
JD	JACKDAW
K.	KESTREL
LB	LESSER BLACK-BACKED GULL
LT	LONG-TAILED TIT
M.	MISTLE THRUSH
MA	MALLARD
MG	MAGPIE
MP	MEADOW PIPIT
PW	PIED WAGTAIL
PH	PHEASANT
R.	ROBIN
RE	REDWING
RO	ROOK
S.	SKYLARK
SD	STOCK DOVE
SG	STARLING
SH	SPARROWHAWK
ST	SONG THRUSH
WP	WOOD PIGEON
WR	WREN
Y.	YELLOWHAMMER

Description

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date

Description

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Description
FOR INFORMATION

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
S2	C01	SD	LH	--	--	08/10/21

Drawing Suitability: FOR INFORMATION

Status: S2

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log)

Construction
None

Maintenance / Cleaning
None

Use
None

Decommission / Demolition
None

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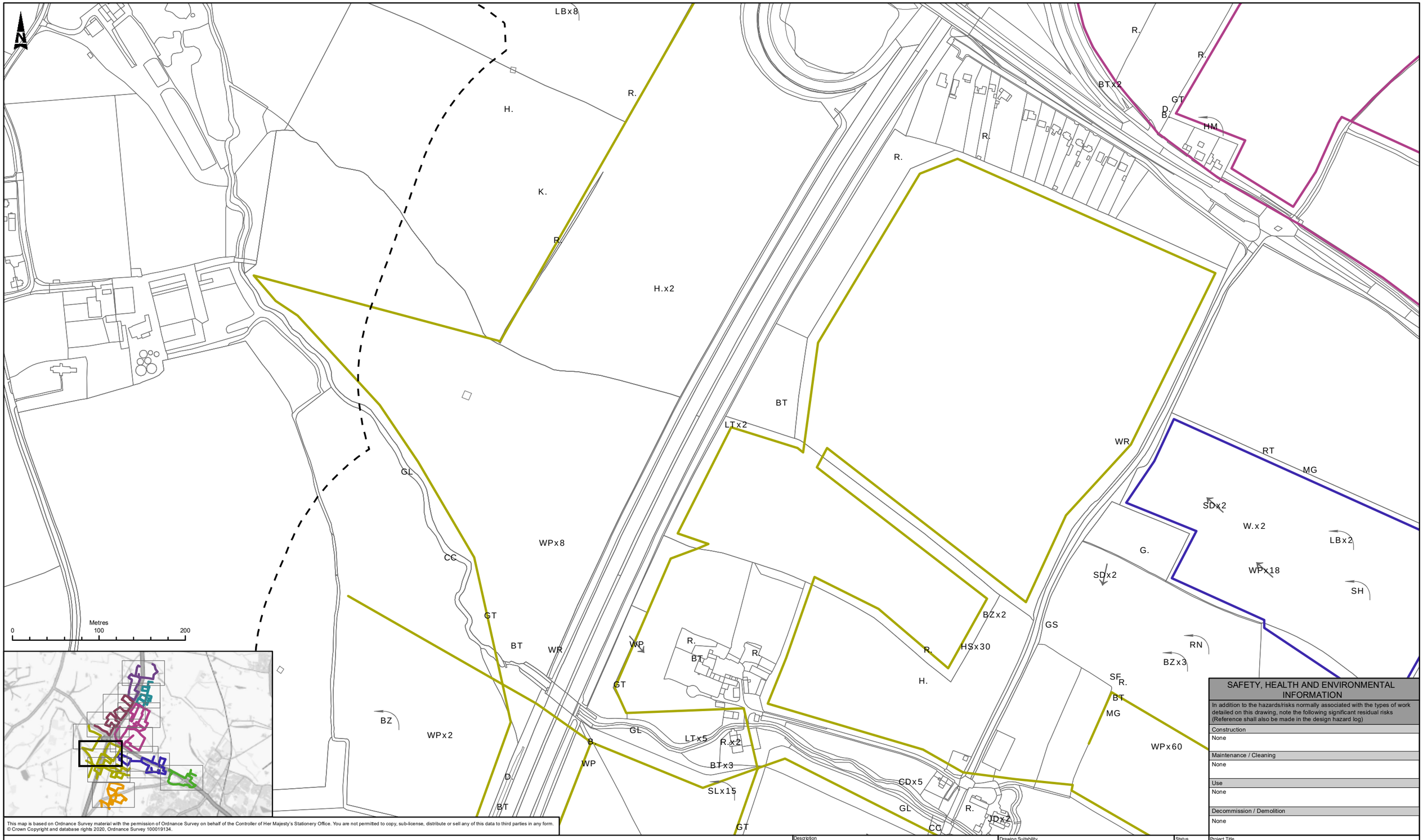
Client: Gloucestershire COUNTY COUNCIL

Project Title: M5 Junction 10 Improvement

Drawing Title: FIGURE 7.9A
WINTERING BIRD SURVEY RESULTS
SEPTEMBER 2019

Drawing Number: Project | Originator | Volume
GCCM5J10 - ATK - EBD
XX - GS - GI - 000020
Location | Type | Number

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A3	1:3,000	5197035	1 of 1	C01



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LEGEND

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- TRANSECT 4
- TRANSECT 5
- TRANSECT 6
- TRANSECT 7
- TRANSECT 8
- TRANSECT 9

BEHAVIOURS

- FORAGING IN FLIGHT
- FLYING

SPECIES (BTO CODES)

B.	BLACKBIRD	BZ	BUZZARD	GC	GOLDCREST	J.	JAY
BT	BLUE TIT	C.	CARRION CROW	GL	GREY WAGTAIL	JD	JACKDAW
BH	BLACK-HEADED GULL	CD	COLLARED DOVE	GO	GOLDFINCH	K.	KESTREL
G.	GREEN WOODPECKER	CH	CHAFFINCH	GS	GREAT SPOTTED WOODPECKER	LB	LESSER BLACK-BACKED GULL
		CT	COAL TIT	GT	GREAT TIT	LT	LONG-TAILED TIT
		D.	DUNNOCK	HG	HERRING GULL	M.	MISTLE THRUSH
		FF	FIELDFARE	HS	HOUSE SPARROW	MA	MALLARD

MG	MAGPIE	SD	STOCK DOVE				
MP	MEADOW PIPIT	SG	STARLING				
PW	PIED WAGTAIL	SH	SPARROWHAWK				
PH	PHEASANT	ST	SONG THRUSH				
R.	ROBIN	WP	WOOD PIGEON				
RE	REDWING	WR	WREN				
RO	ROOK	Y.	YELLOWHAMMER				
S.	SKYLARK						

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Description FOR INFORMATION

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
S2	C01	SD	LH	--	--	08/10/21

Drawing Suitability: FOR INFORMATION

Status: S2

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

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Construction
None

Maintenance / Cleaning
None

Use
None

Decommission / Demolition
None

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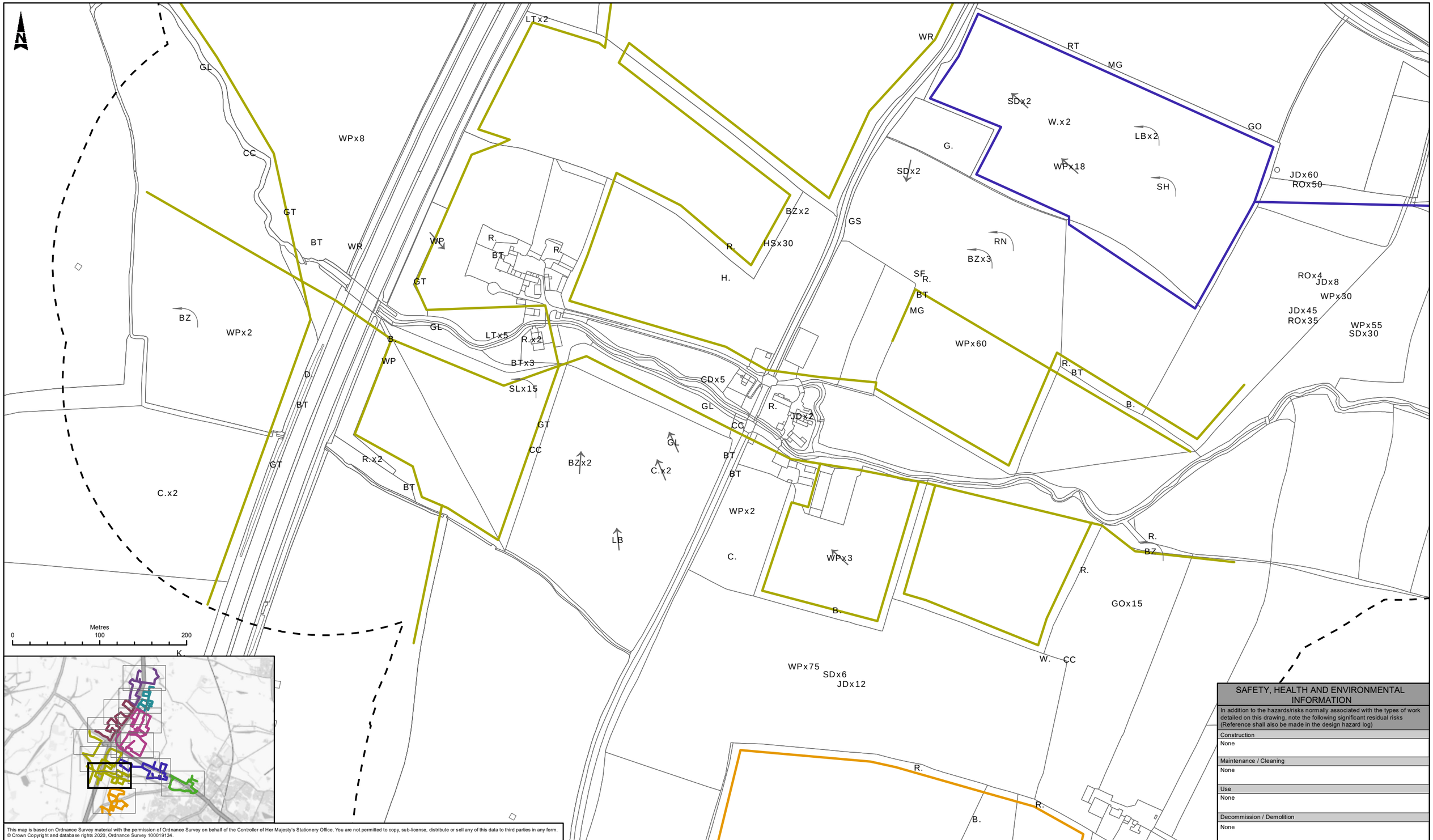
Client: Gloucestershire County Council

Project Title: M5 Junction 10 Improvement

Drawing Title: FIGURE 7.9A
WINTERING BIRD SURVEY RESULTS
SEPTEMBER 2019

Drawing Number: Project | Originator | Volume
GCCM5J10 - ATK - EBD
XX - GS - GI - 000020
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- TRANSECT 4
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- TRANSECT 6
- TRANSECT 7
- TRANSECT 8
- TRANSECT 9

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- FORAGING IN FLIGHT
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D.	DUNNOCK	CH	CHAFFINCH	GS	GREAT SPOTTED WOODPECKER	LB	LESSER BLACK-BACKED GULL	PH	PHEASANT	ST	SONG THRUSH
FF	FIELDFARE	CT	COAL TIT	GT	GREAT TIT	LT	LONG-TAILED TIT	R.	ROBIN	WP	WOOD PIGEON
G.	GREEN WOODPECKER			HG	HERRING GULL	M.	MISTLE THRUSH	RE	REDWING	WR	WREN
				HS	HOUSE SPARROW	MA	MALLARD	RO	ROOK	Y.	YELLOWHAMMER
								S.	SKYLARK		

Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
FOR INFORMATION	S2	C01	SD	LH	--	--	08/10/21

Drawing Suitability: FOR INFORMATION

Status: S2

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Client: Gloucestershire County Council

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

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Construction
None

Maintenance / Cleaning
None

Use
None

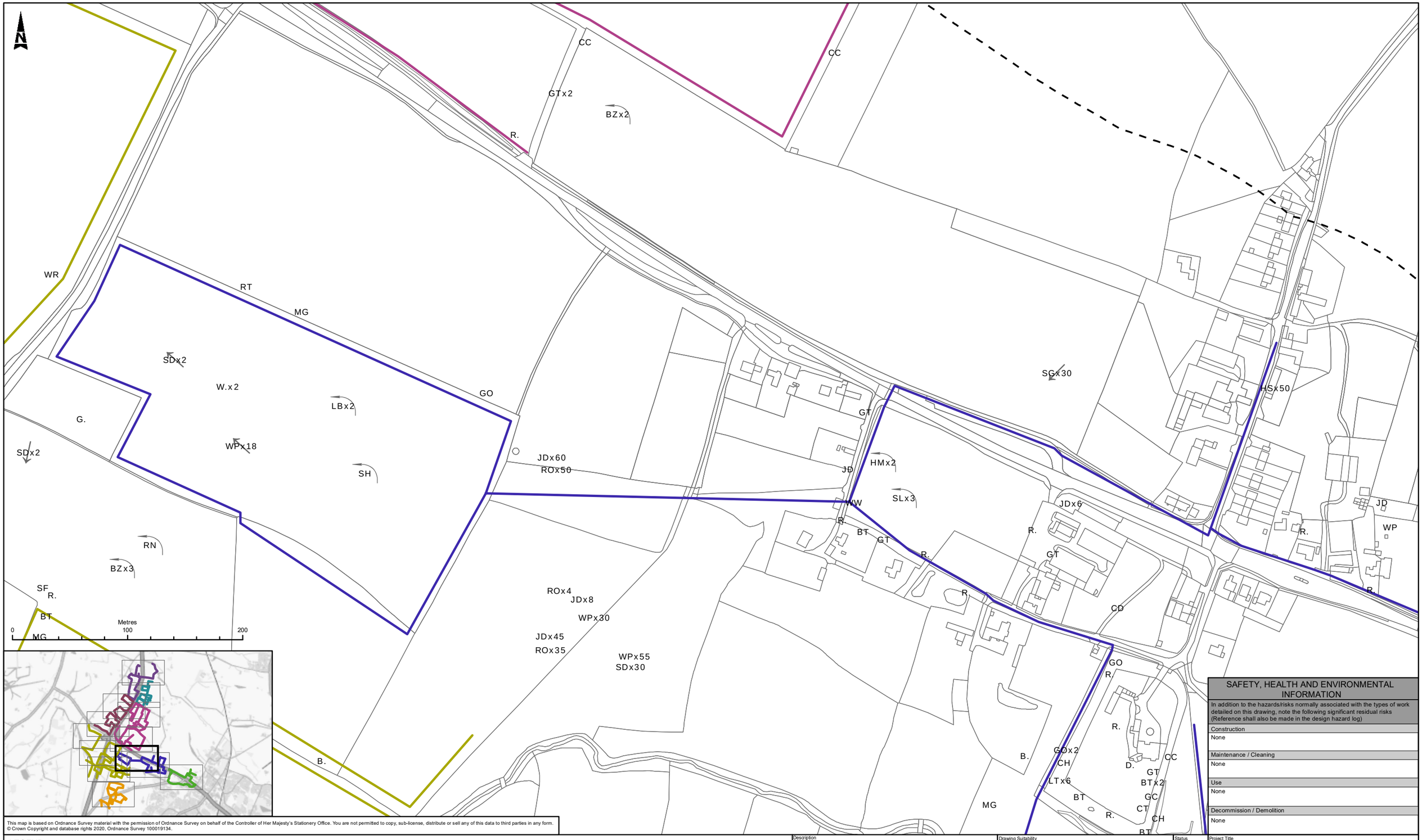
Decommission / Demolition
None

Project Title: M5 Junction 10 Improvement

Drawing Title: FIGURE 7.9A
WINTERING BIRD SURVEY RESULTS
SEPTEMBER 2019

Drawing Number: Project | Originator | Volume
GCCM5J10 - ATK - EBD
XX - GS - GI - 000020
Location | Type | Number

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LEGEND

- 250M STUDY AREA
- TRANSECT 2
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- TRANSECT 4
- TRANSECT 5
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- TRANSECT 8
- TRANSECT 9

BEHAVIOURS

- FORAGING IN FLIGHT
- FLYING

SPECIES (BTO CODES)

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		FF	FIELDFARE	HS	HOUSE SPARROW	MA	MALLARD
		G.	GREEN WOODPECKER				

MG	MAGPIE	SD	STOCK DOVE
MP	MEADOW PIPIT	SG	STARLING
PW	PIED WAGTAIL	SH	SPARROWHAWK
PH	PHEASANT	ST	SONG THRUSH
R.	ROBIN	WP	WOOD PIGEON
RE	REDWING	WR	WREN
RO	ROOK	Y.	YELLOWHAMMER
S.	SKYLARK		

Description

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Description
FOR INFORMATION

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
S2	C01	SD	LH	--	--	08/10/21

Drawing Suitability: FOR INFORMATION
Status: S2

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log)

Construction
None

Maintenance / Cleaning
None

Use
None

Decommission / Demolition
None

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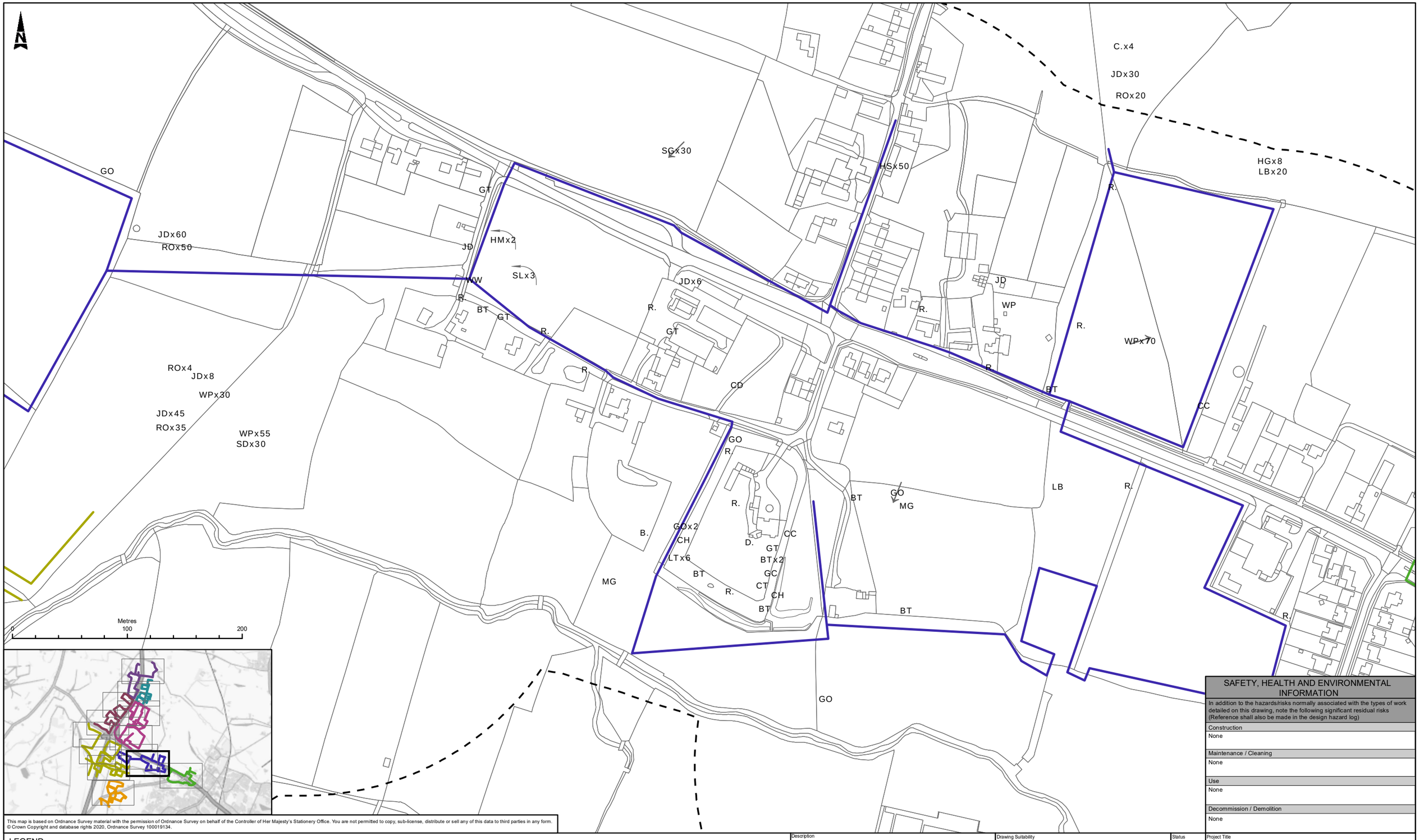
Client: Gloucestershire County Council

Project Title: M5 Junction 10 Improvement

Drawing Title: FIGURE 7.9A
WINTERING BIRD SURVEY RESULTS
SEPTEMBER 2019

Drawing Number: GCCM5J10 - ATK - EBD - XX - GS - GI - 000020
(Project | Originator | Volume | Location | Type | Number)

Original Size:	Scale	Project Ref:	Sheet:	Rev:
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LEGEND

- 250M STUDY AREA
- TRANSECT 2
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- TRANSECT 6
- TRANSECT 7
- TRANSECT 8
- TRANSECT 9

BEHAVIOURS

- FORAGING IN FLIGHT
- FLYING

SPECIES (BTO CODES)

BZ	BUZZARD	GC	GOLDCREST	J.	JAY	MG	MAGPIE	SD	STOCK DOVE
C.	CARRION CROW	GL	GREY WAGTAIL	JD	JACKDAW	MP	MEADOW PIPIT	SG	STARLING
CD	COLLARED DOVE	GO	GOLDFINCH	K.	KESTREL	PW	PIED WAGTAIL	SH	SPARROWHAWK
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CT	COAL TIT	GT	GREAT TIT	LT	LONG-TAILED TIT	R.	ROBIN	WP	WOOD PIGEON
D.	DUNNOCK	HG	HERRING GULL	M.	MISTLE THRUSH	RE	REDWING	WR	WREN
FF	FIELDFARE	HS	HOUSE SPARROW	MA	MALLARD	RO	ROOK	Y.	YELLOWHAMMER
G.	GREEN WOODPECKER					S.	SKYLARK		

Description

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date

Description

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date

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Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date

Description FOR INFORMATION

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
S2	C01	SD	LH	--	--	08/10/21

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log)

Construction
None

Maintenance / Cleaning
None

Use
None

Decommission / Demolition
None

Drawing Suitability: FOR INFORMATION
Status: S2

Project Title: M5 Junction 10 Improvement

Drawing Title: FIGURE 7.9A
WINTERING BIRD SURVEY RESULTS
SEPTEMBER 2019

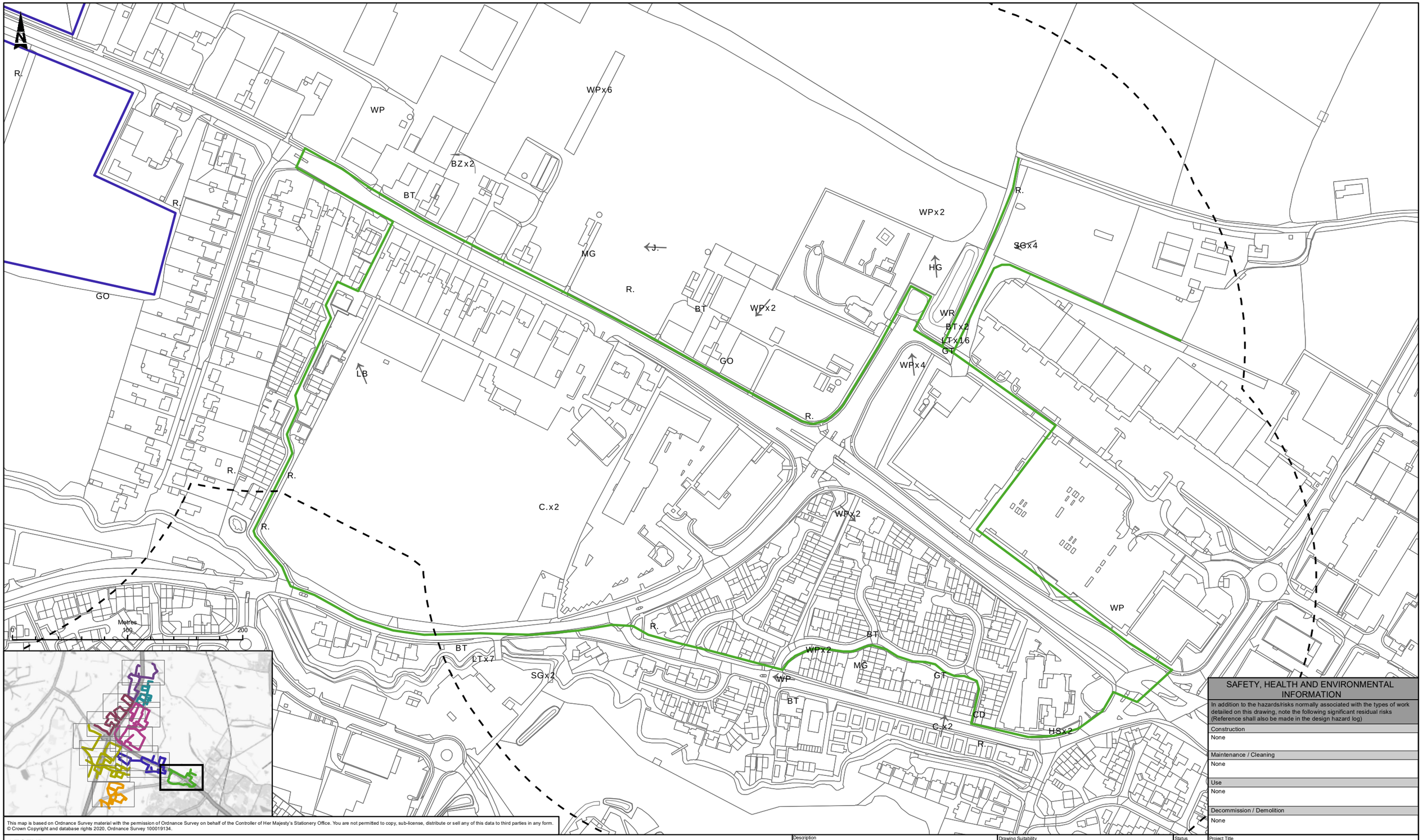
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Project | Originator | Volume | Location | Type | Number
GCCM5J10 - ATK - EBD
XX - GS - GI - 000020

Original Size:	Scale	Project Ref:	Sheet:	Rev:
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LEGEND

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BEHAVIOURS

- FORAGING IN FLIGHT
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SPECIES (BTO CODES)

B.	BLACKBIRD	BZ	BUZZARD	GC	GOLDCREST	J.	JAY
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PH	PHEASANT	ST	SONG THRUSH
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FOR INFORMATION

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S2	C01	SD	LH	--	--	08/10/21

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

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Construction
None

Maintenance / Cleaning
None

Use
None

Decommission / Demolition
None

Drawing Suitability: FOR INFORMATION

Status: S2

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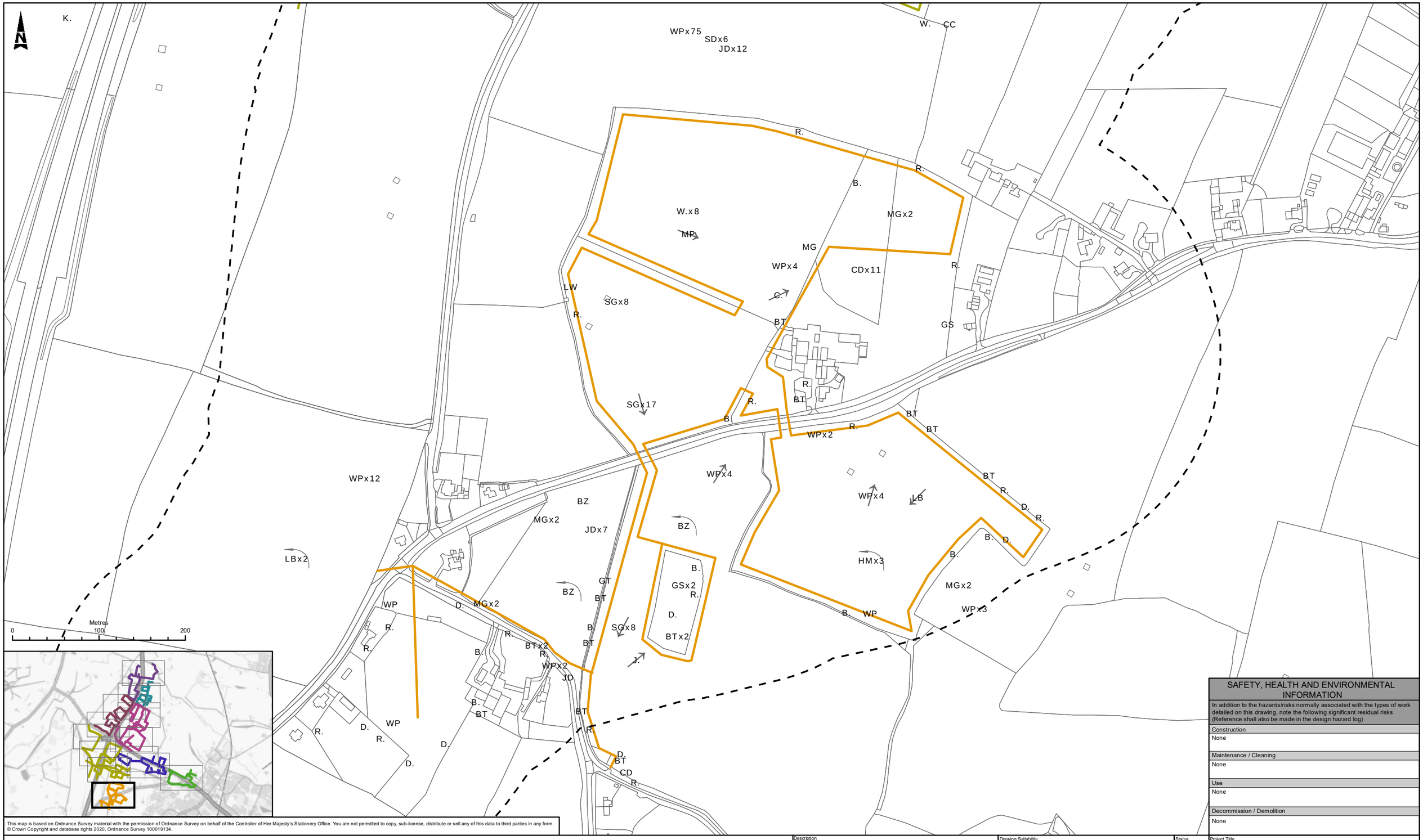
Client: Gloucestershire County Council

Project Title: M5 Junction 10 Improvement

Drawing Title: FIGURE 7.9A
WINTERING BIRD SURVEY RESULTS
SEPTEMBER 2019

Drawing Number: Project | Originator | Volume | Location | Type | Number
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MA	MALLARD
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FOR INFORMATION	S2	C01	SD	LH	--	--	08/10/21

Drawing Suitability: FOR INFORMATION
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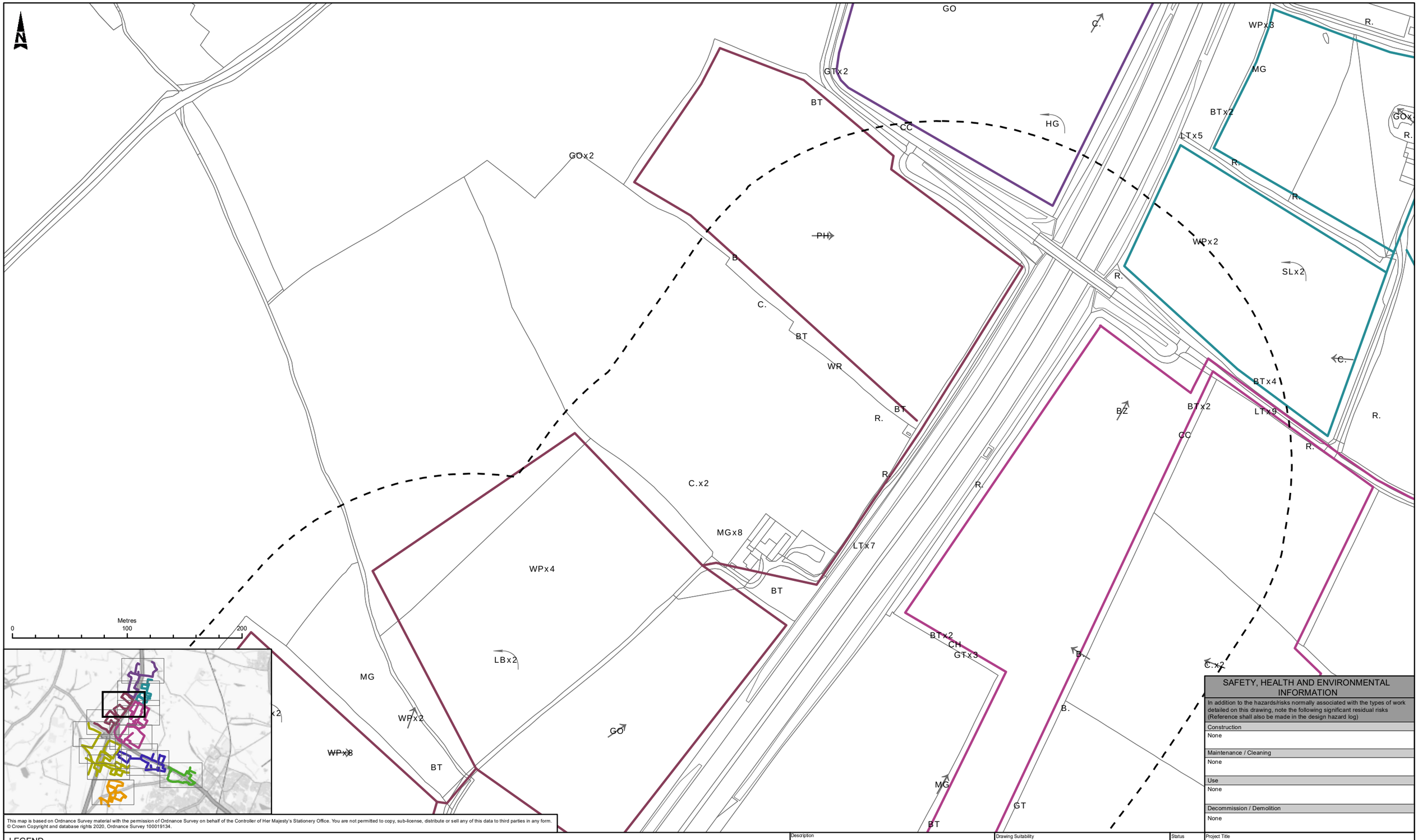
Client: Gloucestershire County Council

Project Title: M5 Junction 10 Improvement

Drawing Title: FIGURE 7.9A
WINTERING BIRD SURVEY RESULTS
SEPTEMBER 2019

Drawing Number: Project | Originator | Volume | Location | Number
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BT	BLUE TIT	C.	CARRION CROW	GL	GREY WAGTAIL	JD	JACKDAW	MP	MEADOW PIPIT	SG	STARLING
BH	BLACK-HEADED GULL	CD	COLLARED DOVE	GO	GOLDFINCH	K.	KESTREL	PW	PIED WAGTAIL	SH	SPARROWHAWK
G.	GREEN WOODPECKER	CH	CHAFFINCH	GS	GREAT SPOTTED WOODPECKER	LB	LESSER BLACK-BACKED GULL	PH	PHEASANT	ST	SONG THRUSH
		CT	COAL TIT	GT	GREAT TIT	LT	LONG-TAILED TIT	R.	ROBIN	WP	WOOD PIGEON
		D.	DUNNOCK	HG	HERRING GULL	M.	MISTLE THRUSH	RE	REDWING	WR	WREN
		FF	FIELDFARE	HS	HOUSE SPARROW	MA	MALLARD	RO	ROOK	Y.	YELLOWHAMMER
								S.	SKYLARK		

Description

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date

Description

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date

Description

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date

Description

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date

Description
FOR INFORMATION

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
S2	C01	SD	LH	--	--	08/10/21

Drawing Suitability: FOR INFORMATION

Status: S2

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log)

Construction
None

Maintenance / Cleaning
None

Use
None

Decommission / Demolition
None

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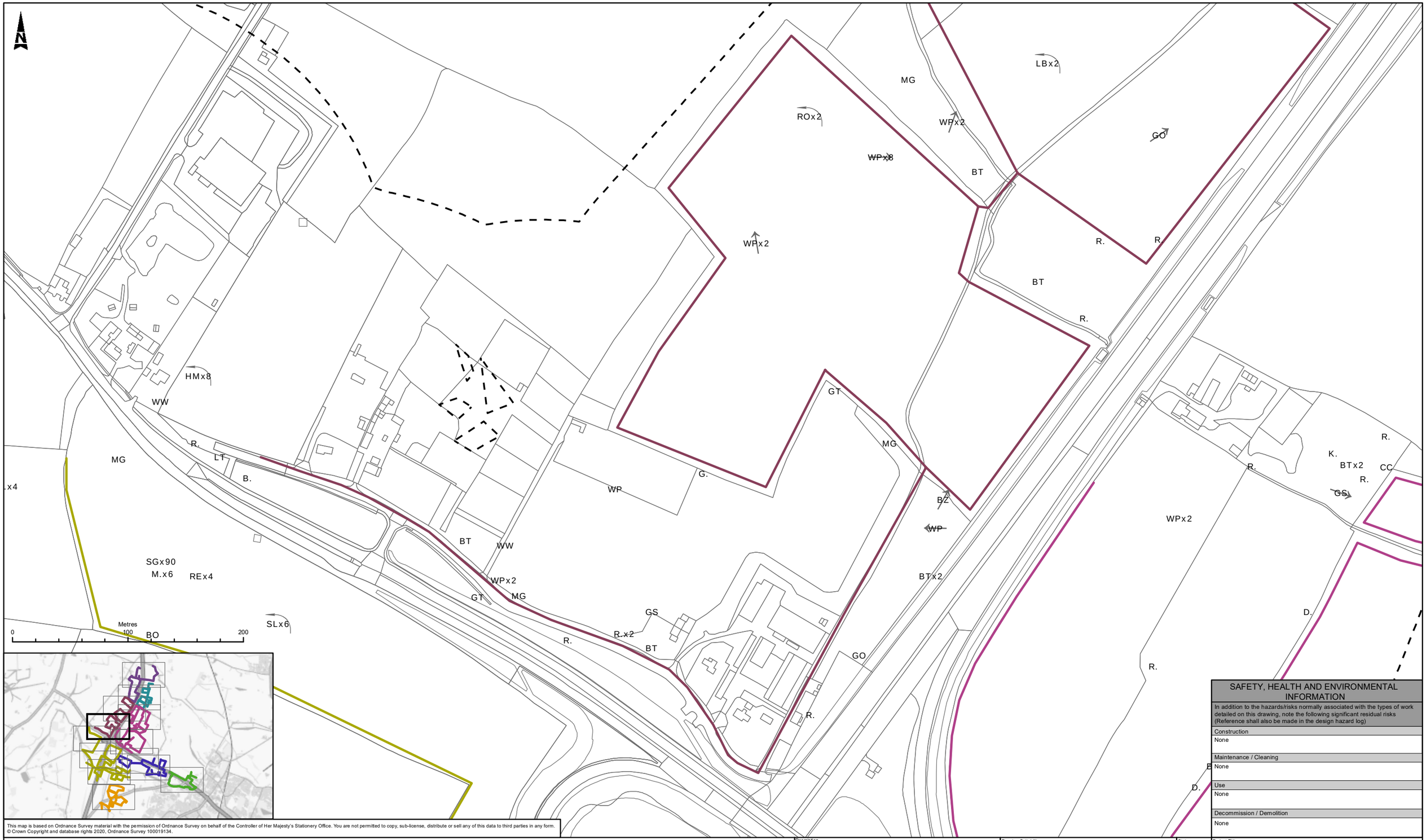
Client: Gloucestershire County Council

Project Title: M5 Junction 10 Improvement

Drawing Title: FIGURE 7.9A
WINTERING BIRD SURVEY RESULTS
SEPTEMBER 2019

Drawing Number: Project | Originator | Volume | Location | Type | Number
GCCM5J10 - ATK - EBD
XX - GS - GI - 000020

Original Size:	Scale	Project Ref:	Sheet:	Rev:
A3	1:3,000	5197035	1 of 1	C01



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LEGEND

- 250M STUDY AREA
- TRANSECT 2
- TRANSECT 3
- TRANSECT 4
- TRANSECT 5
- TRANSECT 6
- TRANSECT 7
- TRANSECT 8
- TRANSECT 9

BEHAVIOURS

- FORAGING IN FLIGHT
- FLYING

SPECIES (BTO CODES)

B.	BLACKBIRD	BZ	BUZZARD	GC	GOLDCREST	J.	JAY	MG	MAGPIE	SD	STOCK DOVE
BT	BLUE TIT	C.	CARRION CROW	GL	GREY WAGTAIL	JD	JACKDAW	MP	MEADOW PIPIT	SG	STARLING
BH	BLACK-HEADED GULL	CD	COLLARED DOVE	GO	GOLDFINCH	K.	KESTREL	PW	PIED WAGTAIL	SH	SPARROWHAWK
		CH	CHAFFINCH	GS	GREAT SPOTTED WOODPECKER	LB	LESSER BLACK-BACKED GULL	PH	PHEASANT	ST	SONG THRUSH
		CT	COAL TIT	GT	GREAT TIT			R.	ROBIN	WP	WOOD PIGEON
		D.	DUNNOCK	HG	HERRING GULL	LT	LONG-TAILED TIT	RE	REDWING	WR	WREN
		FF	FIELDFARE	HS	HOUSE SPARROW	M.	MISTLE THRUSH	RO	ROOK	Y.	YELLOWHAMMER
		G.	GREEN WOODPECKER			MA	MALLARD	S.	SKYLARK		

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log)

Construction
None

Maintenance / Cleaning
None

Use
None

Decommission / Demolition
None

Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
FOR INFORMATION	S2	C01	SD	LH	--	--	08/10/21

Drawing Suitability: FOR INFORMATION
Status: S2

Project Title: M5 Junction 10 Improvement

Drawing Title: FIGURE 7.9A
WINTERING BIRD SURVEY RESULTS
SEPTEMBER 2019

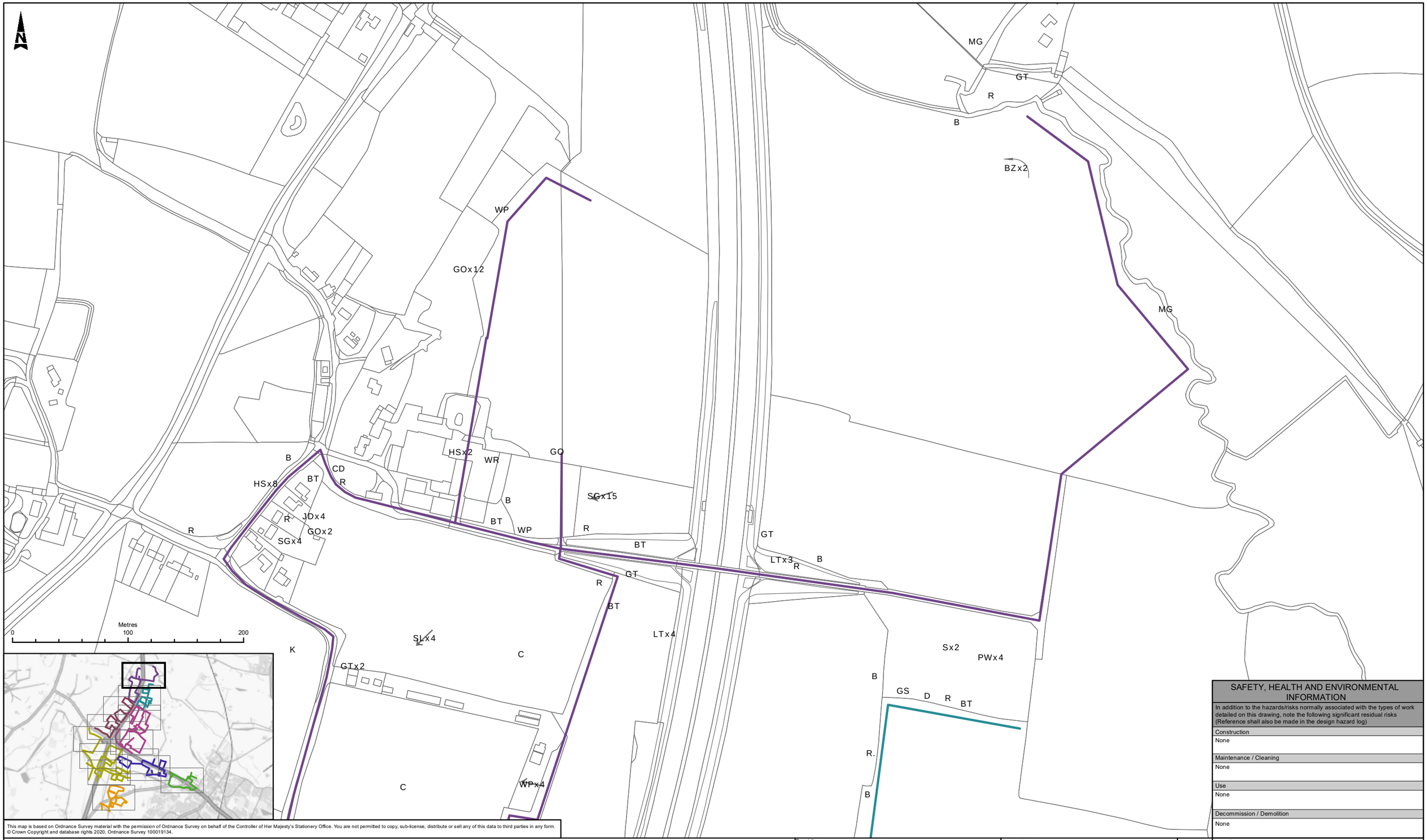
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Client: Gloucestershire County Council

Drawing Number: Project | Originator | Volume
GCCM5J10 - ATK - EBD
XX - GS - GI - 000020
Location | Type | Number

Original Size:	Scale	Project Ref:	Sheet:	Rev:
A3	1:3,000	5197035	1 of 1	C01



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LEGEND

- 250M STUDY AREA
- TRANSECT 2
- TRANSECT 3
- TRANSECT 4
- TRANSECT 5
- TRANSECT 6
- TRANSECT 7
- TRANSECT 8
- TRANSECT 9

BEHAVIOURS

- FORAGING IN FLIGHT
- FLYING

SPECIES (BTO CODES)

B.	BLACKBIRD	BZ	BUZZARD	GO	GOLDFINCH	K.	KESTREL	MP	MEADOW PIPIT	SG	STARLING
BT	BLUE TIT	CC	CHIFFCHAFF	GR	GREENFINCH	KF	KINGFISHER	PW	PIED WAGTAIL	SH	SPARROWHAWK
BH	BLACK-HEADED GULL	CD	COLLARED DOVE	GS	GREAT SPOTTED WOODPECKER	LB	LESSER BLACK-BACKED GULL	R.	ROBIN	SL	SWALLOW
		CH	CHAFFINCH	GT	GREAT TIT	LI	LINNET	RE	REDWING	ST	SONG THRUSH
		CT	COAL TIT	HM	HOUSE MARTIN	LT	LONG-TAILED TIT	RN	RAVEN	WP	WOOD PIGEON
		D.	DUNNOCK	HS	HOUSE SPARROW	MA	MALLARD	RO	ROOK	WR	WREN
		FP	FERAL PIGEON	J.	JAY	MG	MAGPIE	S.	SKYLARK	Y.	YELLOWHAMMER
		GC	GOLDCREST	JD	JACKDAW			SC	STONECHAT		
		GL	GREY WAGTAIL					SD	STOCK DOVE		

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log)

Construction
None

Maintenance / Cleaning
None

Use
None

Decommission / Demolition
None

Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
PUBLISHED	A1	P01	SD	LH	CC	MT	20/09/21

Drawing Suitability: PUBLISHED
Status: A1

Project Title: M5 Junction 10 Improvement

Drawing Title: FIGURE 7.9B
WINTERING BIRD SURVEY RESULTS
OCTOBER 2019

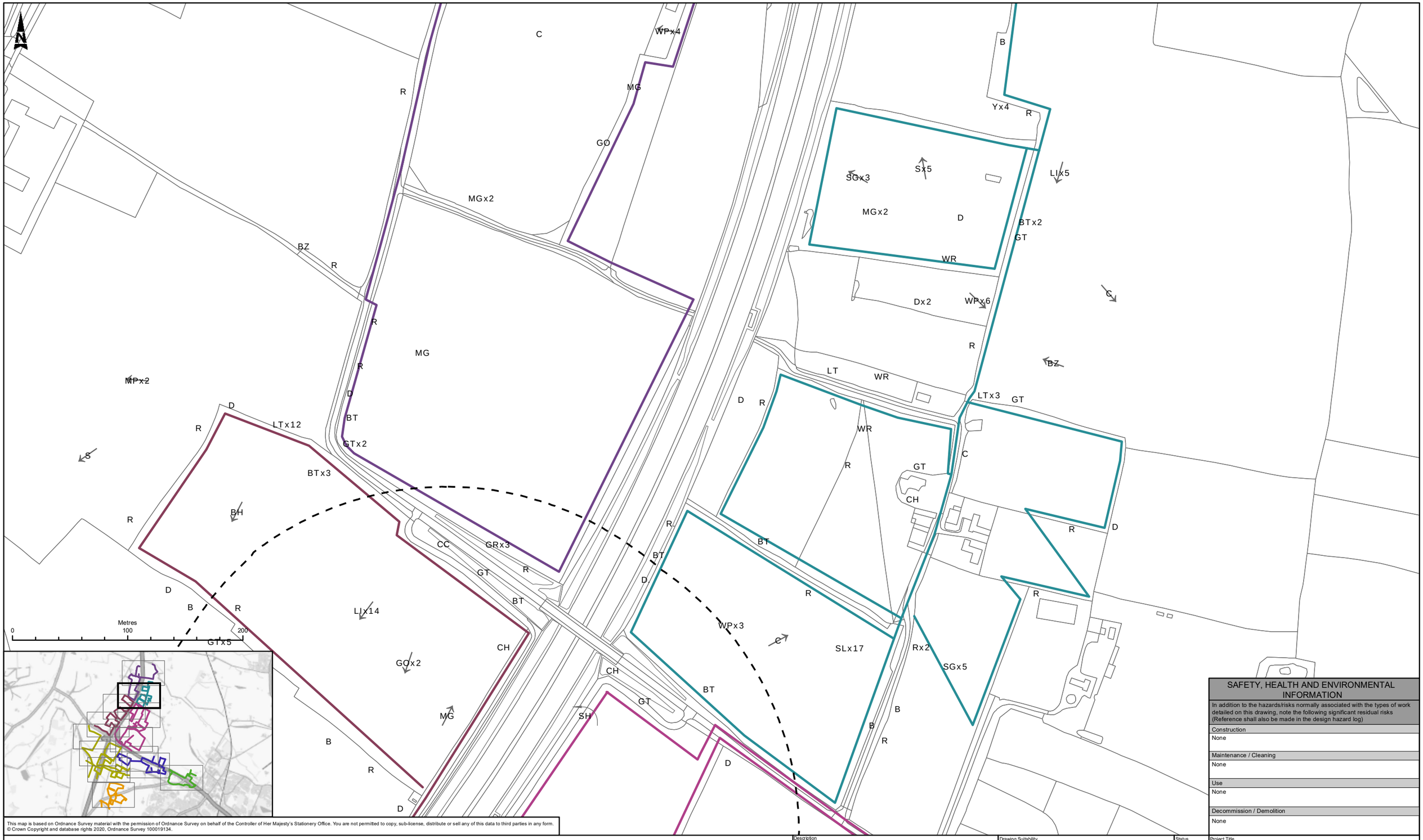
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Client: Gloucestershire County Council

Drawing Number: Project | Originator | Volume
GCCM5J10 - ATK - EBD
XX - GS - GI - 000020
Location | Number

Original Size: A3 | Scale: 1:3,000 | Project Ref: 5197035 | Sheet: 1 of 13 | Rev: P01



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LEGEND

- 250M STUDY AREA
- TRANSECT 2
- TRANSECT 3
- TRANSECT 4
- TRANSECT 5
- TRANSECT 6
- TRANSECT 7
- TRANSECT 8
- TRANSECT 9

BEHAVIOURS

- FORAGING IN FLIGHT
- FLYING

SPECIES (BTO CODES)

B.	BLACKBIRD	BZ	BUZZARD	GO	GOLDFINCH	K.	KESTREL	MP	MEADOW PIPIT	SG	STARLING
BT	BLUE TIT	CC	CHIFFCHAFF	GR	GREENFINCH	KF	KINGFISHER	PW	PIED WAGTAIL	SH	SPARROWHAWK
BH	BLACK-HEADED GULL	CD	COLLARED DOVE	GS	GREAT SPOTTED WOODPECKER	LB	LESSER BLACK-BACKED GULL	R.	ROBIN	SL	SWALLOW
		CH	CHAFFINCH	GT	GREAT TIT	LI	LINNET	RE	REDWING	ST	SONG THRUSH
		CT	COAL TIT	HM	HOUSE MARTIN	LT	LONG-TAILED TIT	RN	RAVEN	WP	WOOD PIGEON
		D.	DUNNOCK	HS	HOUSE SPARROW	MA	MALLARD	RO	ROOK	WR	WREN
		FP	FERAL PIGEON	J.	JAY	MG	MAGPIE	S.	SKYLARK	Y.	YELLOWHAMMER
		GC	GOLDCREST	JD	JACKDAW			SC	STONECHAT		
		GL	GREY WAGTAIL					SD	STOCK DOVE		

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log)

Construction
None

Maintenance / Cleaning
None

Use
None

Decommission / Demolition
None

Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
PUBLISHED	A1	P01	SD	LH	CC	MT	20/09/21

Drawing Suitability: PUBLISHED
Status: A1

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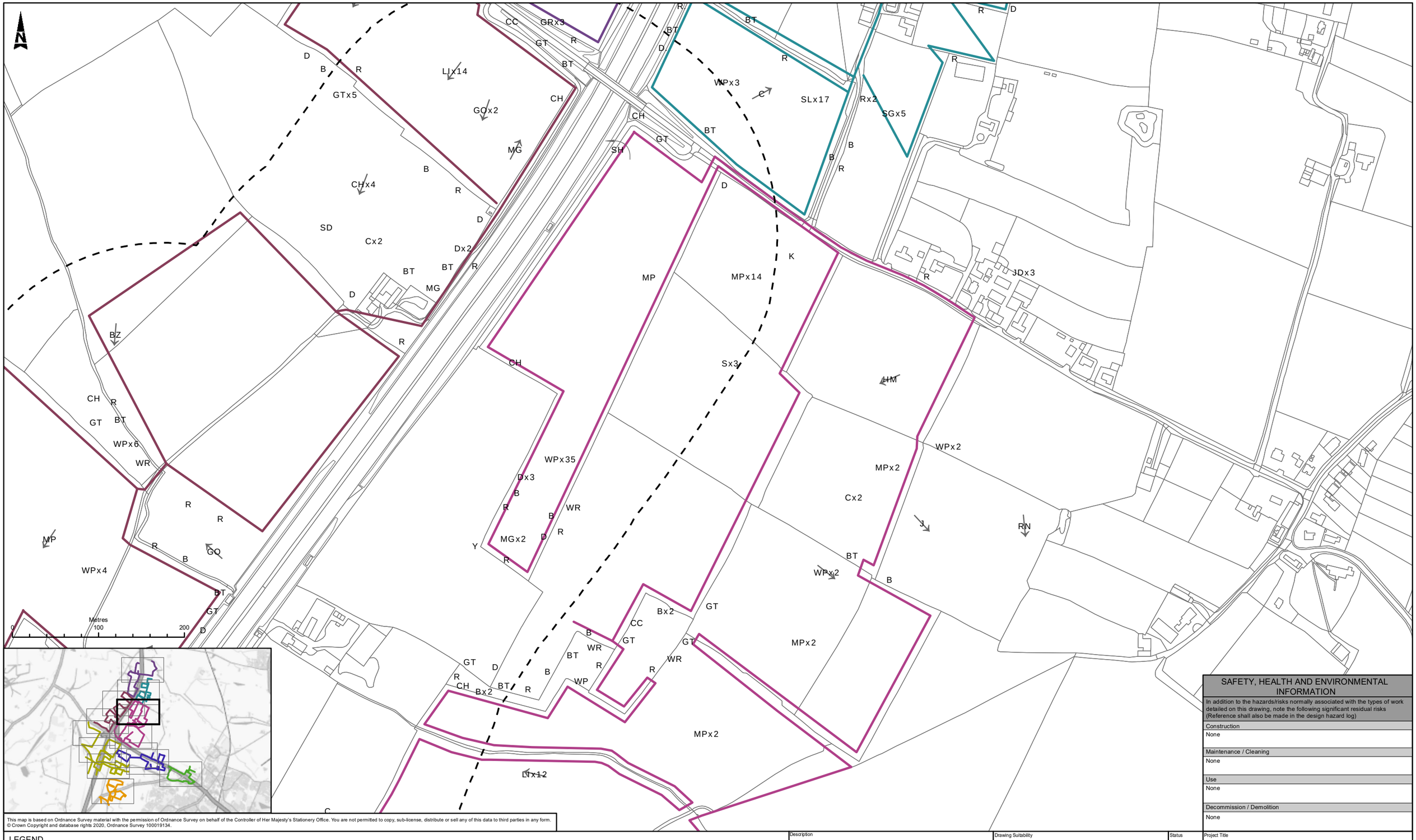
Client: Gloucestershire County Council

Project Title: M5 Junction 10 Improvement

Drawing Title: FIGURE 7.9B
WINTERING BIRD SURVEY RESULTS
OCTOBER 2019

Drawing Number: GCCM5J10 - ATK - EBD - XX - GS - GI - 000020
(Project | Originator | Volume | Location | Type | Number)

Original Size:	Scale	Project Ref:	Sheet:	Rev:
A3	1:3,000	5197035	2 of 13	P01



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LEGEND

- 250M STUDY AREA
- TRANSECT 2
- TRANSECT 3
- TRANSECT 4
- TRANSECT 5
- TRANSECT 6
- TRANSECT 7
- TRANSECT 8
- TRANSECT 9

BEHAVIOURS

- FORAGING IN FLIGHT
- FLYING

SPECIES (BTO CODES)

B.	BLACKBIRD
BT	BLUE TIT
BH	BLACK-HEADED GULL
BZ	BUZZARD
CC	CHIFFCHAFF
CD	COLLARED DOVE
CH	CHAFFINCH
CT	COAL TIT
D.	DUNNOCK
FP	FERAL PIGEON
GC	GOLDCREST
GL	GREY WAGTAIL
GO	GOLDFINCH
GR	GREENFINCH
GS	GREAT SPOTTED WOODPECKER
GT	GREAT TIT
HM	HOUSE MARTIN
HS	HOUSE SPARROW
J.	JAY
JD	JACKDAW
K.	KESTREL
KF	KINGFISHER
LB	LESSER BLACK-BACKED GULL
LI	LINNET
LT	LONG-TAILED TIT
MA	MALLARD
MG	MAGPIE
MP	MEADOW PIPIT
PW	PIED WAGTAIL
R.	ROBIN
RE	REDWING
RN	RAVEN
RO	ROOK
S.	SKYLARK
SC	STONECHAT
SD	STOCK DOVE
SG	STARLING
SH	SPARROWHAWK
SL	SWALLOW
ST	SONG THRUSH
WP	WOOD PIGEON
WR	WREN
Y.	YELLOWHAMMER

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log)

Construction
None

Maintenance / Cleaning
None

Use
None

Decommission / Demolition
None

Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
PUBLISHED	A1	P01	SD	LH	CC	MT	20/09/21

Drawing Suitability: PUBLISHED
Status: A1

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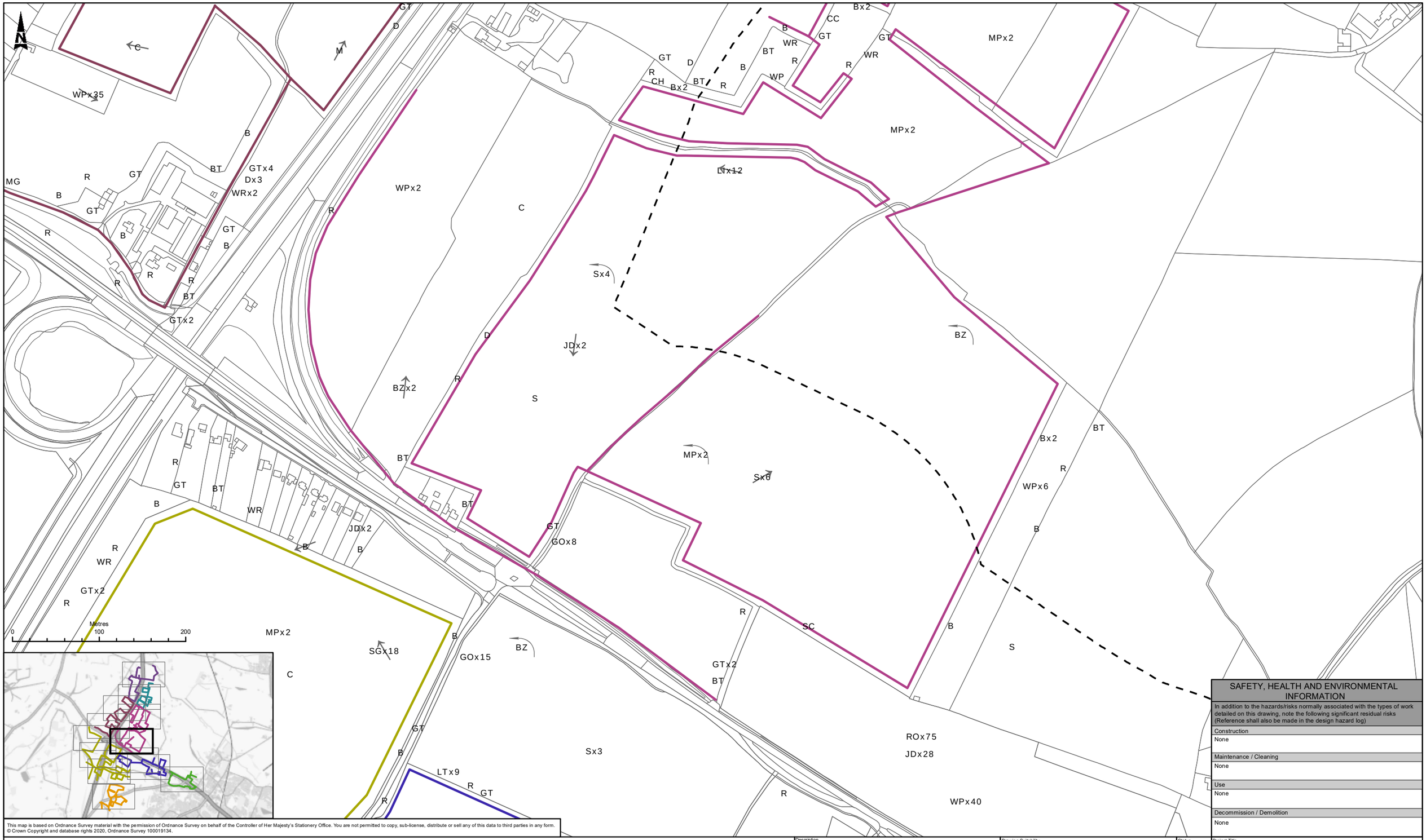
Client: Gloucestershire County Council

Project Title: M5 Junction 10 Improvement

Drawing Title: FIGURE 7.9B
WINTERING BIRD SURVEY RESULTS
OCTOBER 2019

Drawing Number: Project | Originator | Volume
GCCM5J10 - ATK - EBD
XX - GS - GI - 000020
Location | Type | Number

Original Size:	Scale	Project Ref:	Sheet:	Rev:
A3	1:4,000	5197035	3 of 13	P01



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LEGEND

- 250M STUDY AREA
- TRANSECT 2
- TRANSECT 3
- TRANSECT 4
- TRANSECT 5
- TRANSECT 6
- TRANSECT 7
- TRANSECT 8
- TRANSECT 9

BEHAVIOURS

- FORAGING IN FLIGHT
- FLYING

SPECIES (BTO CODES)

B.	BLACKBIRD
BT	BLUE TIT
BH	BLACK-HEADED GULL
BZ	BUZZARD
CC	CHIFFCHAFF
CD	COLLARED DOVE
CH	CHAFFINCH
CT	COAL TIT
D.	DUNNOCK
FP	FERAL PIGEON
GC	GOLDCREST
GL	GREY WAGTAIL
GO	GOLDFINCH
GR	GREENFINCH
GS	GREAT SPOTTED WOODPECKER
GT	GREAT TIT
HM	HOUSE MARTIN
HS	HOUSE SPARROW
J.	JAY
JD	JACKDAW
K.	KESTREL
KF	KINGFISHER
LB	LESSER BLACK-BACKED GULL
LI	LINNET
LT	LONG-TAILED TIT
MA	MALLARD
MG	MAGPIE
MP	MEADOW PIPIT
PW	PIED WAGTAIL
R.	ROBIN
RE	REDWING
RN	RAVEN
RO	ROOK
S.	SKYLARK
SC	STONECHAT
SD	STOCK DOVE
SG	STARLING
SH	SPARROWHAWK
SL	SWALLOW
ST	SONG THRUSH
WP	WOOD PIGEON
WR	WREN
Y.	YELLOWHAMMER

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log)

Construction
None

Maintenance / Cleaning
None

Use
None

Decommission / Demolition
None

Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
	A1	P01	SD	LH	CC	MT	20/09/21

Description: PUBLISHED

Drawing Suitability: PUBLISHED
Status: A1

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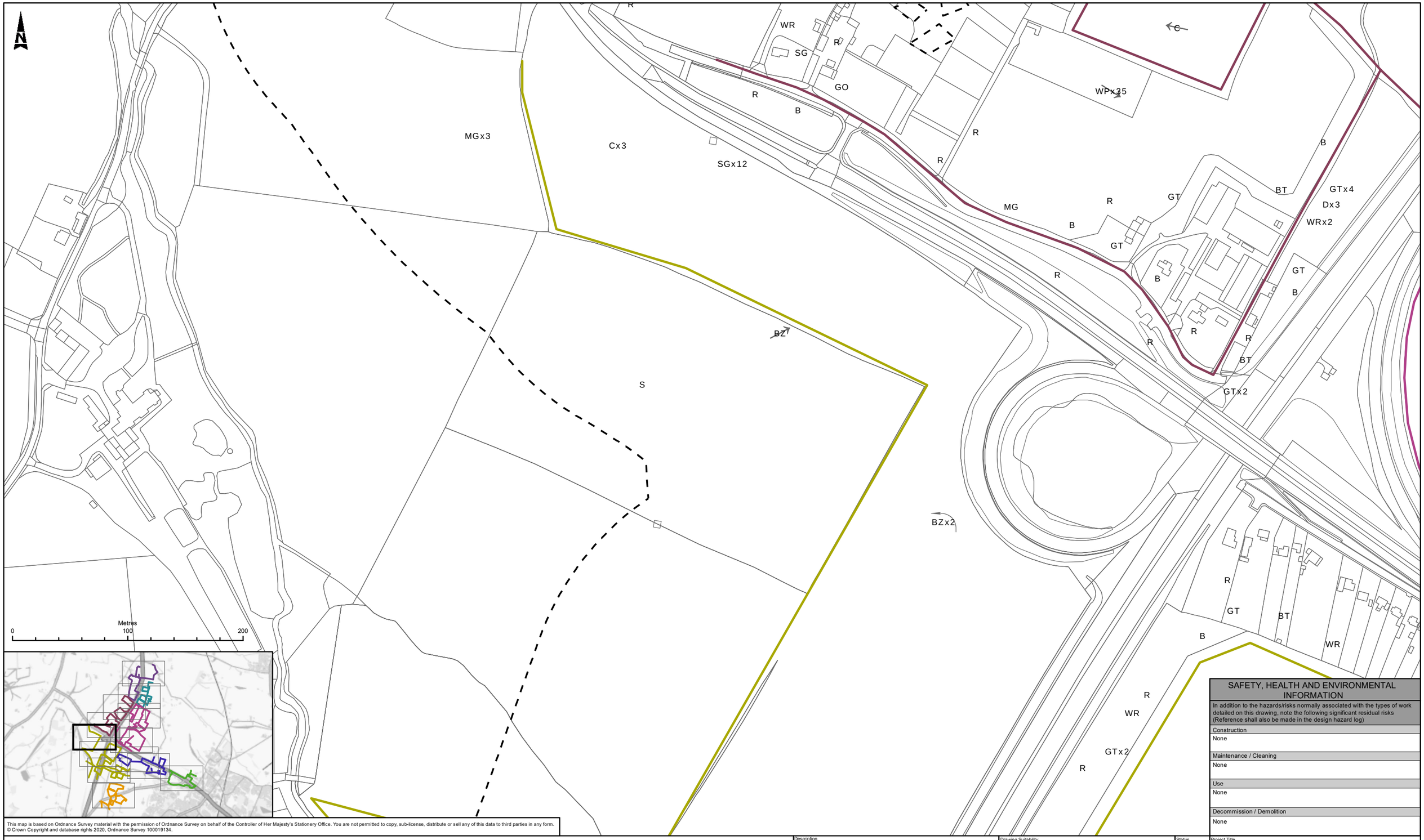
Client: Gloucestershire County Council

Project Title: M5 Junction 10 Improvement

Drawing Title: FIGURE 7.9B
WINTERING BIRD SURVEY RESULTS
OCTOBER 2019

Drawing Number: Project | Originator | Volume
GCCM5J10 - ATK - EBD
XX - GS - GI - 000020
Location | Type | Number

Original Size:	Scale	Project Ref:	Sheet:	Rev:
A3	1:4,000	5197035	4 of 13	P01



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LEGEND

- 250M STUDY AREA
- TRANSECT 2
- TRANSECT 3
- TRANSECT 4
- TRANSECT 5
- TRANSECT 6
- TRANSECT 7
- TRANSECT 8
- TRANSECT 9

BEHAVIOURS

- FORAGING IN FLIGHT
- FLYING

SPECIES (BTO CODES)

B.	BLACKBIRD	BZ	BUZZARD	GO	GOLDFINCH	K.	KESTREL
BT	BLUE TIT	CC	CHIFFCHAFF	GR	GREENFINCH	KF	KINGFISHER
BH	BLACK-HEADED GULL	CD	COLLARED DOVE	GS	GREAT SPOTTED WOODPECKER	LB	LESSER BLACK-BACKED GULL
		CH	CHAFFINCH	GT	GREAT TIT	LI	LINNET
		CT	COAL TIT	HM	HOUSE MARTIN	LT	LONG-TAILED TIT
		D.	DUNNOCK	HS	HOUSE SPARROW	MA	MALLARD
		FP	FERAL PIGEON	J.	JAY	MG	MAGPIE
		GC	GOLDCREST	JD	JACKDAW		
		GL	GREY WAGTAIL				

MP	MEADOW PIPIT	SG	STARLING
PW	PIED WAGTAIL	SH	SPARROWHAWK
R.	ROBIN	SL	SWALLOW
RE	REDWING	ST	SONG THRUSH
RN	RAVEN	WP	WOOD PIGEON
RO	ROOK	WR	WREN
S.	SKYLARK	Y.	YELLOWHAMMER
SC	STONECHAT		
SD	STOCK DOVE		

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log)

Construction
None

Maintenance / Cleaning
None

Use
None

Decommission / Demolition
None

Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
PUBLISHED	A1	P01	SD	LH	CC	MT	20/09/21

Drawing Suitability: PUBLISHED
Status: A1

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Client: Gloucestershire COUNTY COUNCIL

Project Title: M5 Junction 10 Improvement

Drawing Title: FIGURE 7.9B
WINTERING BIRD SURVEY RESULTS
OCTOBER 2019

Drawing Number: GCCM5J10 - ATK - EBD - XX - GS - GI - 000020
(Project | Originator | Volume | Location | Type | Number)

Original Size:	Scale	Project Ref:	Sheet:	Rev:
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LEGEND

- 250M STUDY AREA
- TRANSECT 2
- TRANSECT 3
- TRANSECT 4
- TRANSECT 5
- TRANSECT 6
- TRANSECT 7
- TRANSECT 8
- TRANSECT 9

BEHAVIOURS

- FORAGING IN FLIGHT
- FLYING

SPECIES (BTO CODES)

B.	BLACKBIRD	BZ	BUZZARD	GO	GOLDFINCH	K.	KESTREL	MP	MEADOW PIPIT	SG	STARLING
BT	BLUE TIT	CC	CHIFFCHAFF	GR	GREENFINCH	KF	KINGFISHER	PW	PIED WAGTAIL	SH	SPARROWHAWK
BH	BLACK-HEADED GULL	CD	COLLARED DOVE	GS	GREAT SPOTTED WOODPECKER	LB	LESSER BLACK-BACKED GULL	R.	ROBIN	SL	SWALLOW
		CH	CHAFFINCH	GT	GREAT TIT	LI	LINNET	RE	REDWING	ST	SONG THRUSH
		CT	COAL TIT	HM	HOUSE MARTIN	LT	LONG-TAILED TIT	RN	RAVEN	WP	WOOD PIGEON
		D.	DUNNOCK	HS	HOUSE SPARROW	MA	MALLARD	RO	ROOK	WR	WREN
		FP	FERAL PIGEON	J.	JAY	MG	MAGPIE	S.	SKYLARK	Y.	YELLOWHAMMER
		GC	GOLDCREST	JD	JACKDAW			SC	STONECHAT		
		GL	GREY WAGTAIL					SD	STOCK DOVE		

Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
PUBLISHED	A1	P01	SD	LH	CC	MT	20/09/21

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log)

Construction
None

Maintenance / Cleaning
None

Use
None

Decommission / Demolition
None

Drawing Suitability: PUBLISHED
Status: A1

Project Title: M5 Junction 10 Improvement

Drawing Title: FIGURE 7.9B
WINTERING BIRD SURVEY RESULTS
OCTOBER 2019

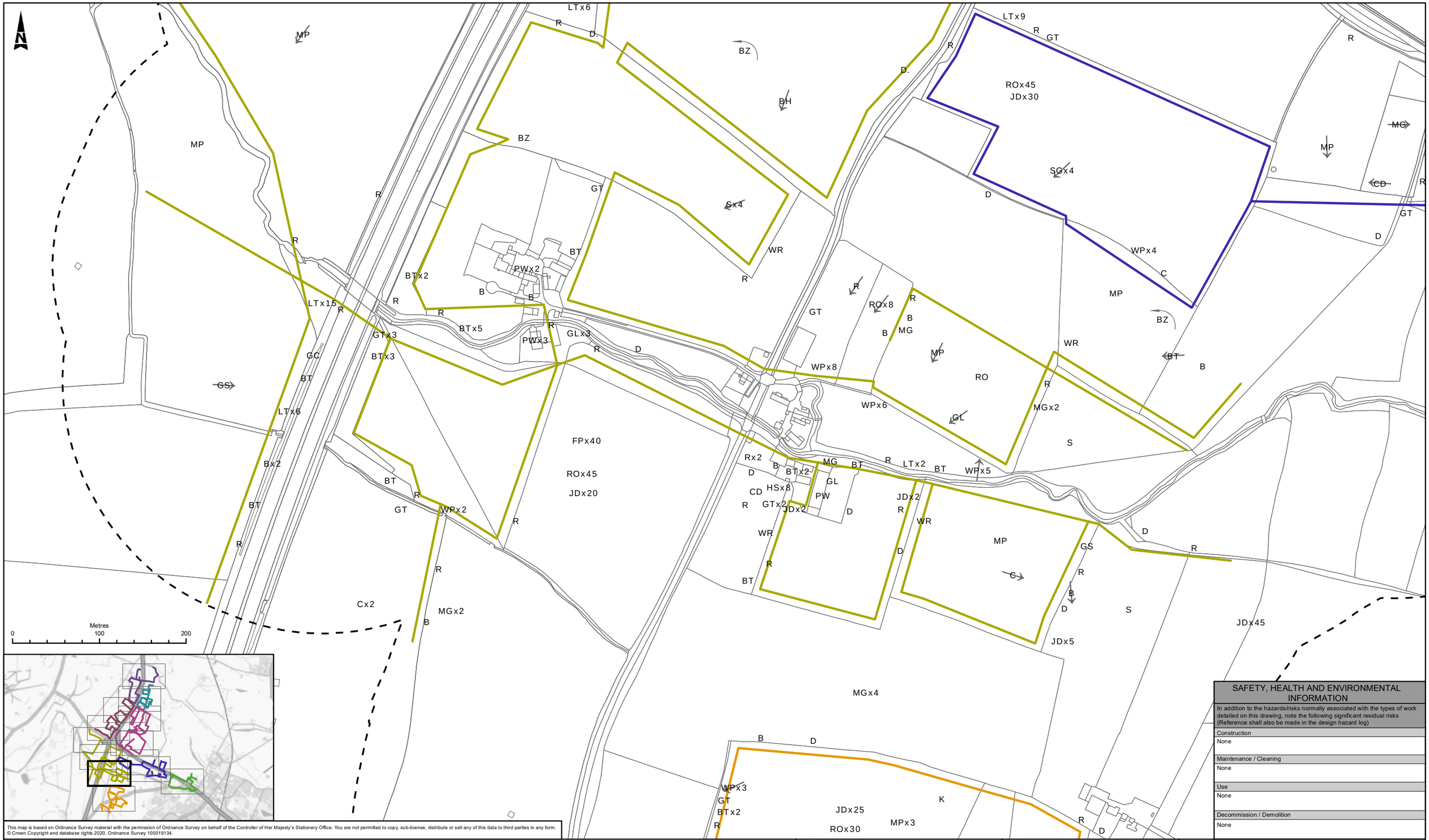
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Client: Gloucestershire County Council

Drawing Number: Project | Originator | Volume
GCCM5J10 - ATK - EBD
Location | Type | Role | Number
XX - GS - GI - 000020

Original Size:	Scale	Project Ref:	Sheet:	Rev:
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LEGEND

- 250M STUDY AREA
- TRANSECT 2
- TRANSECT 3
- TRANSECT 4
- TRANSECT 5
- TRANSECT 6
- TRANSECT 7
- TRANSECT 8
- TRANSECT 9

BEHAVIOURS

- FORAGING IN FLIGHT
- FLYING

SPECIES (BTO CODES)

B.	BLACKBIRD	BZ	BUZZARD	GO	GOLDFINCH	K.	KESTREL	MP	MEADOW PIPIT	SG	STARLING
BT	BLUE TIT	CC	CHIFFCHAFF	GR	GREENFINCH	KF	KINGFISHER	PW	PIED WAGTAIL	SH	SPARROWHAWK
BH	BLACK-HEADED GULL	CD	COLLARED DOVE	GS	GREAT SPOTTED WOODPECKER	LB	LESSER BLACK-BACKED GULL	R.	ROBIN	SL	SWALLOW
		CH	CHAFFINCH	GT	GREAT TIT	LI	LINNET	RE	REDWING	ST	SONG THRUSH
		CT	COAL TIT	HM	HOUSE MARTIN	LT	LONG-TAILED TIT	RN	RAVEN	WP	WOOD PIGEON
		D.	DUNNOCK	HS	HOUSE SPARROW	MA	MALLARD	RO	ROOK	WR	WREN
		FP	FERAL PIGEON	J.	JAY	MG	MAGPIE	S.	SKYLARK	Y.	YELLOWHAMMER
		GC	GOLDCREST	JD	JACKDAW			SC	STONECHAT		
		GL	GREY WAGTAIL					SD	STOCK DOVE		

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log)

Construction
None

Maintenance / Cleaning
None

Use
None

Decommission / Demolition
None

Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
PUBLISHED	A1	P01	SD	LH	CC	MT	20/09/21

Drawing Suitability: PUBLISHED — Status: A1

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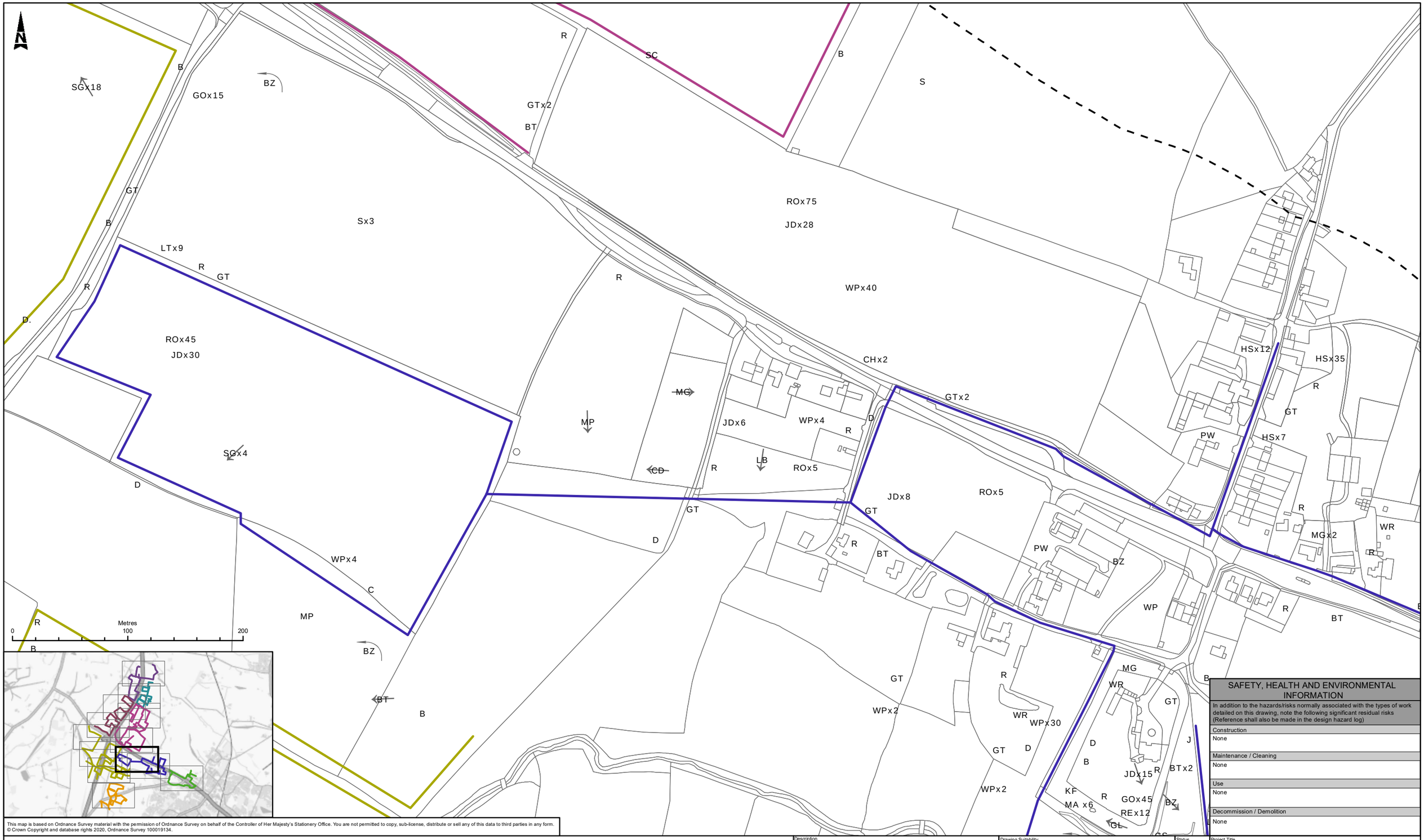
Client: Gloucestershire County Council

Project Title: M5 Junction 10 Improvement

Drawing Title: FIGURE 7.9B
WINTERING BIRD SURVEY RESULTS
OCTOBER 2019

Drawing Number: Project | Originator | Volume
GCCM5J10 - ATK - EBD
XX - GS - GI - 000020
Location | Type | Number

Original Size:	Scale	Project Ref:	Sheet:	Rev:
A3	1:4,000	5197035	7 of 13	P01



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LEGEND

- 250M STUDY AREA
- TRANSECT 2
- TRANSECT 3
- TRANSECT 4
- TRANSECT 5
- TRANSECT 6
- TRANSECT 7
- TRANSECT 8
- TRANSECT 9

BEHAVIOURS

- FORAGING IN FLIGHT
- FLYING

SPECIES (BTO CODES)

B.	BLACKBIRD	BZ	BUZZARD	GO	GOLDFINCH	K.	KESTREL	MP	MEADOW PIPIT	SG	STARLING
BT	BLUE TIT	CC	CHIFFCHAFF	GR	GREENFINCH	KF	KINGFISHER	PW	PIED WAGTAIL	SH	SPARROWHAWK
BH	BLACK-HEADED GULL	CD	COLLARED DOVE	GS	GREAT SPOTTED WOODPECKER	LB	LESSER BLACK-BACKED GULL	R.	ROBIN	SL	SWALLOW
		CH	CHAFFINCH	GT	GREAT TIT	LI	LINNET	RE	REDWING	ST	SONG THRUSH
		CT	COAL TIT	HM	HOUSE MARTIN	LT	LONG-TAILED TIT	RN	RAVEN	WP	WOOD PIGEON
		D.	DUNNOCK	HS	HOUSE SPARROW	MA	MALLARD	RO	ROOK	WR	WREN
		FP	FERAL PIGEON	J.	JAY	MG	MAGPIE	S.	SKYLARK	Y.	YELLOWHAMMER
		GC	GOLDCREST	JD	JACKDAW			SC	STONECHAT		
		GL	GREY WAGTAIL					SD	STOCK DOVE		

Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
PUBLISHED	A1	P01	SD	LH	CC	MT	20/09/21

Drawing Suitability: PUBLISHED

Status: A1

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log)

Construction: None

Maintenance / Cleaning: None

Use: None

Decommission / Demolition: None

Project Title: M5 Junction 10 Improvement

Drawing Title: FIGURE 7.9B WINTERING BIRD SURVEY RESULTS OCTOBER 2019

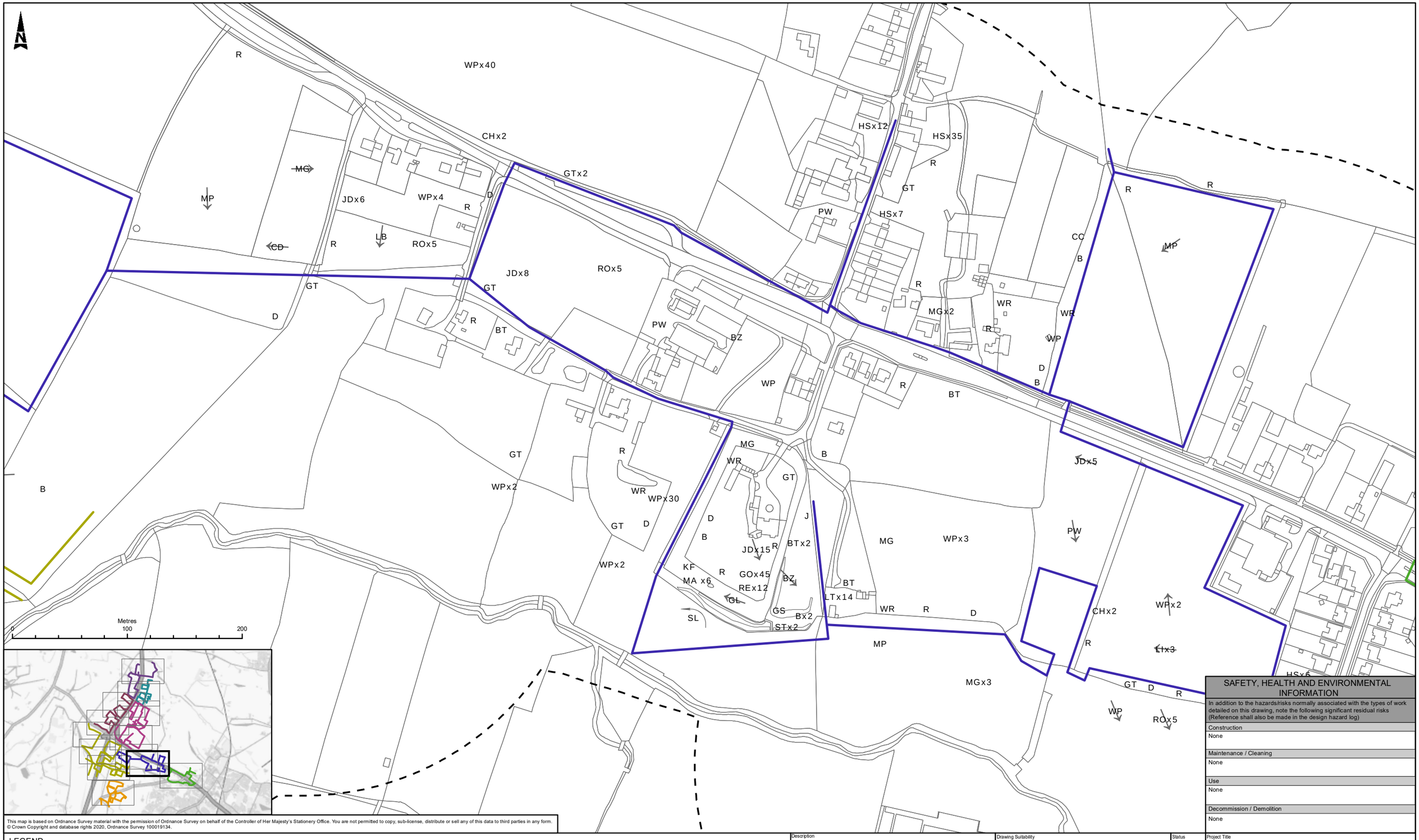
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Drawing Number: Project | Originator | Volume | Location | Type | Number
GCCM5J10 - ATK - EBD
XX - GS - GI - 000020

Original Size:	Scale	Project Ref:	Sheet:	Rev:
A3	1:3,000	5197035	8 of 13	P01



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LEGEND

- 250M STUDY AREA
- TRANSECT 2
- TRANSECT 3
- TRANSECT 4
- TRANSECT 5
- TRANSECT 6
- TRANSECT 7
- TRANSECT 8
- TRANSECT 9

BEHAVIOURS

- FORAGING IN FLIGHT
- FLYING

SPECIES (BTO CODES)

B.	BLACKBIRD	BZ	BUZZARD	GO	GOLDFINCH	K.	KESTREL
BT	BLUE TIT	CC	CHIFFCHAFF	GR	GREENFINCH	KF	KINGFISHER
BH	BLACK-HEADED GULL	CD	COLLARED DOVE	GS	GREAT SPOTTED WOODPECKER	LB	LESSER BLACK-BACKED GULL
		CH	CHAFFINCH	GT	GREAT TIT	LI	LINNET
		CT	COAL TIT	HM	HOUSE MARTIN	LT	LONG-TAILED TIT
		D.	DUNNOCK	HS	HOUSE SPARROW	MA	MALLARD
		FP	FERAL PIGEON	J.	JAY	MG	MAGPIE
		GC	GOLDCREST	JD	JACKDAW		
		GL	GREY WAGTAIL				

MP	MEADOW PIPIT	SG	STARLING
PW	PIED WAGTAIL	SH	SPARROWHAWK
R.	ROBIN	SL	SWALLOW
RE	REDWING	ST	SONG THRUSH
RN	RAVEN	WP	WOOD PIGEON
RO	ROOK	WR	WREN
S.	SKYLARK	Y.	YELLOWHAMMER
SC	STONECHAT		
SD	STOCK DOVE		

Description

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date

Description

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date

Description

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date

Description

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date

Description
PUBLISHED

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
A1	P01	SD	LH	CC	MT	20/09/21

Drawing Suitability: PUBLISHED

Status: A1

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log)

Construction
None

Maintenance / Cleaning
None

Use
None

Decommission / Demolition
None

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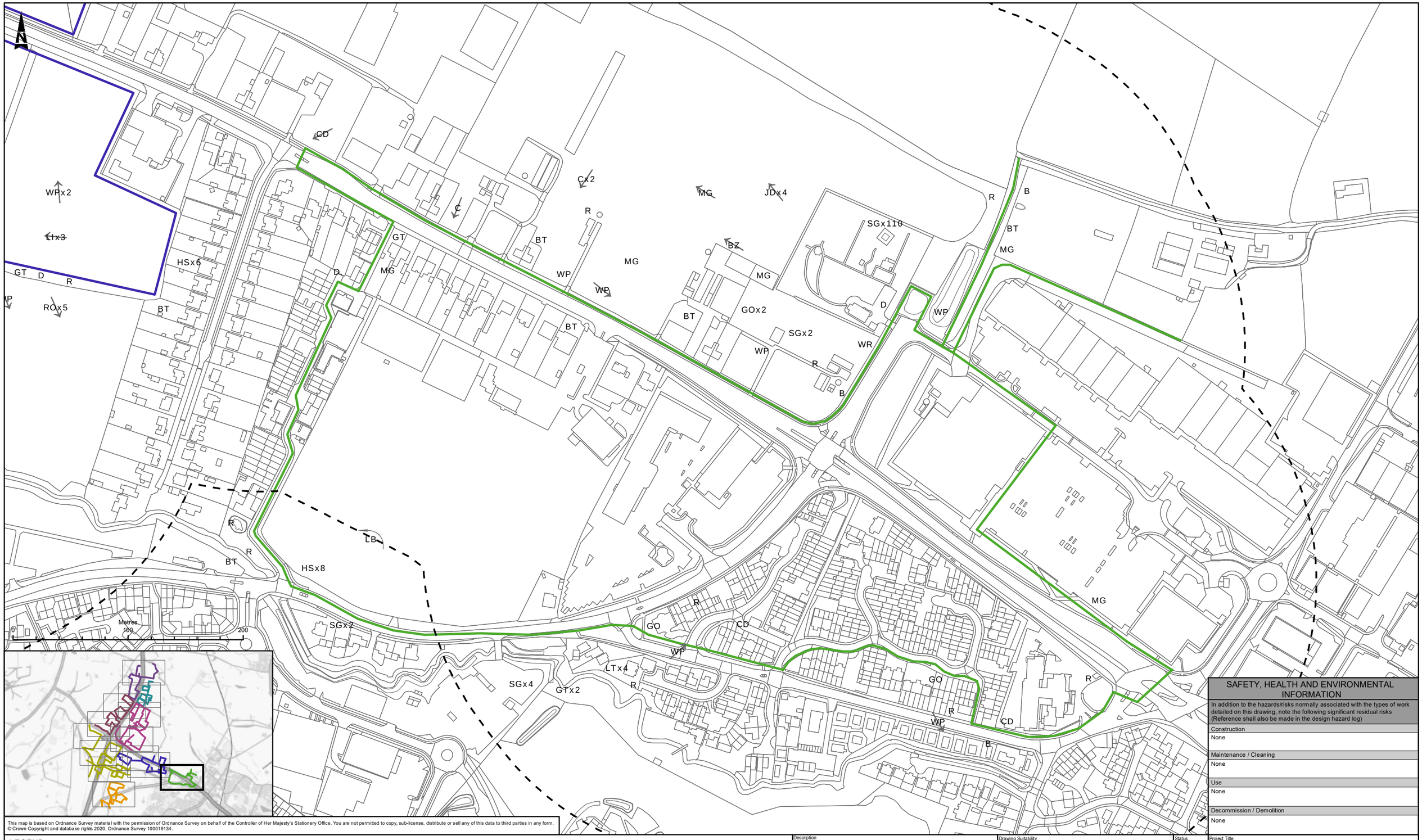
Client: Gloucestershire County Council

Project Title: M5 Junction 10 Improvement

Drawing Title: FIGURE 7.9B
WINTERING BIRD SURVEY RESULTS
OCTOBER 2019

Drawing Number
Project | Originator | Volume
GCCM5J10 - ATK - EBD
Location | Type | Number
XX - GS - GI - 000020

Original Size:	Scale	Project Ref:	Sheet:	Rev:
A3	1:3,000	5197035	9 of 13	P01



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LEGEND

- 250M STUDY AREA
- TRANSECT 2
- TRANSECT 3
- TRANSECT 4
- TRANSECT 5
- TRANSECT 6
- TRANSECT 7
- TRANSECT 8
- TRANSECT 9

BEHAVIOURS

- FORAGING IN FLIGHT
- FLYING

SPECIES (BTO CODES)

B.	BLACKBIRD	BZ	BUZZARD	GO	GOLDFINCH	K.	KESTREL	MP	MEADOW PIPIT	SG	STARLING
BT	BLUE TIT	CC	CHIFFCHAFF	GR	GREENFINCH	KF	KINGFISHER	PW	PIED WAGTAIL	SH	SPARROWHAWK
BH	BLACK-HEADED GULL	CD	COLLARED DOVE	GS	GREAT SPOTTED WOODPECKER	LB	LESSER BLACK-BACKED GULL	R.	ROBIN	SL	SWALLOW
GC	GOLDCREST	CH	CHAFFINCH	GT	GREAT TIT	LI	LINNET	RE	REDWING	ST	SONG THRUSH
GL	GREY WAGTAIL	CT	COAL TIT	HM	HOUSE MARTIN	LT	LONG-TAILED TIT	RN	RAVEN	WP	WOOD PIGEON
JD	JACKDAW	D.	DUNNOCK	HS	HOUSE SPARROW	MA	MALLARD	RO	ROOK	WR	WREN
		FP	FERAL PIGEON	J.	JAY	MG	MAGPIE	S.	SKYLARK	Y.	YELLOWHAMMER
								SC	STONECHAT		
								SD	STOCK DOVE		

Description

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date

Description

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date

Description

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date

Description

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date

Description
PUBLISHED

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
A1	P01	SD	LH	CC	MT	20/09/21

Drawing Suitability: PUBLISHED

Status: A1

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Client: Gloucestershire County Council

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log)

Construction
None

Maintenance / Cleaning
None

Use
None

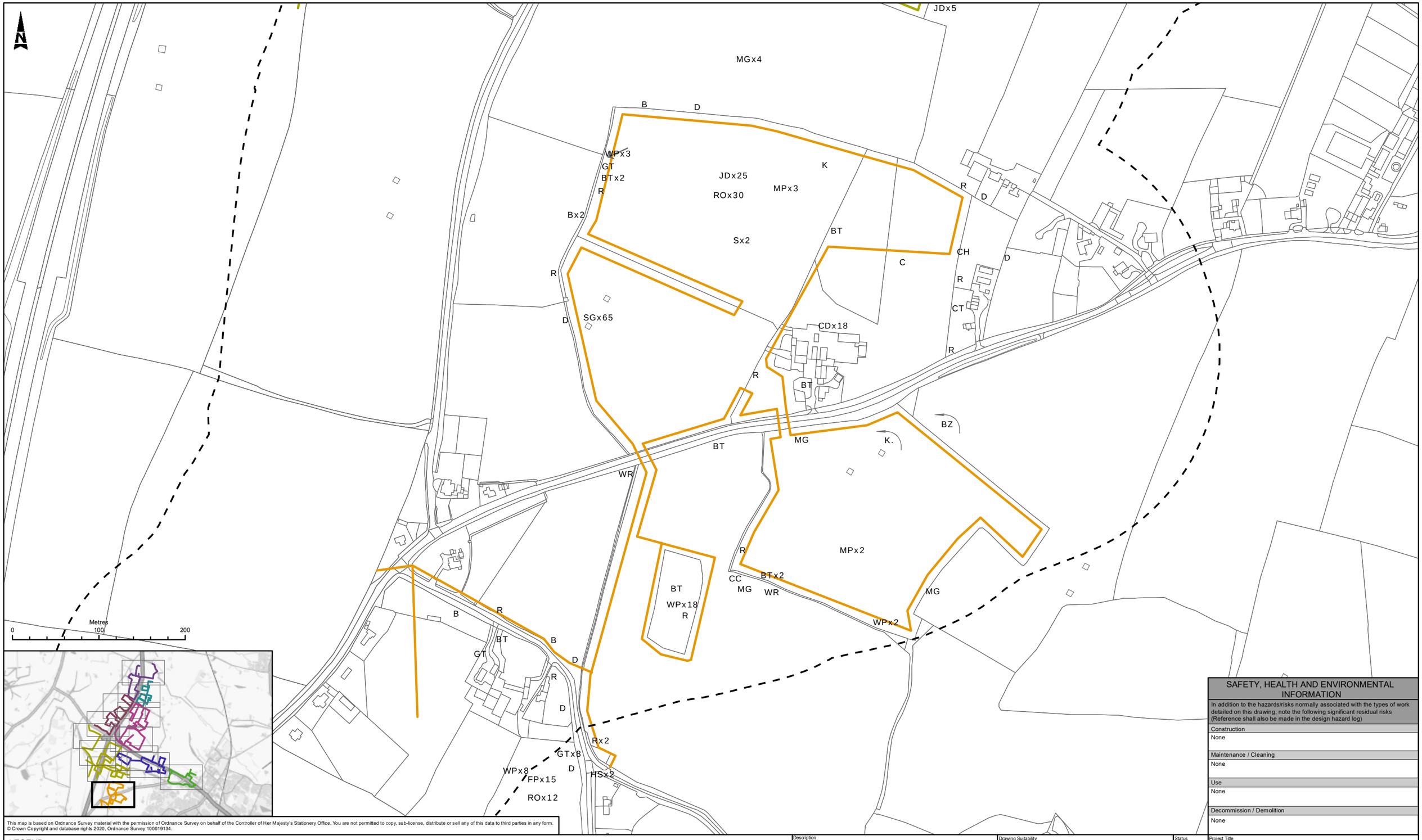
Decommission / Demolition
None

Project Title: M5 Junction 10 Improvement

Drawing Title: FIGURE 7.9B WINTERING BIRD SURVEY RESULTS OCTOBER 2019

Drawing Number: Project | Originator | Volume | Location | Type | Number
GCCM5J10 - ATK - EBD
XX - GS - GI - 000020

Original Size:	Scale	Project Ref:	Sheet:	Rev:
A3	1:3,000	5197035	10 of 13	P01



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LEGEND

- 250M STUDY AREA
- TRANSECT 2
- TRANSECT 3
- TRANSECT 4
- TRANSECT 5
- TRANSECT 6
- TRANSECT 7
- TRANSECT 8
- TRANSECT 9

BEHAVIOURS

- FORAGING IN FLIGHT
- FLYING

SPECIES (BTO CODES)

B.	BLACKBIRD	BZ	BUZZARD	GO	GOLDFINCH	K.	KESTREL	MP	MEADOW PIPIT	SG	STARLING
BT	BLUE TIT	CC	CHIFFCHAFF	GR	GREENFINCH	KF	KINGFISHER	PW	PIED WAGTAIL	SH	SPARROWHAWK
BH	BLACK-HEADED GULL	CD	COLLARED DOVE	GS	GREAT SPOTTED WOODPECKER	LB	LESSER BLACK-BACKED GULL	R.	ROBIN	SL	SWALLOW
		CH	CHAFFINCH	GT	GREAT TIT	LI	LINNET	RE	REDWING	ST	SONG THRUSH
		CT	COAL TIT	HM	HOUSE MARTIN	LT	LONG-TAILED TIT	RN	RAVEN	WP	WOOD PIGEON
		D.	DUNNOCK	HS	HOUSE SPARROW	MA	MALLARD	RO	ROOK	WR	WREN
		FP	FERAL PIGEON	J.	JAY	MG	MAGPIE	S.	SKYLARK	Y.	YELLOWHAMMER
		GC	GOLDCREST	JD	JACKDAW			SC	STONECHAT		
		GL	GREY WAGTAIL					SD	STOCK DOVE		

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log)

Construction
None

Maintenance / Cleaning
None

Use
None

Decommission / Demolition
None

Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
PUBLISHED	A1	P01	SD	LH	CC	MT	20/09/21

Drawing Suitability: PUBLISHED
Status: A1

Project Title: M5 Junction 10 Improvement

Drawing Title: FIGURE 7.9B WINTERING BIRD SURVEY RESULTS OCTOBER 2019

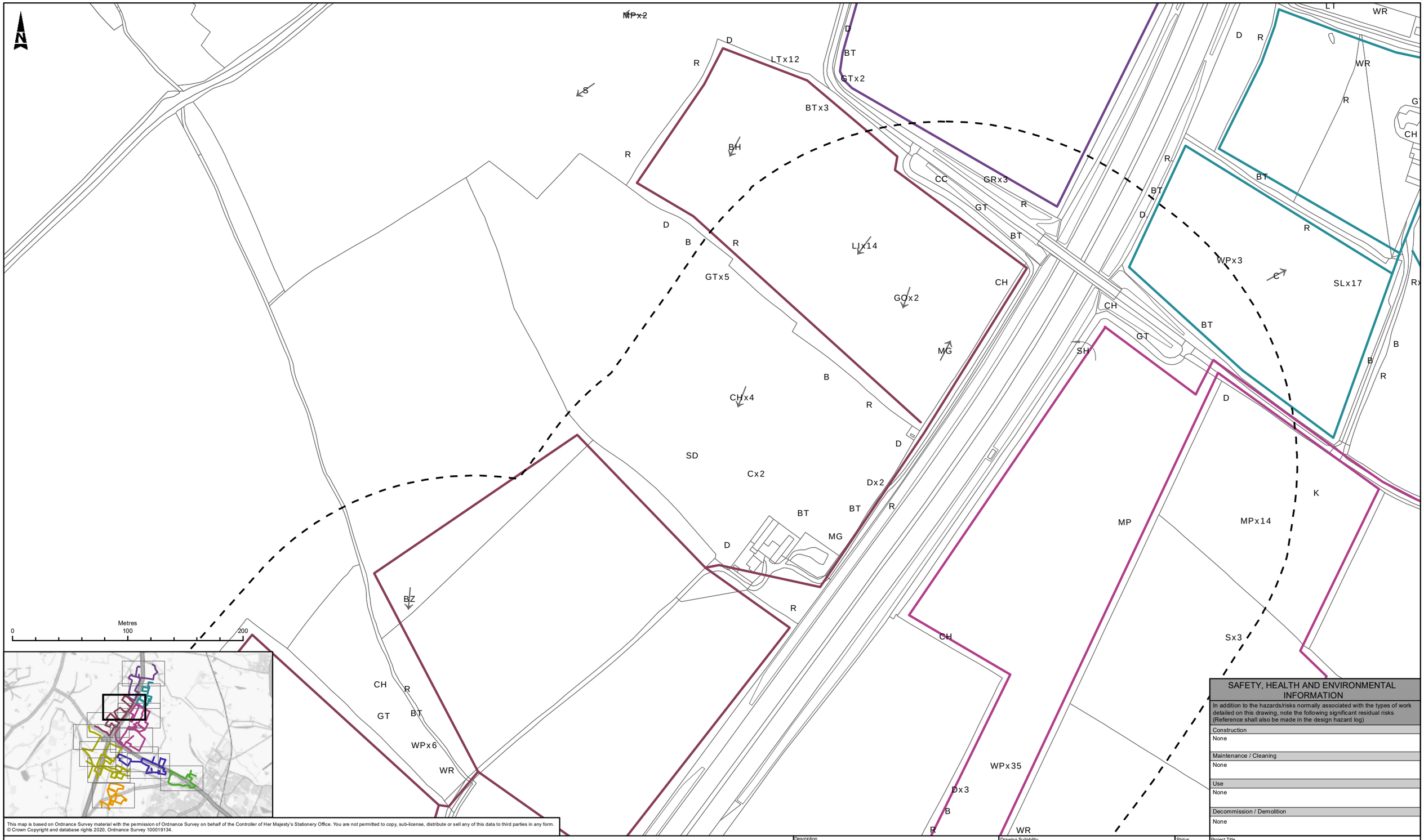
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Drawing Number: Project | Originator | Volume | Location | Type | Number
GCCM5J10 - ATK - EBD
XX - GS - GI - 000020

Original Size: A3 | Scale: 1:4,000 | Project Ref: 5197035 | Sheet: 11 of 13 | Rev: P01



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LEGEND

- 250M STUDY AREA
- TRANSECT 2
- TRANSECT 3
- TRANSECT 4
- TRANSECT 5
- TRANSECT 6
- TRANSECT 7
- TRANSECT 8
- TRANSECT 9

BEHAVIOURS

- FORAGING IN FLIGHT
- FLYING

SPECIES (BTO CODES)

B.	BLACKBIRD	BZ	BUZZARD	GO	GOLDFINCH	K.	KESTREL
BT	BLUE TIT	CC	CHIFFCHAFF	GR	GREENFINCH	KF	KINGFISHER
BH	BLACK-HEADED GULL	CD	COLLARED DOVE	GS	GREAT SPOTTED WOODPECKER	LB	LESSER BLACK-BACKED GULL
		CH	CHAFFINCH	GT	GREAT TIT	LI	LINNET
		CT	COAL TIT	HM	HOUSE MARTIN	LT	LONG-TAILED TIT
		D.	DUNNOCK	HS	HOUSE SPARROW	MA	MALLARD
		FP	FERAL PIGEON	J.	JAY	MG	MAGPIE
		GC	GOLDCREST	JD	JACKDAW		
		GL	GREY WAGTAIL				

MP	MEADOW PIPIT	SG	STARLING
PW	PIED WAGTAIL	SH	SPARROWHAWK
R.	ROBIN	SL	SWALLOW
RE	REDWING	ST	SONG THRUSH
RN	RAVEN	WP	WOOD PIGEON
RO	ROOK	WR	WREN
S.	SKYLARK	Y.	YELLOWHAMMER
SC	STONECHAT		
SD	STOCK DOVE		

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log)

Construction
None

Maintenance / Cleaning
None

Use
None

Decommission / Demolition
None

Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
PUBLISHED	A1	P01	SD	LH	CC	MT	20/09/21

Drawing Suitability: PUBLISHED
Status: A1

Project Title: M5 Junction 10 Improvement

Drawing Title: FIGURE 7.9B WINTERING BIRD SURVEY RESULTS OCTOBER 2019

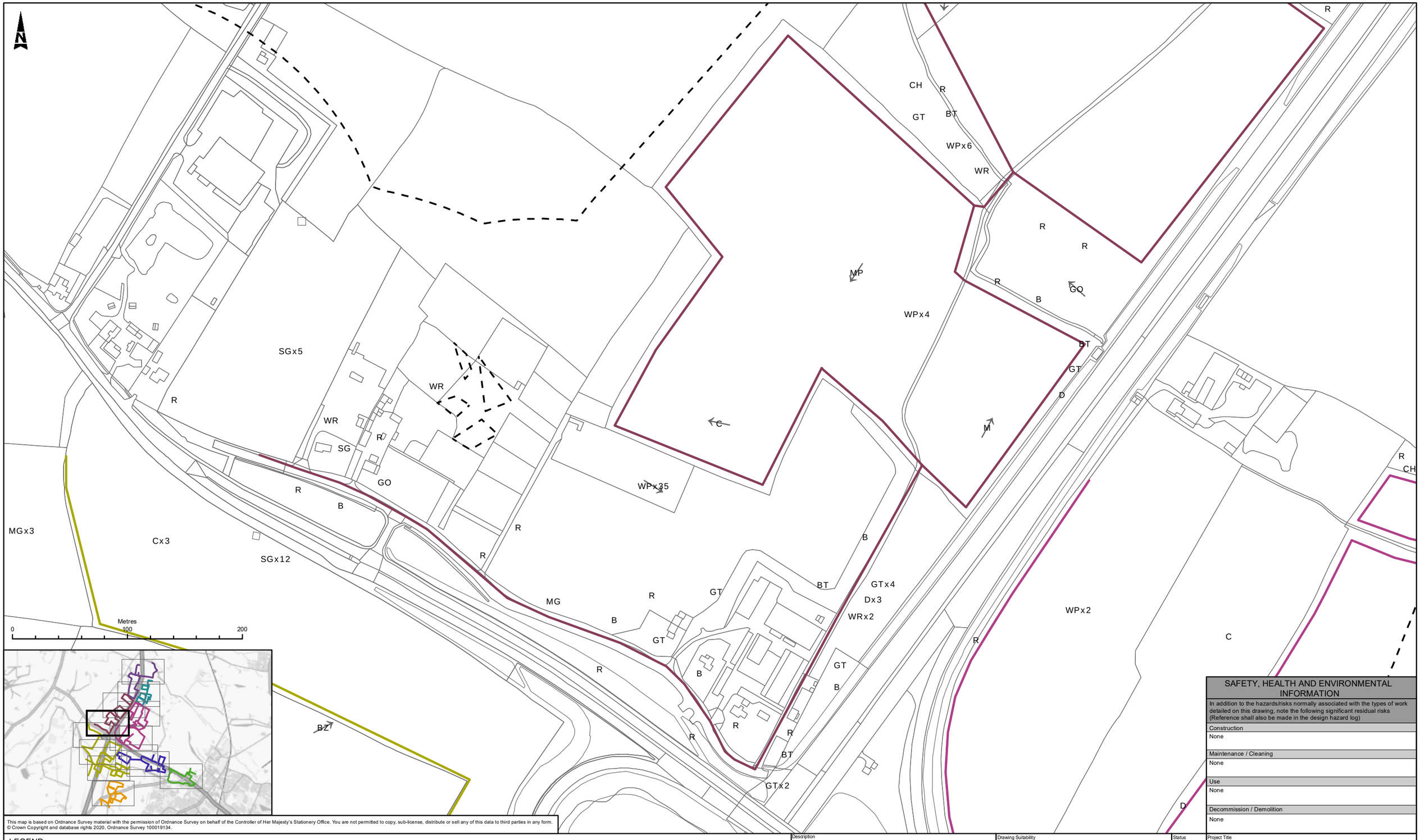
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GCCM5J10 - ATK - EBD
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Original Size: A3 | Scale: 1:3,000 | Project Ref: 5197035 | Sheet: 12 of 13 | Rev: P01



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LEGEND

- 250M STUDY AREA
- TRANSECT 2
- TRANSECT 3
- TRANSECT 4
- TRANSECT 5
- TRANSECT 6
- TRANSECT 7
- TRANSECT 8
- TRANSECT 9

BEHAVIOURS

- FORAGING IN FLIGHT
- FLYING

SPECIES (BTO CODES)

B.	BLACKBIRD	BZ	BUZZARD	GO	GOLDFINCH	K.	KESTREL	MP	MEADOW PIPIT	SG	STARLING
BT	BLUE TIT	CC	CHIFFCHAFF	GR	GREENFINCH	KF	KINGFISHER	PW	PIED WAGTAIL	SH	SPARROWHAWK
BH	BLACK-HEADED GULL	CD	COLLARED DOVE	GS	GREAT SPOTTED WOODPECKER	LB	LESSER BLACK-BACKED GULL	R.	ROBIN	SL	SWALLOW
		CH	CHAFFINCH	GT	GREAT TIT	LI	LINNET	RE	REDWING	ST	SONG THRUSH
		CT	COAL TIT	HM	HOUSE MARTIN	LT	LONG-TAILED TIT	RN	RAVEN	WP	WOOD PIGEON
		D.	DUNNOCK	HS	HOUSE SPARROW	MA	MALLARD	RO	ROOK	WR	WREN
		FP	FERAL PIGEON	J.	JAY	MG	MAGPIE	S.	SKYLARK	Y.	YELLOWHAMMER
		GC	GOLDCREST	JD	JACKDAW			SC	STONECHAT		
		GL	GREY WAGTAIL					SD	STOCK DOVE		

Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
PUBLISHED	A1	P01	SD	LH	CC	MT	20/09/21

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log)

Construction
None

Maintenance / Cleaning
None

Use
None

Decommission / Demolition
None

Drawing Suitability: PUBLISHED
Status: A1

Project Title: M5 Junction 10 Improvement

Drawing Title: FIGURE 7.9B WINTERING BIRD SURVEY RESULTS OCTOBER 2019

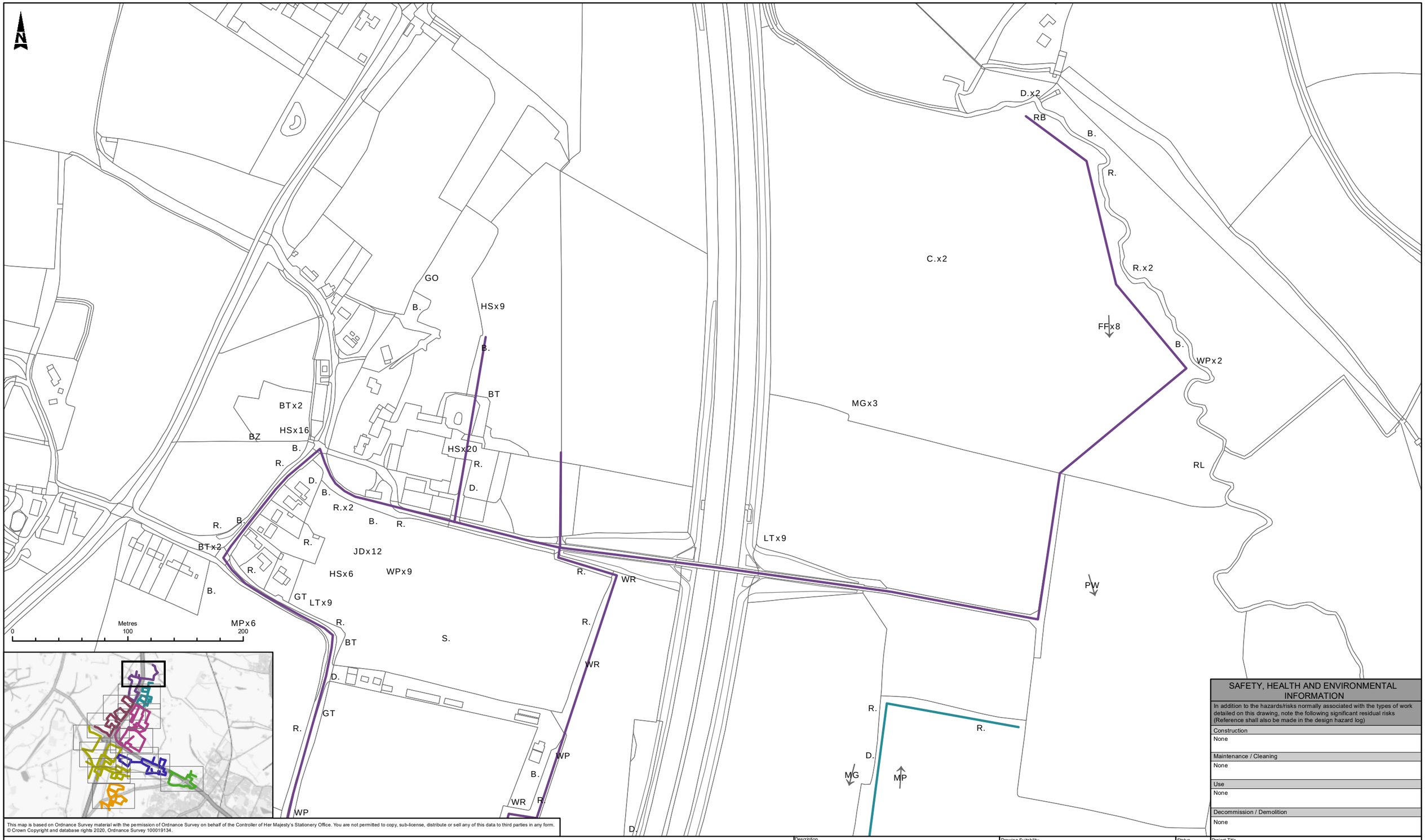
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A3	1:3,000	5197035	13 of 13	P01



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LEGEND

- 250M STUDY AREA
- TRANSECT 2
- TRANSECT 3
- TRANSECT 4
- TRANSECT 5
- TRANSECT 6
- TRANSECT 7
- TRANSECT 8
- TRANSECT 9

BEHAVIOURS

- FORAGING IN FLIGHT
- FLYING

SPECIES (BTO CODES)

B.	BLACKBIRD	BZ	BUZZARD	GC	GOLDCREST	J.	JAY
BT	BLUE TIT	C.	CARRION CROW	GL	GREY WAGTAIL	JD	JACKDAW
BH	BLACK-HEADED GULL	CD	COLLARED DOVE	GO	GOLDFINCH	K.	KESTREL
D.	DUNNOCK	CH	CHAFFINCH	GS	GREAT SPOTTED WOODPECKER	LB	LESSER BLACK-BACKED GULL
FF	FIELDFARE	CT	COAL TIT	GT	GREAT TIT	LT	LONG-TAILED TIT
G.	GREEN WOODPECKER			HG	HERRING GULL	M.	MISTLE THRUSH
				HS	HOUSE SPARROW	MA	MALLARD

MG	MAGPIE	SD	STOCK DOVE				
MP	MEADOW PIPIT	SG	STARLING				
PW	PIED WAGTAIL	SH	SPARROWHAWK				
PH	PHEASANT	ST	SONG THRUSH				
R.	ROBIN	WP	WOOD PIGEON				
RE	REDWING	WR	WREN				
RO	ROOK	Y.	YELLOWHAMMER				
S.	SKYLARK						

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log)

Construction
None

Maintenance / Cleaning
None

Use
None

Decommission / Demolition
None

Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
FOR INFORMATION	S2	C01	SD	LH	--	--	08/10/21

Drawing Suitability: FOR INFORMATION
Status: S2

Project Title: M5 Junction 10 Improvement

Drawing Title: FIGURE 7.9C WINTERING BIRD SURVEY RESULTS NOVEMBER 2019

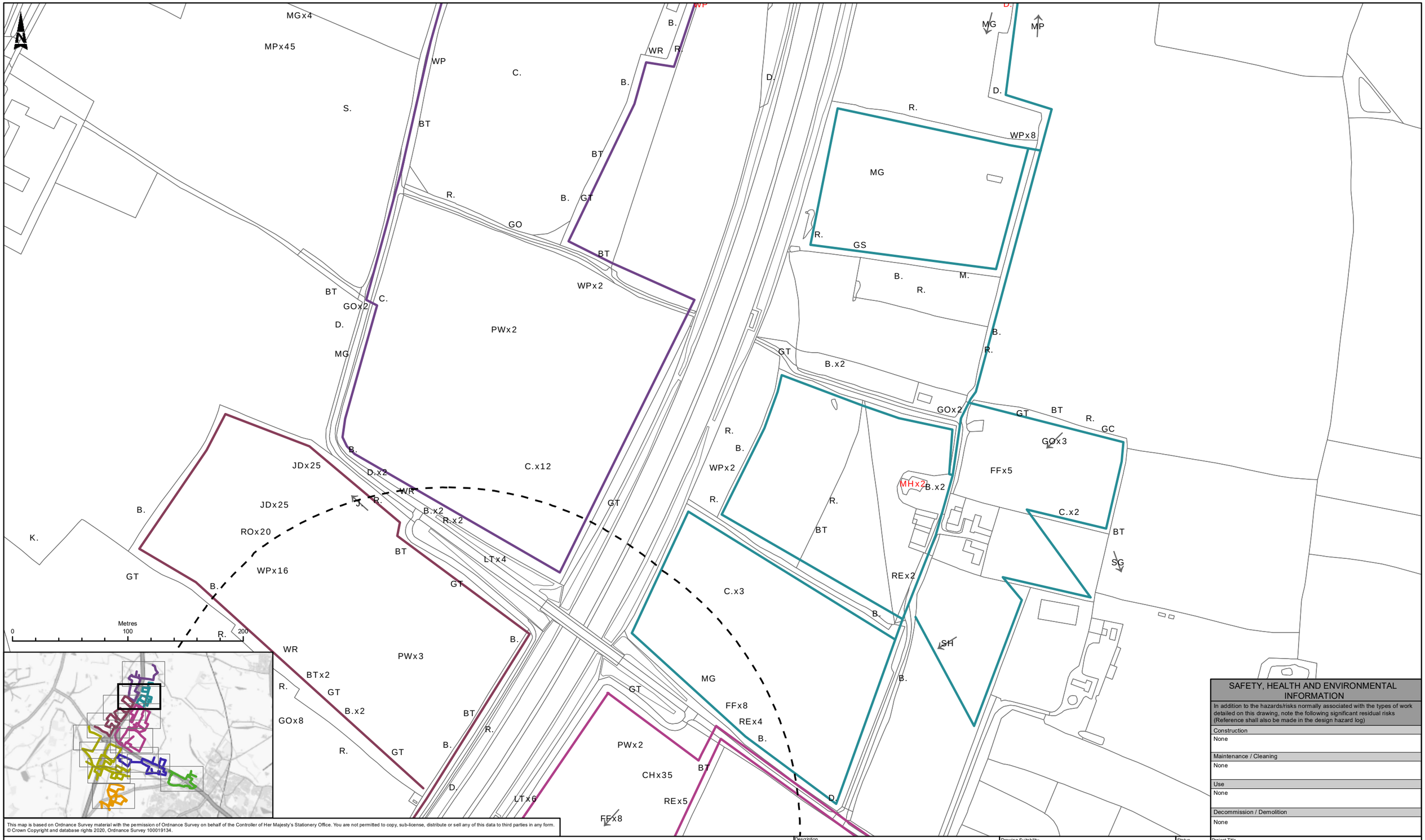
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Drawing Number: Project | Originator | Volume
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XX - GS - GI - 000021
Location | Type | Number

Original Size:	Scale	Project Ref:	Sheet:	Rev:
A3	1:3,000	5197035	1 of 1	C01



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LEGEND

- 250M STUDY AREA
- TRANSECT 2
- TRANSECT 3
- TRANSECT 4
- TRANSECT 5
- TRANSECT 6
- TRANSECT 7
- TRANSECT 8
- TRANSECT 9

BEHAVIOURS

- FORAGING IN FLIGHT
- FLYING

SPECIES (BTO CODES)

B.	BLACKBIRD	BZ	BUZZARD	GC	GOLDCREST	J.	JAY	MG	MAGPIE	SD	STOCK DOVE
BT	BLUE TIT	C.	CARRION CROW	GL	GREY WAGTAIL	JD	JACKDAW	MP	MEADOW PIPIT	SG	STARLING
BH	BLACK-HEADED GULL	CD	COLLARED DOVE	GO	GOLDFINCH	K.	KESTREL	PW	PIED WAGTAIL	SH	SPARROWHAWK
G.	GREEN WOODPECKER	CH	CHAFFINCH	GS	GREAT SPOTTED WOODPECKER	LB	LESSER BLACK-BACKED GULL	PH	PHEASANT	ST	SONG THRUSH
		CT	COAL TIT	GT	GREAT TIT	LT	LONG-TAILED TIT	R.	ROBIN	WP	WOOD PIGEON
		D.	DUNNOCK	HG	HERRING GULL	M.	MISTLE THRUSH	RE	REDWING	WR	WREN
		FF	FIELDFARE	HS	HOUSE SPARROW	MA	MALLARD	RO	ROOK	Y.	YELLOWHAMMER
		G.	GREEN WOODPECKER					S.	SKYLARK		

Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
FOR INFORMATION	S2	C01	SD	LH	--	--	08/10/21

Drawing Suitability: FOR INFORMATION
Status: S2

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Client: Gloucestershire County Council

Project Title: M5 Junction 10 Improvement

Drawing Title: FIGURE 7.9C
WINTERING BIRD SURVEY RESULTS
NOVEMBER 2019

Drawing Number: Project | Originator | Volume
GCCM5J10 - ATK - EBD
XX - GS - GI - 000021
Location | Type | Number

Original Size:	Scale	Project Ref:	Sheet:	Rev:
A3	1:3,000	5197035	1 of 1	C01

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

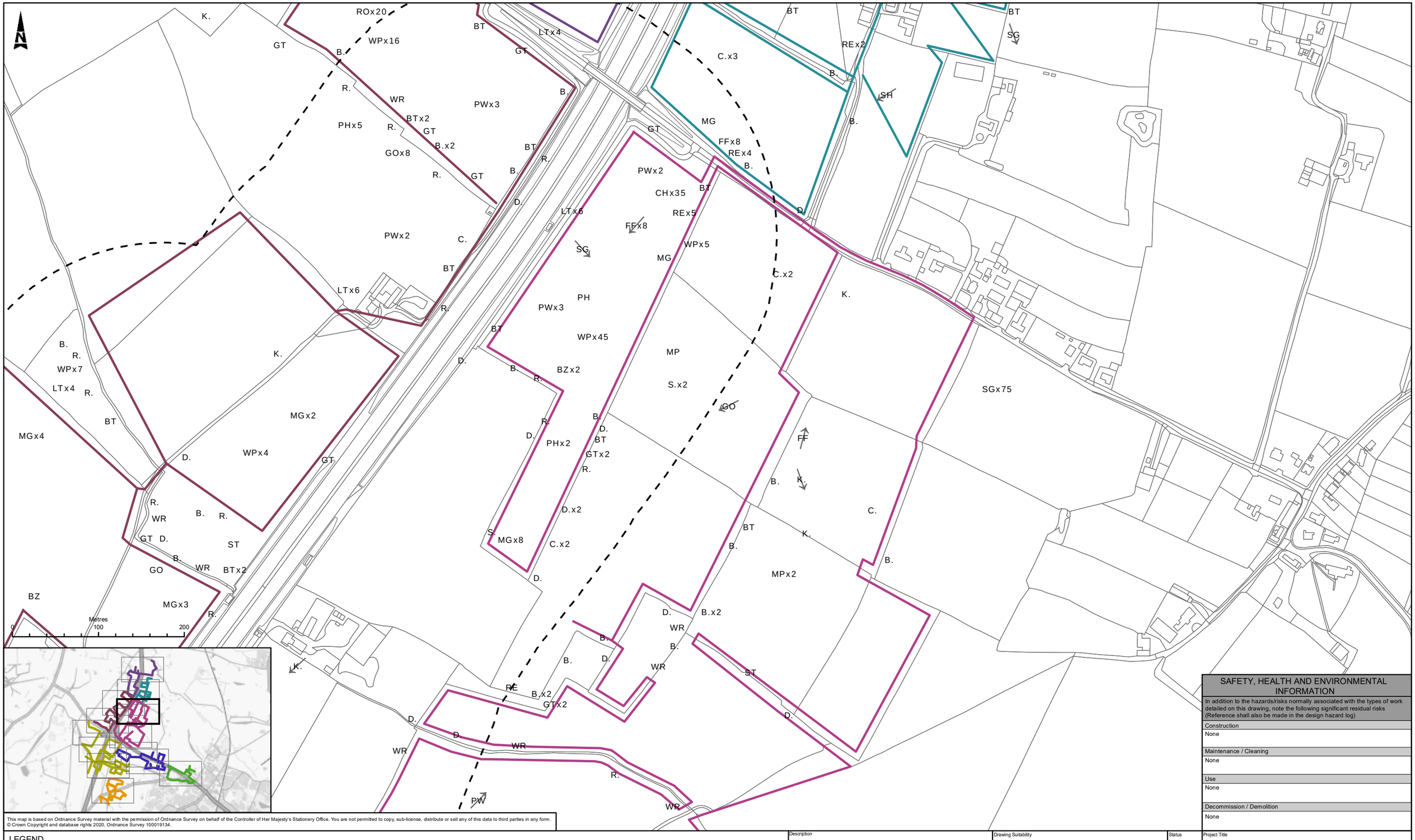
In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log)

Construction
None

Maintenance / Cleaning
None

Use
None

Decommission / Demolition
None



LEGEND

- 250M STUDY AREA
- TRANSECT 2
- TRANSECT 3
- TRANSECT 4
- TRANSECT 5
- TRANSECT 6
- TRANSECT 7
- TRANSECT 8
- TRANSECT 9

BEHAVIOURS

- FORAGING IN FLIGHT
- FLYING

SPECIES (BTO CODES)

B.	BLACKBIRD	BZ	BUZZARD	GC	GOLDCREST	J.	JAY	MG	MAGPIE	SD	STOCK DOVE
BT	BLUE TIT	C.	CARRION CROW	GL	GREY WAGTAIL	JD	JACKDAW	MP	MEADOW PIPIT	SG	STARLING
BH	BLACK-HEADED GULL	CD	COLLARED DOVE	GO	GOLDFINCH	K.	KESTREL	PW	PIED WAGTAIL	SH	SPARROWHAWK
G.	GREEN WOODPECKER	CH	CHAFFINCH	GS	GREAT SPOTTED WOODPECKER	LB	LESSER BLACK-BACKED GULL	PH	PHEASANT	ST	SONG THRUSH
		CT	COAL TIT	GT	GREAT TIT	LT	LONG-TAILED TIT	R.	ROBIN	WP	WOOD PIGEON
		D.	DUNNOCK	HG	HERRING GULL	M.	MISTLE THRUSH	RE	REDWING	WR	WREN
		FF	FIELDFARE	HS	HOUSE SPARROW	MA	MALLARD	RO	ROOK	Y.	YELLOWHAMMER
								S.	SKYLARK		

Description

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date

Description

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date

Description

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date

Description

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date

Description FOR INFORMATION

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
S2	C01	SD	LH	--	--	08/10/21

Drawing Suitability: FOR INFORMATION

Status: S2

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log)

Construction
None

Maintenance / Cleaning
None

Use
None

Decommission / Demolition
None

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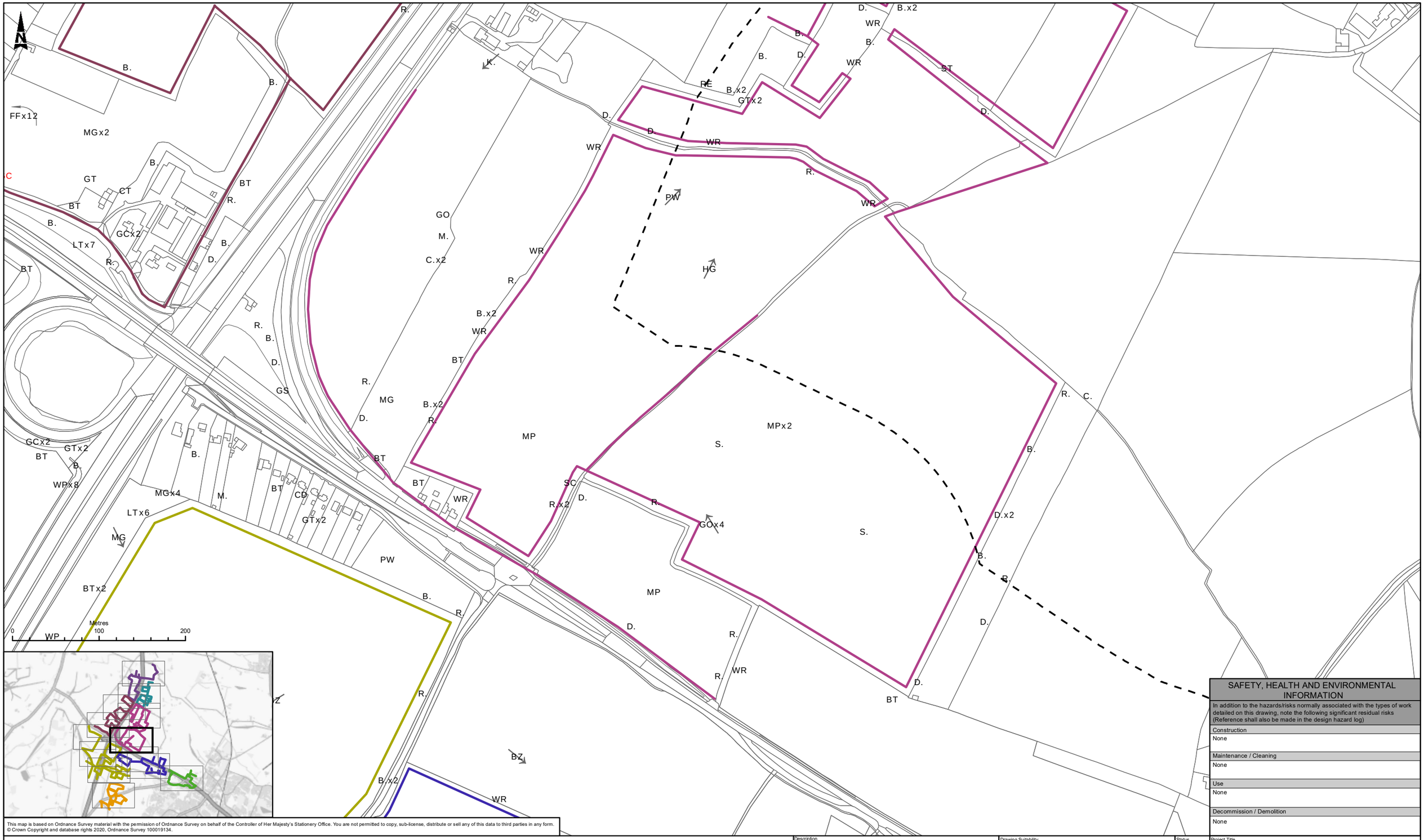
Client: Gloucestershire County Council

Project Title: M5 Junction 10 Improvement

Drawing Title: FIGURE 7.9C
WINTERING BIRD SURVEY RESULTS
NOVEMBER 2019

Drawing Number: Project | Originator | Volume
GCCM5J10 - ATK - EBD
XX - GS - GI - 000021
Location | Type | Role | Number

Original Size:	Scale	Project Ref:	Sheet:	Rev:
A3	1:4,000	5197035	1 of 1	C01



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LEGEND

- 250M STUDY AREA
- TRANSECT 2
- TRANSECT 3
- TRANSECT 4
- TRANSECT 5
- TRANSECT 6
- TRANSECT 7
- TRANSECT 8
- TRANSECT 9

BEHAVIOURS

- FORAGING IN FLIGHT
- FLYING

SPECIES (BTO CODES)

B.	BLACKBIRD	BZ	BUZZARD	GC	GOLDCREST	J.	JAY	MG	MAGPIE	SD	STOCK DOVE
BT	BLUE TIT	C.	CARRION CROW	GL	GREY WAGTAIL	JD	JACKDAW	MP	MEADOW PIPIT	SG	STARLING
BH	BLACK-HEADED GULL	CD	COLLARED DOVE	GO	GOLDFINCH	K.	KESTREL	PW	PIED WAGTAIL	SH	SPARROWHAWK
D.	DUNNOCK	CH	CHAFFINCH	GS	GREAT SPOTTED WOODPECKER	LB	LESSER BLACK-BACKED GULL	PH	PHEASANT	ST	SONG THRUSH
FF	FIELDFARE	CT	COAL TIT	GT	GREAT TIT	LT	LONG-TAILED TIT	R.	ROBIN	WP	WOOD PIGEON
G.	GREEN WOODPECKER			HG	HERRING GULL	M.	MISTLE THRUSH	RE	REDWING	WR	WREN
				HS	HOUSE SPARROW	MA	MALLARD	RO	ROOK	Y.	YELLOWHAMMER
								S.	SKYLARK		

Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
FOR INFORMATION	S2	C01	SD	LH	--	--	08/10/21

Drawing Suitability: FOR INFORMATION — Status: S2

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Client: Gloucestershire County Council

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log)

Construction: None

Maintenance / Cleaning: None

Use: None

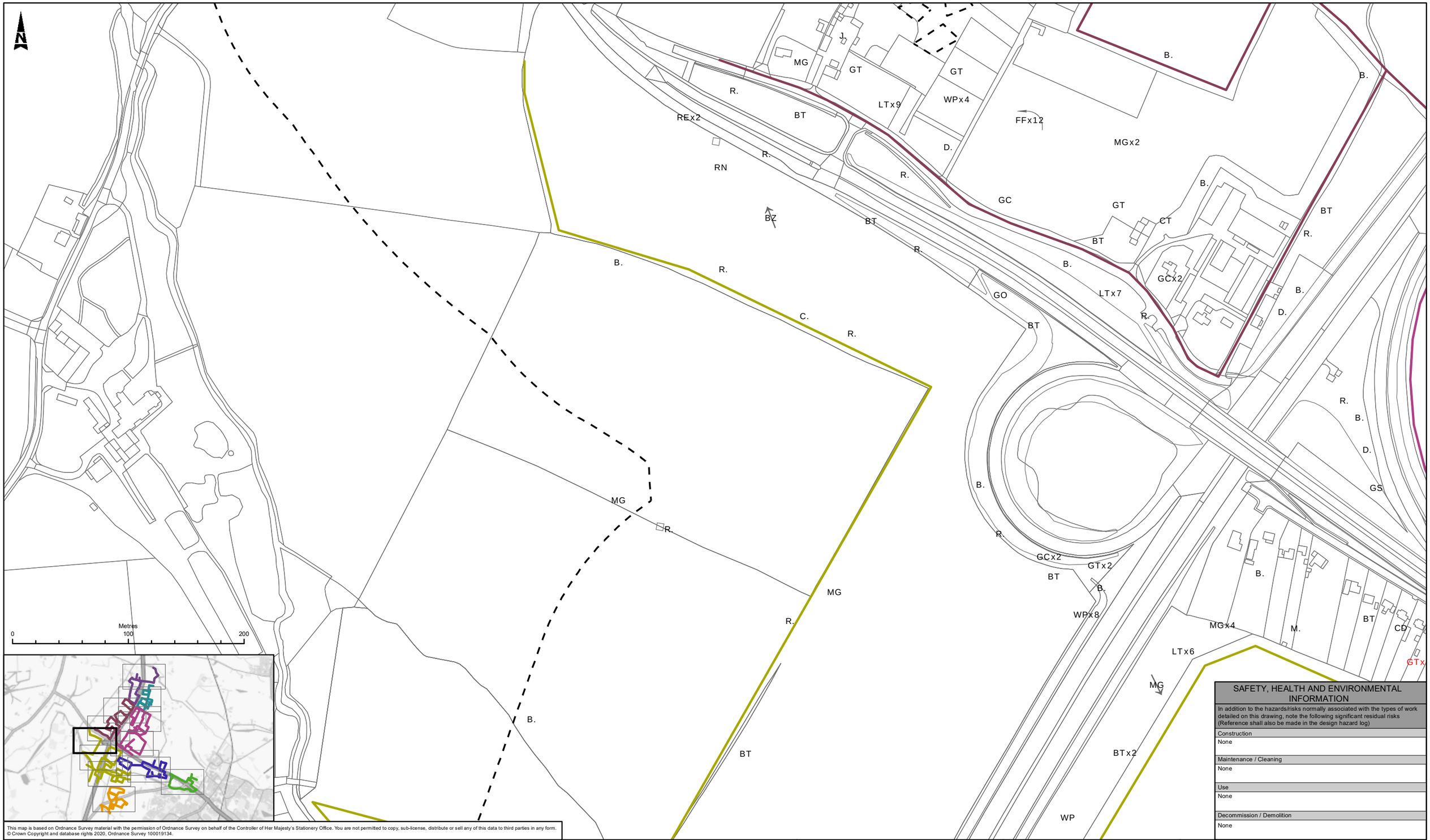
Decommission / Demolition: None

Project Title: M5 Junction 10 Improvement

Drawing Title: FIGURE 7.9C
WINTERING BIRD SURVEY RESULTS
NOVEMBER 2019

Drawing Number: Project | Originator | Volume
GCCM5J10 - ATK - EBD
XX - GS - GI - 000021
Location | Type | Number

Original Size:	Scale	Project Ref:	Sheet:	Rev:
A3	1:4,000	5197035	1 of 1	C01



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LEGEND

- 250M STUDY AREA
- TRANSECT 2
- TRANSECT 3
- TRANSECT 4
- TRANSECT 5
- TRANSECT 6
- TRANSECT 7
- TRANSECT 8
- TRANSECT 9

BEHAVIOURS

- FORAGING IN FLIGHT
- FLYING

SPECIES (BTO CODES)

B.	BLACKBIRD	BZ	BUZZARD	GC	GOLDCREST	J.	JAY
BT	BLUE TIT	C.	CARRION CROW	GL	GREY WAGTAIL	JD	JACKDAW
BH	BLACK-HEADED GULL	CD	COLLARED DOVE	GO	GOLDFINCH	K.	KESTREL
D.	DUNNOCK	CH	CHAFFINCH	GS	GREAT SPOTTED WOODPECKER	LB	LESSER BLACK-BACKED GULL
FF	FIELDFARE	CT	COAL TIT	GT	GREAT TIT	LT	LONG-TAILED TIT
G.	GREEN WOODPECKER	D.	DUNNOCK	HG	HERRING GULL	M.	MISTLE THRUSH
		FF	FIELDFARE	HS	HOUSE SPARROW	MA	MALLARD
		G.	GREEN WOODPECKER				

MG	MAGPIE	SD	STOCK DOVE				
MP	MEADOW PIPIT	SG	STARLING				
PW	PIED WAGTAIL	SH	SPARROWHAWK				
PH	PHEASANT	ST	SONG THRUSH				
R.	ROBIN	WP	WOOD PIGEON				
RE	REDWING	WR	WREN				
RO	ROOK	Y.	YELLOWHAMMER				
S.	SKYLARK						

Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
FOR INFORMATION	S2	C01	SD	LH	--	--	08/10/21

Drawing Suitability: FOR INFORMATION
Status: S2

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Client: Gloucestershire COUNTY COUNCIL

Project Title: M5 Junction 10 Improvement

Drawing Title: FIGURE 7.9C
WINTERING BIRD SURVEY RESULTS
NOVEMBER 2019

Drawing Number: Project | Originator | Volume
GCCM5J10 - ATK - EBD
XX - GS - GI - 000021
Location | Type | Number

Original Size:	Scale	Project Ref:	Sheet:	Rev:
A3	1:3,000	5197035	1 of 1	C01

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

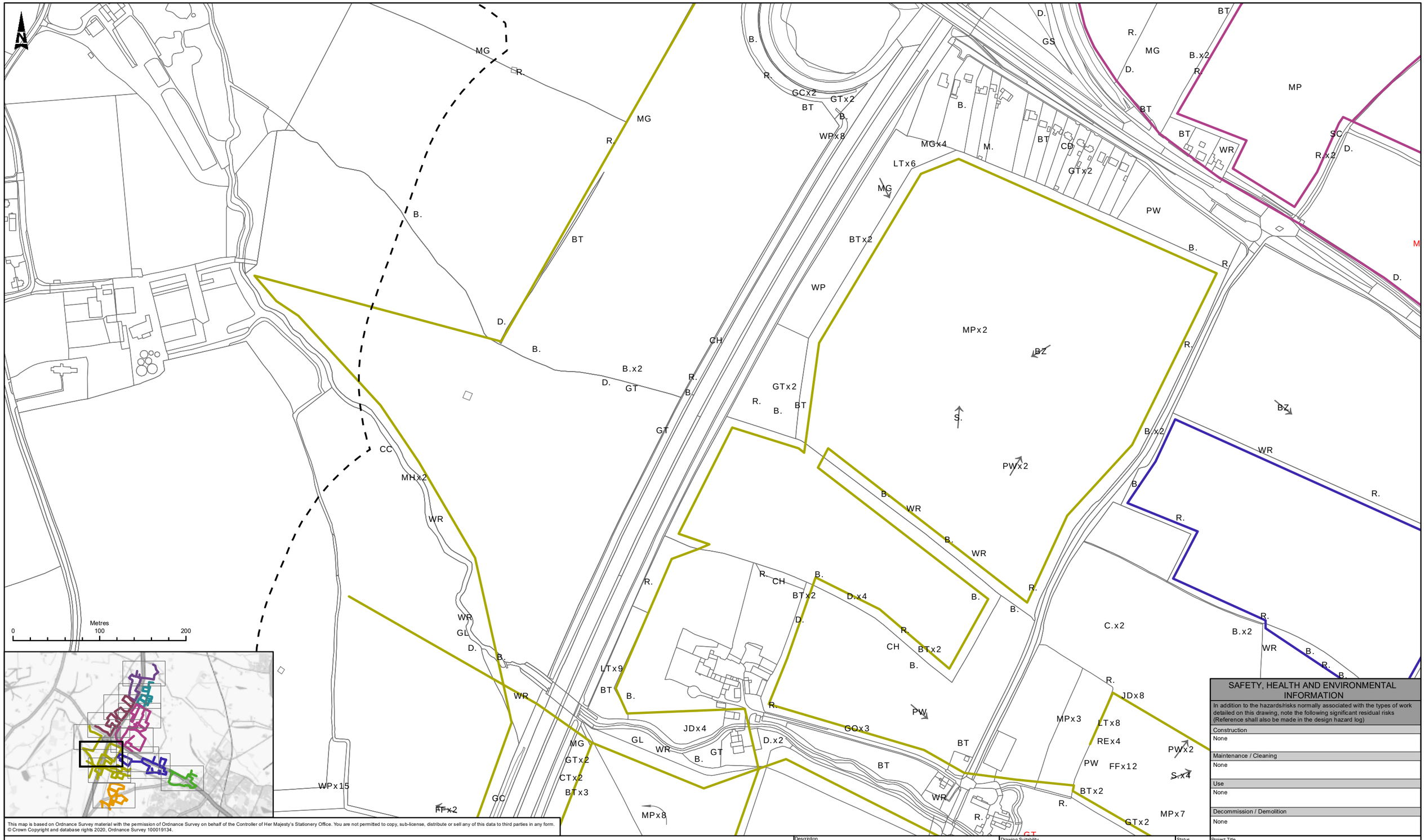
In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log)

Construction
None

Maintenance / Cleaning
None

Use
None

Decommission / Demolition
None



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LEGEND

- 250M STUDY AREA
- TRANSECT 2
- TRANSECT 3
- TRANSECT 4
- TRANSECT 5
- TRANSECT 6
- TRANSECT 7
- TRANSECT 8
- TRANSECT 9

BEHAVIOURS

- FORAGING IN FLIGHT
- FLYING

SPECIES (BTO CODES)

B.	BLACKBIRD	BZ	BUZZARD	GC	GOLDCREST	J.	JAY
BT	BLUE TIT	C.	CARRION CROW	GL	GREY WAGTAIL	JD	JACKDAW
BH	BLACK-HEADED GULL	CD	COLLARED DOVE	GO	GOLDFINCH	K.	KESTREL
G.	GREEN WOODPECKER	CH	CHAFFINCH	GS	GREAT SPOTTED WOODPECKER	LB	LESSER BLACK-BACKED GULL
		CT	COAL TIT	GT	GREAT TIT	LT	LONG-TAILED TIT
		D.	DUNNOCK	HG	HERRING GULL	M.	MISTLE THRUSH
		FF	FIELDFARE	HS	HOUSE SPARROW	MA	MALLARD

MG	MAGPIE	SD	STOCK DOVE				
MP	MEADOW PIPIT	SG	STARLING				
PW	PIED WAGTAIL	SH	SPARROWHAWK				
PH	PHEASANT	ST	SONG THRUSH				
R.	ROBIN	WP	WOOD PIGEON				
RE	REDWING	WR	WREN				
RO	ROOK	Y.	YELLOWHAMMER				
S.	SKYLARK						

Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
FOR INFORMATION	S2	C01	SD	LH	--	--	08/10/21

Drawing Suitability: FOR INFORMATION

Status: S2

Project Title: M5 Junction 10 Improvement

Drawing Title: FIGURE 7.9C WINTERING BIRD SURVEY RESULTS NOVEMBER 2019

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Client: Gloucestershire County Council

Drawing Number: Project | Originator | Volume: GCCM5J10 - ATK - EBD; Location | Type | Number: XX - GS - GI - 000021

Original Size: A3 | Scale: 1:4,000 | Project Ref: 5197035 | Sheet: 1 of 1 | Rev: C01

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

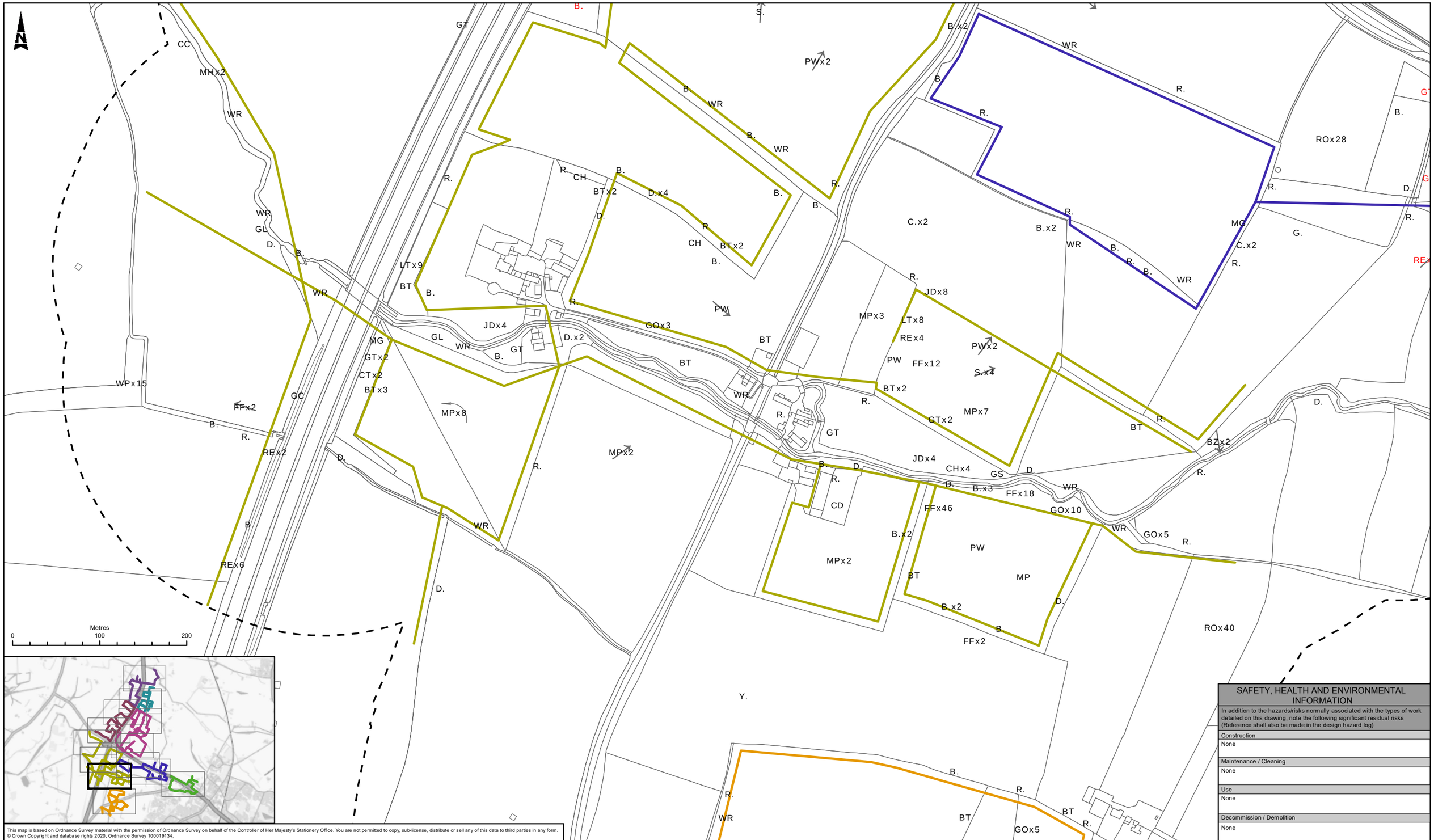
In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log)

Construction: None

Maintenance / Cleaning: None

Use: None

Decommission / Demolition: None



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LEGEND

- 250M STUDY AREA
- TRANSECT 2
- TRANSECT 3
- TRANSECT 4
- TRANSECT 5
- TRANSECT 6
- TRANSECT 7
- TRANSECT 8
- TRANSECT 9

BEHAVIOURS

- FORAGING IN FLIGHT
- FLYING

SPECIES (BTO CODES)

B. BLACKBIRD	BZ BUZZARD	GC GOLDCREST	J. JAY	MG MAGPIE	SD STOCK DOVE
BT BLUE TIT	C. CARRION CROW	GL GREY WAGTAIL	JD JACKDAW	MP MEADOW PIPIT	SG STARLING
BH BLACK-HEADED GULL	CD COLLARED DOVE	GO GOLDFINCH	K. KESTREL	PW PIED WAGTAIL	SH SPARROWHAWK
G. GREEN WOODPECKER	CH CHAFFINCH	GS GREAT SPOTTED WOODPECKER	LB LESSER BLACK-BACKED GULL	PH PHEASANT	ST SONG THRUSH
	CT COAL TIT	GT GREAT TIT	LT LONG-TAILED TIT	R. ROBIN	WP WOOD PIGEON
	D. DUNNOCK	HG HERRING GULL	M. MISTLE THRUSH	RE REDWING	WR WREN
	FF FIELDFARE	HS HOUSE SPARROW	MA MALLARD	RO ROOK	Y. YELLOWHAMMER
				S. SKYLARK	

Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
FOR INFORMATION	S2	C01	SD	LH	--	--	08/10/21

Drawing Suitability: FOR INFORMATION

Status: S2

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

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Construction: None

Maintenance / Cleaning: None

Use: None

Decommission / Demolition: None

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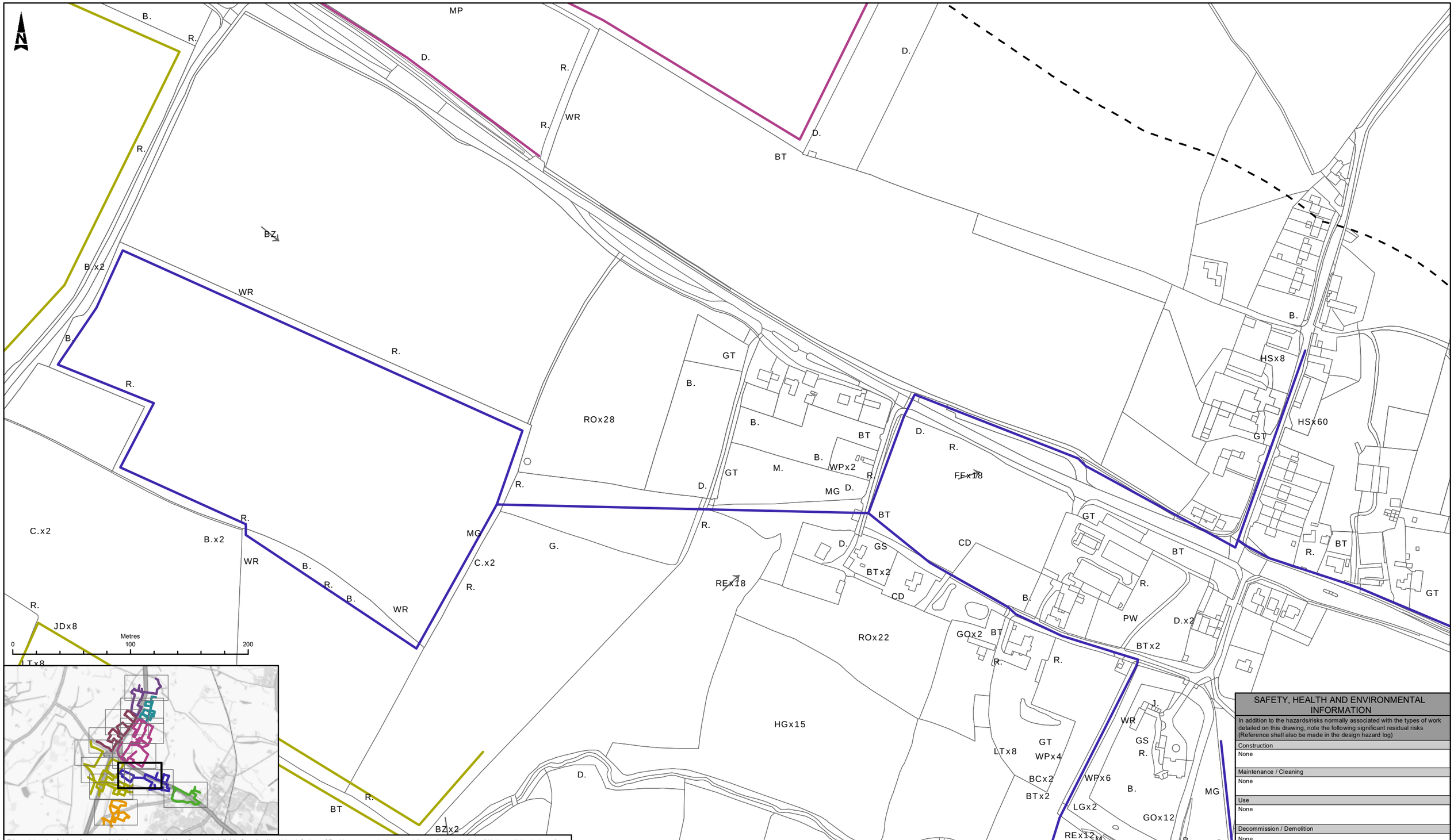
Client: Gloucestershire County Council

Project Title: M5 Junction 10 Improvement

Drawing Title: FIGURE 7.9C
WINTERING BIRD SURVEY RESULTS
NOVEMBER 2019

Drawing Number: Project | Originator | Volume
GCCM5J10 - ATK - EBD
XX - GS - GI - 000021
Location | Type | Number

Original Size:	Scale	Project Ref:	Sheet:	Rev:
A3	1:4,000	5197035	1 of 1	C01



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LEGEND

- 250M STUDY AREA
- TRANSECT 2
- TRANSECT 3
- TRANSECT 4
- TRANSECT 5
- TRANSECT 6
- TRANSECT 7
- TRANSECT 8
- TRANSECT 9

BEHAVIOURS

- FORAGING IN FLIGHT
- FLYING

SPECIES (BTO CODES)

B.	BLACKBIRD	BZ	BUZZARD	GC	GOLDCREST	J.	JAY
BT	BLUE TIT	C.	CARRION CROW	GL	GREY WAGTAIL	JD	JACKDAW
BH	BLACK-HEADED GULL	CD	COLLARED DOVE	GO	GOLDFINCH	K.	KESTREL
D.	DUNNOCK	CH	CHAFFINCH	GS	GREAT SPOTTED WOODPECKER	LB	LESSER BLACK-BACKED GULL
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G.	GREEN WOODPECKER			HG	HERRING GULL	M.	MISTLE THRUSH
				HS	HOUSE SPARROW	MA	MALLARD

MG	MAGPIE	SD	STOCK DOVE				
MP	MEADOW PIPIT	SG	STARLING				
PW	PIED WAGTAIL	SH	SPARROWHAWK				
PH	PHEASANT	ST	SONG THRUSH				
R.	ROBIN	WP	WOOD PIGEON				
RE	REDWING	WR	WREN				
RO	ROOK	Y.	YELLOWHAMMER				
S.	SKYLARK						

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log)

Construction
None

Maintenance / Cleaning
None

Use
None

Decommission / Demolition
None

Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
FOR INFORMATION	S2	C01	SD	LH	--	--	08/10/21

Drawing Suitability: FOR INFORMATION
Status: S2

Project Title: M5 Junction 10 Improvement

Drawing Title: FIGURE 7.9C WINTERING BIRD SURVEY RESULTS NOVEMBER 2019

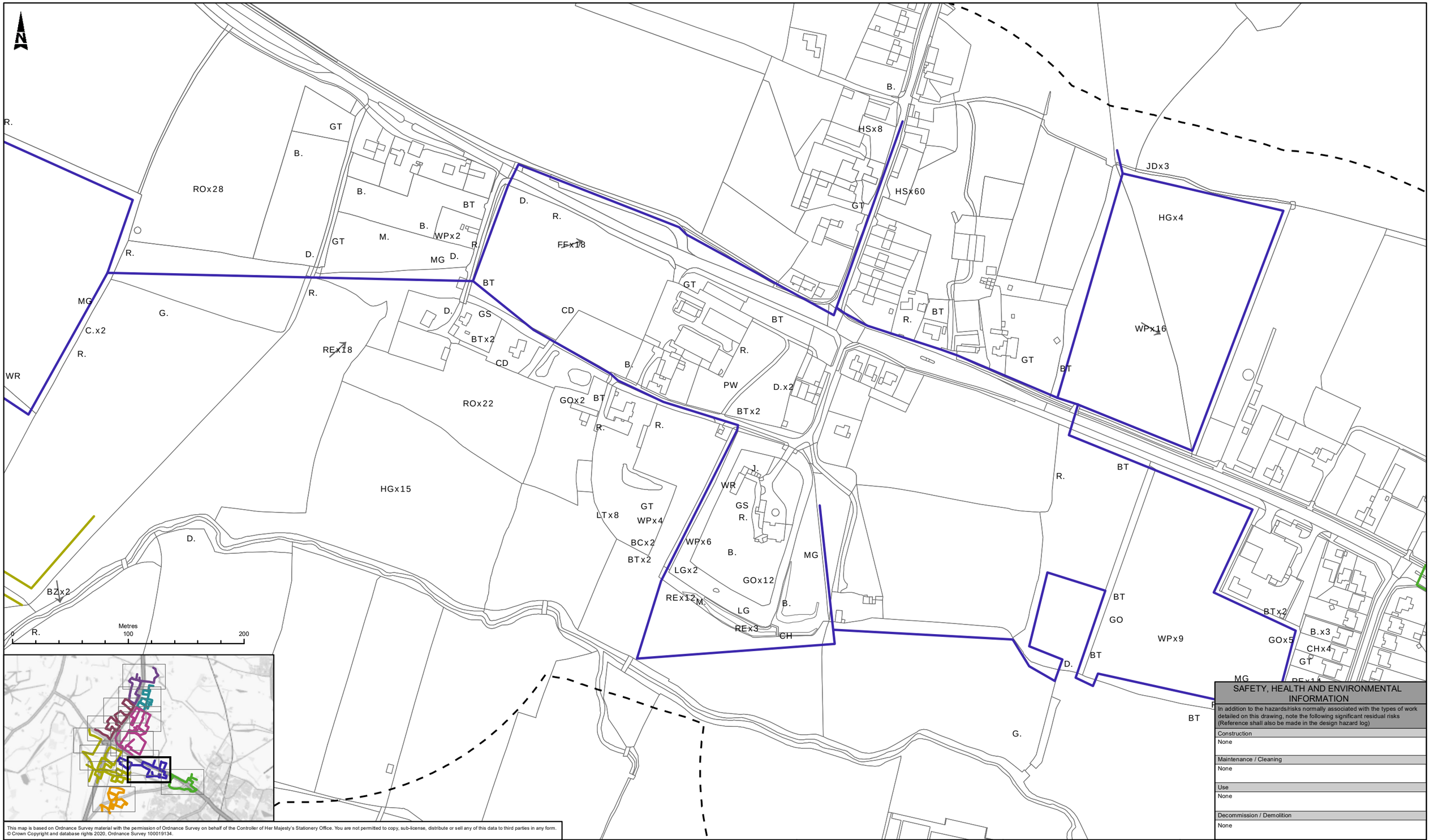
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Drawing Number: Project | Originator | Volume | Location | Type | Number
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LEGEND

250M STUDY AREA
TRANSECT 2
TRANSECT 3
TRANSECT 4
TRANSECT 5
TRANSECT 6
TRANSECT 7
TRANSECT 8
TRANSECT 9

BEHAVIOURS
FORAGING IN FLIGHT
FLYING

SPECIES (BTO CODES)

B.	BLACKBIRD	BZ	BUZZARD	GC	GOLDCREST	J.	JAY
BT	BLUE TIT	C.	CARRION CROW	GL	GREY WAGTAIL	JD	JACKDAW
BH	BLACK-HEADED GULL	CD	COLLARED DOVE	GO	GOLDFINCH	K.	KESTREL
G.	GREEN WOODPECKER	CH	CHAFFINCH	GS	GREAT SPOTTED WOODPECKER	LB	LESSER BLACK-BACKED GULL
		CT	COAL TIT	GT	GREAT TIT	LT	LONG-TAILED TIT
		D.	DUNNOCK	HG	HERRING GULL	M.	MISTLE THRUSH
		FF	FIELDFARE	HS	HOUSE SPARROW	MA	MALLARD

MG	MAGPIE	SD	STOCK DOVE				
MP	MEADOW PIPIT	SG	STARLING				
PW	PIED WAGTAIL	SH	SPARROWHAWK				
PH	PHEASANT	ST	SONG THRUSH				
R.	ROBIN	WP	WOOD PIGEON				
RE	REDWING	WR	WREN				
RO	ROOK	Y.	YELLOWHAMMER				
S.	SKYLARK						

Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
FOR INFORMATION	S2	C01	SD	LH	--	--	08/10/21

Drawing Suitability: FOR INFORMATION
Status: S2

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Client: Gloucestershire County Council

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

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Construction: None

Maintenance / Cleaning: None

Use: None

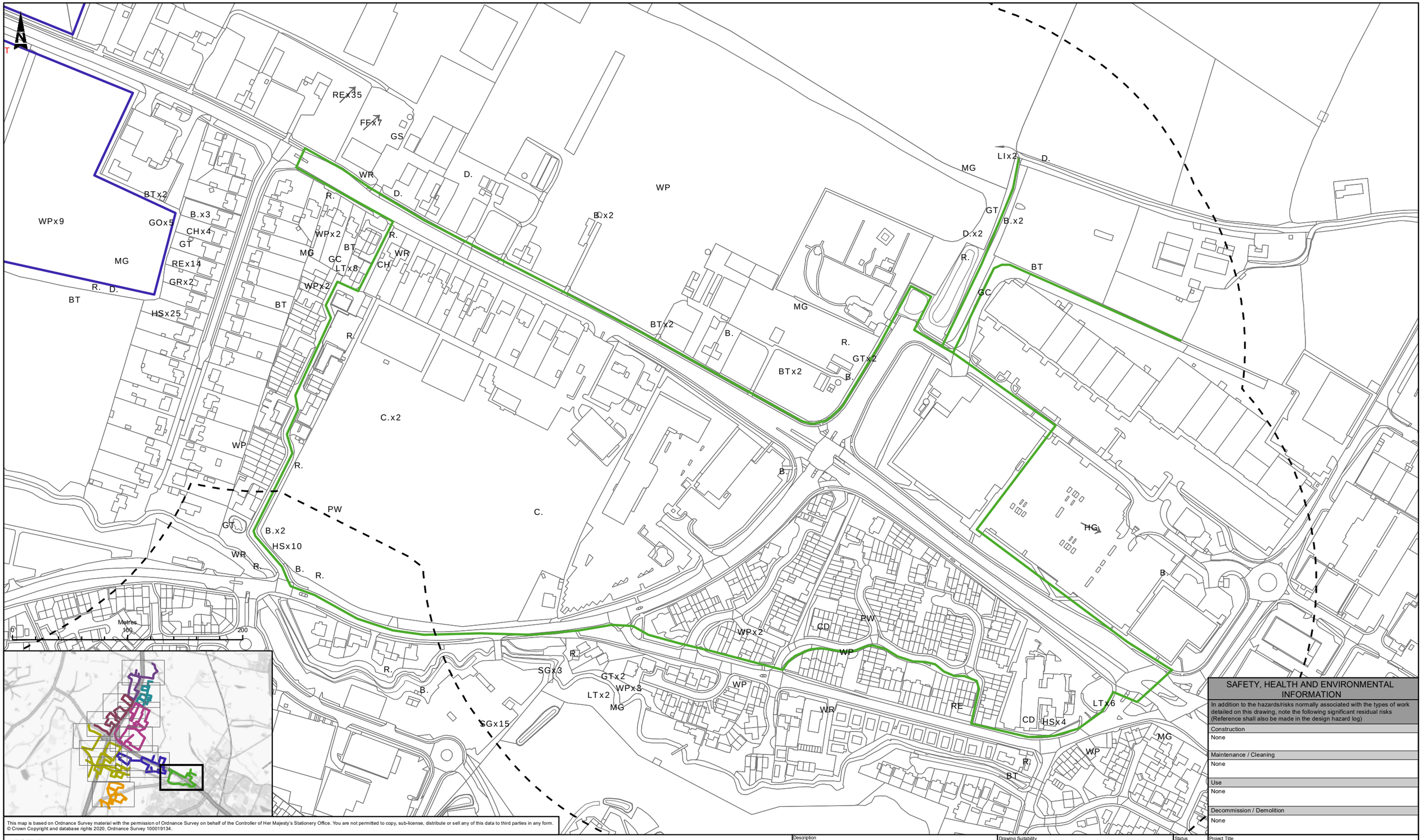
Decommission / Demolition: None

Project Title: M5 Junction 10 Improvement

Drawing Title: FIGURE 7.9C
WINTERING BIRD SURVEY RESULTS
NOVEMBER 2019

Drawing Number: Project | Originator | Volume
GCCM5J10 - ATK - EBD
XX - GS - GI - 000021
Location | Type | Number

Original Size:	Scale	Project Ref:	Sheet:	Rev:
A3	1:3,000	5197035	1 of 1	C01



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LEGEND

- 250M STUDY AREA
- TRANSECT 2
- TRANSECT 3
- TRANSECT 4
- TRANSECT 5
- TRANSECT 6
- TRANSECT 7
- TRANSECT 8
- TRANSECT 9

BEHAVIOURS

- FORAGING IN FLIGHT
- FLYING

SPECIES (BTO CODES)

B.	BLACKBIRD	BZ	BUZZARD	GC	GOLDCREST	J.	JAY
BT	BLUE TIT	C.	CARRION CROW	GL	GREY WAGTAIL	JD	JACKDAW
BH	BLACK-HEADED GULL	CD	COLLARED DOVE	GO	GOLDFINCH	K.	KESTREL
		CH	CHAFFINCH	GS	GREAT SPOTTED WOODPECKER	LB	LESSER BLACK-BACKED GULL
		CT	COAL TIT	GT	GREAT TIT	LT	LONG-TAILED TIT
		D.	DUNNOCK	HG	HERRING GULL	M.	MISTLE THRUSH
		FF	FIELDFARE	HS	HOUSE SPARROW	MA	MALLARD
		G.	GREEN WOODPECKER				

MG	MAGPIE	SD	STOCK DOVE				
MP	MEADOW PIPIT	SG	STARLING				
PW	PIED WAGTAIL	SH	SPARROWHAWK				
PH	PHEASANT	ST	SONG THRUSH				
R.	ROBIN	WP	WOOD PIGEON				
RE	REDWING	WR	WREN				
RO	ROOK	Y.	YELLOWHAMMER				
S.	SKYLARK						

Description

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date

Description

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date

Description

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date

Description

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date

Description: FOR INFORMATION

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
S2	C01	SD	LH	--	--	08/10/21

Drawing Suitability: FOR INFORMATION

Status: S2

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Client: Gloucestershire County Council

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log)

Construction
None

Maintenance / Cleaning
None

Use
None

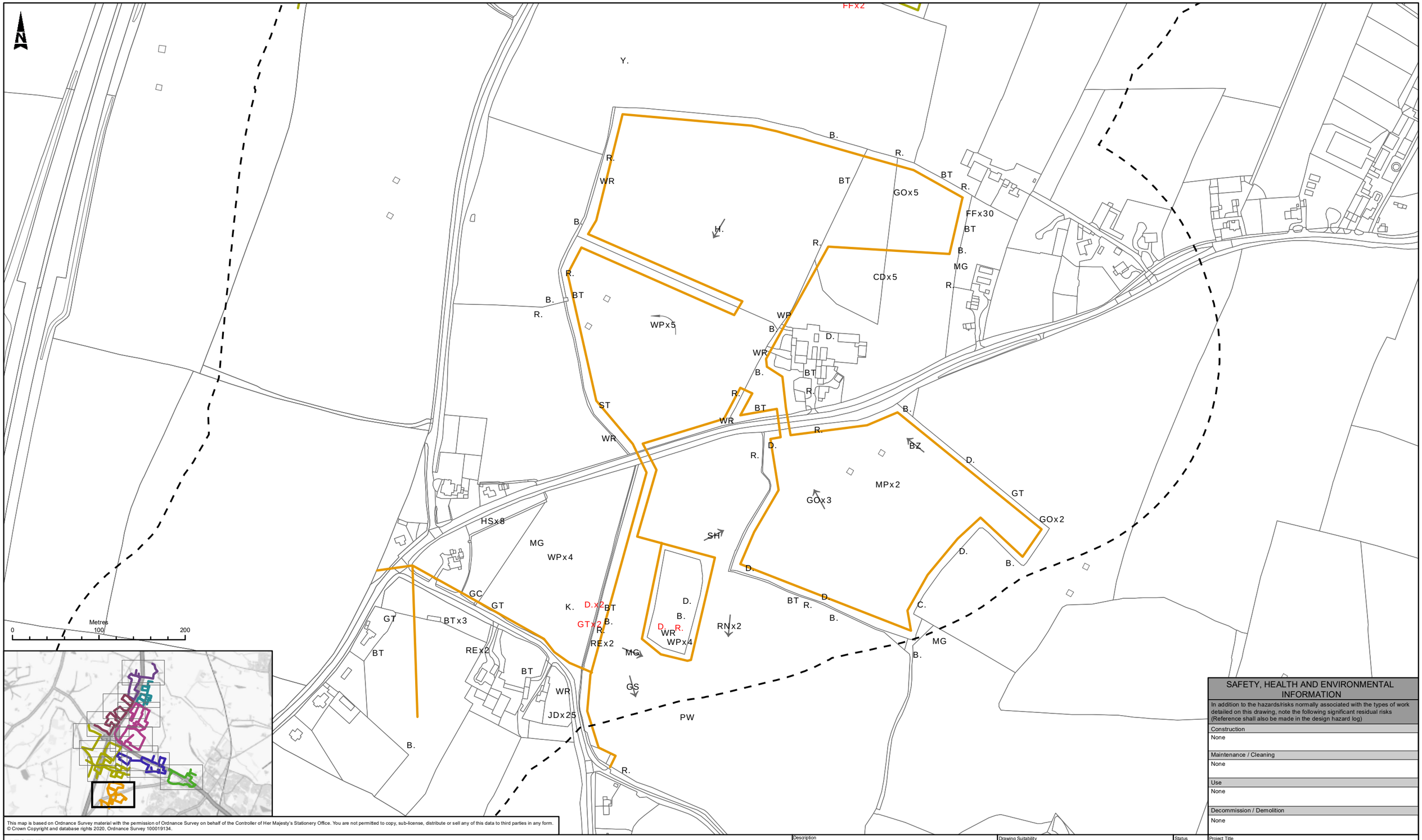
Decommission / Demolition
None

Project Title: M5 Junction 10 Improvement

Drawing Title: FIGURE 7.9C
WINTERING BIRD SURVEY RESULTS
NOVEMBER 2019

Drawing Number: Project | Originator | Volume | Location | Type | Number
GCCM5J10 - ATK - EBD
XX - GS - GI - 000021

Original Size:	Scale	Project Ref:	Sheet:	Rev:
A3	1:3,000	5197035	1 of 1	C01



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LEGEND

- 250M STUDY AREA
- TRANSECT 2
- TRANSECT 3
- TRANSECT 4
- TRANSECT 5
- TRANSECT 6
- TRANSECT 7
- TRANSECT 8
- TRANSECT 9

BEHAVIOURS

- FORAGING IN FLIGHT
- FLYING

SPECIES (BTO CODES)

B.	BLACKBIRD	BZ	BUZZARD	GC	GOLDCREST	J.	JAY	MG	MAGPIE	SD	STOCK DOVE
BT	BLUE TIT	C.	CARRION CROW	GL	GREY WAGTAIL	JD	JACKDAW	MP	MEADOW PIPIT	SG	STARLING
BH	BLACK-HEADED GULL	CD	COLLARED DOVE	GO	GOLDFINCH	K.	KESTREL	PW	PIED WAGTAIL	SH	SPARROWHAWK
G.	GREEN WOODPECKER	CH	CHAFFINCH	GS	GREAT SPOTTED WOODPECKER	LB	LESSER BLACK-BACKED GULL	PH	PHEASANT	ST	SONG THRUSH
		CT	COAL TIT	GT	GREAT TIT	LT	LONG-TAILED TIT	R.	ROBIN	WP	WOOD PIGEON
		D.	DUNNOCK	HG	HERRING GULL	M.	MISTLE THRUSH	RE	REDWING	WR	WREN
		FF	FIELDFARE	HS	HOUSE SPARROW	MA	MALLARD	RO	ROOK	Y.	YELLOWHAMMER
		G.	GREEN WOODPECKER					S.	SKYLARK		

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log)

Construction
None

Maintenance / Cleaning
None

Use
None

Decommission / Demolition
None

Description

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date

Description

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date

Description

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date

Description

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date

Description FOR INFORMATION

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
S2	C01	SD	LH	--	--	08/10/21

Drawing Suitability: FOR INFORMATION

Status: S2

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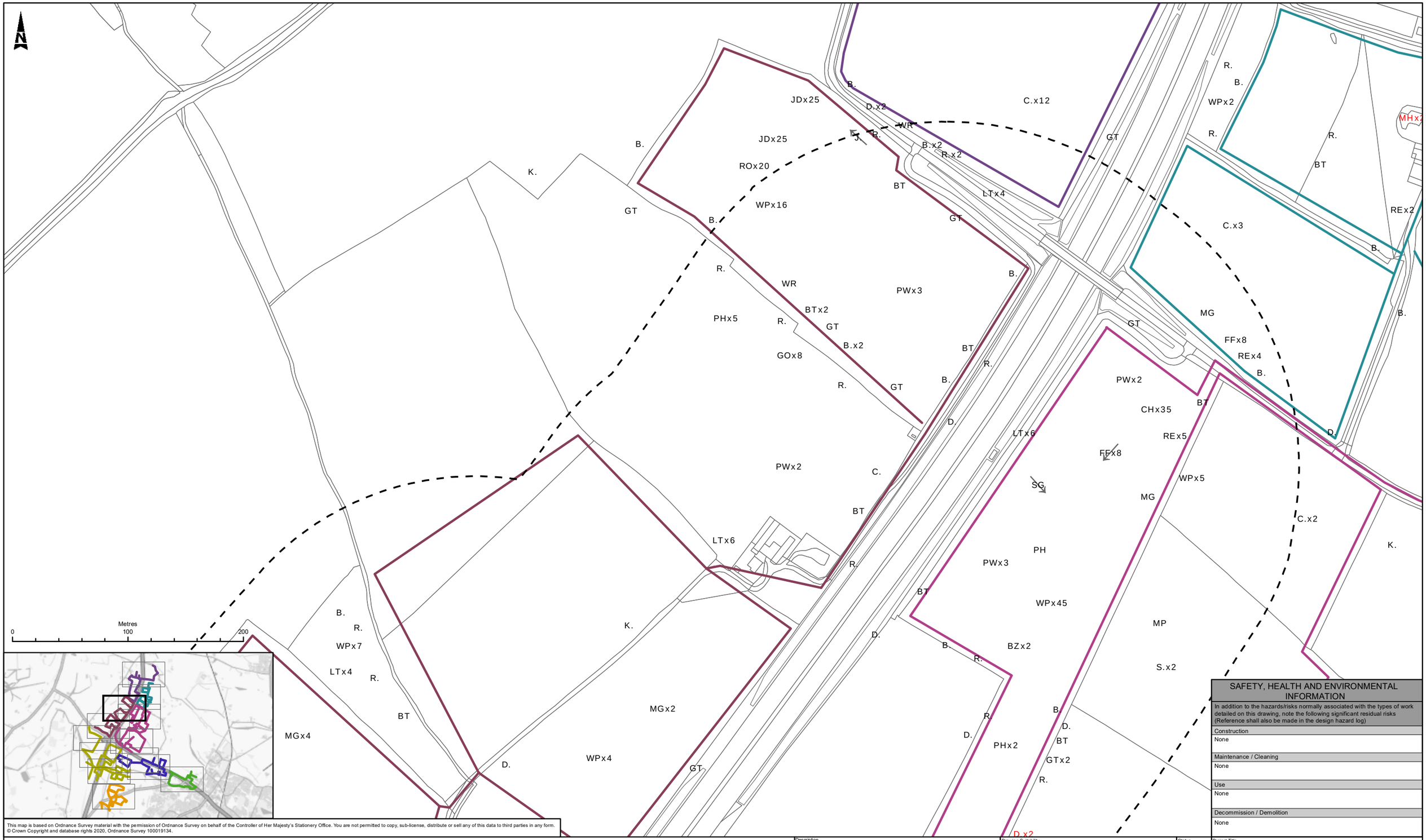
Client: Gloucestershire County Council

Project Title: M5 Junction 10 Improvement

Drawing Title: FIGURE 7.9C
WINTERING BIRD SURVEY RESULTS
NOVEMBER 2019

Drawing Number: Project | Originator | Volume | Location | Type | Number
GCCM5J10 - ATK - EBD
XX - GS - GI - 000021

Original Size:	Scale	Project Ref:	Sheet:	Rev:
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LEGEND

- 250M STUDY AREA
- TRANSECT 2
- TRANSECT 3
- TRANSECT 4
- TRANSECT 5
- TRANSECT 6
- TRANSECT 7
- TRANSECT 8
- TRANSECT 9

BEHAVIOURS

- FORAGING IN FLIGHT
- FLYING

SPECIES (BTO CODES)

B.	BLACKBIRD	BZ	BUZZARD	GC	GOLDCREST	J.	JAY	MG	MAGPIE	SD	STOCK DOVE
BT	BLUE TIT	C.	CARRION CROW	GL	GREY WAGTAIL	JD	JACKDAW	MP	MEADOW PIPIT	SG	STARLING
BH	BLACK-HEADED GULL	CD	COLLARED DOVE	GO	GOLDFINCH	K.	KESTREL	PW	PIED WAGTAIL	SH	SPARROWHAWK
G.	GREEN WOODPECKER	CH	CHAFFINCH	GS	GREAT SPOTTED WOODPECKER	LB	LESSER BLACK-BACKED GULL	PH	PHEASANT	ST	SONG THRUSH
		CT	COAL TIT	GT	GREAT TIT	LT	LONG-TAILED TIT	R.	ROBIN	WP	WOOD PIGEON
		D.	DUNNOCK	HG	HERRING GULL	M.	MISTLE THRUSH	RE	REDWING	WR	WREN
		FF	FIELDFARE	HS	HOUSE SPARROW	MA	MALLARD	RO	ROOK	Y.	YELLOWHAMMER
								S.	SKYLARK		

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log)

Construction
None

Maintenance / Cleaning
None

Use
None

Decommission / Demolition
None

Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
FOR INFORMATION	S2	C01	SD	LH	--	--	08/10/21

Drawing Suitability: FOR INFORMATION
Status: S2

Project Title: M5 Junction 10 Improvement

Drawing Title: FIGURE 7.9C
WINTERING BIRD SURVEY RESULTS
NOVEMBER 2019

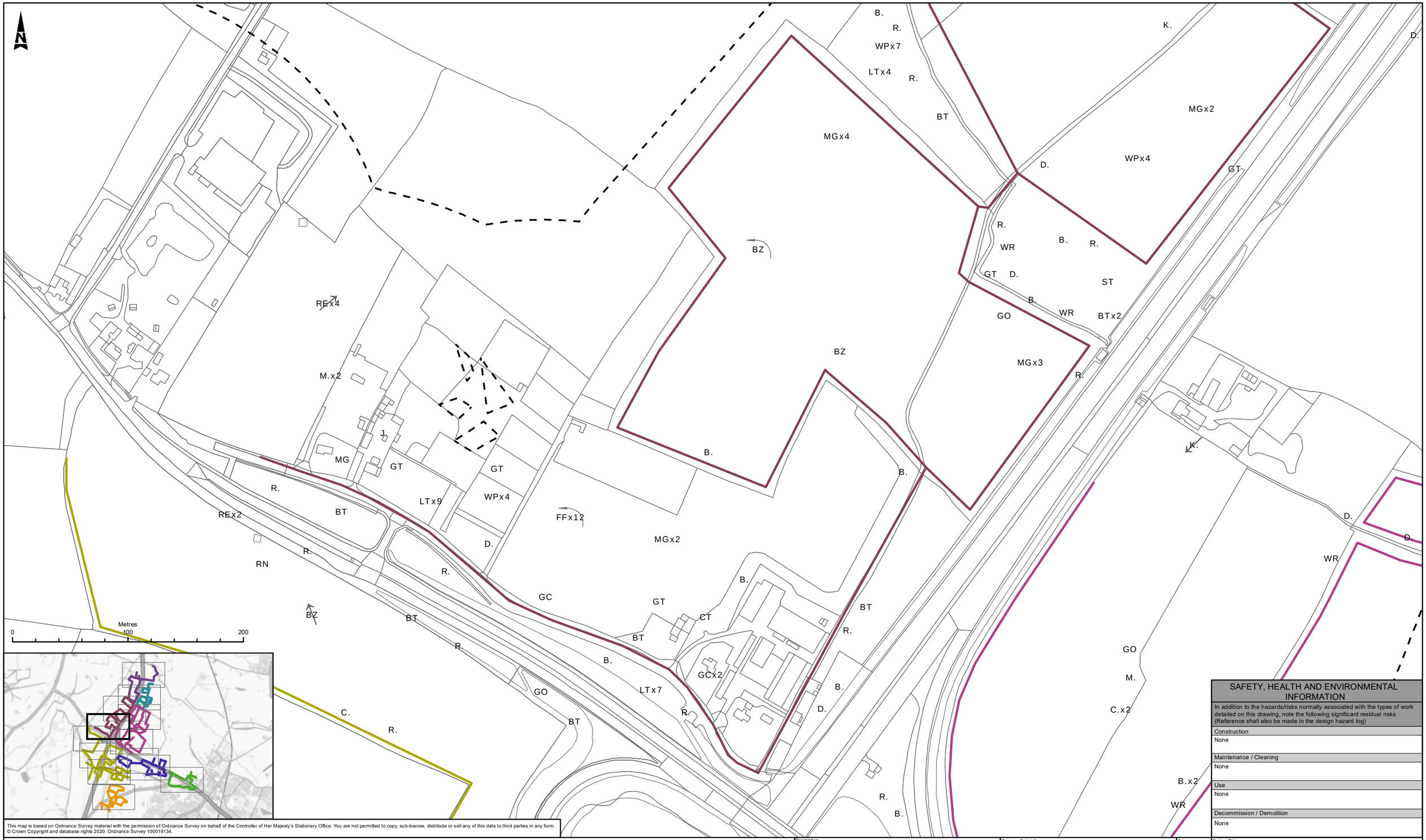
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Client: Gloucestershire County Council

Drawing Number: Project | Originator | Volume
GCCM5J10 - ATK - EBD
XX - GS - GI - 000021
Location | Type | Number

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LEGEND

- 250M STUDY AREA
- TRANSECT 2
- TRANSECT 3
- TRANSECT 4
- TRANSECT 5
- TRANSECT 6
- TRANSECT 7
- TRANSECT 8
- TRANSECT 9

BEHAVIOURS

- FORAGING IN FLIGHT
- FLYING

SPECIES (BTO CODES)

B.	BLACKBIRD	BZ	BUZZARD	GC	GOLDCREST	J.	JAY	MG	MAGPIE	SD	STOCK DOVE
BT	BLUE TIT	C.	CARRION CROW	GL	GREY WAGTAIL	JD	JACKDAW	MP	MEADOW PIPIT	SG	STARLING
BH	BLACK-HEADED GULL	CD	COLLARED DOVE	GO	GOLDFINCH	K.	KESTREL	PW	PIED WAGTAIL	SH	SPARROWHAWK
		CH	CHAFFINCH	GS	GREAT SPOTTED WOODPECKER	LB	LESSER BLACK-BACKED GULL	PH	PHEASANT	ST	SONG THRUSH
		CT	COAL TIT	GT	GREAT TIT			R.	ROBIN	WP	WOOD PIGEON
		D.	DUNNOCK	HG	HERRING GULL	LT	LONG-TAILED TIT	RE	REDWING	WR	WREN
		FF	FIELDFARE	HS	HOUSE SPARROW	M.	MISTLE THRUSH	RO	ROOK	Y.	YELLOWHAMMER
		G.	GREEN WOODPECKER			MA	MALLARD	S.	SKYLARK		

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log)

Construction
None

Maintenance / Cleaning
None

Use
None

Decommission / Demolition
None

Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
FOR INFORMATION	S2	C01	SD	LH	--	--	08/10/21

Drawing Suitability: FOR INFORMATION
Status: S2

Project Title: M5 Junction 10 Improvement

Drawing Title: FIGURE 7.9C
WINTERING BIRD SURVEY RESULTS
NOVEMBER 2019

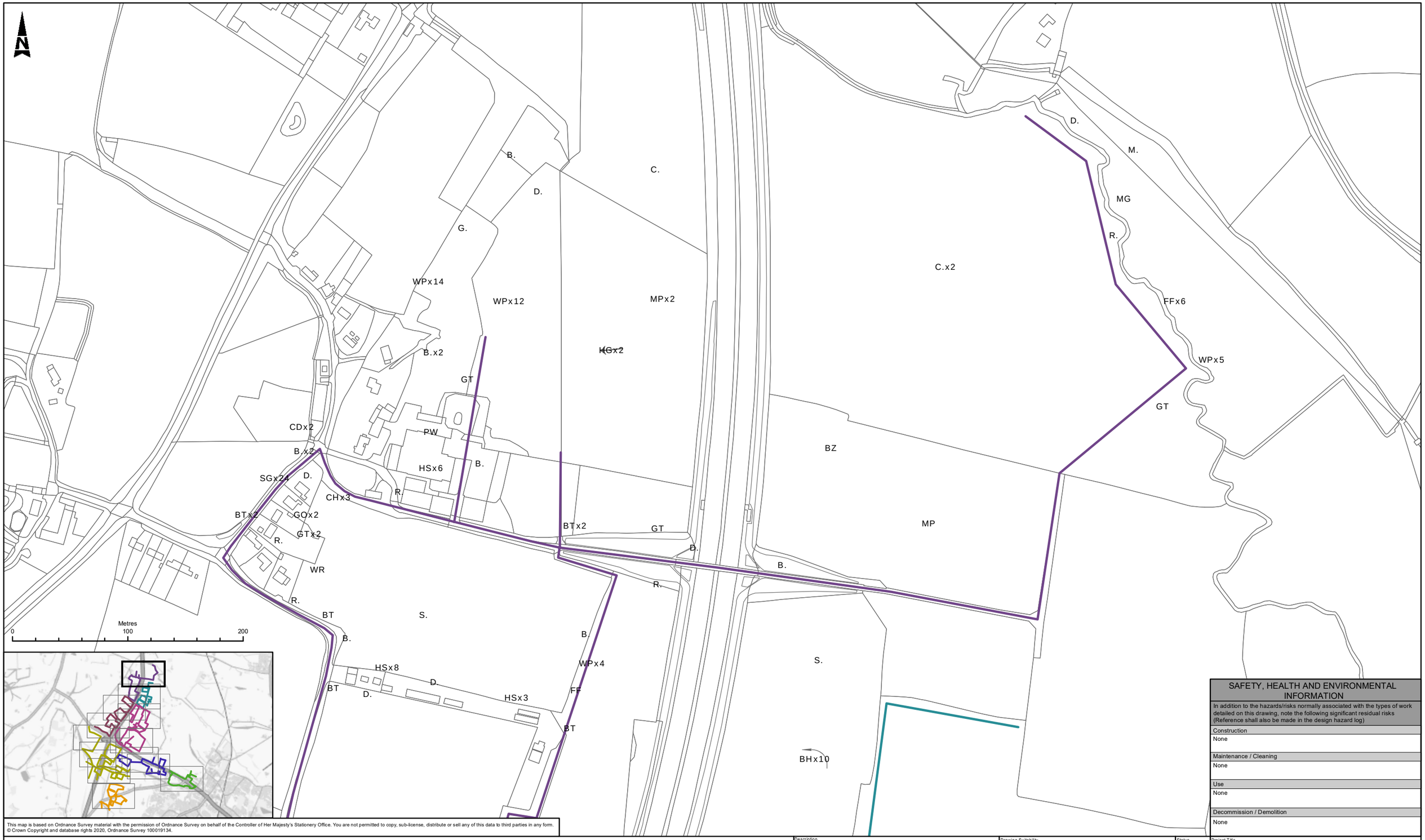
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LEGEND

- 250M STUDY AREA
- TRANSECT 2
- TRANSECT 3
- TRANSECT 4
- TRANSECT 5
- TRANSECT 6
- TRANSECT 7
- TRANSECT 8
- TRANSECT 9

BEHAVIOURS

- FORAGING IN FLIGHT
- FLYING

SPECIES (BTO CODES)

B.	BLACKBIRD	BZ	BUZZARD	G.	GREEN WOODPECKER	HS	HOUSE SPARROW	MA	MALLARD	S.	SKYLARK
BT	BLUE TIT	C.	CARRION CROW	GC	GOLDCREST	J.	JAY	MG	MAGPIE	SD	STOCK DOVE
BH	BLACK-HEADED GULL	CD	COLLARED DOVE	GL	GREY WAGTAIL	JD	JACKDAW	MP	MEADOW PIPIT	SG	STARLING
		CH	CHAFFINCH	GO	GOLDFINCH	K.	KESTREL	PW	PIED WAGTAIL	SH	SPARROWHAWK
		CT	COAL TIT	GS	GREAT SPOTTED WOODPECKER	LB	LESSER BLACK-BACKED GULL	PH	PHEASANT	ST	SONG THRUSH
		D.	DUNNOCK	GT	GREAT TIT	LT	LONG-TAILED TIT	R.	ROBIN	WP	WOOD PIGEON
		FF	FIELDFARE	HG	HERRING GULL	M.	MISTLE THRUSH	RE	REDWING	WR	WREN
								RO	ROOK	Y.	YELLOWHAM...

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log)

Construction
None

Maintenance / Cleaning
None

Use
None

Decommission / Demolition
None

Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
PUBLISHED	A1	P01	SD	LH	CC	MT	19/09/21

Drawing Suitability: PUBLISHED
Status: A1

Project Title: M5 Junction 10 Improvement

Drawing Title: FIGURE 7.9D
WINTERING BIRD SURVEY RESULTS
DECEMBER 2019

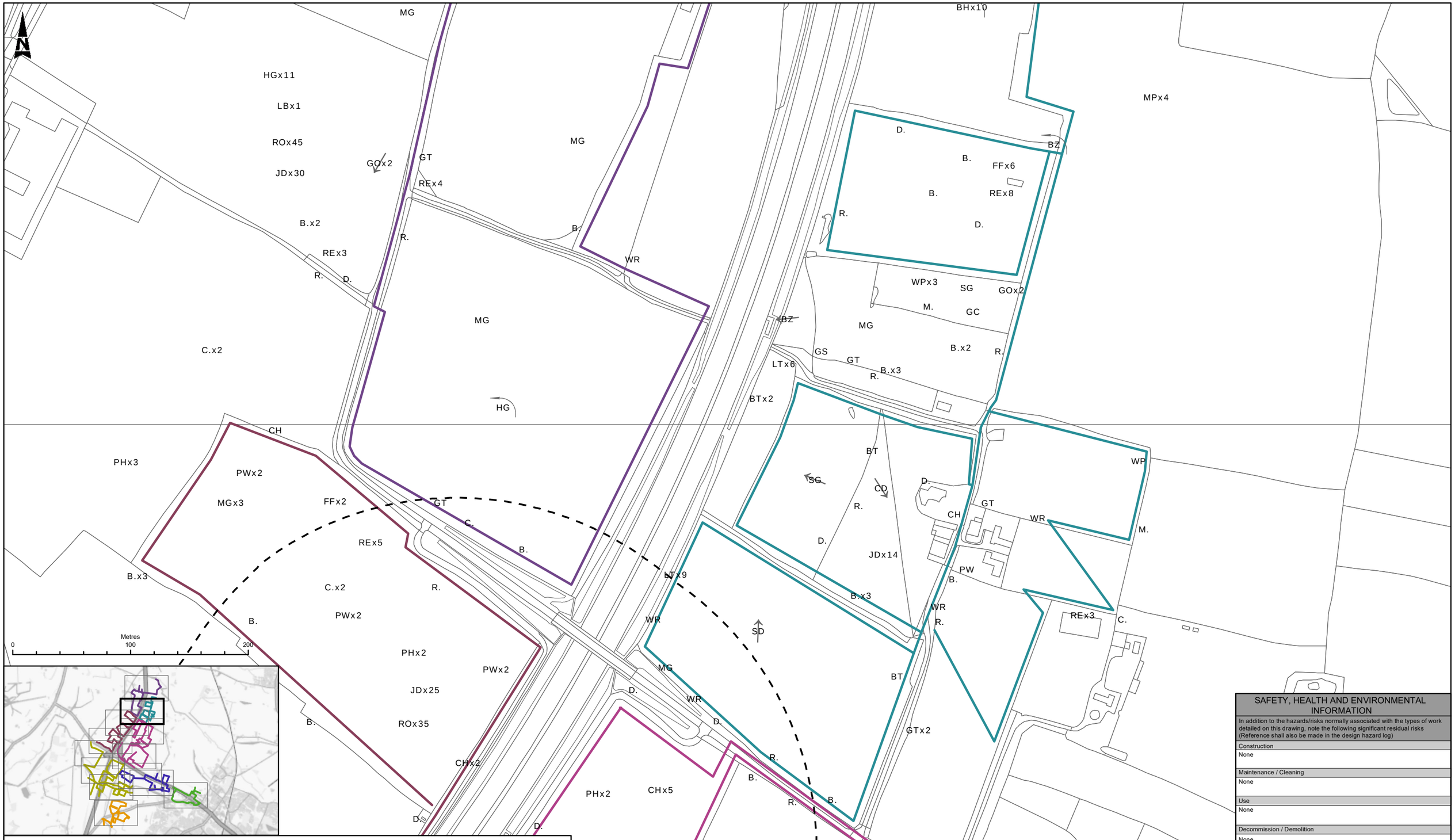
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Drawing Number: Project | Originator | Volume
GCCM5J10 - ATK - EBD
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Location | Type | Number

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A3	1:3,000	5197035	1 of 13	P01



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LEGEND

- 250M STUDY AREA
- TRANSECT 2
- TRANSECT 3
- TRANSECT 4
- TRANSECT 5
- TRANSECT 6
- TRANSECT 7
- TRANSECT 8
- TRANSECT 9

BEHAVIOURS

- FORAGING IN FLIGHT
- FLYING

SPECIES (BTO CODES)

B.	BLACKBIRD
BT	BLUE TIT
BH	BLACK-HEADED GULL
BZ	BUZZARD
C.	CARRION CROW
CD	COLLARED DOVE
CH	CHAFFINCH
CT	COAL TIT
D.	DUNNOCK
FF	FIELDFARE
G.	GREEN WOODPECKER
GC	GOLDCREST
GL	GREY WAGTAIL
GO	GOLDFINCH
GS	GREAT SPOTTED WOODPECKER
GT	GREAT TIT
HG	HERRING GULL
HS	HOUSE SPARROW
J.	JAY
JD	JACKDAW
K.	KESTREL
LB	LESSER BLACK-BACKED GULL
LT	LONG-TAILED TIT
M.	MISTLE THRUSH
MA	MALLARD
MG	MAGPIE
MP	MEADOW PIPIT
PW	PIED WAGTAIL
PH	PHEASANT
R.	ROBIN
RE	REDWING
RO	ROOK
S.	SKYLARK
SD	STOCK DOVE
SG	STARLING
SH	SPARROWHAWK
ST	SONG THRUSH
WP	WOOD PIGEON
WR	WREN
Y.	YELLOWHAM...

Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
PUBLISHED	A1	P01	SD	LH	CC	MT	19/09/21

Drawing Suitability: PUBLISHED
Status: A1

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log)

Construction
None

Maintenance / Cleaning
None

Use
None

Decommission / Demolition
None

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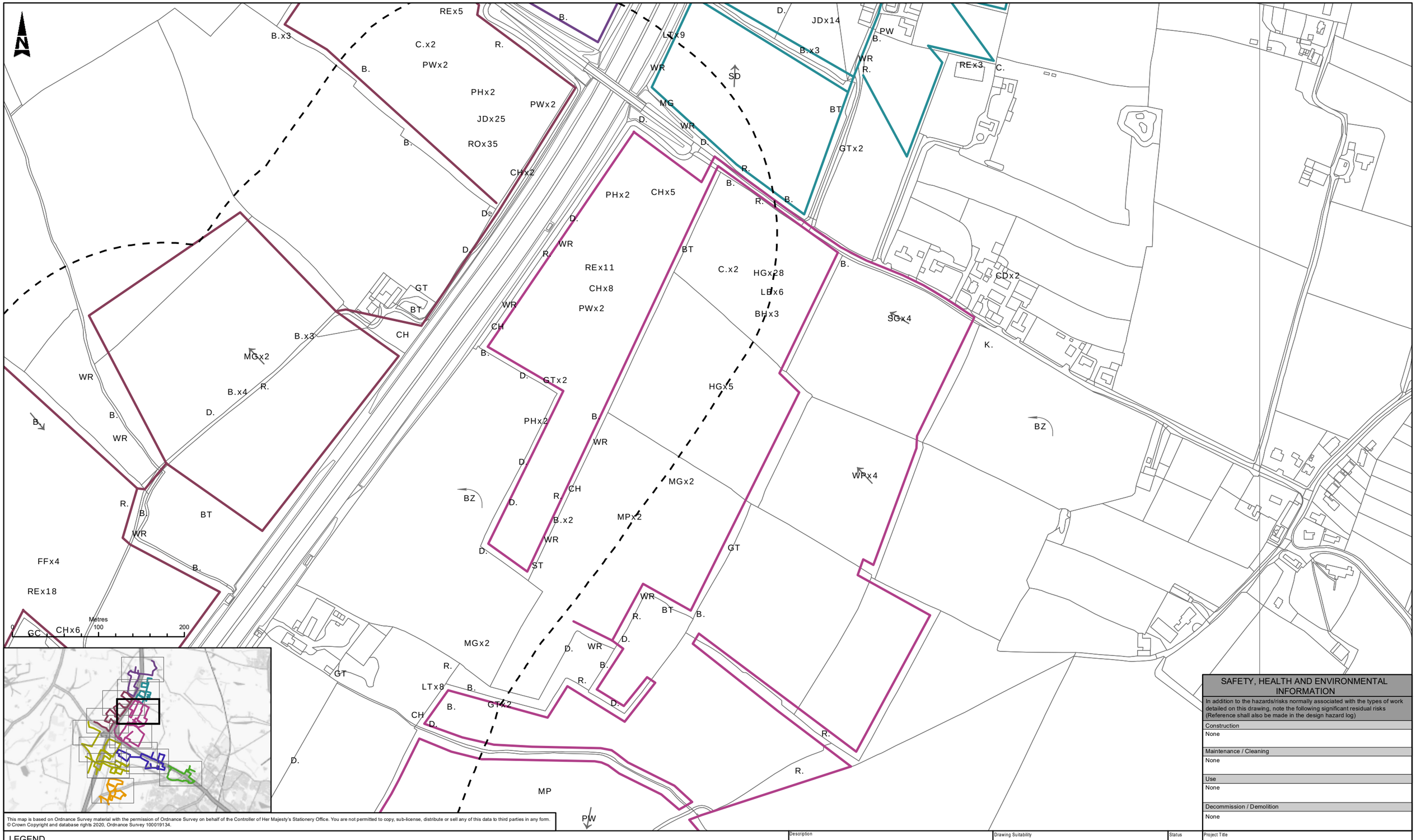
Client: Gloucestershire County Council

Project Title: M5 Junction 10 Improvement

Drawing Title: FIGURE 7.9D
WINTERING BIRD SURVEY RESULTS
DECEMBER 2019

Drawing Number: Project | Originator | Volume
GCCM5J10 - ATK - EBD
XX - GS - GI - 000022
Location | Type | Number

Original Size:	Scale	Project Ref:	Sheet:	Rev:
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LEGEND

- 250M STUDY AREA
- TRANSECT 2
- TRANSECT 3
- TRANSECT 4
- TRANSECT 5
- TRANSECT 6
- TRANSECT 7
- TRANSECT 8
- TRANSECT 9

BEHAVIOURS

- FORAGING IN FLIGHT
- FLYING

SPECIES (BTO CODES)

B.	BLACKBIRD
BT	BLUE TIT
BH	BLACK-HEADED GULL
BZ	BUZZARD
C.	CARRION CROW
CD	COLLARED DOVE
CH	CHAFFINCH
CT	COAL TIT
D.	DUNNOCK
FF	FIELDFARE
G.	GREEN WOODPECKER
GC	GOLDCREST
GL	GREY WAGTAIL
GO	GOLDFINCH
GS	GREAT SPOTTED WOODPECKER
GT	GREAT TIT
HG	HERRING GULL
HS	HOUSE SPARROW
J.	JAY
JD	JACKDAW
K.	KESTREL
LB	LESSER BLACK-BACKED GULL
LT	LONG-TAILED TIT
M.	MISTLE THRUSH
MA	MALLARD
MG	MAGPIE
MP	MEADOW PIPIT
PW	PIED WAGTAIL
PH	PHEASANT
R.	ROBIN
RE	REDWING
RO	ROOK
S.	SKYLARK
SD	STOCK DOVE
SG	STARLING
SH	SPARROWHAWK
ST	SONG THRUSH
WP	WOOD PIGEON
WR	WREN
Y.	YELLOWHAM...

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log)

Construction
None

Maintenance / Cleaning
None

Use
None

Decommission / Demolition
None

Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
PUBLISHED	A1	P01	SD	LH	CC	MT	19/09/21

Drawing Suitability: PUBLISHED
Status: A1

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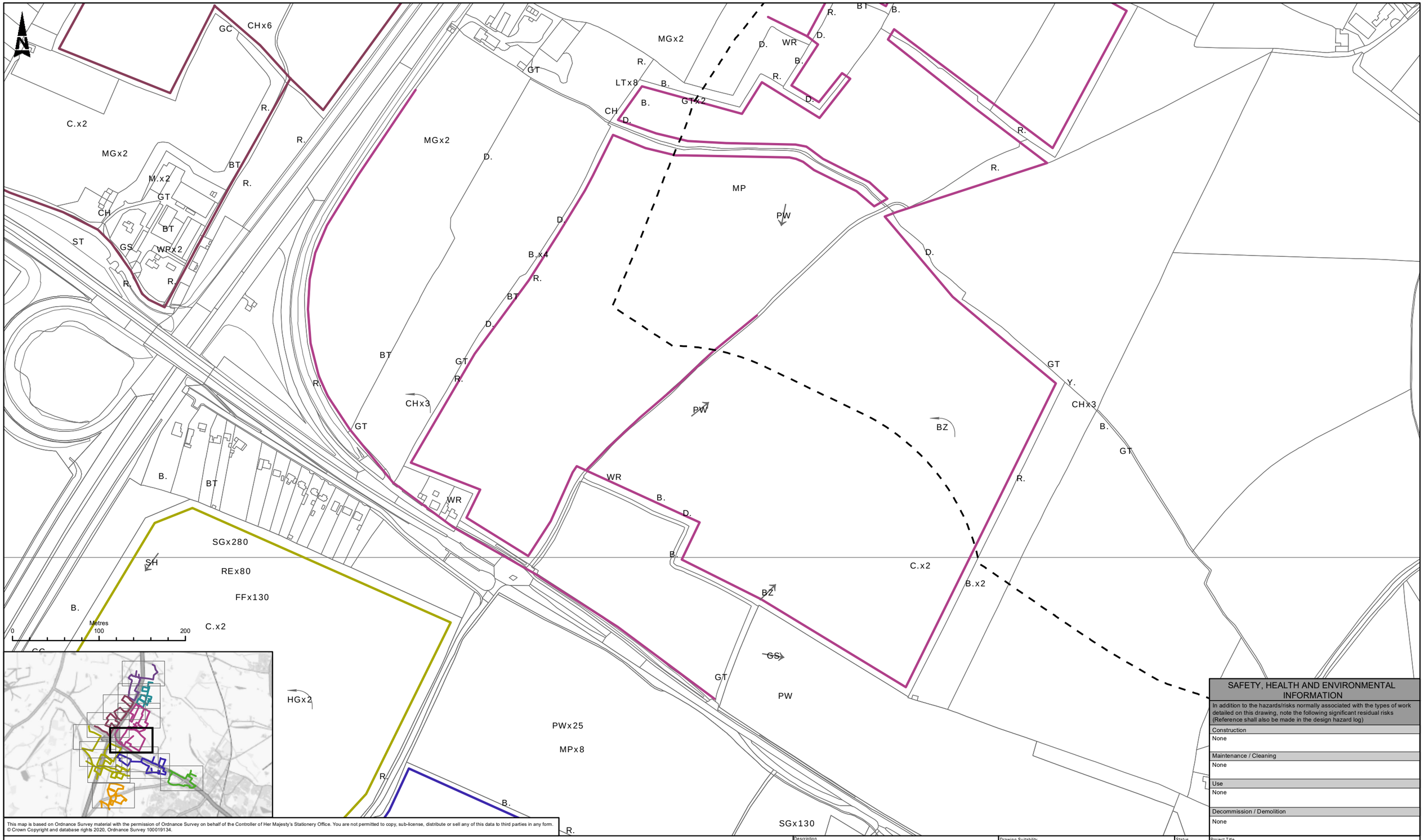
Client: Gloucestershire County Council

Project Title: M5 Junction 10 Improvement

Drawing Title: FIGURE 7.9D
WINTERING BIRD SURVEY RESULTS
DECEMBER 2019

Drawing Number: Project | Originator | Volume
GCCM5J10 - ATK - EBD
XX - GS - GI - 000022
Location | Type | Number

Original Size:	Scale	Project Ref:	Sheet:	Rev:
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LEGEND

- 250M STUDY AREA
- TRANSECT 2
- TRANSECT 3
- TRANSECT 4
- TRANSECT 5
- TRANSECT 6
- TRANSECT 7
- TRANSECT 8
- TRANSECT 9

BEHAVIOURS

- FORAGING IN FLIGHT
- FLYING

SPECIES (BTO CODES)

B.	BLACKBIRD
BT	BLUE TIT
BH	BLACK-HEADED GULL
BZ	BUZZARD
C.	CARRION CROW
CD	COLLARED DOVE
CH	CHAFFINCH
CT	COAL TIT
D.	DUNNOCK
FF	FIELDFARE
G.	GREEN WOODPECKER
GC	GOLDCREST
GL	GREY WAGTAIL
GO	GOLDFINCH
GS	GREAT SPOTTED WOODPECKER
GT	GREAT TIT
HG	HERRING GULL
HS	HOUSE SPARROW
J.	JAY
JD	JACKDAW
K.	KESTREL
LB	LESSER BLACK-BACKED GULL
LT	LONG-TAILED TIT
M.	MISTLE THRUSH
MA	MALLARD
MG	MAGPIE
MP	MEADOW PIPIT
PW	PIED WAGTAIL
PH	PHEASANT
R.	ROBIN
RE	REDWING
RO	ROOK
S.	SKYLARK
SD	STOCK DOVE
SG	STARLING
SH	SPARROWHAWK
ST	SONG THRUSH
WP	WOOD PIGEON
WR	WREN
Y.	YELLOWHAM...

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log)

Construction: None

Maintenance / Cleaning: None

Use: None

Decommission / Demolition: None

Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
PUBLISHED	A1	P01	SD	LH	CC	MT	19/09/21

Drawing Suitability: PUBLISHED — Status: A1

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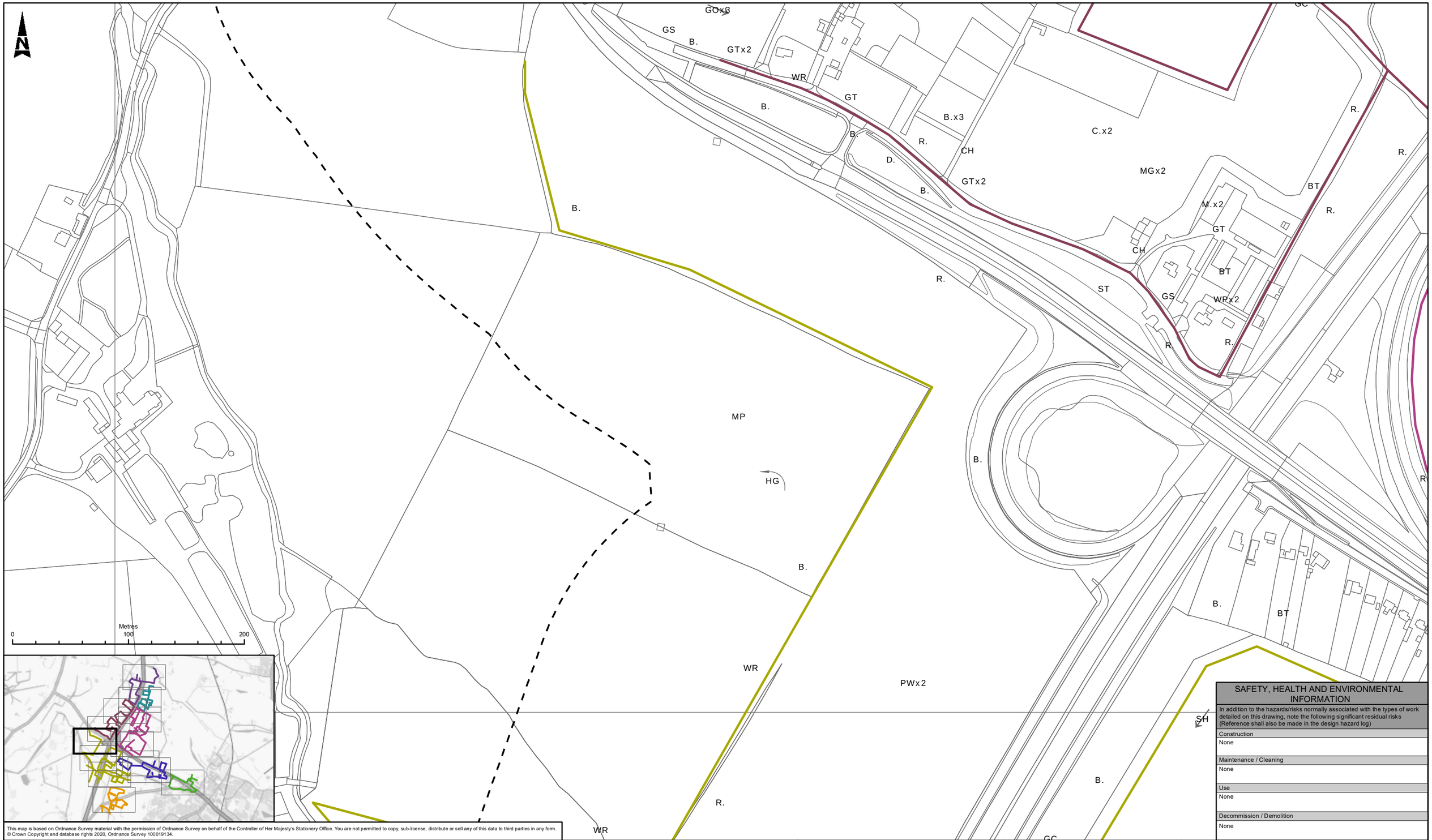
Client: Gloucestershire County Council

Project Title: M5 Junction 10 Improvement

Drawing Title: FIGURE 7.9D
WINTERING BIRD SURVEY RESULTS
DECEMBER 2019

Drawing Number: Project | Originator | Volume
GCCM5J10 - ATK - EBD
XX - GS - GI - 000022
Location | Type | Number

Original Size:	Scale	Project Ref:	Sheet:	Rev:
A3	1:4,000	5197035	4 of 13	P01



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LEGEND

- 250M STUDY AREA
- TRANSECT 2
- TRANSECT 3
- TRANSECT 4
- TRANSECT 5
- TRANSECT 6
- TRANSECT 7
- TRANSECT 8
- TRANSECT 9

BEHAVIOURS

- FORAGING IN FLIGHT
- FLYING

SPECIES (BTO CODES)

B.	BLACKBIRD	BZ	BUZZARD	G.	GREEN WOODPECKER	HS	HOUSE SPARROW	MA	MALLARD
BT	BLUE TIT	C.	CARRION CROW	GC	GOLDCREST	J.	JAY	MG	MAGPIE
BH	BLACK-HEADED GULL	CD	COLLARED DOVE	GL	GREY WAGTAIL	JD	JACKDAW	MP	MEADOW PIPIT
		CH	CHAFFINCH	GO	GOLDFINCH	K.	KESTREL	PW	PIED WAGTAIL
		CT	COAL TIT	GS	GREAT SPOTTED WOODPECKER	LB	LESSER BLACK-BACKED GULL	PH	PHEASANT
		D.	DUNNOCK	GT	GREAT TIT	LT	LONG-TAILED TIT	R.	ROBIN
		FF	FIELDFARE	HG	HERRING GULL	M.	MISTLE THRUSH	RE	REDWING
								RO	ROOK

S.	SKYLARK					
SD	STOCK DOVE					
SG	STARLING					
SH	SPARROWHAWK					
ST	SONG THRUSH					
WP	WOOD PIGEON					
WR	WREN					
Y.	YELLOWHAM...					

Description

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date

Description

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date

Description

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date

Description

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date

Description

PUBLISHED

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
A1	P01	SD	LH	CC	MT	19/09/21

Drawing Suitability: PUBLISHED

Status: A1

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log)

Construction
None

Maintenance / Cleaning
None

Use
None

Decommission / Demolition
None

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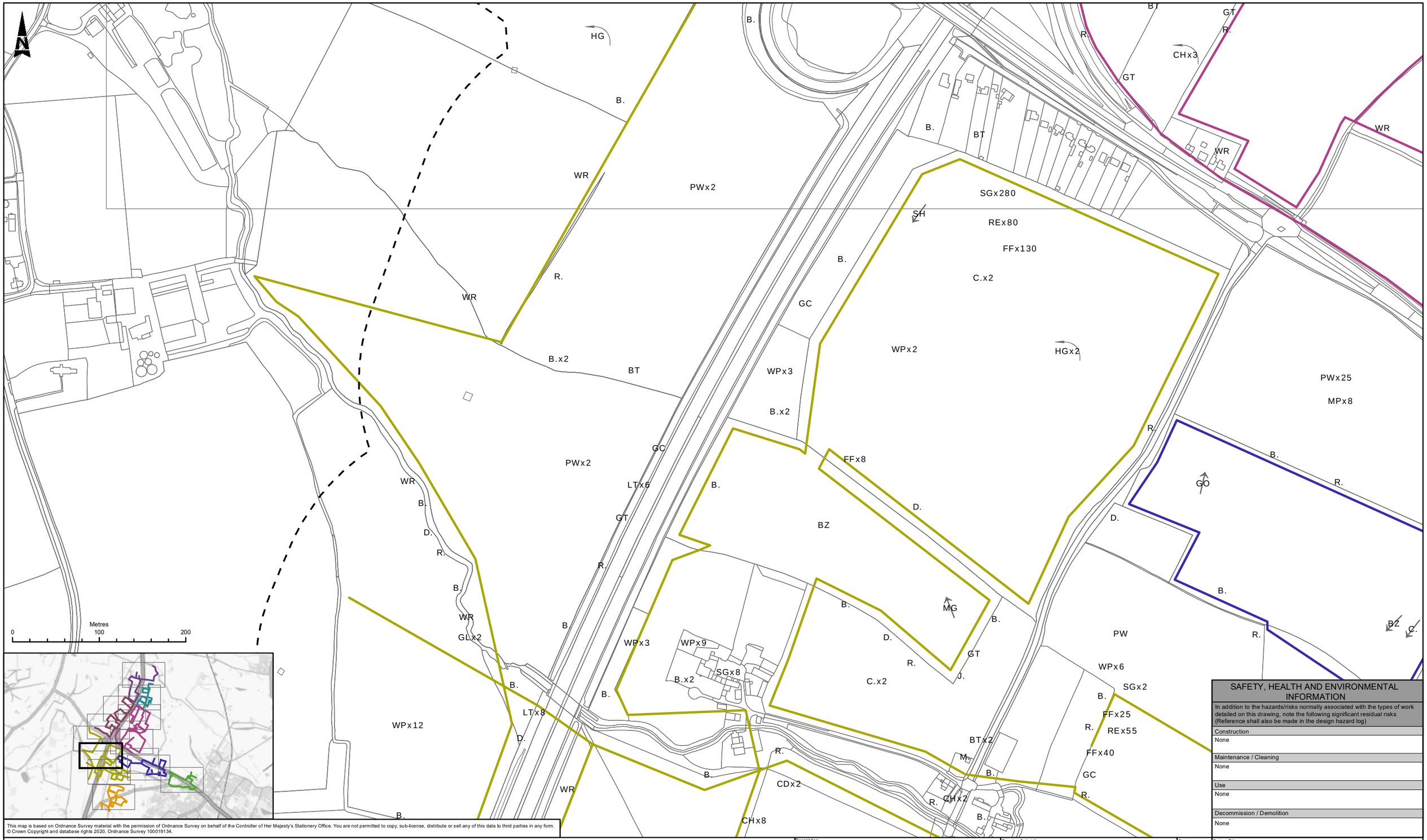
Client: Gloucestershire COUNTY COUNCIL

Project Title: M5 Junction 10 Improvement

Drawing Title: FIGURE 7.9D
WINTERING BIRD SURVEY RESULTS
DECEMBER 2019

Drawing Number: Project | Originator | Volume
GCCM5J10 - ATK - EBD
XX - GS - GI - 000022
Location | Type | Number

Original Size:	Scale	Project Ref:	Sheet:	Rev:
A3	1:3,000	5197035	5 of 13	P01



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LEGEND

- 250M STUDY AREA
- TRANSECT 2
- TRANSECT 3
- TRANSECT 4
- TRANSECT 5
- TRANSECT 6
- TRANSECT 7
- TRANSECT 8
- TRANSECT 9

BEHAVIOURS

- FORAGING IN FLIGHT
- FLYING

SPECIES (BTO CODES)

B.	BLACKBIRD
BT	BLUE TIT
BH	BLACK-HEADED GULL
BZ	BUZZARD
C.	CARRION CROW
CD	COLLARED DOVE
CH	CHAFFINCH
CT	COAL TIT
D.	DUNNOCK
FF	FIELDFARE
G.	GREEN WOODPECKER
GC	GOLDCREST
GL	GREY WAGTAIL
GO	GOLDFINCH
GS	GREAT SPOTTED WOODPECKER
GT	GREAT TIT
HG	HERRING GULL
HS	HOUSE SPARROW
J.	JAY
JD	JACKDAW
K.	KESTREL
LB	LESSER BLACK-BACKED GULL
LT	LONG-TAILED TIT
M.	MISTLE THRUSH
MA	MALLARD
MG	MAGPIE
MP	MEADOW PIPIT
PW	PIED WAGTAIL
PH	PHEASANT
R.	ROBIN
RE	REDWING
RO	ROOK
S.	SKYLARK
SD	STOCK DOVE
SG	STARLING
SH	SPARROWHAWK
ST	SONG THRUSH
WP	WOOD PIGEON
WR	WREN
Y.	YELLOWHAM...

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log)

Construction
None

Maintenance / Cleaning
None

Use
None

Decommission / Demolition
None

Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
PUBLISHED	A1	P01	SD	LH	CC	MT	19/09/21

Drawing Suitability: PUBLISHED
Status: A1

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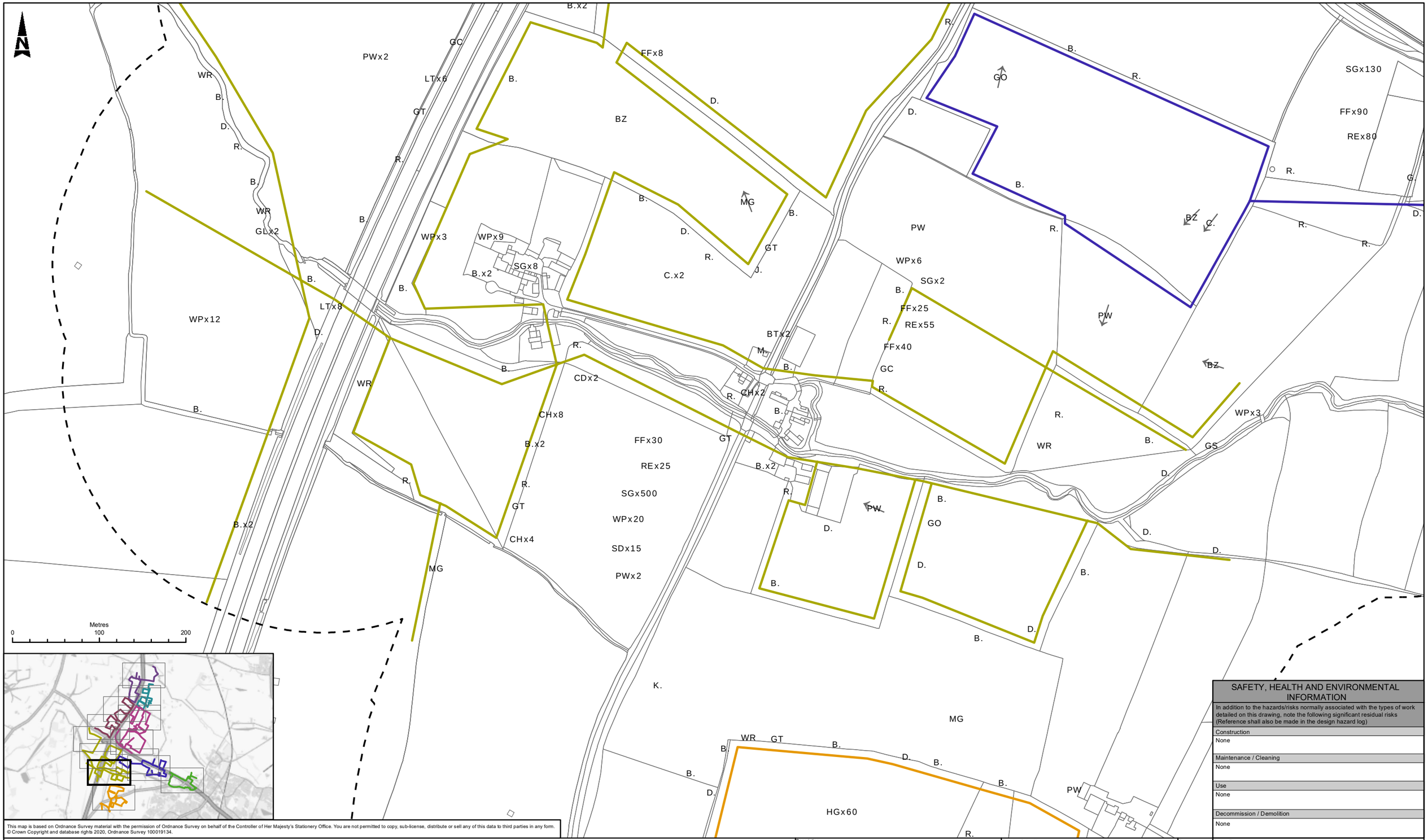
Client: Gloucestershire County Council

Project Title: M5 Junction 10 Improvement

Drawing Title: FIGURE 7.9D
WINTERING BIRD SURVEY RESULTS
DECEMBER 2019

Drawing Number: GCCM5J10 - ATK - EBD - XX - GS - GI - 000022

Original Size: A3 | Scale: 1:4,000 | Project Ref: 5197035 | Sheet: 6 of 13 | Rev: P01



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LEGEND

- 250M STUDY AREA
- TRANSECT 2
- TRANSECT 3
- TRANSECT 4
- TRANSECT 5
- TRANSECT 6
- TRANSECT 7
- TRANSECT 8
- TRANSECT 9

BEHAVIOURS

- FORAGING IN FLIGHT
- FLYING

SPECIES (BTO CODES)

B.	BLACKBIRD
BT	BLUE TIT
BH	BLACK-HEADED GULL
BZ	BUZZARD
C.	CARRION CROW
CD	COLLARED DOVE
CH	CHAFFINCH
CT	COAL TIT
D.	DUNNOCK
FF	FIELDFARE
G.	GREEN WOODPECKER
GC	GOLDCREST
GL	GREY WAGTAIL
GO	GOLDFINCH
GS	GREAT SPOTTED WOODPECKER
GT	GREAT TIT
HG	HERRING GULL
HS	HOUSE SPARROW
J.	JAY
JD	JACKDAW
K.	KESTREL
LB	LESSER BLACK-BACKED GULL
LT	LONG-TAILED TIT
M.	MISTLE THRUSH
MA	MALLARD
MG	MAGPIE
MP	MEADOW PIPIT
PW	PIED WAGTAIL
PH	PHEASANT
R.	ROBIN
RE	REDWING
RO	ROOK
S.	SKYLARK
SD	STOCK DOVE
SG	STARLING
SH	SPARROWHAWK
ST	SONG THRUSH
WP	WOOD PIGEON
WR	WREN
Y.	YELLOWHAM...

Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
PUBLISHED	A1	P01	SD	LH	CC	MT	19/09/21

Drawing Suitability: PUBLISHED

Status: A1

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log)

Construction
None

Maintenance / Cleaning
None

Use
None

Decommission / Demolition
None

Project Title: M5 Junction 10 Improvement

Drawing Title: FIGURE 7.9D
WINTERING BIRD SURVEY RESULTS
DECEMBER 2019

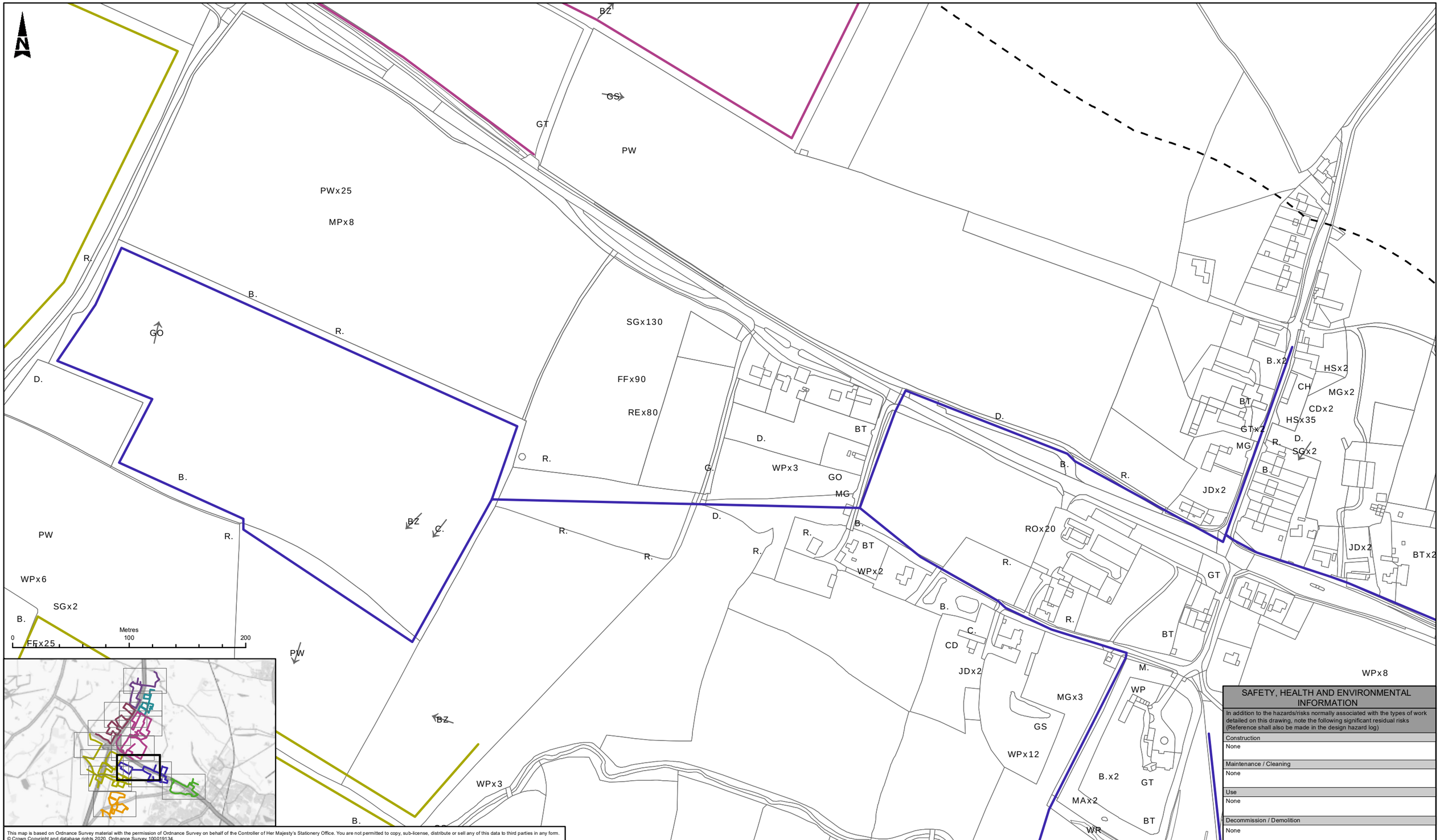
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Drawing Number: GCCM5J10 - ATK - EBD - XX - GS - GI - 000022

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A3		1:4,000	5197035	7 of 13		P01



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LEGEND

- 250M STUDY AREA
- TRANSECT 2
- TRANSECT 3
- TRANSECT 4
- TRANSECT 5
- TRANSECT 6
- TRANSECT 7
- TRANSECT 8
- TRANSECT 9

BEHAVIOURS

- FORAGING IN FLIGHT
- FLYING

SPECIES (BTO CODES)

B.	BLACKBIRD	BZ	BUZZARD	G.	GREEN WOODPECKER	HS	HOUSE SPARROW	MA	MALLARD	S.	SKYLARK
BT	BLUE TIT	C.	CARRION CROW	GC	GOLDCREST	J.	JAY	MG	MAGPIE	SD	STOCK DOVE
BH	BLACK-HEADED GULL	CD	COLLARED DOVE	GL	GREY WAGTAIL	JD	JACKDAW	MP	MEADOW PIPIT	SG	STARLING
		CH	CHAFFINCH	GO	GOLDFINCH	K.	KESTREL	PW	PIED WAGTAIL	SH	SPARROWHAWK
		CT	COAL TIT	GS	GREAT SPOTTED WOODPECKER	LB	LESSER BLACK-BACKED GULL	PH	PHEASANT	ST	SONG THRUSH
		D.	DUNNOCK	GT	GREAT TIT	LT	LONG-TAILED TIT	R.	ROBIN	WP	WOOD PIGEON
		FF	FIELDFARE	HG	HERRING GULL	M.	MISTLE THRUSH	RE	REDWING	WR	WREN
								RO	ROOK	Y.	YELLOWHAM...

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log)

Construction
None

Maintenance / Cleaning
None

Use
None

Decommission / Demolition
None

Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
	PUBLISHED	P01	SD	LH	CC	MT	19/09/21

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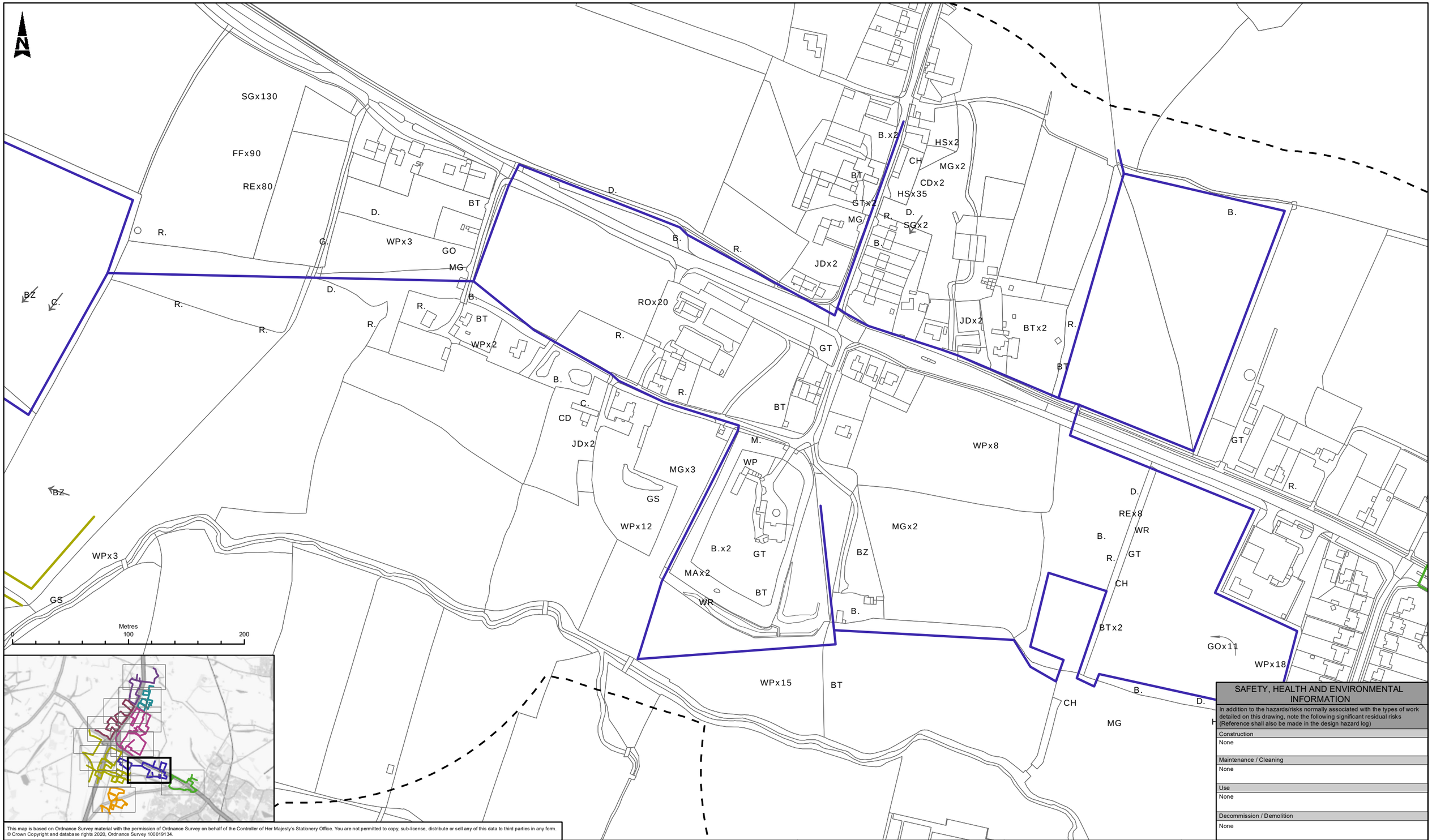
Client: Gloucestershire County Council

Project Title: M5 Junction 10 Improvement

Drawing Title: FIGURE 7.9D
WINTERING BIRD SURVEY RESULTS
DECEMBER 2019

Drawing Number: Project | Originator | Volume
GCCM5J10 - ATK - EBD
XX - GS - GI - 000022
Location | Type | Number

Original Size:	Scale	Project Ref:	Sheet:	Rev:
A3	1:3,000	5197035	8 of 13	P01



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LEGEND

- 250M STUDY AREA
- TRANSECT 2
- TRANSECT 3
- TRANSECT 4
- TRANSECT 5
- TRANSECT 6
- TRANSECT 7
- TRANSECT 8
- TRANSECT 9

BEHAVIOURS

- FORAGING IN FLIGHT
- FLYING

SPECIES (BTO CODES)

B.	BLACKBIRD	BZ	BUZZARD	G.	GREEN WOODPECKER	HS	HOUSE SPARROW	MA	MALLARD	S.	SKYLARK
BT	BLUE TIT	C.	CARRION CROW	GC	GOLDCREST	J.	JAY	MG	MAGPIE	SD	STOCK DOVE
BH	BLACK-HEADED GULL	CD	COLLARED DOVE	GL	GREY WAGTAIL	JD	JACKDAW	MP	MEADOW PIPIT	SG	STARLING
		CH	CHAFFINCH	GO	GOLDFINCH	K.	KESTREL	PW	PIED WAGTAIL	SH	SPARROWHAWK
		CT	COAL TIT	GS	GREAT SPOTTED WOODPECKER	LB	LESSER BLACK-BACKED GULL	PH	PHEASANT	ST	SONG THRUSH
		D.	DUNNOCK	GT	GREAT TIT	LT	LONG-TAILED TIT	R.	ROBIN	WP	WOOD PIGEON
		FF	FIELDFARE	HG	HERRING GULL	M.	MISTLE THRUSH	RE	REDWING	WR	WREN
								RO	ROOK	Y.	YELLOWHAM...

Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
PUBLISHED	A1	P01	SD	LH	CC	MT	19/09/21

Drawing Suitability: PUBLISHED
Status: A1

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Client: Gloucestershire COUNTY COUNCIL

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log)

Construction
None

Maintenance / Cleaning
None

Use
None

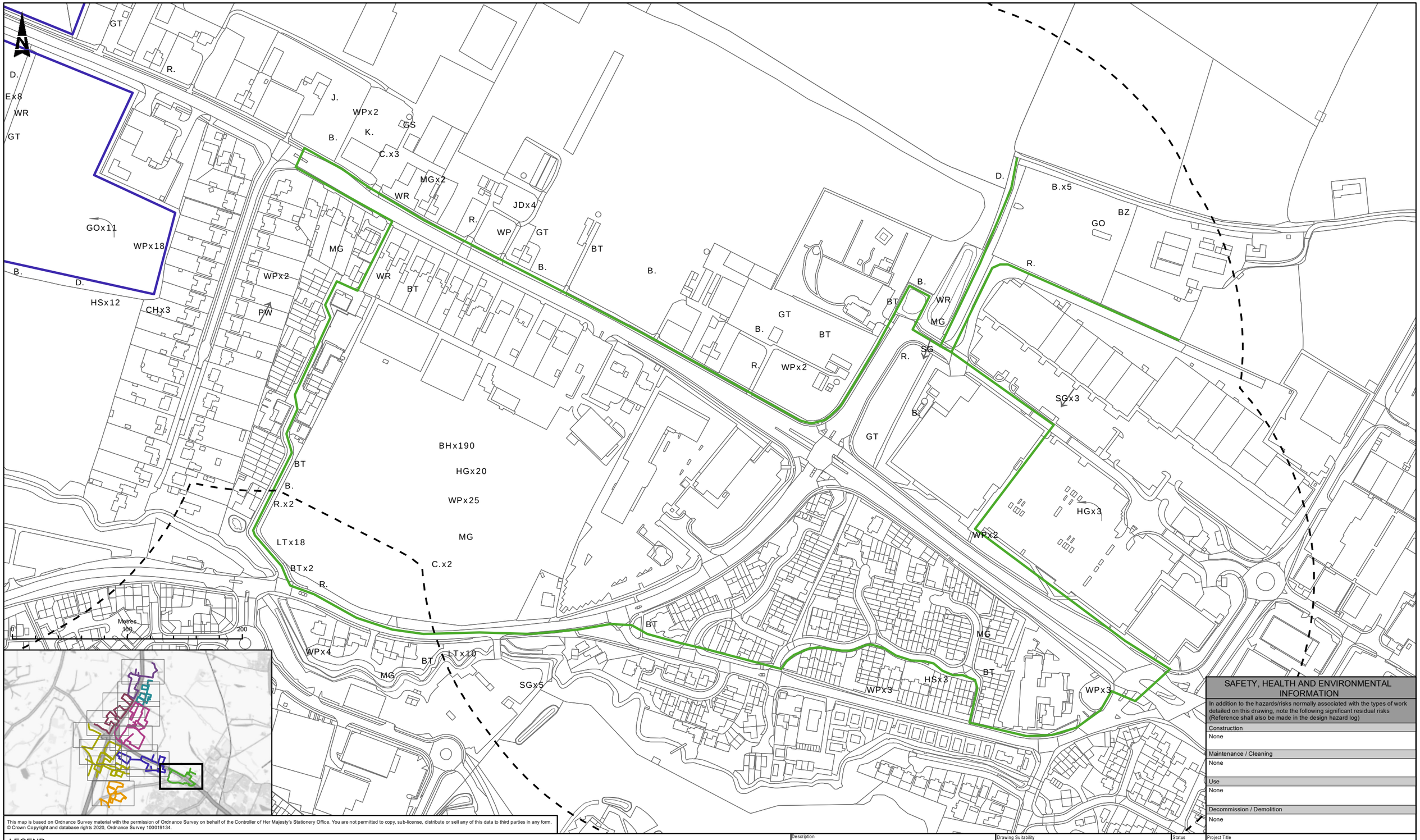
Decommission / Demolition
None

Project Title: M5 Junction 10 Improvement

Drawing Title: FIGURE 7.9D
WINTERING BIRD SURVEY RESULTS
DECEMBER 2019

Drawing Number: Project | Originator | Volume
GCCM5J10 - ATK - EBD
XX - GS - GI - 000022
Location | Type | Number

Original Size:	Scale	Project Ref:	Sheet:	Rev:
A3	1:3,000	5197035	9 of 13	P01



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LEGEND

- 250M STUDY AREA
- TRANSECT 2
- TRANSECT 3
- TRANSECT 4
- TRANSECT 5
- TRANSECT 6
- TRANSECT 7
- TRANSECT 8
- TRANSECT 9

BEHAVIOURS

- FORAGING IN FLIGHT
- FLYING

SPECIES (BTO CODES)

B.	BLACKBIRD	BZ	BUZZARD	G.	GREEN WOODPECKER	HS	HOUSE SPARROW
BT	BLUE TIT	C.	CARRION CROW	GC	GOLDCREST	J.	JAY
BH	BLACK-HEADED GULL	CD	COLLARED DOVE	GL	GREY WAGTAIL	JD	JACKDAW
		CH	CHAFFINCH	GO	GOLDFINCH	K.	KESTREL
		CT	COAL TIT	GS	GREAT SPOTTED WOODPECKER	LB	LESSER BLACK-BACKED GULL
		D.	DUNNOCK	GT	GREAT TIT	LT	LONG-TAILED TIT
		FF	FIELDFARE	HG	HERRING GULL	M.	MISTLE THRUSH

MA	MALLARD	S.	SKYLARK
MG	MAGPIE	SD	STOCK DOVE
MP	MEADOW PIPIT	SG	STARLING
PW	PIED WAGTAIL	SH	SPARROWHAWK
PH	PHEASANT	ST	SONG THRUSH
R.	ROBIN	WP	WOOD PIGEON
RE	REDWING	WR	WREN
RO	ROOK	Y.	YELLOWHAM...

Description

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
PUBLISHED						
A1	P01	SD	LH	CC	MT	19/09/21

Drawing Suitability: PUBLISHED

Status: A1

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log)

Construction
None

Maintenance / Cleaning
None

Use
None

Decommission / Demolition
None

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Client: Gloucestershire County Council

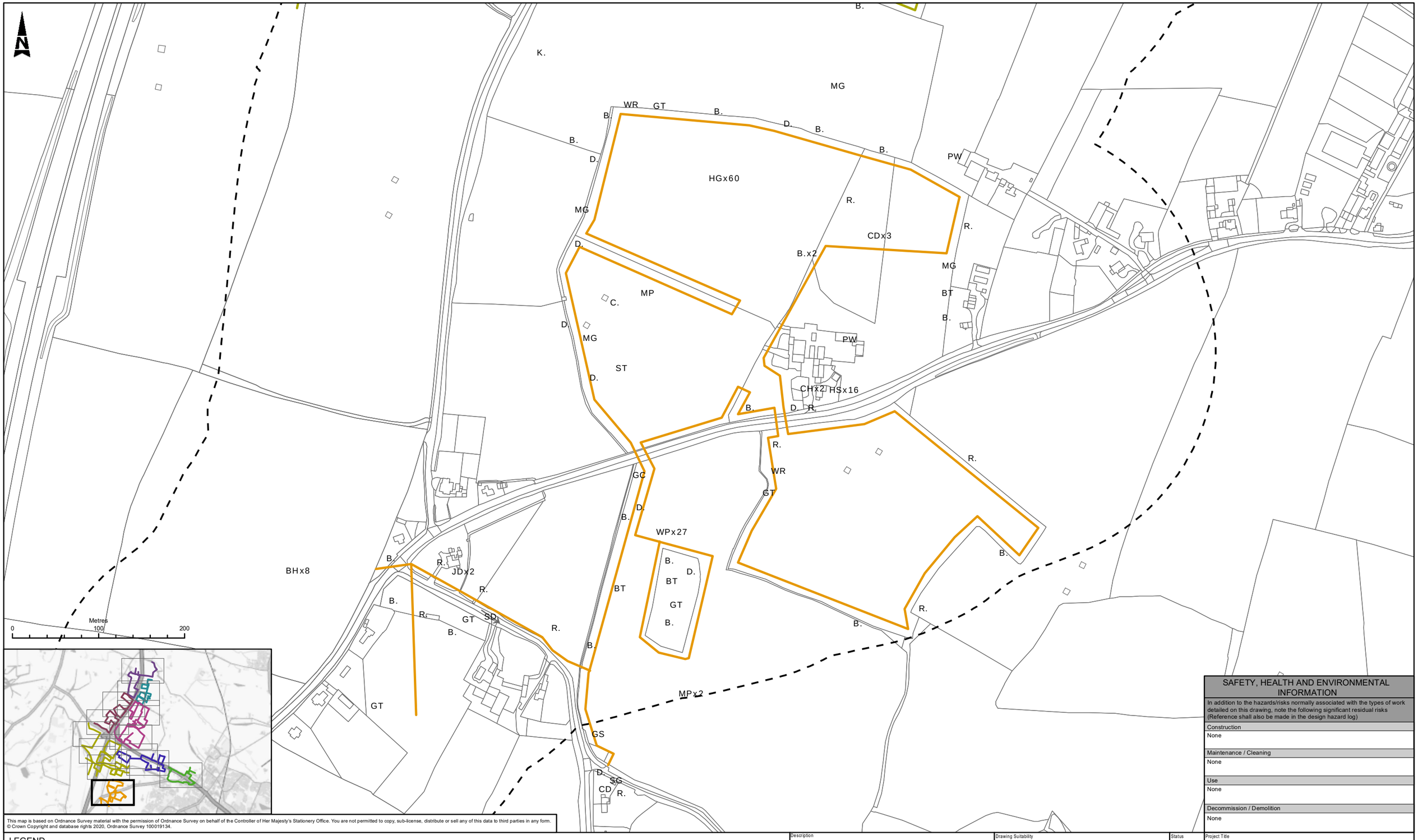
Project Title: M5 Junction 10 Improvement

Drawing Title: FIGURE 7.9D
WINTERING BIRD SURVEY RESULTS
DECEMBER 2019

Drawing Number: GCCM5J10 - ATK - EBD - XX - GS - GI - 000022

Project | Originator | Volume | Location | Type | Number

Original Size:	Scale	Project Ref:	Sheet:	Rev:
A3	1:3,000	5197035	10 of 13	P01



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LEGEND

- 250M STUDY AREA
- TRANSECT 2
- TRANSECT 3
- TRANSECT 4
- TRANSECT 5
- TRANSECT 6
- TRANSECT 7
- TRANSECT 8
- TRANSECT 9

BEHAVIOURS

- FORAGING IN FLIGHT
- FLYING

SPECIES (BTO CODES)

B.	BLACKBIRD
BT	BLUE TIT
BH	BLACK-HEADED GULL
BZ	BUZZARD
C.	CARRION CROW
CD	COLLARED DOVE
CH	CHAFFINCH
CT	COAL TIT
D.	DUNNOCK
FF	FIELDFARE
G.	GREEN WOODPECKER
GC	GOLDCREST
GL	GREY WAGTAIL
GO	GOLDFINCH
GS	GREAT SPOTTED WOODPECKER
GT	GREAT TIT
HG	HERRING GULL
HS	HOUSE SPARROW
J.	JAY
JD	JACKDAW
K.	KESTREL
LB	LESSER BLACK-BACKED GULL
LT	LONG-TAILED TIT
M.	MISTLE THRUSH
MA	MALLARD
MG	MAGPIE
MP	MEADOW PIPIT
PW	PIED WAGTAIL
PH	PHEASANT
R.	ROBIN
RE	REDWING
RO	ROOK
S.	SKYLARK
SD	STOCK DOVE
SG	STARLING
SH	SPARROWHAWK
ST	SONG THRUSH
WP	WOOD PIGEON
WR	WREN
Y.	YELLOWHAM...

Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
PUBLISHED	A1	P01	SD	LH	CC	MT	19/09/21

Drawing Suitability: PUBLISHED

Status: A1

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Client: Gloucestershire County Council

Project Title: M5 Junction 10 Improvement

Drawing Title: FIGURE 7.9D
WINTERING BIRD SURVEY RESULTS
DECEMBER 2019

Drawing Number: Project | Originator | Volume
GCCM5J10 - ATK - EBD
Location | Type | Role | Number
XX - GS - GI - 000022

Original Size:	Scale	Project Ref:	Sheet:	Rev:
A3	1:4,000	5197035	11 of 13	P01

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

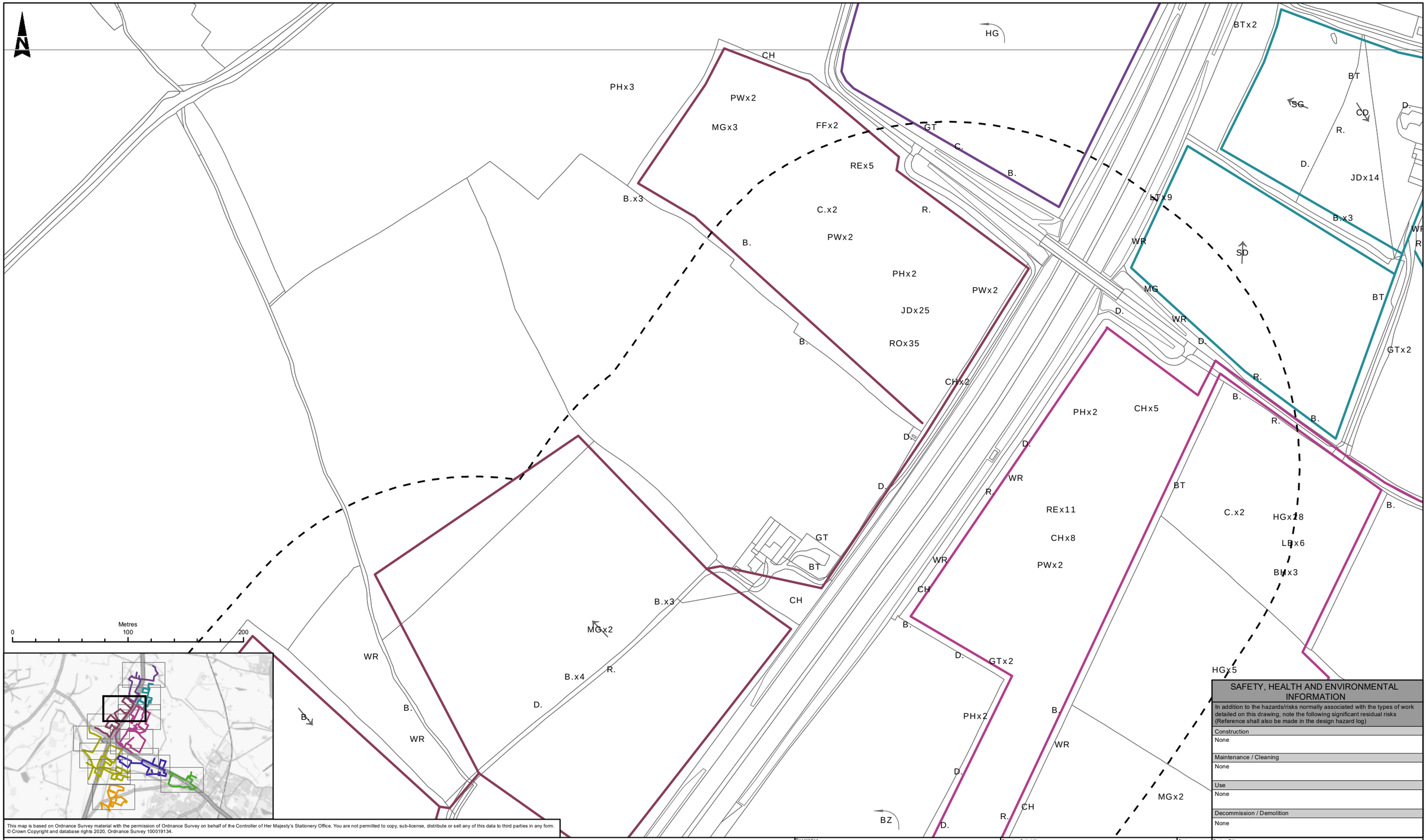
In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log)

Construction
None

Maintenance / Cleaning
None

Use
None

Decommission / Demolition
None



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LEGEND

- 250M STUDY AREA
- TRANSECT 2
- TRANSECT 3
- TRANSECT 4
- TRANSECT 5
- TRANSECT 6
- TRANSECT 7
- TRANSECT 8
- TRANSECT 9

BEHAVIOURS

- FORAGING IN FLIGHT
- FLYING

SPECIES (BTO CODES)

B.	BLACKBIRD	BZ	BUZZARD	G.	GREEN WOODPECKER	HS	HOUSE SPARROW	MA	MALLARD	S.	SKYLARK
BT	BLUE TIT	C.	CARRION CROW	GC	GOLDCREST	J.	JAY	MG	MAGPIE	SD	STOCK DOVE
BH	BLACK-HEADED GULL	CD	COLLARED DOVE	GL	GREY WAGTAIL	JD	JACKDAW	MP	MEADOW PIPIT	SG	STARLING
		CH	CHAFFINCH	GO	GOLDFINCH	K.	KESTREL	PW	PIED WAGTAIL	SH	SPARROWHAWK
		CT	COAL TIT	GS	GREAT SPOTTED WOODPECKER	LB	LESSER BLACK-BACKED GULL	PH	PHEASANT	ST	SONG THRUSH
		D.	DUNNOCK	GT	GREAT TIT	LT	LONG-TAILED TIT	R.	ROBIN	WP	WOOD PIGEON
		FF	FIELDFARE	HG	HERRING GULL	M.	MISTLE THRUSH	RE	REDWING	WR	WREN
								RO	ROOK	Y.	YELLOWHAM...

Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
PUBLISHED	A1	P01	SD	LH	CC	MT	19/09/21

Drawing Suitability: PUBLISHED
Status: A1

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Client: Gloucestershire County Council

Project Title: M5 Junction 10 Improvement

Drawing Title: FIGURE 7.9D
WINTERING BIRD SURVEY RESULTS
DECEMBER 2019

Drawing Number: Project | Originator | Volume
GCCM5J10 - ATK - EBD
XX - GS - GI - 000022
Location | Type | Number

Original Size:	Scale	Project Ref:	Sheet:	Rev:
A3	1:3,000	5197035	12 of 13	P01

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

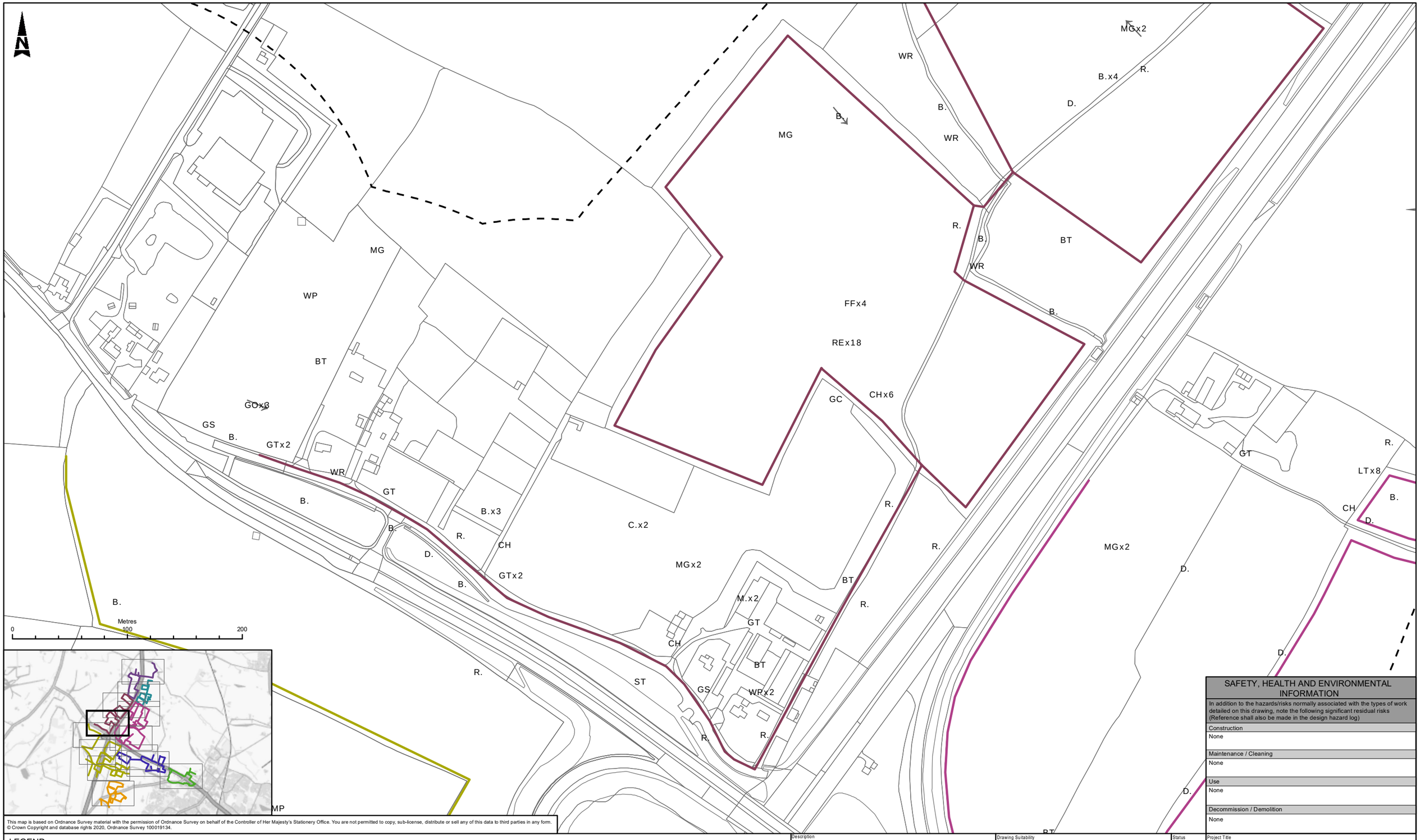
In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log)

Construction
None

Maintenance / Cleaning
None

Use
None

Decommission / Demolition
None



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LEGEND

- 250M STUDY AREA
- TRANSECT 2
- TRANSECT 3
- TRANSECT 4
- TRANSECT 5
- TRANSECT 6
- TRANSECT 7
- TRANSECT 8
- TRANSECT 9

BEHAVIOURS

- FORAGING IN FLIGHT
- FLYING

SPECIES (BTO CODES)

B.	BLACKBIRD	BZ	BUZZARD	G.	GREEN WOODPECKER	HS	HOUSE SPARROW
BT	BLUE TIT	C.	CARRION CROW	GC	GOLDCREST	J.	JAY
BH	BLACK-HEADED GULL	CD	COLLARED DOVE	GL	GREY WAGTAIL	JD	JACKDAW
		CH	CHAFFINCH	GO	GOLDFINCH	K.	KESTREL
		CT	COAL TIT	GS	GREAT SPOTTED WOODPECKER	LB	LESSER BLACK-BACKED GULL
		D.	DUNNOCK	GT	GREAT TIT	LT	LONG-TAILED TIT
		FF	FIELDFARE	HG	HERRING GULL	M.	MISTLE THRUSH

MA	MALLARD	S.	SKYLARK
MG	MAGPIE	SD	STOCK DOVE
MP	MEADOW PIPIT	SG	STARLING
PW	PIED WAGTAIL	SH	SPARROWHAWK
PH	PHEASANT	ST	SONG THRUSH
R.	ROBIN	WP	WOOD PIGEON
RE	REDWING	WR	WREN
RO	ROOK	Y.	YELLOWHAM...

Description

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date

Description

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date

Description

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date

Description

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date

Description

PUBLISHED

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
A1	P01	SD	LH	CC	MT	19/09/21

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log)

Construction
None

Maintenance / Cleaning
None

Use
None

Decommission / Demolition
None

Drawing Suitability: PUBLISHED

Status: A1

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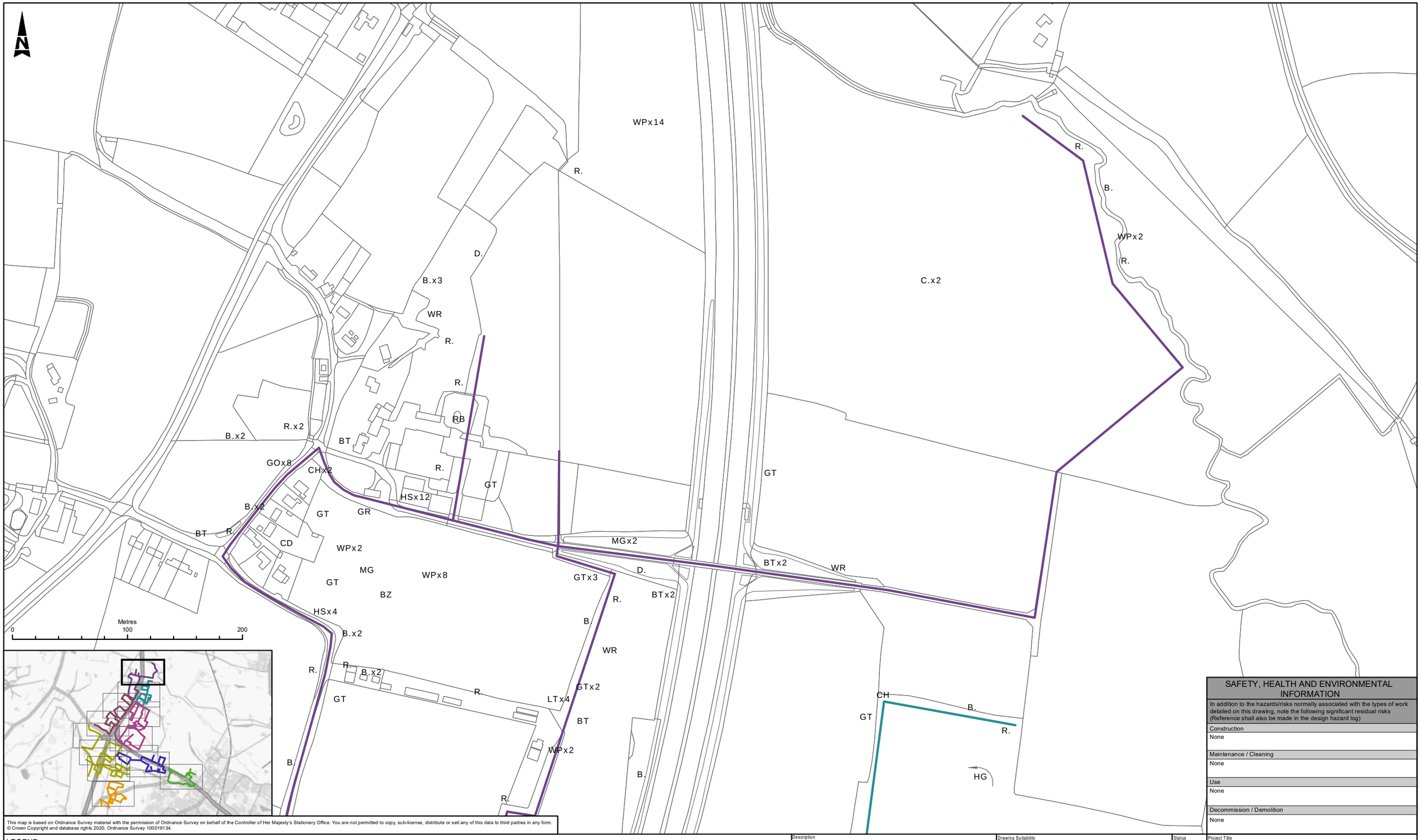
Client: Gloucestershire County Council

Project Title: M5 Junction 10 Improvement

Drawing Title: FIGURE 7.9D
WINTERING BIRD SURVEY RESULTS
DECEMBER 2019

Drawing Number: GCCM5J10 - ATK - EBD - XX - GS - GI - 000022

Original Size:	Scale	Project Ref:	Sheet:	Rev:
A3	1:3,000	5197035	13 of 13	P01



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LEGEND

- 250M STUDY AREA
- TRANSECT 2
- TRANSECT 3
- TRANSECT 4
- TRANSECT 5
- TRANSECT 6
- TRANSECT 7
- TRANSECT 8
- TRANSECT 9

BEHAVIOURS

- FORAGING IN FLIGHT
- FLYING

SPECIES (BTO CODES)

B.	BLACKBIRD	BH	BLACK-HEADED GULL	FF	FIELDFARE	GT	GREAT TIT	L.	LAPWING	MP	MEADOW PIPIT	S.	SKYLARK
BT	BLUE TIT	BZ	BUZZARD	G.	GREEN WOODPECKER	H.	GREY HERON	LB	LESSER BLACK-BACKED GULL	PW	PIED WAGTAIL	SC	STONECHAT
CA	CORMORANT	C.	CARRION CROW	GC	GOLDCREST	HG	HERRING GULL	LT	LONG-TAILED TIT	PH	PHEASANT	SD	STOCK DOVE
CH	CHAFFINCH	CD	COLLARED DOVE	GL	GREY WAGTAIL	HS	HOUSE SPARROW	M.	MISTLE THRUSH	R.	ROBIN	SG	STARLING
CT	COAL TIT	GO	GOLDFINCH	GR	GREENFINCH	J.	JAY	MA	MALLARD	RE	REDWING	SH	SPARROWHAWK
D.	DUNNOCK	GS	GREAT SPOTTED WOODPECKER	K.	KESTREL	JD	JACKDAW	MG	MAGPIE	RB	REED BUNTING	ST	SONG THRUSH
				KF	KINGFISHER			MH	MOORHEN	RN	RAVEN	WP	WOOD PIGEON
										RO	ROOK	WR	WREN

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log)

Construction
None

Maintenance / Cleaning
None

Use
None

Decommission / Demolition
None

Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
PUBLISHED	A1	P01	SD	LH	CC	MT	19/09/21

Drawing Suitability: PUBLISHED
Status: A1

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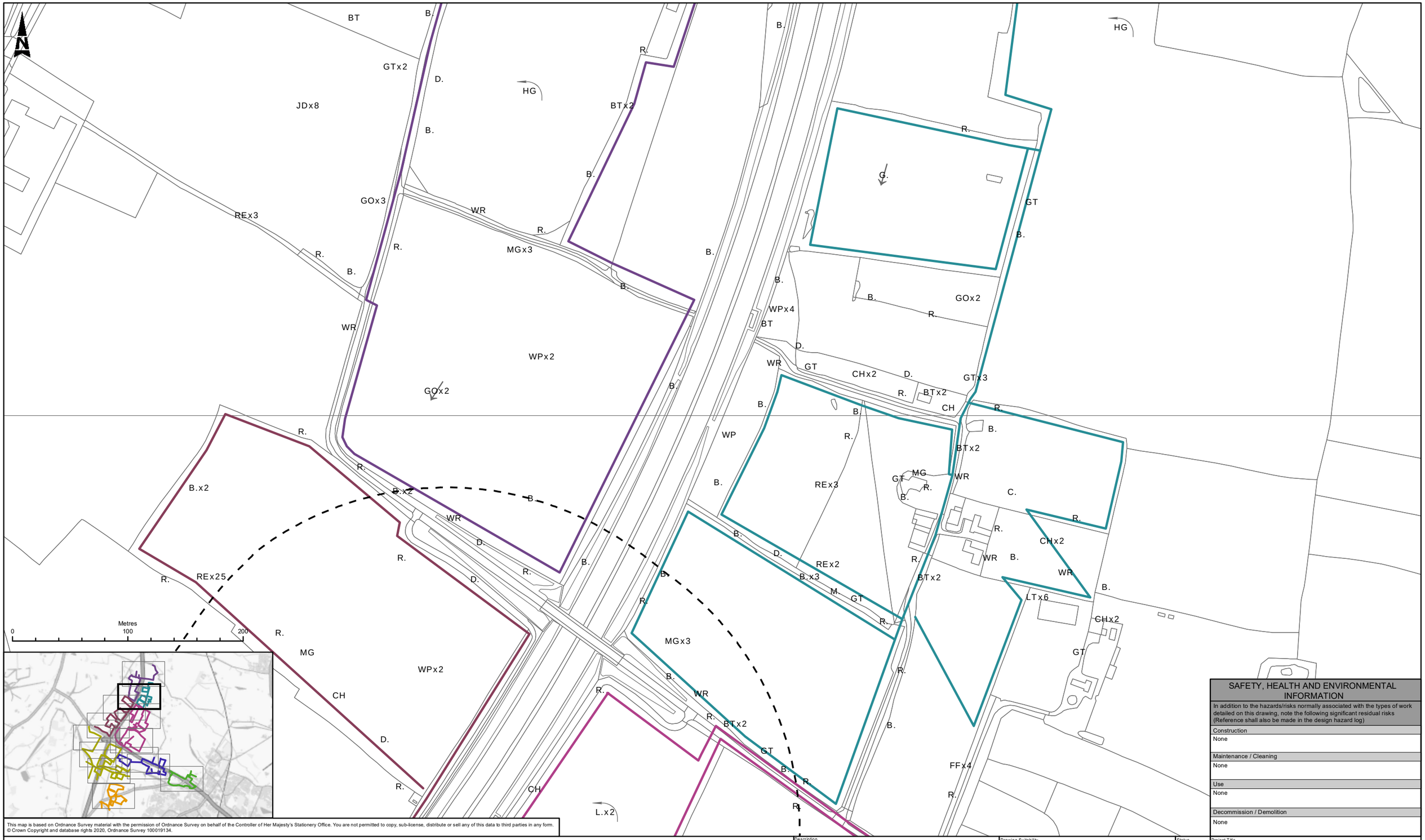
Client: Gloucestershire County Council

Project Title: M5 Junction 10 Improvement

Drawing Title: FIGURE 7.9E
WINTERING BIRD SURVEY RESULTS
JANUARY 2020

Drawing Number: Project | Originator | Volume | Location | Type | Number
GCCM5J10 - ATK - EBD
XX - GS - GI - 000023

Original Size:	Scale	Project Ref:	Sheet:	Rev:
A3	1:3,000	5197035	1 of 13	P01



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LEGEND

- 250M STUDY AREA
- TRANSECT 2
- TRANSECT 3
- TRANSECT 4
- TRANSECT 5
- TRANSECT 6
- TRANSECT 7
- TRANSECT 8
- TRANSECT 9

BEHAVIOURS

- FORAGING IN FLIGHT
- FLYING

SPECIES (BTO CODES)

B.	BLACKBIRD	BH	BLACK-HEADED GULL	FF	FIELDFARE	GT	GREAT TIT	L.	LAPWING	MP	MEADOW PIPIT	S.	SKYLARK
BT	BLUE TIT	BZ	BUZZARD	G.	GREEN WOODPECKER	H.	GREY HERON	LB	LESSER BLACK-BACKED GULL	PW	PIED WAGTAIL	SC	STONECHAT
		C.	CARRION CROW	GC	GOLDCREST	HG	HERRING GULL	LT	LONG-TAILED TIT	PH	PHEASANT	SD	STOCK DOVE
		CD	COLLARED DOVE	GL	GREY WAGTAIL	HS	HOUSE SPARROW	M.	MISTLE THRUSH	R.	ROBIN	SG	STARLING
		CA	CORMORANT	GO	GOLDFINCH	J.	JAY	MA	MALLARD	RE	REDWING	SH	SPARROWHAWK
		CH	CHAFFINCH	GR	GREENFINCH	JD	JACKDAW	MG	MAGPIE	RB	REED BUNTING	ST	SONG THRUSH
		CT	COAL TIT	GS	GREAT SPOTTED WOODPECKER	K.	KESTREL	MH	MOORHEN	RN	RAVEN	WP	WOOD PIGEON
		D.	DUNNOCK			KF	KINGFISHER			RO	ROOK	WR	WREN

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log)

Construction
None

Maintenance / Cleaning
None

Use
None

Decommission / Demolition
None

Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
PUBLISHED	A1	P01	SD	LH	CC	MT	19/09/21

Drawing Suitability: PUBLISHED
Status: A1

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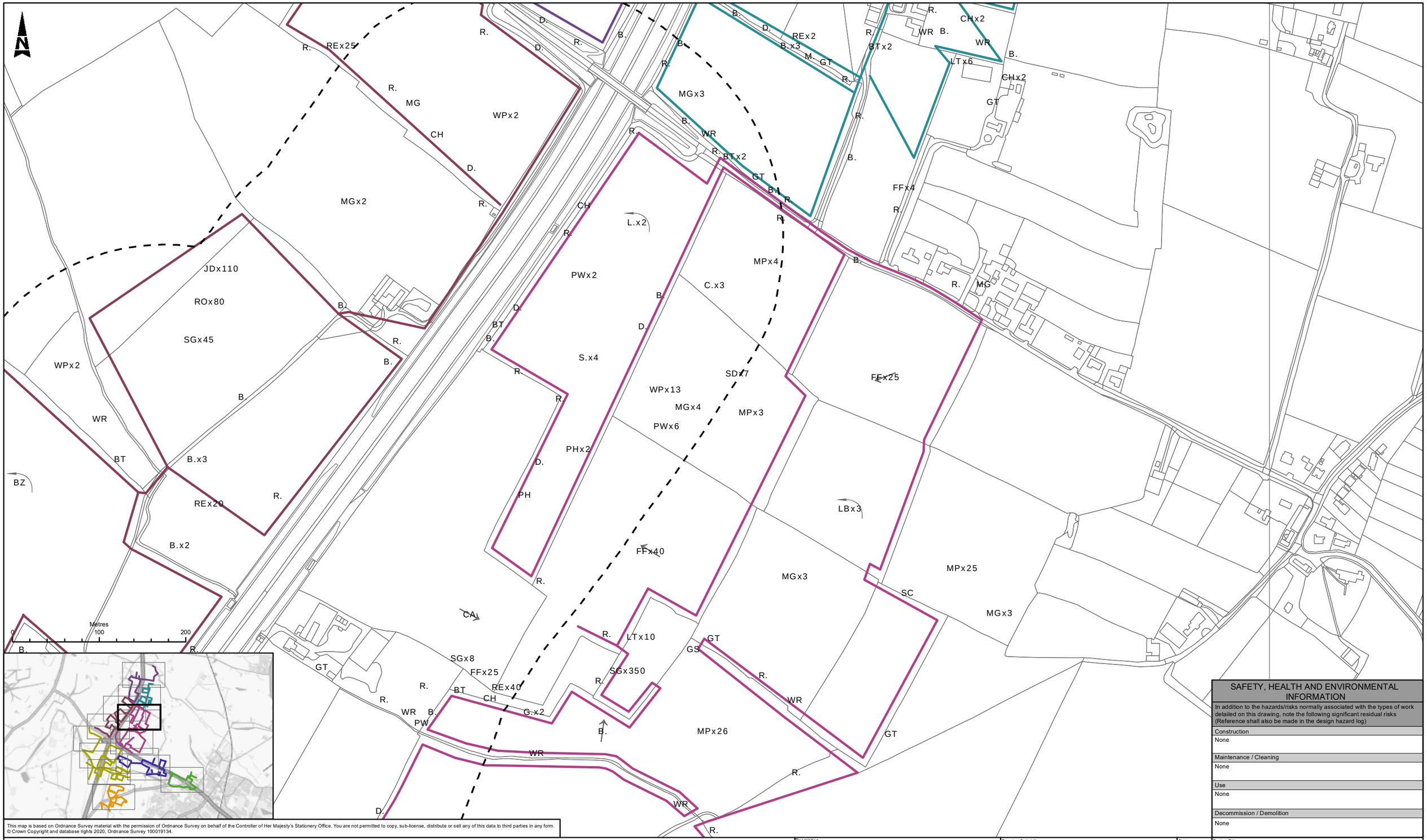
Client: Gloucestershire County Council

Project Title: M5 Junction 10 Improvement

Drawing Title: FIGURE 7.9E
WINTERING BIRD SURVEY RESULTS
JANUARY 2020

Drawing Number: Project | Originator | Volume
GCCM5J10 - ATK - EBD
XX - GS - GI - 000023
Location | Type | Number

Original Size:	Scale	Project Ref:	Sheet:	Rev:
A3	1:3,000	5197035	2 of 13	P01



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LEGEND

- 250M STUDY AREA
- TRANSECT 2
- TRANSECT 3
- TRANSECT 4
- TRANSECT 5
- TRANSECT 6
- TRANSECT 7
- TRANSECT 8
- TRANSECT 9

BEHAVIOURS

- FORAGING IN FLIGHT
- FLYING

SPECIES (BTO CODES)

B.	BLACKBIRD	BH	BLACK-HEADED GULL	FF	FIELDFARE	GT	GREAT TIT	L.	LAPWING	MP	MEADOW PIPIT	S.	SKYLARK
BT	BLUE TIT	BZ	BUZZARD	G.	GREEN WOODPECKER	H.	GREY HERON	LB	LESSER BLACK-BACKED GULL	PW	PIED WAGTAIL	SC	STONECHAT
		C.	CARRION CROW	GC	GOLDCREST	HG	HERRING GULL	LT	LONG-TAILED TIT	PH	PHEASANT	SD	STOCK DOVE
		CD	COLLARED DOVE	GL	GREY WAGTAIL	HS	HOUSE SPARROW	M.	MISTLE THRUSH	R.	ROBIN	SG	STARLING
		CA	CORMORANT	GO	GOLDFINCH	J.	JAY	MA	MALLARD	RE	REDWING	SH	SPARROWHAWK
		CH	CHAFFINCH	GR	GREENFINCH	JD	JACKDAW	MG	MAGPIE	RB	REED BUNTING	ST	SONG THRUSH
		CT	COAL TIT	GS	GREAT SPOTTED WOODPECKER	K.	KESTREL	MH	MOORHEN	RN	RAVEN	WP	WOOD PIGEON
		D.	DUNNOCK			KF	KINGFISHER			RO	ROOK	WR	WREN

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log)

Construction
None

Maintenance / Cleaning
None

Use
None

Decommission / Demolition
None

Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
PUBLISHED	A1	P01	SD	LH	CC	MT	19/09/21

Drawing Suitability: PUBLISHED
Status: A1

Project Title: M5 Junction 10 Improvement

Drawing Title: FIGURE 7.9E
WINTERING BIRD SURVEY RESULTS
JANUARY 2020

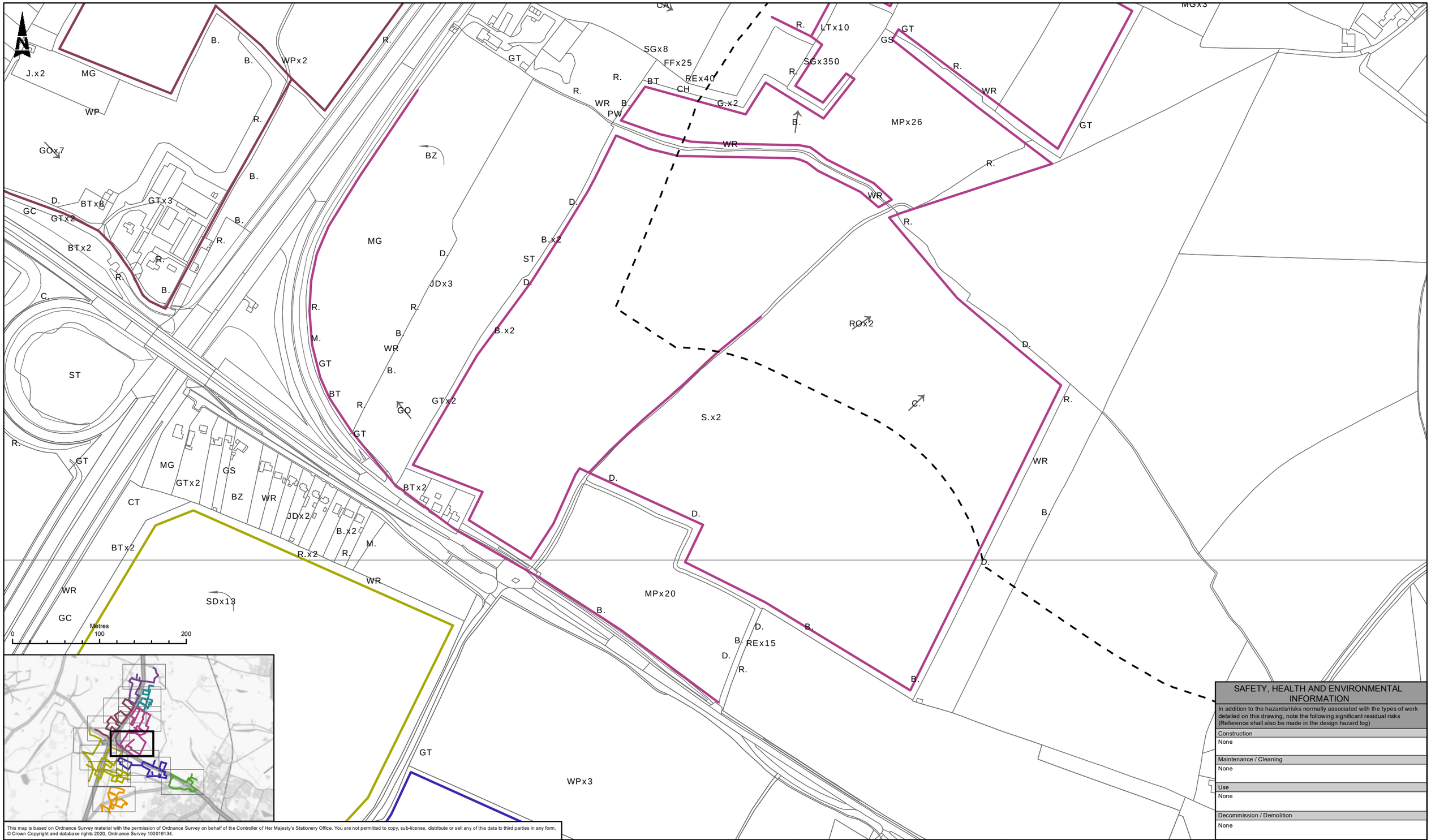
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Client: Gloucestershire County Council

Drawing Number: Project | Originator | Volume
GCCM5J10 - ATK - EBD
XX - GS - GI - 000023
Location | Type | Number

Original Size:	Scale	Project Ref:	Sheet:	Rev:
A3	1:4,000	5197035	3 of 13	P01



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LEGEND

- 250M STUDY AREA
- TRANSECT 2
- TRANSECT 3
- TRANSECT 4
- TRANSECT 5
- TRANSECT 6
- TRANSECT 7
- TRANSECT 8
- TRANSECT 9

BEHAVIOURS

- FORAGING IN FLIGHT
- FLYING

SPECIES (BTO CODES)

B.	BLACKBIRD	BH	BLACK-HEADED GULL	F F	FIELDFARE	G T	GREAT TIT	L.	LAPWING	M P	MEADOW PIPIT	S.	SKYLARK
B T	BLUE TIT	B Z	BUZZARD	G.	GREEN WOODPECKER	H.	GREY HERON	L B	LESSER BLACK-BACKED GULL	P W	PIED WAGTAIL	S C	STONECHAT
		C.	CARRION CROW	G C	GOLDCREST	H G	HERRING GULL			P H	PHEASANT	S D	STOCK DOVE
		C D	COLLARED DOVE	G L	GREY WAGTAIL	H S	HOUSE SPARROW	L T	LONG-TAILED TIT	R.	ROBIN	S G	STARLING
		C A	CORMORANT	G O	GOLDFINCH	J.	JAY	M.	MISTLE THRUSH	R E	REDWING	S H	SPARROWHAWK
		C H	CHAFFINCH	G R	GREENFINCH	J D	JACKDAW	M A	MALLARD	R B	REED BUNTING	S T	SONG THRUSH
		C T	COAL TIT	G S	GREAT SPOTTED WOODPECKER	K.	KESTREL	M G	MAGPIE	R N	RAVEN	W P	WOOD PIGEON
		D.	DUNNOCK			K F	KINGFISHER	M H	MOORHEN	R O	ROOK	W R	WREN

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log)

Construction
None

Maintenance / Cleaning
None

Use
None

Decommission / Demolition
None

Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
PUBLISHED	A1	P01	SD	LH	CC	MT	19/09/21

Drawing Suitability: PUBLISHED — Status: A1

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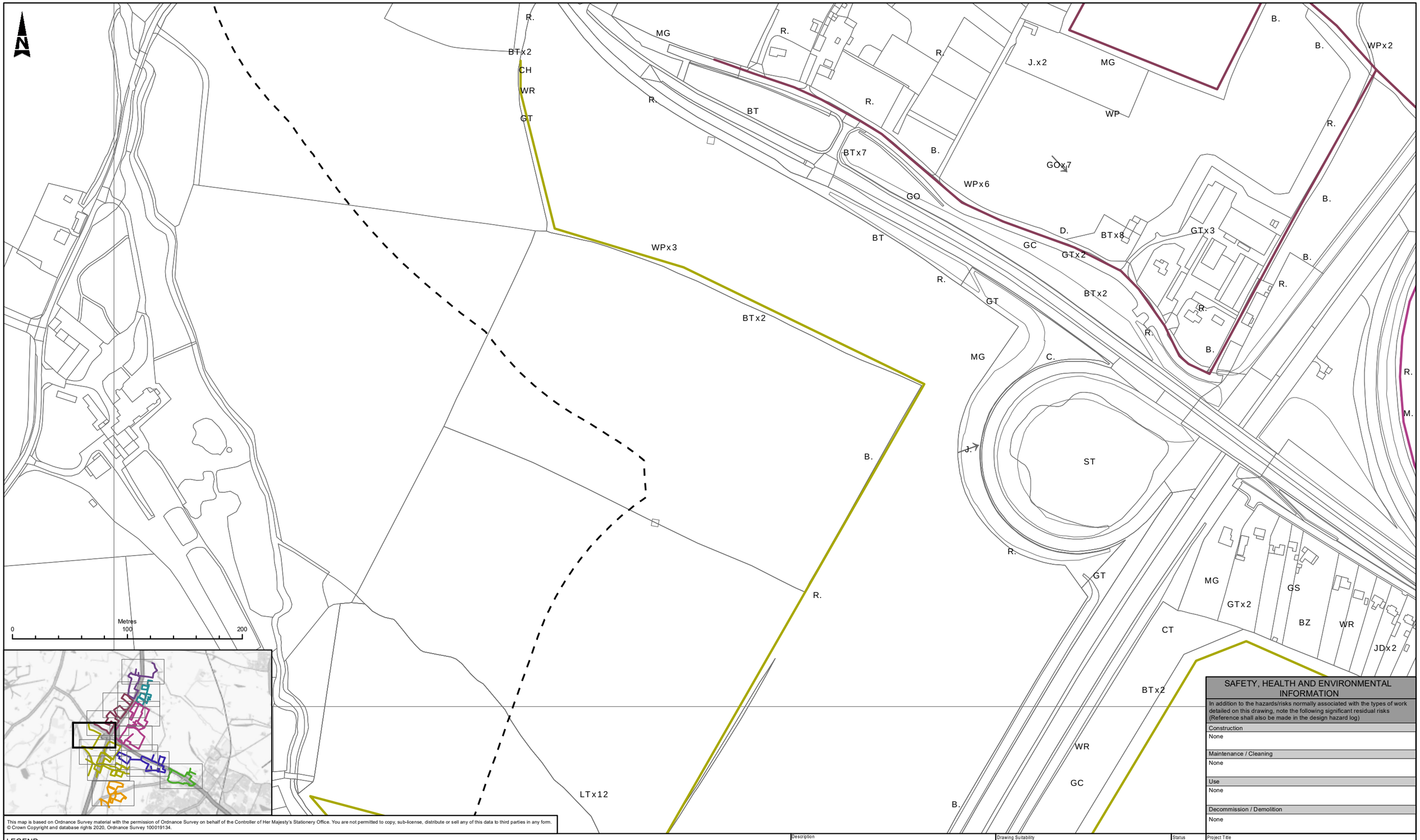
Client: Gloucestershire County Council

Project Title: M5 Junction 10 Improvement

Drawing Title: FIGURE 7.9E
WINTERING BIRD SURVEY RESULTS
JANUARY 2020

Drawing Number: Project | Originator | Volume
GCCM5J10 - ATK - EBD
XX - GS - GI - 000023
Location | Type | Number

Original Size:	Scale	Project Ref:	Sheet:	Rev:
A3	1:4,000	5197035	4 of 13	P01



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LEGEND

- 250M STUDY AREA
- TRANSECT 2
- TRANSECT 3
- TRANSECT 4
- TRANSECT 5
- TRANSECT 6
- TRANSECT 7
- TRANSECT 8
- TRANSECT 9

BEHAVIOURS

- FORAGING IN FLIGHT
- FLYING

SPECIES (BTO CODES)

B.	BLACKBIRD	BH	BLACK-HEADED GULL	FF	FIELDFARE	GT	GREAT TIT	L.	LAPWING	MP	MEADOW PIPIT	S.	SKYLARK
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		C.	CARRION CROW	GC	GOLDCREST	HG	HERRING GULL	LT	LONG-TAILED TIT	PH	PHEASANT	SD	STOCK DOVE
		CD	COLLARED DOVE	GL	GREY WAGTAIL	HS	HOUSE SPARROW	M.	MISTLE THRUSH	R.	ROBIN	SG	STARLING
		CA	CORMORANT	GO	GOLDFINCH	J.	JAY	MA	MALLARD	RE	REDWING	SH	SPARROWHAWK
		CH	CHAFFINCH	GR	GREENFINCH	JD	JACKDAW	MG	MAGPIE	RB	REED BUNTING	ST	SONG THRUSH
		CT	COAL TIT	GS	GREAT SPOTTED WOODPECKER	K.	KESTREL	MH	MOORHEN	RN	RAVEN	WP	WOOD PIGEON
		D.	DUNNOCK			KF	KINGFISHER			RO	ROOK	WR	WREN

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log)

Construction
None

Maintenance / Cleaning
None

Use
None

Decommission / Demolition
None

Description

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
PUBLISHED						
A1	P01	SD	LH	CC	MT	19/09/21

Drawing Suitability: PUBLISHED
Status: A1

Project Title: M5 Junction 10 Improvement

Drawing Title: FIGURE 7.9E
WINTERING BIRD SURVEY RESULTS
JANUARY 2020

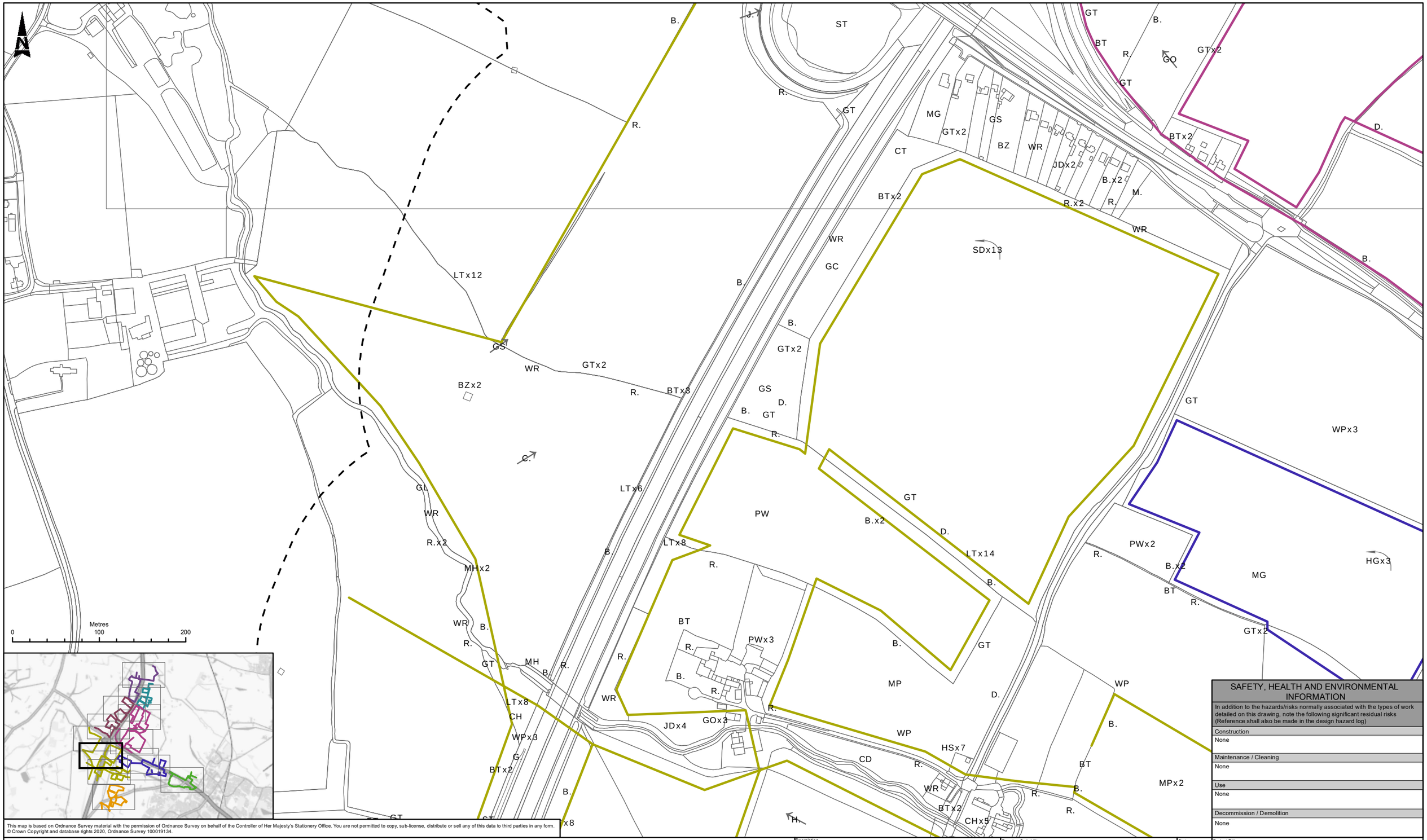
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Client: Gloucestershire County Council

Drawing Number: Project | Originator | Volume | Location | Type | Number
GCCM5J10 - ATK - EBD
XX - GS - GI - 000023

Original Size: A3 | Scale: 1:3,000 | Project Ref: 5197035 | Sheet: 5 of 13 | Rev: P01



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LEGEND

- 250M STUDY AREA
- TRANSECT 2
- TRANSECT 3
- TRANSECT 4
- TRANSECT 5
- TRANSECT 6
- TRANSECT 7
- TRANSECT 8
- TRANSECT 9

BEHAVIOURS

- FORAGING IN FLIGHT
- FLYING

SPECIES (BTO CODES)

B.	BLACKBIRD	BH	BLACK-HEADED GULL	F F	FIELDFARE	G T	GREAT TIT	L.	LAPWING	MP	MEADOW PIPIT	S.	SKYLARK
B T	BLUE TIT	B Z	BUZZARD	G.	GREEN WOODPECKER	H.	GREY HERON	LB	LESSER BLACK-BACKED GULL	PW	PIED WAGTAIL	S C	STONECHAT
		C.	CARRION CROW	G C	GOLDCREST	H G	HERRING GULL	L T	LONG-TAILED TIT	P H	PHEASANT	S D	STOCK DOVE
		C D	COLLARED DOVE	G L	GREY WAGTAIL	H S	HOUSE SPARROW	M.	MISTLE THRUSH	R.	ROBIN	S G	STARLING
		C A	CORMORANT	G O	GOLDFINCH	J.	JAY	M A	MALLARD	R E	REDWING	S H	SPARROWHAWK
		C H	CHAFFINCH	G R	GREENFINCH	J D	JACKDAW	M G	MAGPIE	R B	REED BUNTING	S T	SONG THRUSH
		C T	COAL TIT	G S	GREAT SPOTTED WOODPECKER	K.	KESTREL	M H	MOORHEN	R N	RAVEN	W P	WOOD PIGEON
		D.	DUNNOCK			K F	KINGFISHER			R O	ROOK	W R	WREN

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log)

Construction
None

Maintenance / Cleaning
None

Use
None

Decommission / Demolition
None

Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
PUBLISHED	A1	P01	SD	LH	CC	MT	19/09/21

Drawing Suitability: PUBLISHED
Status: A1

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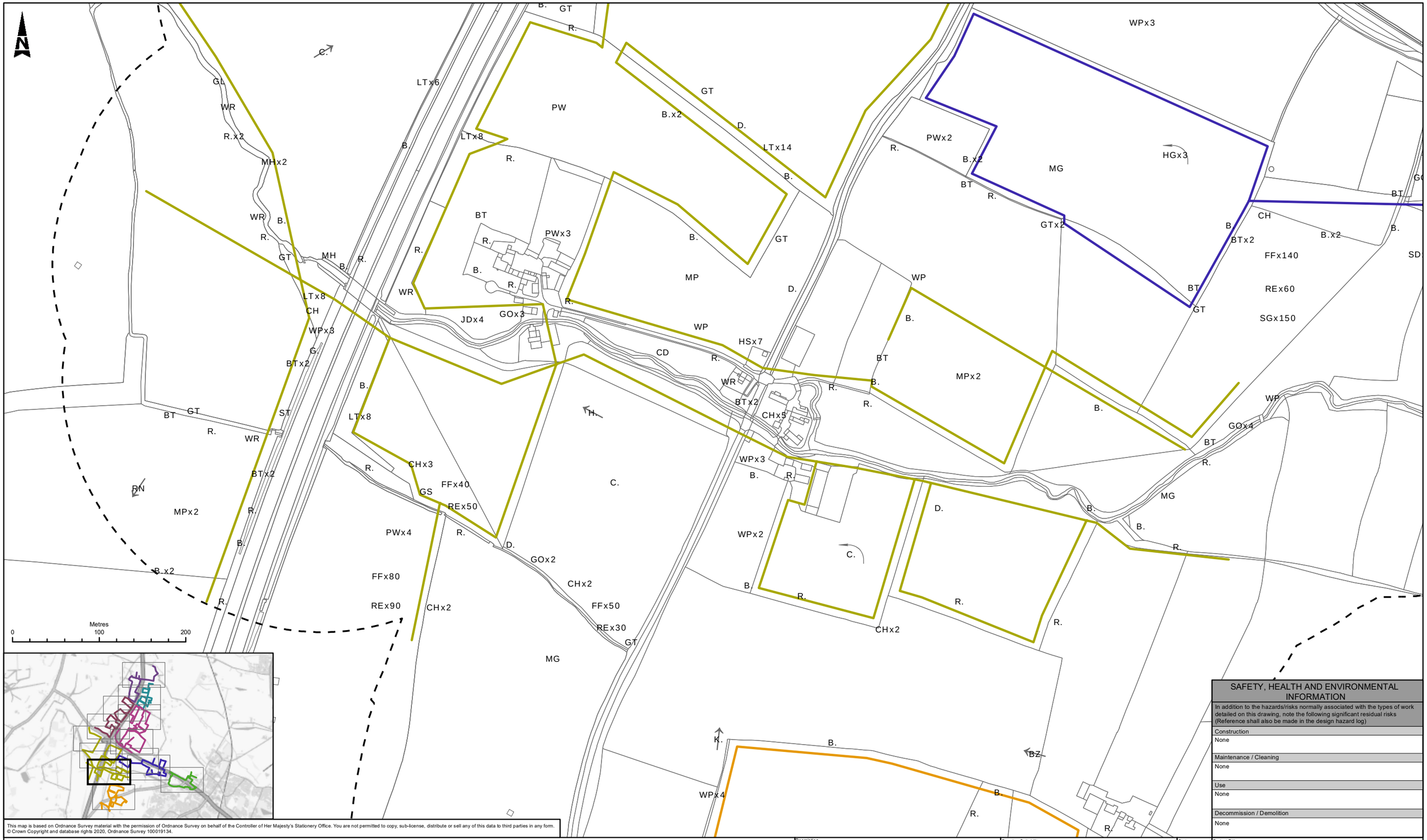
Client: Gloucestershire County Council

Project Title: M5 Junction 10 Improvement

Drawing Title: FIGURE 7.9E
WINTERING BIRD SURVEY RESULTS
JANUARY 2020

Drawing Number: GCCM5J10 - ATK - EBD | XX - GS - GI - 000023

Original Size:	Scale	Project Ref:	Sheet:	Rev:
A3	1:4,000	5197035	6 of 13	P01



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Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
PUBLISHED	A1	P01	SD	LH	CC	MT	19/09/21

Drawing Suitability: PUBLISHED

Status: A1

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log)

Construction
None

Maintenance / Cleaning
None

Use
None

Decommission / Demolition
None

Project Title: M5 Junction 10 Improvement

Drawing Title: FIGURE 7.9E
WINTERING BIRD SURVEY RESULTS
JANUARY 2020

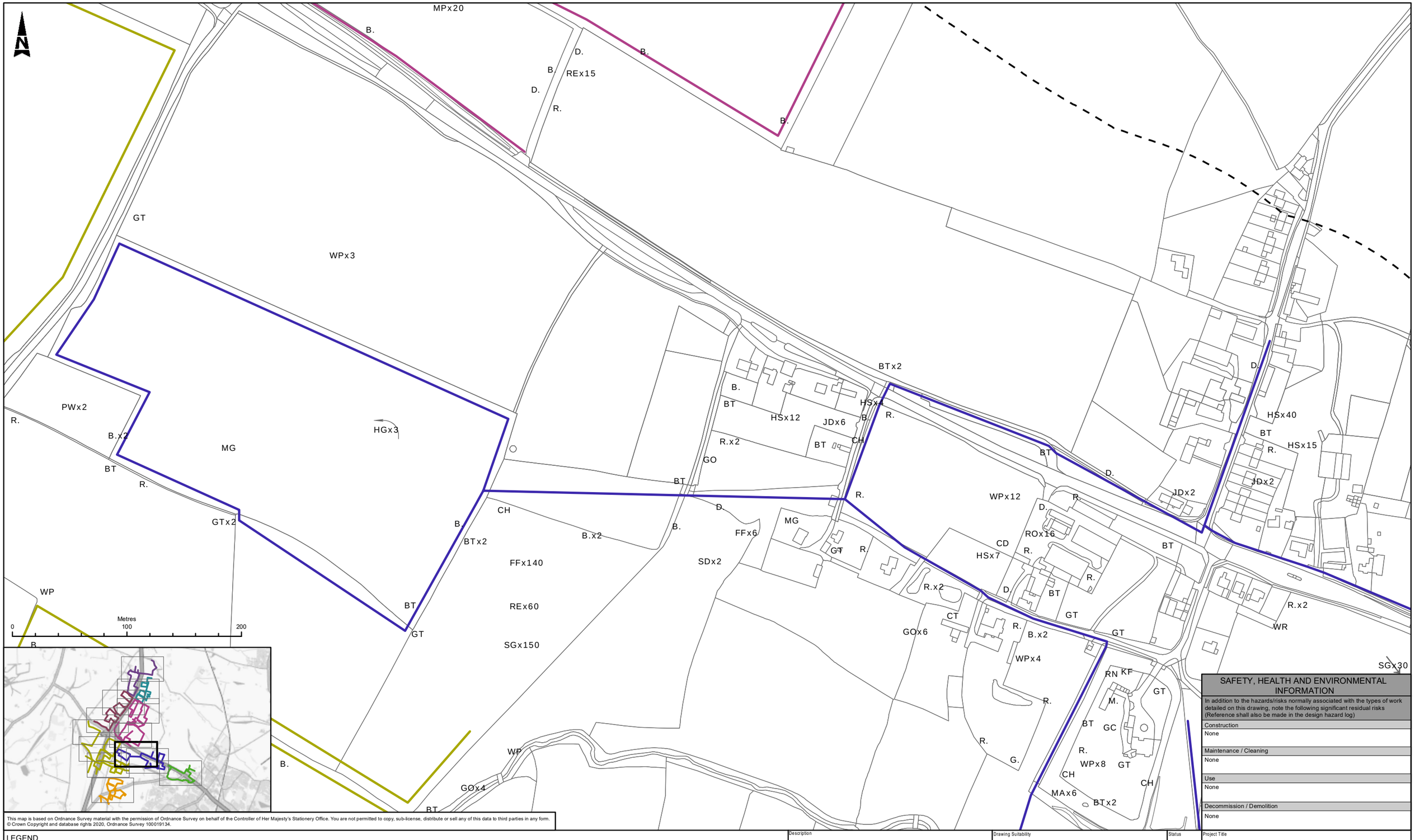
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Client: Gloucestershire County Council

Drawing Number: Project | Originator | Volume
GCCM5J10 - ATK - EBD
XX - GS - GI - 000023
Location | Type | Number

Original Size:	Scale	Project Ref:	Sheet:	Rev:
A3	1:4,000	5197035	7 of 13	P01



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LEGEND

- 250M STUDY AREA
- TRANSECT 2
- TRANSECT 3
- TRANSECT 4
- TRANSECT 5
- TRANSECT 6
- TRANSECT 7
- TRANSECT 8
- TRANSECT 9

BEHAVIOURS

- FORAGING IN FLIGHT
- FLYING

SPECIES (BTO CODES)

B.	BLACKBIRD	BH	BLACK-HEADED GULL	FF	FIELDFARE	GT	GREAT TIT	L.	LAPWING	MP	MEADOW PIPIT	S.	SKYLARK
BT	BLUE TIT	BZ	BUZZARD	G.	GREEN WOODPECKER	H.	GREY HERON	LB	LESSER BLACK-BACKED GULL	PW	PIED WAGTAIL	SC	STONECHAT
		C.	CARRION CROW	GC	GOLDCREST	HG	HERRING GULL	LT	LONG-TAILED TIT	PH	PHEASANT	SD	STOCK DOVE
		CD	COLLARED DOVE	GL	GREY WAGTAIL	HS	HOUSE SPARROW	M.	MISTLE THRUSH	R.	ROBIN	SG	STARLING
		CA	CORMORANT	GO	GOLDFINCH	J.	JAY	MA	MALLARD	RE	REDWING	SH	SPARROWHAWK
		CH	CHAFFINCH	GR	GREENFINCH	JD	JACKDAW	MG	MAGPIE	RB	REED BUNTING	ST	SONG THRUSH
		CT	COAL TIT	GS	GREAT SPOTTED WOODPECKER	K.	KESTREL	MH	MOORHEN	RN	RAVEN	WP	WOOD PIGEON
		D.	DUNNOCK			KF	KINGFISHER			RO	ROOK	WR	WREN

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log)

Construction
None

Maintenance / Cleaning
None

Use
None

Decommission / Demolition
None

Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
PUBLISHED	A1	P01	SD	LH	CC	MT	19/09/21

Drawing Suitability: PUBLISHED
Status: A1

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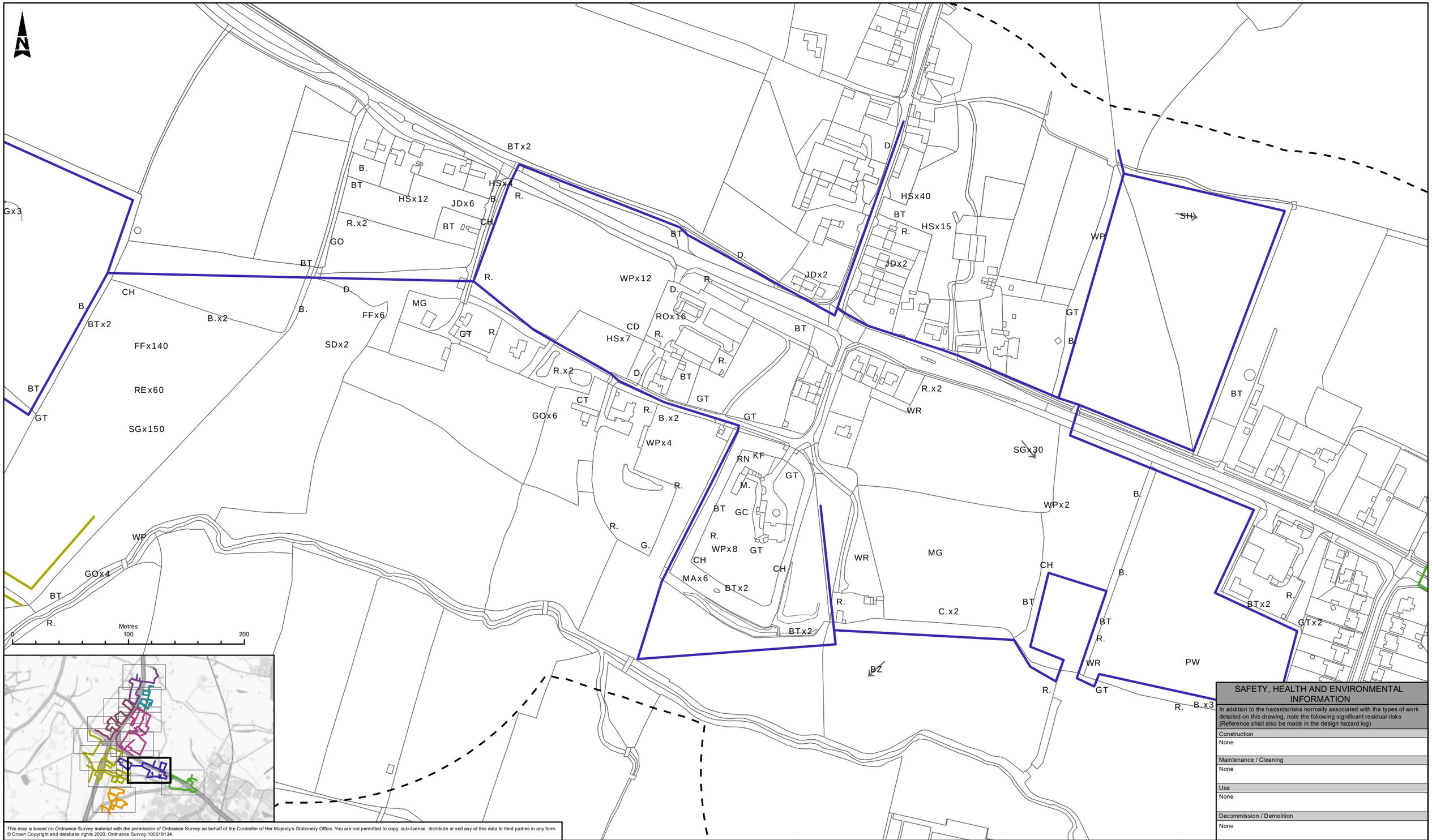
Client: Gloucestershire County Council

Project Title: M5 Junction 10 Improvement

Drawing Title: FIGURE 7.9E
WINTERING BIRD SURVEY RESULTS
JANUARY 2020

Drawing Number: GCCM5J10 - ATK - EBD - XX - GS - GI - 000023

Original Size:	Scale	Project Ref:	Sheet:	Rev:
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LEGEND

- 250M STUDY AREA
- TRANSECT 2
- TRANSECT 3
- TRANSECT 4
- TRANSECT 5
- TRANSECT 6
- TRANSECT 7
- TRANSECT 8
- TRANSECT 9

BEHAVIOURS

- FORAGING IN FLIGHT
- FLYING

SPECIES (BTO CODES)

B.	BLACKBIRD	BH	BLACK-HEADED GULL	FF	FIELDFARE	GT	GREAT TIT	L.	LAPWING	MP	MEADOW PIPIT	S.	SKYLARK
BT	BLUE TIT	BZ	BUZZARD	G.	GREEN WOODPECKER	H.	GREY HERON	LB	LESSER BLACK-BACKED GULL	PW	PIED WAGTAIL	SC	STONECHAT
		C.	CARRION CROW	GC	GOLDCREST	HG	HERRING GULL			PH	PHEASANT	SD	STOCK DOVE
		CD	COLLARED DOVE	GL	GREY WAGTAIL	HS	HOUSE SPARROW	LT	LONG-TAILED TIT	R.	ROBIN	SG	STARLING
		CA	CORMORANT	GO	GOLDFINCH	J.	JAY	M.	MISTLE THRUSH	RE	REDWING	SH	SPARROWHAWK
		CH	CHAFFINCH	GR	GREENFINCH	JD	JACKDAW	MA	MALLARD	RB	REED BUNTING	ST	SONG THRUSH
		CT	COAL TIT	GS	GREAT SPOTTED WOODPECKER	K.	KESTREL	MG	MAGPIE	RN	RAVEN	WP	WOOD PIGEON
		D.	DUNNOCK			KF	KINGFISHER	MH	MOORHEN	RO	ROOK	WR	WREN

Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
PUBLISHED	A1	P01	SD	LH	CC	MT	19/09/21

Drawing Suitability: PUBLISHED
Status: A1

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Client: Gloucestershire COUNTY COUNCIL

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log)

Construction
None

Maintenance / Cleaning
None

Use
None

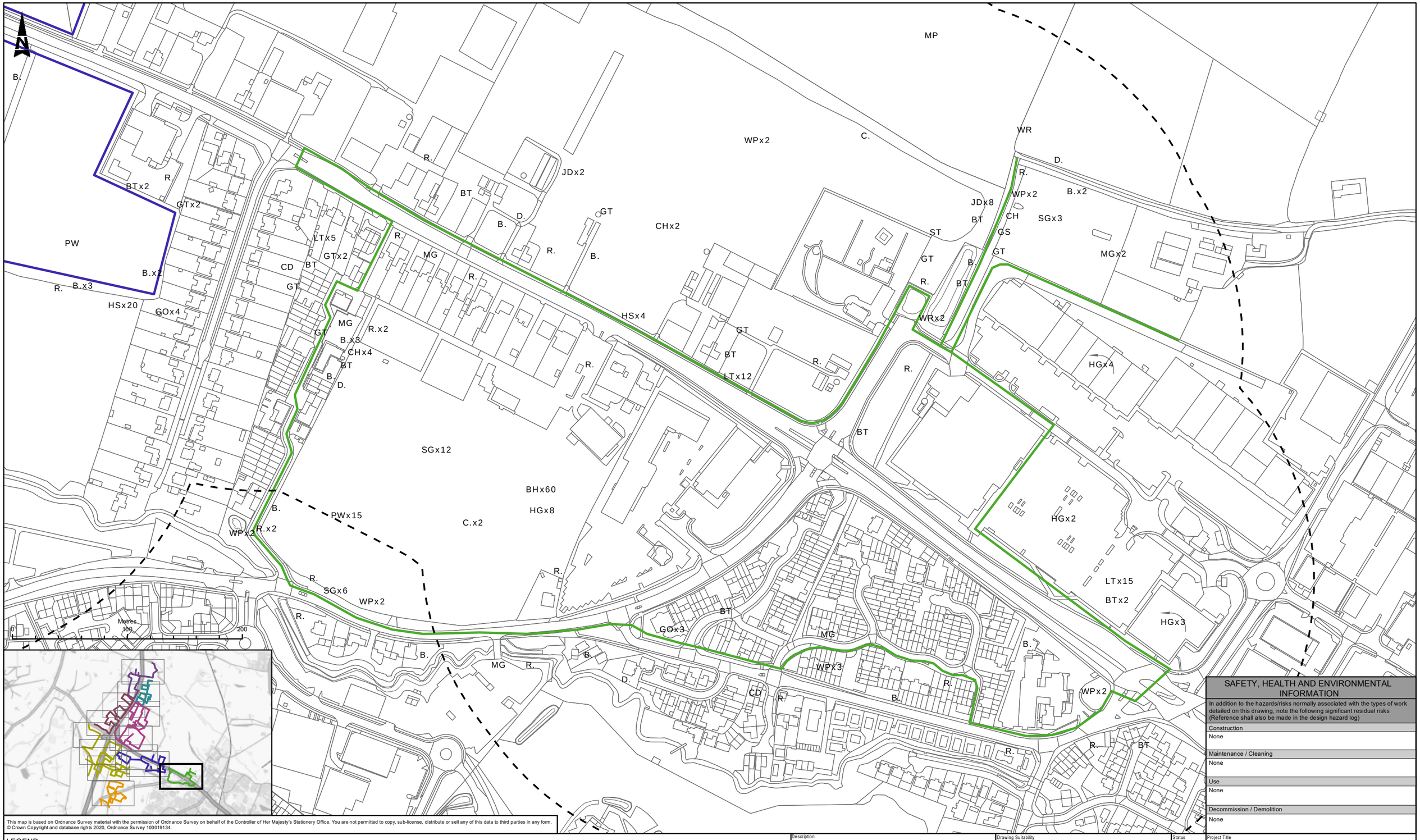
Decommission / Demolition
None

Project Title: M5 Junction 10 Improvement

Drawing Title: FIGURE 7.9E
WINTERING BIRD SURVEY RESULTS
JANUARY 2020

Drawing Number: Project | Originator | Volume
GCCM5J10 - ATK - EBD
XX - GS - GI - 000023
Location | Type | Number

Original Size:	Scale	Project Ref:	Sheet:	Rev:
A3	1:3,000	5197035	9 of 13	P01



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LEGEND

- 250M STUDY AREA
- TRANSECT 2
- TRANSECT 3
- TRANSECT 4
- TRANSECT 5
- TRANSECT 6
- TRANSECT 7
- TRANSECT 8
- TRANSECT 9

BEHAVIOURS

- FORAGING IN FLIGHT
- FLYING

SPECIES (BTO CODES)

B.	BLACKBIRD	BH	BLACK-HEADED GULL	FF	FIELDFARE	GT	GREAT TIT	L.	LAPWING	MP	MEADOW PIPIT	S.	SKYLARK
BT	BLUE TIT	BZ	BUZZARD	G.	GREEN WOODPECKER	H.	GREY HERON	LB	LESSER BLACK-BACKED GULL	PW	PIED WAGTAIL	SC	STONECHAT
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		CD	COLLARED DOVE	GL	GREY WAGTAIL	HS	HOUSE SPARROW	M.	MISTLE THRUSH	R.	ROBIN	SG	STARLING
		CA	CORMORANT	GO	GOLDFINCH	J.	JAY	MA	MALLARD	RE	REDWING	SH	SPARROWHAWK
		CH	CHAFFINCH	GR	GREENFINCH	JD	JACKDAW	MG	MAGPIE	RB	REED BUNTING	ST	SONG THRUSH
		CT	COAL TIT	GS	GREAT SPOTTED WOODPECKER	K.	KESTREL	MH	MOORHEN	RN	RAVEN	WP	WOOD PIGEON
		D.	DUNNOCK			KF	KINGFISHER			RO	ROOK	WR	WREN

Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
PUBLISHED	A1	P01	SD	LH	CC	MT	19/09/21

Drawing Suitability: PUBLISHED

Status: A1

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Client: Gloucestershire County Council

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log)

Construction
None

Maintenance / Cleaning
None

Use
None

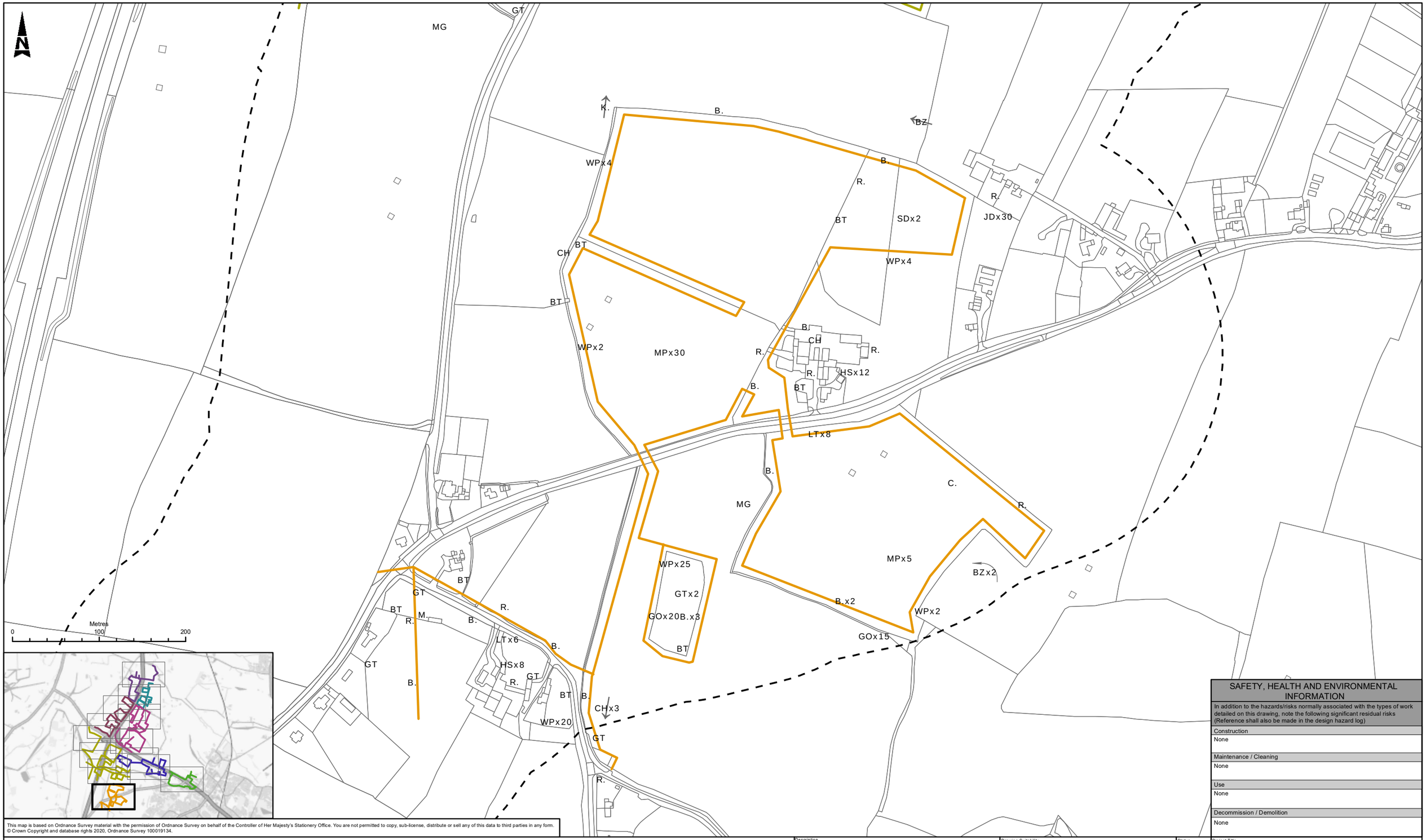
Decommission / Demolition
None

Project Title: M5 Junction 10 Improvement

Drawing Title: FIGURE 7.9E
WINTERING BIRD SURVEY RESULTS
JANUARY 2020

Drawing Number: Project | Originator | Volume
GCCM5J10 - ATK - EBD
Location | Type | Number
XX - GS - GI - 000023

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LEGEND

- 250M STUDY AREA
- TRANSECT 2
- TRANSECT 3
- TRANSECT 4
- TRANSECT 5
- TRANSECT 6
- TRANSECT 7
- TRANSECT 8
- TRANSECT 9

BEHAVIOURS

- FORAGING IN FLIGHT
- FLYING

SPECIES (BTO CODES)

B.	BLACKBIRD	BH	BLACK-HEADED GULL	F F	FIELDFARE	G T	GREAT TIT	L.	LAPWING	MP	MEADOW PIPIT	S.	SKYLARK
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		C.	CARRION CROW	G C	GOLDCREST	H G	HERRING GULL	L T	LONG-TAILED TIT	P H	PHEASANT	S D	STOCK DOVE
		C D	COLLARED DOVE	G L	GREY WAGTAIL	H S	HOUSE SPARROW	M.	MISTLE THRUSH	R.	ROBIN	S G	STARLING
		C A	CORMORANT	G O	GOLDFINCH	J.	JAY	MA	MALLARD	R E	REDWING	S H	SPARROWHAWK
		C H	CHAFFINCH	G R	GREENFINCH	J D	JACKDAW	MG	MAGPIE	R B	REED BUNTING	S T	SONG THRUSH
		C T	COAL TIT	G S	GREAT SPOTTED WOODPECKER	K.	KESTREL	MH	MOORHEN	R N	RAVEN	W P	WOOD PIGEON
		D.	DUNNOCK			K F	KINGFISHER			R O	ROOK	W R	WREN

Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
PUBLISHED	A1	P01	SD	LH	CC	MT	19/09/21

Drawing Suitability: PUBLISHED
Status: A1

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Project Title: M5 Junction 10 Improvement

Drawing Title: FIGURE 7.9E
WINTERING BIRD SURVEY RESULTS
JANUARY 2020

Drawing Number: Project | Originator | Volume
GCCM5J10 - ATK - EBD
XX - GS - GI - 000023
Location | Type | Number

Original Size:	Scale	Project Ref:	Sheet:	Rev:
A3	1:4,000	5197035	11 of 13	P01

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

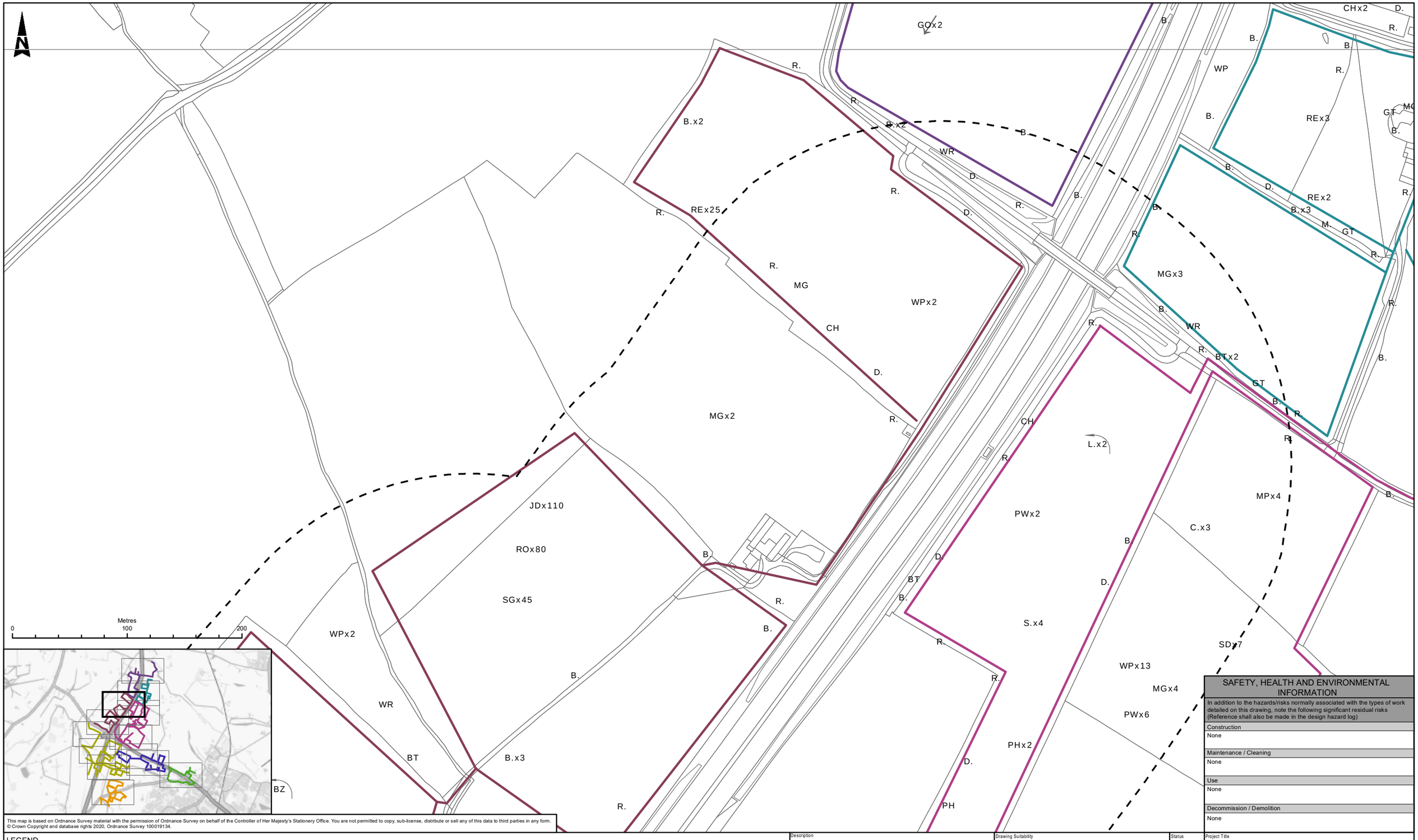
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Construction
None

Maintenance / Cleaning
None

Use
None

Decommission / Demolition
None



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LEGEND

- 250M STUDY AREA
- TRANSECT 2
- TRANSECT 3
- TRANSECT 4
- TRANSECT 5
- TRANSECT 6
- TRANSECT 7
- TRANSECT 8
- TRANSECT 9

BEHAVIOURS

- FORAGING IN FLIGHT
- FLYING

SPECIES (BTO CODES)

B.	BLACKBIRD	BH	BLACK-HEADED GULL	FF	FIELDFARE	GT	GREAT TIT	L.	LAPWING	MP	MEADOW PIPIT	S.	SKYLARK
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		CD	COLLARED DOVE	GL	GREY WAGTAIL	HS	HOUSE SPARROW	M.	MISTLE THRUSH	R.	ROBIN	SG	STARLING
		CA	CORMORANT	GO	GOLDFINCH	J.	JAY	MA	MALLARD	RE	REDWING	SH	SPARROWHAWK
		CH	CHAFFINCH	GR	GREENFINCH	JD	JACKDAW	MG	MAGPIE	RB	REED BUNTING	ST	SONG THRUSH
		CT	COAL TIT	GS	GREAT SPOTTED WOODPECKER	K.	KESTREL	MH	MOORHEN	RN	RAVEN	WP	WOOD PIGEON
		D.	DUNNOCK			KF	KINGFISHER			RO	ROOK	WR	WREN

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

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Construction
None

Maintenance / Cleaning
None

Use
None

Decommission / Demolition
None

Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
PUBLISHED	A1	P01	SD	LH	CC	MT	19/09/21

Drawing Suitability: PUBLISHED
Status: A1

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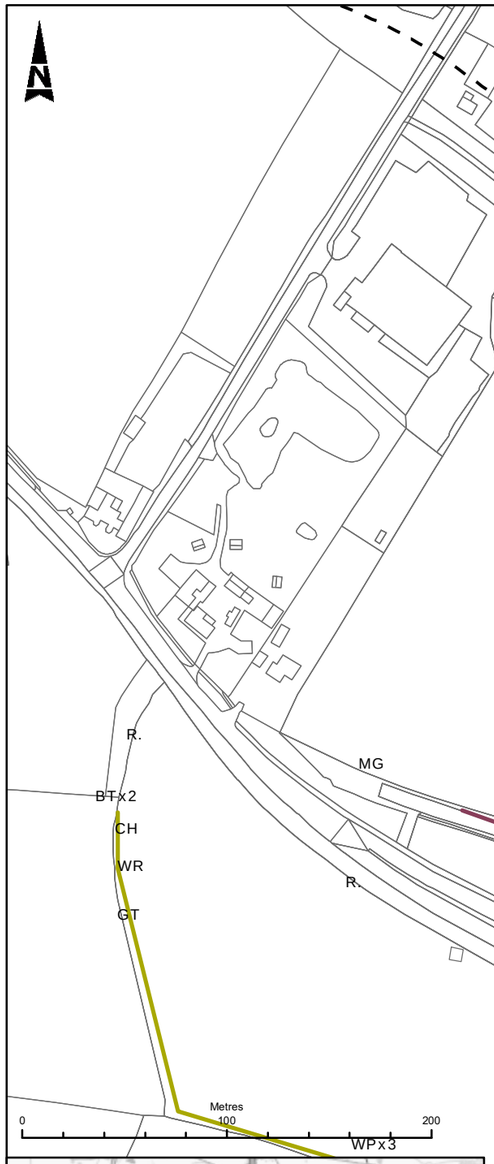
Project Title: M5 Junction 10 Improvement

Drawing Title: FIGURE 7.9E
WINTERING BIRD SURVEY RESULTS
JANUARY 2020

Drawing Number: GCCM5J10 - ATK - EBD - XX - GS - GI - 000023

Location	Project	Originator	Volume	Number
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LEGEND

- 250M STUDY AREA
- TRANSECT 2
- TRANSECT 3
- TRANSECT 4
- TRANSECT 5
- TRANSECT 6
- TRANSECT 7
- TRANSECT 8
- TRANSECT 9

BEHAVIOURS

- FORAGING IN FLIGHT
- FLYING

SPECIES (BTO CODES)

B.	BLACKBIRD	BH	BLACK-HEADED GULL	F F	FIELDFARE	G T	GREAT TIT	L.	LAPWING	MP	MEADOW PIPIT	S.	SKYLARK
B T	BLUE TIT	B Z	BUZZARD	G.	GREEN WOODPECKER	H.	GREY HERON	LB	LESSER BLACK-BACKED GULL	PW	PIED WAGTAIL	S C	STONECHAT
		C.	CARRION CROW	G C	GOLDCREST	H G	HERRING GULL	L T	LONG-TAILED TIT	P H	PHEASANT	S D	STOCK DOVE
		C D	COLLARED DOVE	G L	GREY WAGTAIL	H S	HOUSE SPARROW	M.	MISTLE THRUSH	R.	ROBIN	S G	STARLING
		C A	CORMORANT	G O	GOLDFINCH	J.	JAY	MA	MALLARD	RE	REDWING	S H	SPARROWHAWK
		C H	CHAFFINCH	G R	GREENFINCH	J D	JACKDAW	MG	MAGPIE	RB	REED BUNTING	S T	SONG THRUSH
		C T	COAL TIT	G S	GREAT SPOTTED WOODPECKER	K.	KESTREL	MH	MOORHEN	RN	RAVEN	WP	WOOD PIGEON
		D.	DUNNOCK			K F	KINGFISHER			R O	ROOK	WR	WREN

Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
PUBLISHED	A1	P01	SD	LH	CC	MT	19/09/21

Drawing Suitability: PUBLISHED

Status: A1

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Client: Gloucestershire County Council

Project Title: M5 Junction 10 Improvement

Drawing Title: FIGURE 7.9E
WINTERING BIRD SURVEY RESULTS
JANUARY 2020

Drawing Number: Project | Originator | Volume
GCCM5J10 - ATK - EBD
XX - GS - GI - 000023
Location | Type | Number

Original Size:	Scale	Project Ref:	Sheet:	Rev:
A3	1:3,000	5197035	13 of 13	P01

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

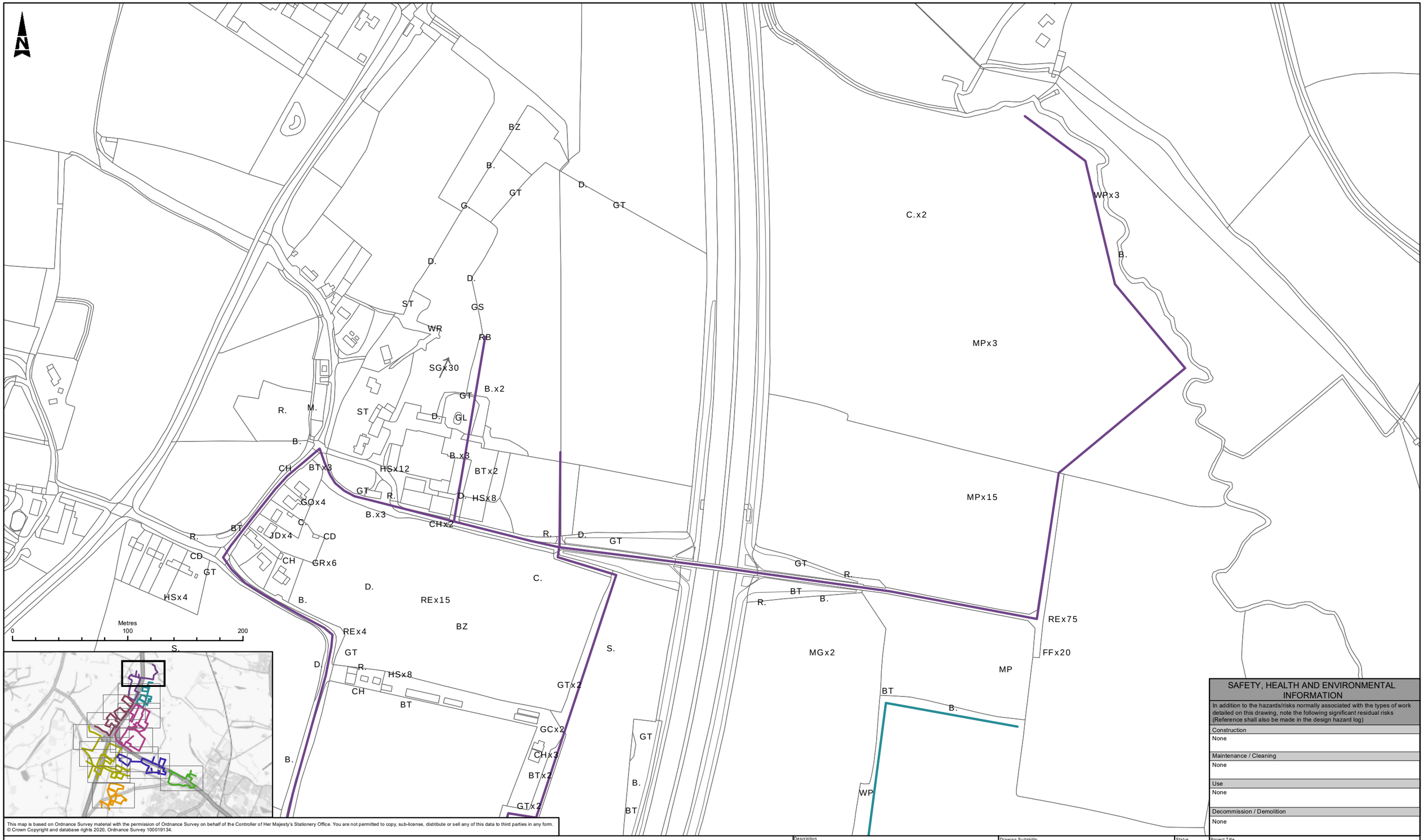
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Construction
None

Maintenance / Cleaning
None

Use
None

Decommission / Demolition
None



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LEGEND

- 250M STUDY AREA
- TRANSECT 2
- TRANSECT 3
- TRANSECT 4
- TRANSECT 5
- TRANSECT 6
- TRANSECT 7
- TRANSECT 8
- TRANSECT 9

BEHAVIOURS

- FORAGING IN FLIGHT
- FLYING

SPECIES (BTO CODES)

B.	BLACKBIRD	CD	COLLARED DOVE	GL	GREY WAGTAIL	JD	JACKDAW	MG	MAGPIE	S.	SKYLARK
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D.	DUNNOCK	FF	FIELDFARE	GT	GREAT TIT	LB	LESSER BLACK-BACKED GULL	R.	ROBIN	ST	SONG THRUSH
G.	GREEN WOODPECKER	HG	HERRING GULL	HS	HOUSE SPARROW	LT	LONG-TAILED TIT	RE	REDWING	WP	WOOD PIGEON
GC	GOLDCREST	J.	JAY	M.	MISTLE THRUSH	MA	MALLARD	RB	REED BUNTING	WR	WREN
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SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

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Construction
None

Maintenance / Cleaning
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Use
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Decommission / Demolition
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Drawing Suitability: PUBLISHED — Status: A1

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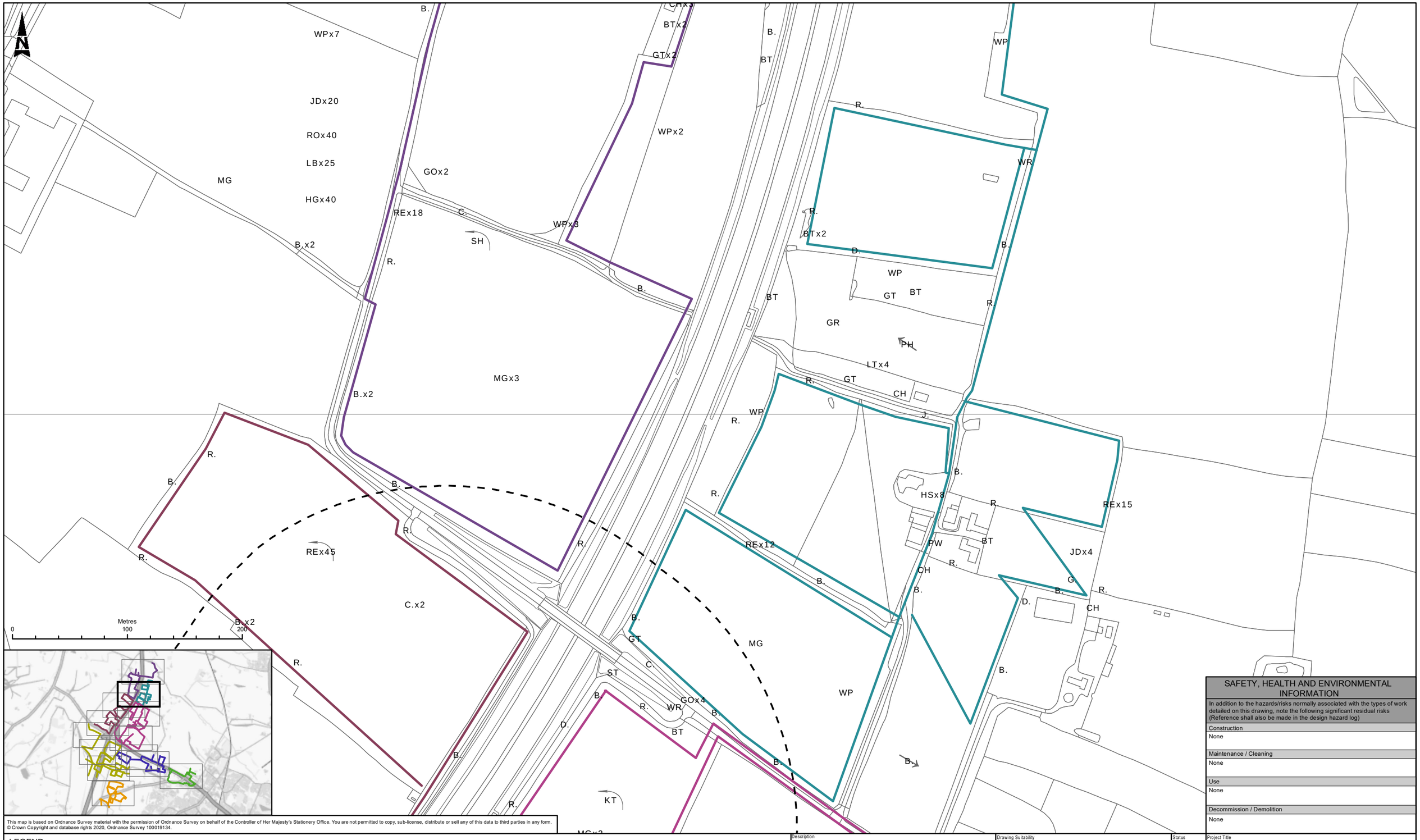
Client: Gloucestershire County Council

Project Title: M5 Junction 10 Improvement

Drawing Title: FIGURE 7.9F
WINTERING BIRD SURVEY RESULTS
FEBRUARY 2020

Drawing Number: Project | Originator | Volume
GCCM5J10 - ATK - EBD
XX - GS - GI - 000024
Location | Type | Number

Original Size:	Scale	Project Ref:	Sheet:	Rev:
A3	1:3,000	5197035	1 of 13	P01



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LEGEND

- 250M STUDY AREA
- TRANSECT 2
- TRANSECT 3
- TRANSECT 4
- TRANSECT 5
- TRANSECT 6
- TRANSECT 7
- TRANSECT 8
- TRANSECT 9

BEHAVIOURS

- FORAGING IN FLIGHT
- FLYING

SPECIES (BTO CODES)

B.	BLACKBIRD	CD	COLLARED DOVE	GL	GREY WAGTAIL	JD	JACKDAW	MG	MAGPIE	S.	SKYLARK
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		D.	DUNNOCK	GT	GREAT TIT	LB	LESSER BLACK-BACKED GULL	R.	ROBIN	ST	SONG THRUSH
		FF	FIELDFARE	HG	HERRING GULL	LT	LONG-TAILED TIT	RE	REDWING	WP	WOOD PIGEON
		G.	GREEN WOODPECKER	HS	HOUSE SPARROW	M.	MISTLE THRUSH	RB	REED BUNTING	WR	WREN
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								RO	ROOK		

Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
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Drawing Suitability: PUBLISHED

Status: A1

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log)

Construction
None

Maintenance / Cleaning
None

Use
None

Decommission / Demolition
None

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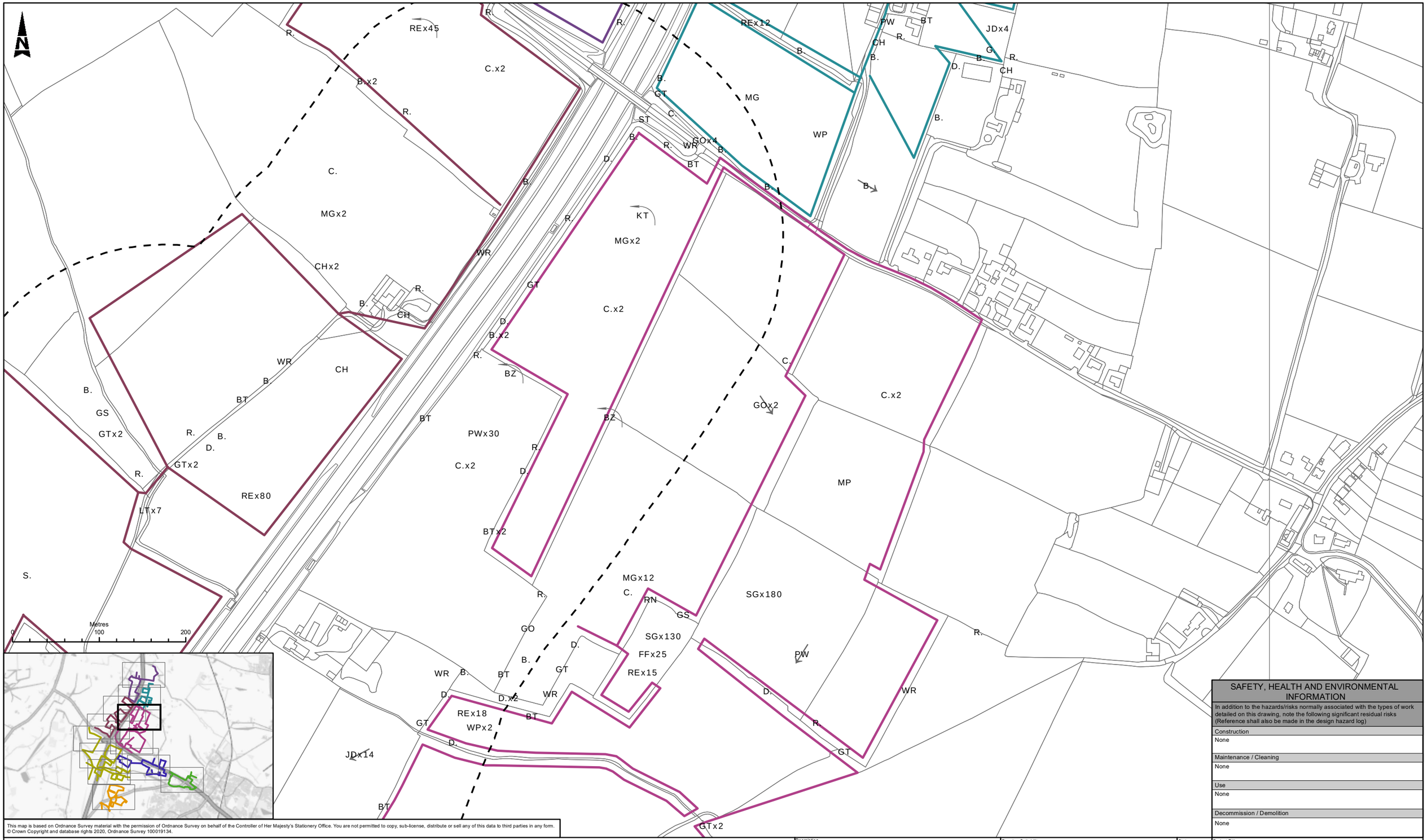
Client: Gloucestershire County Council

Project Title: M5 Junction 10 Improvement

Drawing Title: FIGURE 7.9F
WINTERING BIRD SURVEY RESULTS
FEBRUARY 2020

Drawing Number: Project | Originator | Volume | Location | Type | Number
GCCM5J10 - ATK - EBD
XX - GS - GI - 000024

Original Size:	Scale	Project Ref:	Sheet:	Rev:
A3	1:3,000	5197035	2 of 13	P01



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LEGEND

- 250M STUDY AREA
- TRANSECT 2
- TRANSECT 3
- TRANSECT 4
- TRANSECT 5
- TRANSECT 6
- TRANSECT 7
- TRANSECT 8
- TRANSECT 9

BEHAVIOURS

- FORAGING IN FLIGHT
- FLYING

SPECIES (BTO CODES)

B.	BLACKBIRD	CD	COLLARED DOVE	GL	GREY WAGTAIL	JD	JACKDAW	MG	MAGPIE	S.	SKYLARK
BT	BLUE TIT	CA	CORMORANT	GO	GOLDFINCH	K.	KESTREL	MP	MEADOW PIPIT	SD	STOCK DOVE
BZ	BUZZARD	CH	CHAFFINCH	GR	GREENFINCH	KF	KINGFISHER	PW	PIED WAGTAIL	SG	STARLING
C.	CARRION CROW	CT	COAL TIT	GS	GREAT SPOTTED WOODPECKER	KT	RED KITE	PH	PHEASANT	SH	SPARROWHAWK
		D.	DUNNOCK	GT	GREAT TIT	LB	LESSER BLACK-BACKED GULL	R.	ROBIN	ST	SONG THRUSH
		FF	FIELDFARE	HG	HERRING GULL	LT	LONG-TAILED TIT	RE	REDWING	WP	WOOD PIGEON
		G.	GREEN WOODPECKER	HS	HOUSE SPARROW	M.	MISTLE THRUSH	RB	REED BUNTING	WR	WREN
		GC	GOLDCREST	J.	JAY	MA	MALLARD	RN	RAVEN		
								RO	ROOK		

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

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Construction
None

Maintenance / Cleaning
None

Use
None

Decommission / Demolition
None

Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
PUBLISHED	A1	P01	SD	LH	CC	MT	19/09/21

Drawing Suitability: PUBLISHED
Status: A1

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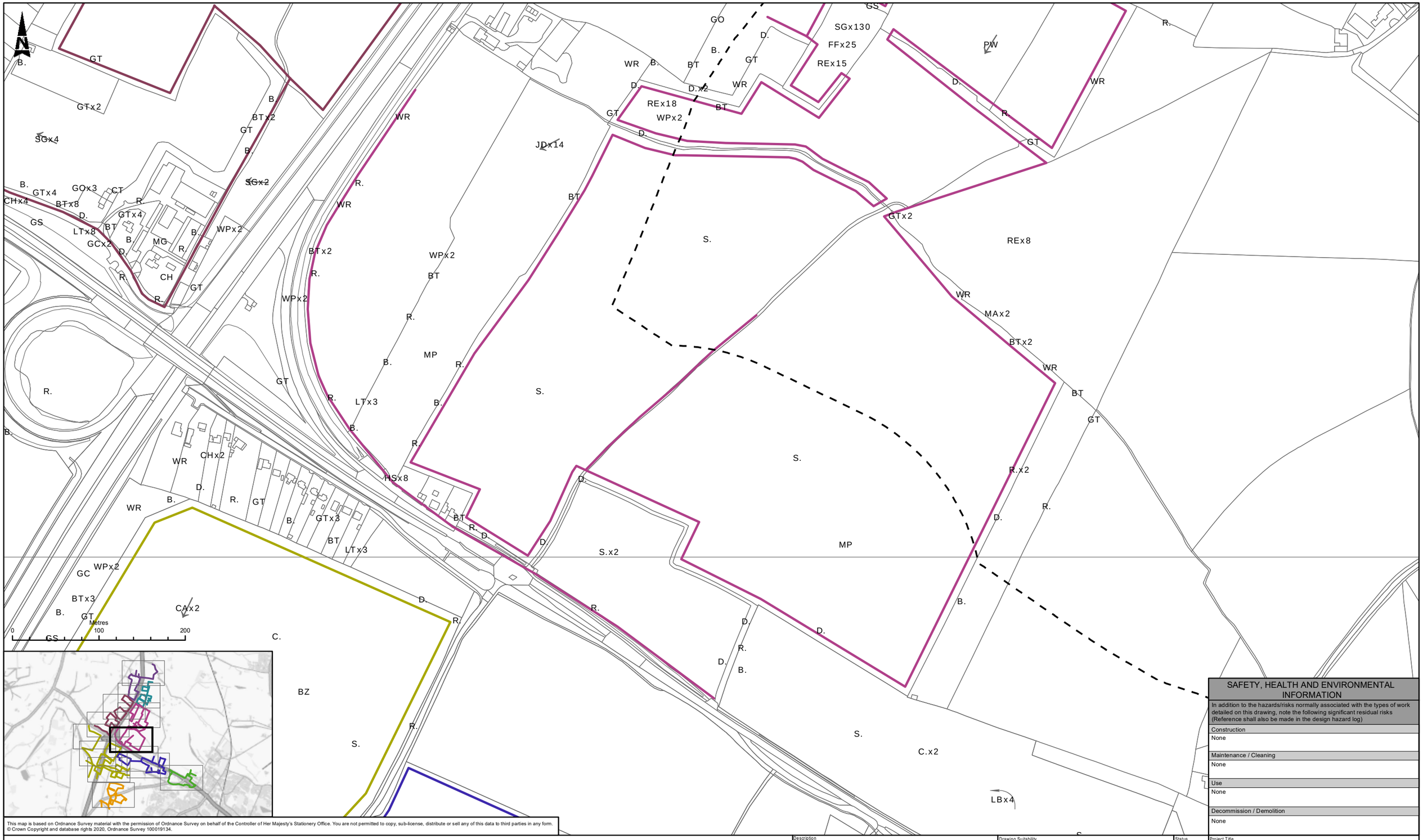
Client: Gloucestershire County Council

Project Title: M5 Junction 10 Improvement

Drawing Title: FIGURE 7.9F
WINTERING BIRD SURVEY RESULTS
FEBRUARY 2020

Drawing Number: GCCM5J10 - ATK - EBD | XX - GS - GI - 000024

Original Size:	Location	Scale	Project Ref:	Sheet:	Rev:
A3		1:4,000	5197035	3 of 13	P01



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LEGEND

- 250M STUDY AREA
- TRANSECT 2
- TRANSECT 3
- TRANSECT 4
- TRANSECT 5
- TRANSECT 6
- TRANSECT 7
- TRANSECT 8
- TRANSECT 9

BEHAVIOURS

- FORAGING IN FLIGHT
- FLYING

SPECIES (BTO CODES)

B.	BLACKBIRD	CD	COLLARED DOVE	GL	GREY WAGTAIL	JD	JACKDAW	MG	MAGPIE	S.	SKYLARK
BT	BLUE TIT	CA	CORMORANT	GO	GOLDFINCH	K.	KESTREL	MP	MEADOW PIPIT	SD	STOCK DOVE
BZ	BUZZARD	CH	CHAFFINCH	GR	GREENFINCH	KF	KINGFISHER	PW	PIED WAGTAIL	SG	STARLING
C.	CARRION CROW	CT	COAL TIT	GS	GREAT SPOTTED WOODPECKER	KT	RED KITE	PH	PHEASANT	SH	SPARROWHAWK
D.	DUNNOCK	FF	FIELDFARE	GT	GREAT TIT	LB	LESSER BLACK-BACKED GULL	R.	ROBIN	ST	SONG THRUSH
G.	GREEN WOODPECKER	HG	HERRING GULL	HS	HOUSE SPARROW	LT	LONG-TAILED TIT	RE	REDWING	WP	WOOD PIGEON
GC	GOLDCREST	J.	JAY	M.	MISTLE THRUSH	MA	MALLARD	RB	REED BUNTING	WR	WREN
								RN	RAVEN		
								RO	ROOK		

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

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Construction
None

Maintenance / Cleaning
None

Use
None

Decommission / Demolition
None

Description

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
PUBLISHED	P01	SD	LH	CC	MT	19/09/21

Drawing Suitability: PUBLISHED
Status: A1

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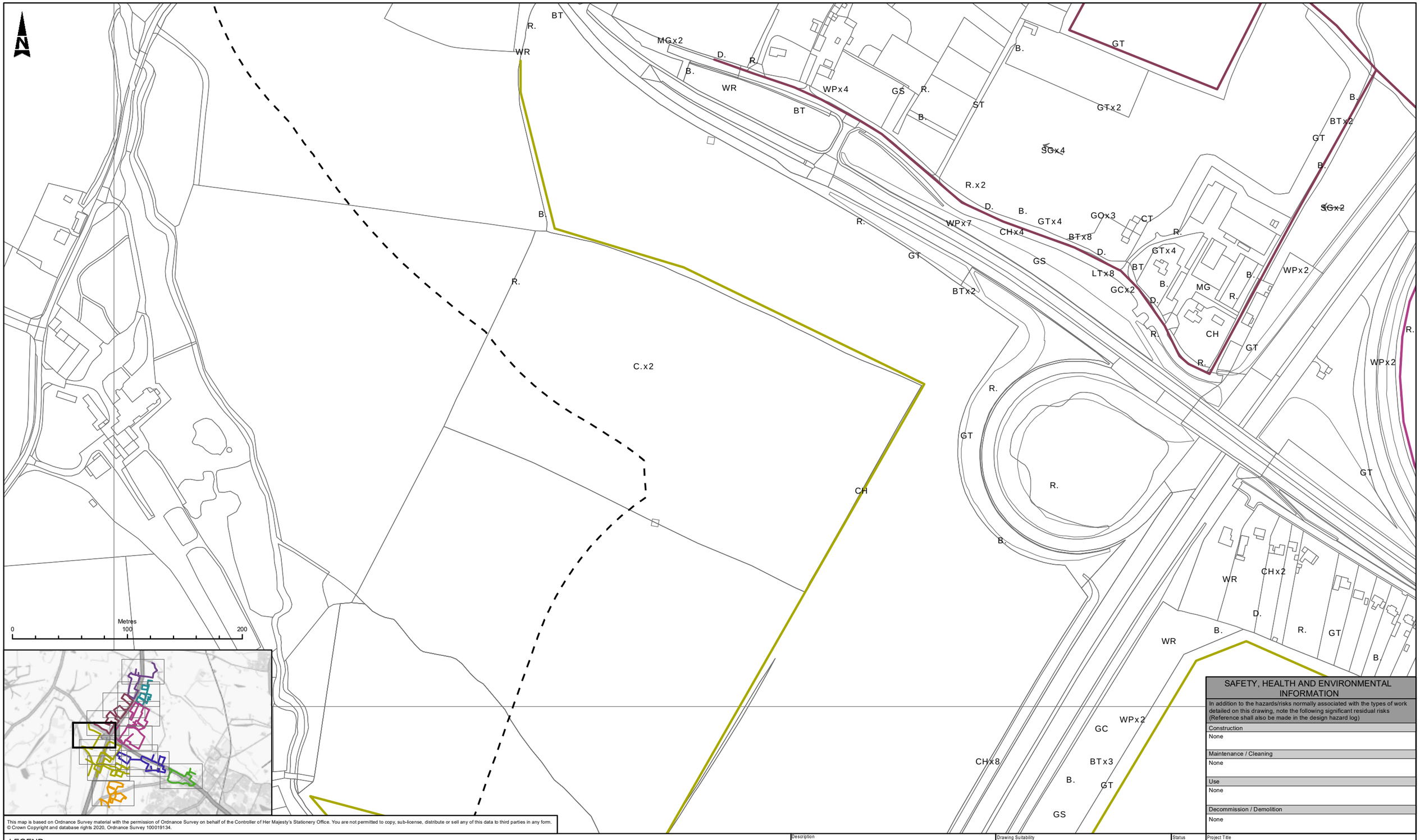
Client: Gloucestershire County Council

Project Title: M5 Junction 10 Improvement

Drawing Title: FIGURE 7.9F
WINTERING BIRD SURVEY RESULTS
FEBRUARY 2020

Drawing Number: Project | Originator | Volume | Location | Number
GCCM5J10 - ATK - EBD
XX - GS - GI - 000024

Original Size:	Scale	Project Ref:	Sheet:	Rev:
A3	1:4,000	5197035	4 of 13	P01



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LEGEND

- 250M STUDY AREA
- TRANSECT 2
- TRANSECT 3
- TRANSECT 4
- TRANSECT 5
- TRANSECT 6
- TRANSECT 7
- TRANSECT 8
- TRANSECT 9

BEHAVIOURS

- FORAGING IN FLIGHT
- FLYING

SPECIES (BTO CODES)

B.	BLACKBIRD	CD	COLLARED DOVE	GL	GREY WAGTAIL	JD	JACKDAW	MG	MAGPIE	S.	SKYLARK
BT	BLUE TIT	CA	CORMORANT	GO	GOLDFINCH	K.	KESTREL	MP	MEADOW PIPIT	SD	STOCK DOVE
BZ	BUZZARD	CH	CHAFFINCH	GR	GREENFINCH	KF	KINGFISHER	PW	PIED WAGTAIL	SG	STARLING
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D.	DUNNOCK	FF	FIELDFARE	GT	GREAT TIT	LB	LESSER BLACK-BACKED GULL	R.	ROBIN	ST	SONG THRUSH
F F	FIELDFARE	G.	GREEN WOODPECKER	HG	HERRING GULL	LT	LONG-TAILED TIT	RE	REDWING	WP	WOOD PIGEON
GC	GOLDCREST	GC	GOLDCREST	HS	HOUSE SPARROW	M.	MISTLE THRUSH	RB	REED BUNTING	WR	WREN
				J.	JAY	MA	MALLARD	RN	RAVEN		
								RO	ROOK		

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

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Construction
None

Maintenance / Cleaning
None

Use
None

Decommission / Demolition
None

Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
PUBLISHED	A1	P01	SD	LH	CC	MT	19/09/21

Drawing Suitability: PUBLISHED
Status: A1

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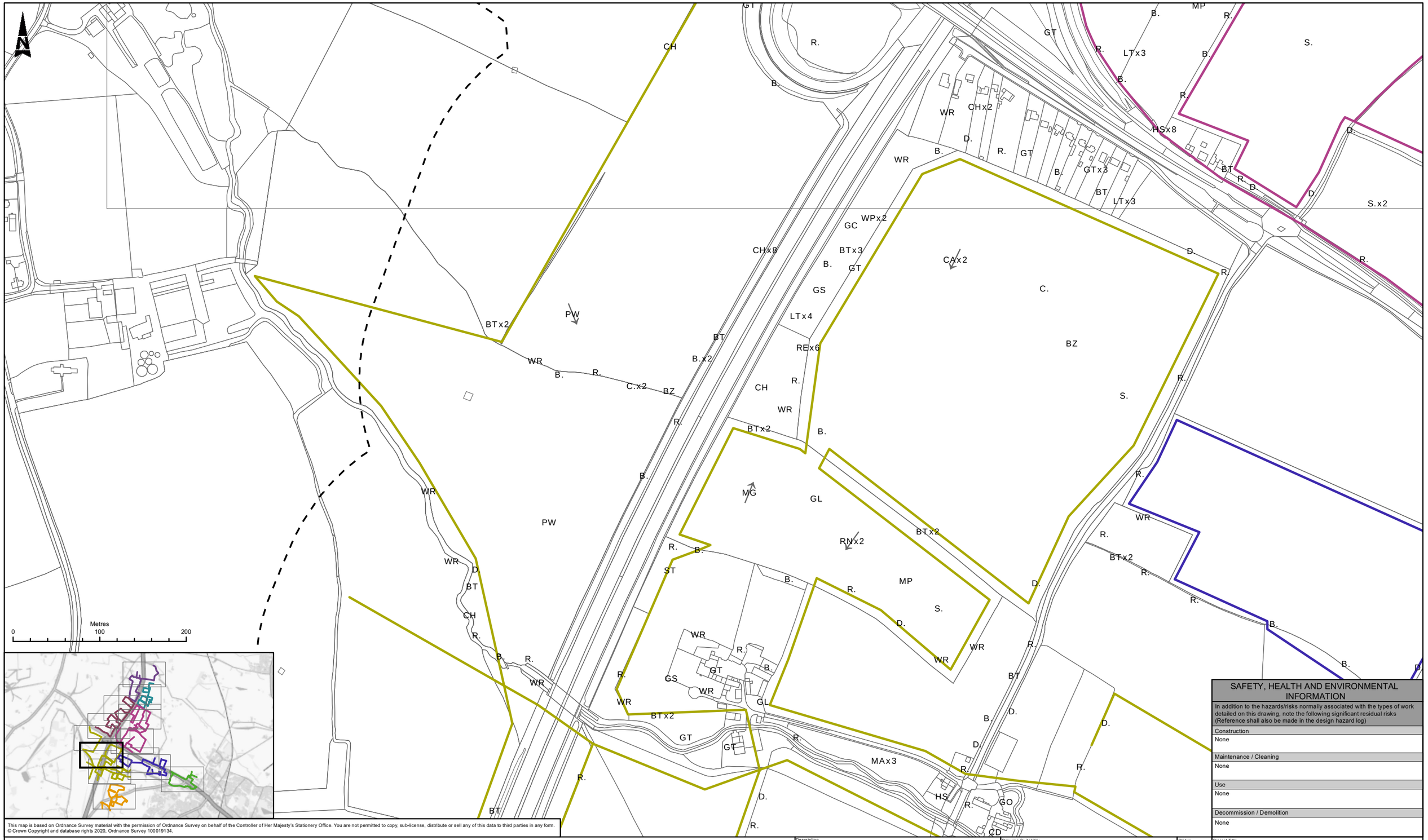
Client: Gloucestershire County Council

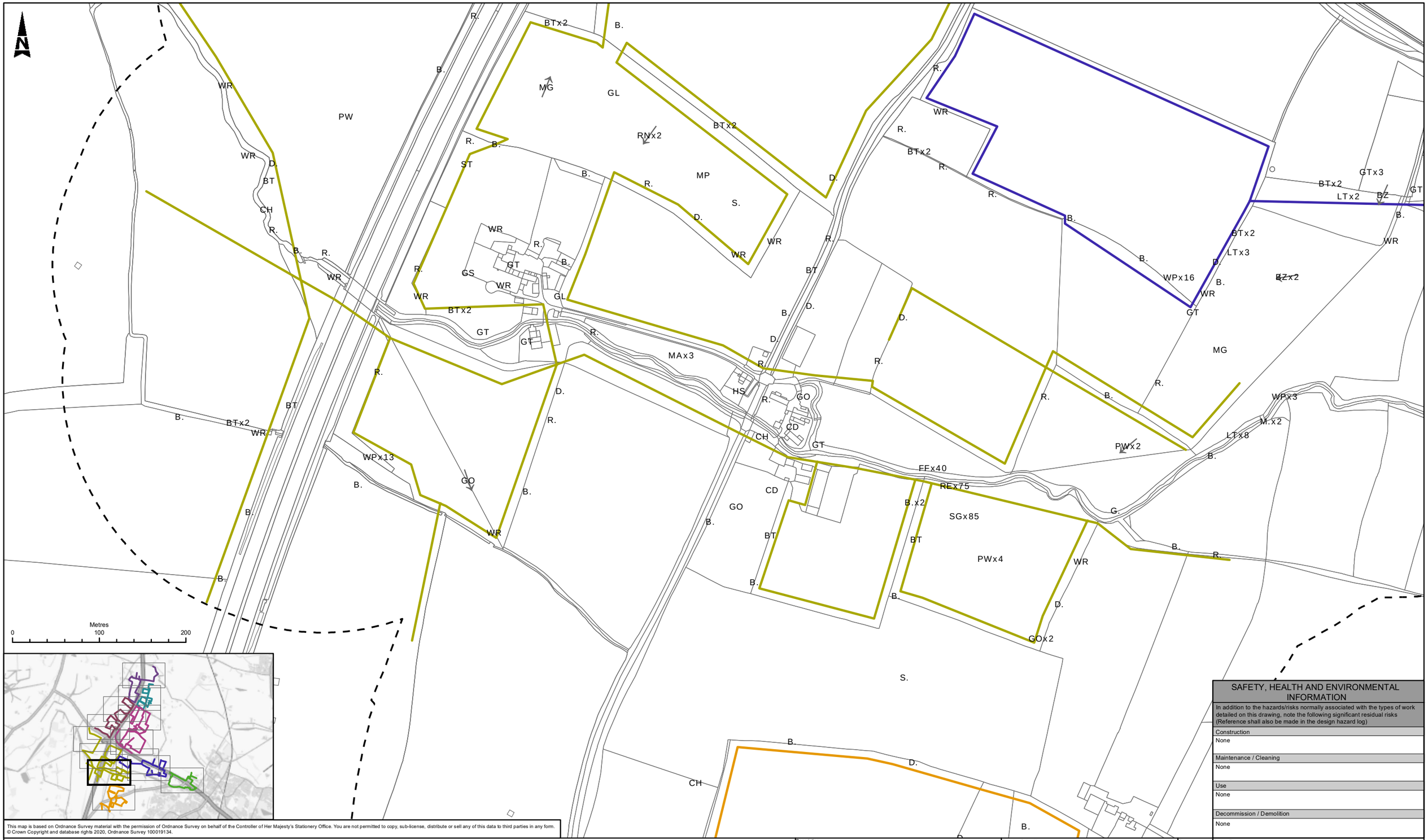
Project Title: M5 Junction 10 Improvement

Drawing Title: FIGURE 7.9F
WINTERING BIRD SURVEY RESULTS
FEBRUARY 2020

Drawing Number: GCCM5J10 - ATK - EBD | XX - GS - GI - 000024
(Project | Originator | Volume | Location | Type | Number)

Original Size:	Scale	Project Ref:	Sheet:	Rev:
A3	1:3,000	5197035	5 of 13	P01


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D.
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LTx3
S.
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WPx2
GC
CHx8
BTx3
CAx2
GS
LTx4
REx6
BZ
C.
BTx2
PW
B.x2
C.x2
MG
GL
RNx2
MP
ST
HSx8
GTx3
MAx3
HS
GO
CD
MP
BT
R.
WR
B.
D.
S.
BZ
CH
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BTx2
B.
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BT
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GL
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LEGEND

- 250M STUDY AREA
- TRANSECT 2
- TRANSECT 3
- TRANSECT 4
- TRANSECT 5
- TRANSECT 6
- TRANSECT 7
- TRANSECT 8
- TRANSECT 9

BEHAVIOURS

- FORAGING IN FLIGHT
- FLYING

SPECIES (BTO CODES)

B.	BLACKBIRD	CD	COLLARED DOVE	GL	GREY WAGTAIL	JD	JACKDAW	MG	MAGPIE
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		D.	DUNNOCK	GT	GREAT TIT	LB	LESSER BLACK-BACKED GULL	R.	ROBIN
		FF	FIELDFARE	HG	HERRING GULL	LT	LONG-TAILED TIT	RE	REDWING
		G.	GREEN WOODPECKER	HS	HOUSE SPARROW	M.	MISTLE THRUSH	RB	REED BUNTING
		GC	GOLDCREST	J.	JAY	MA	MALLARD	RN	RAVEN
								RO	ROOK
								S.	SKYLARK
								SD	STOCK DOVE
								SG	STARLING
								SH	SPARROWHAWK
								ST	SONG THRUSH
								WP	WOOD PIGEON
								WR	WREN

Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
PUBLISHED	A1	P01	SD	LH	CC	MT	19/09/21

Drawing Suitability: PUBLISHED

Status: A1

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SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

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Construction
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Maintenance / Cleaning
None

Use
None

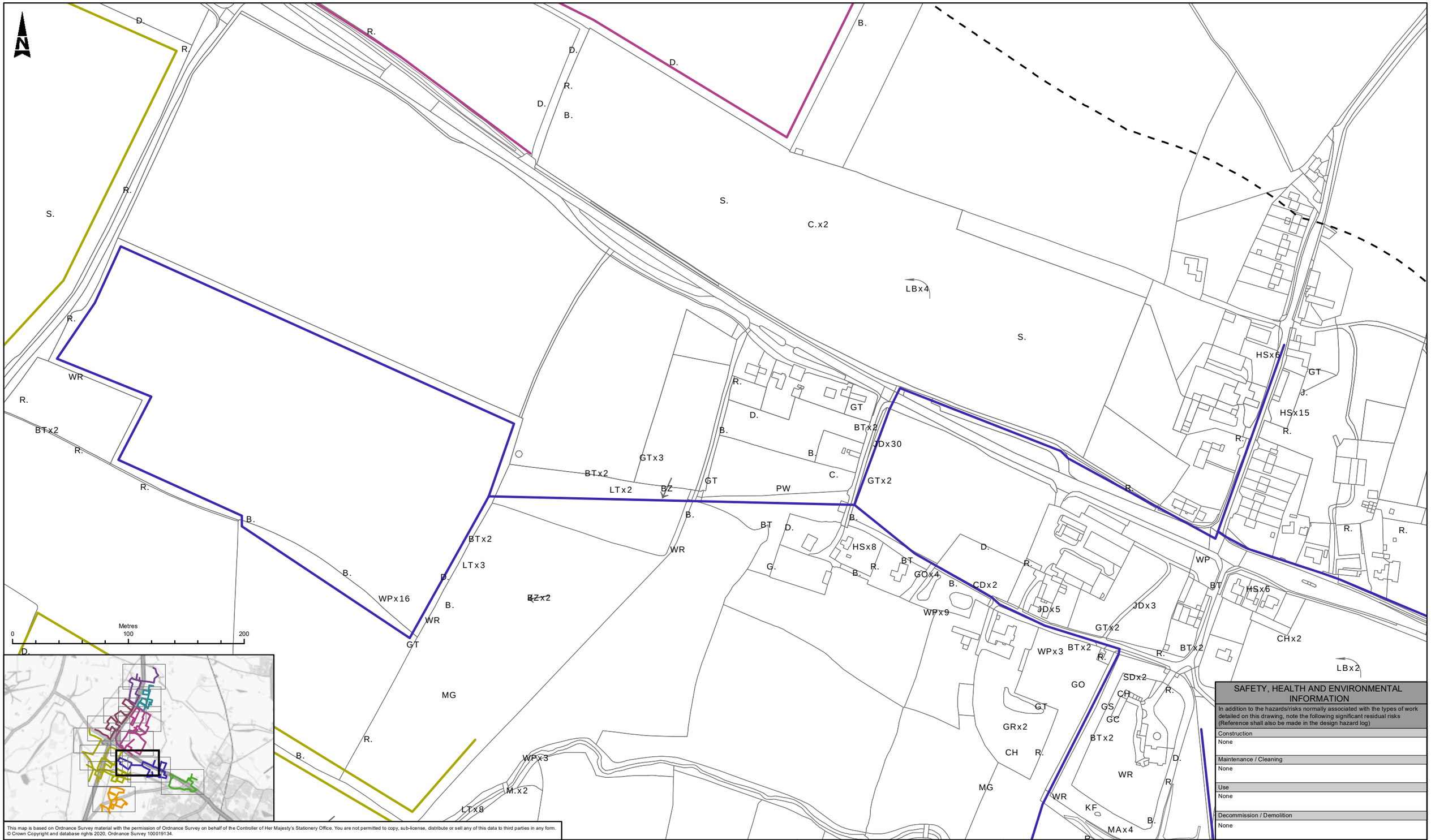
Decommission / Demolition
None

Project Title: M5 Junction 10 Improvement

Drawing Title: FIGURE 7.9F
WINTERING BIRD SURVEY RESULTS
FEBRUARY 2020

Drawing Number: GCCM5J10 - ATK - EBD | XX - GS - GI - 000024 | P01

Original Size:	Scale	Project Ref:	Sheet:	Rev:
A3	1:4,000	5197035	7 of 13	P01



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LEGEND

- 250M STUDY AREA
- TRANSECT 2
- TRANSECT 3
- TRANSECT 4
- TRANSECT 5
- TRANSECT 6
- TRANSECT 7
- TRANSECT 8
- TRANSECT 9

BEHAVIOURS

- FORAGING IN FLIGHT
- FLYING

SPECIES (BTO CODES)

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								RO	ROOK		

Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
PUBLISHED	A1	P01	SD	LH	CC	MT	19/09/21

Drawing Suitability: PUBLISHED
Status: A1

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Client: Gloucestershire COUNTY COUNCIL

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

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Construction
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Maintenance / Cleaning
None

Use
None

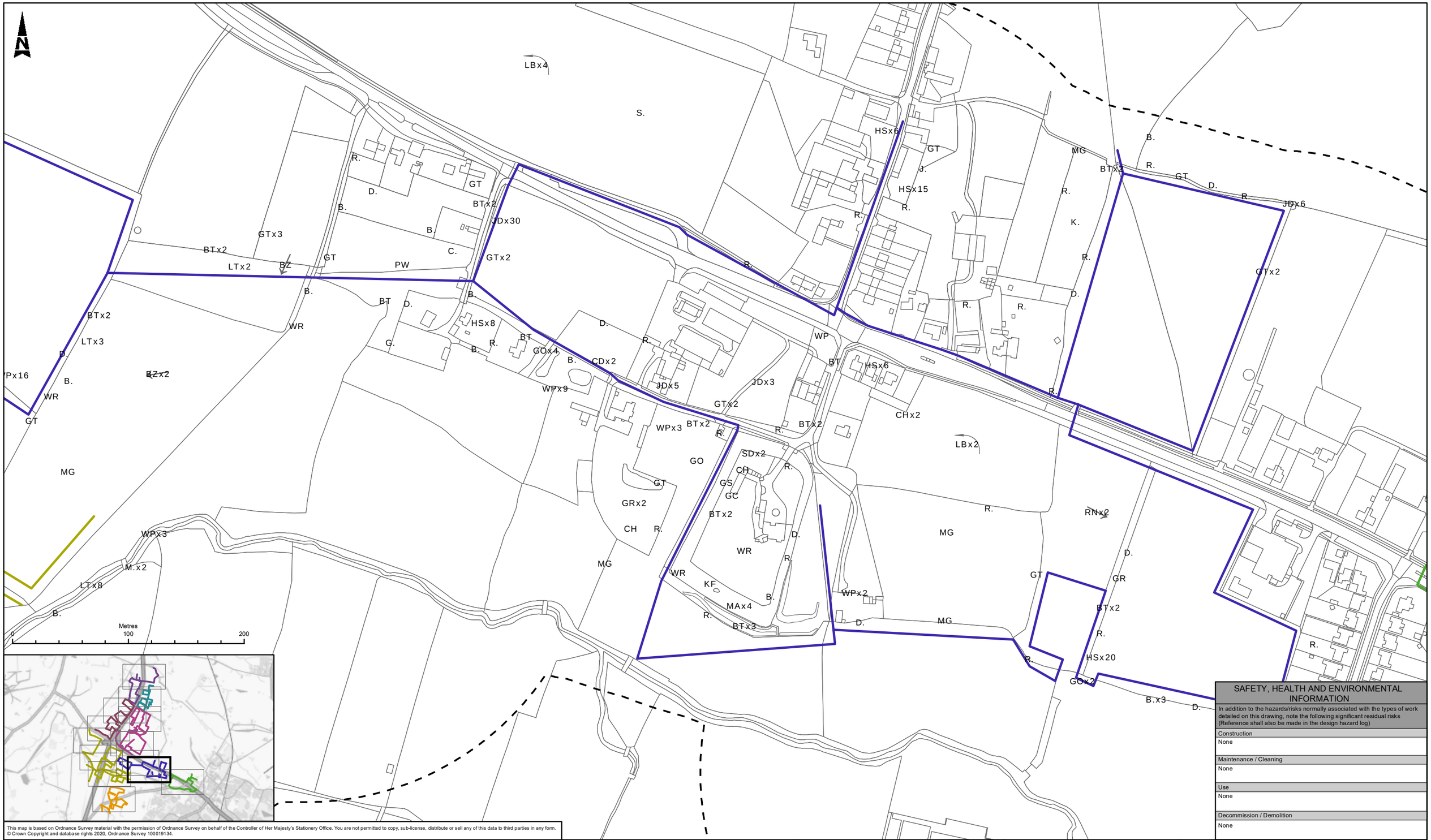
Decommission / Demolition
None

Project Title: M5 Junction 10 Improvement

Drawing Title: FIGURE 7.9F
WINTERING BIRD SURVEY RESULTS
FEBRUARY 2020

Drawing Number: Project | Originator | Volume
GCCM5J10 - ATK - EBD
Location | Type | Number
XX - GS - GI - 000024

Original Size:	Scale	Project Ref:	Sheet:	Rev:
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LEGEND

- 250M STUDY AREA
- TRANSECT 2
- TRANSECT 3
- TRANSECT 4
- TRANSECT 5
- TRANSECT 6
- TRANSECT 7
- TRANSECT 8
- TRANSECT 9

BEHAVIOURS

- FORAGING IN FLIGHT
- FLYING

SPECIES (BTO CODES)

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Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
PUBLISHED	A1	P01	SD	LH	CC	MT	19/09/21

Drawing Suitability: PUBLISHED
Status: A1

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Client: Gloucestershire COUNTY COUNCIL

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

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Construction
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Maintenance / Cleaning
None

Use
None

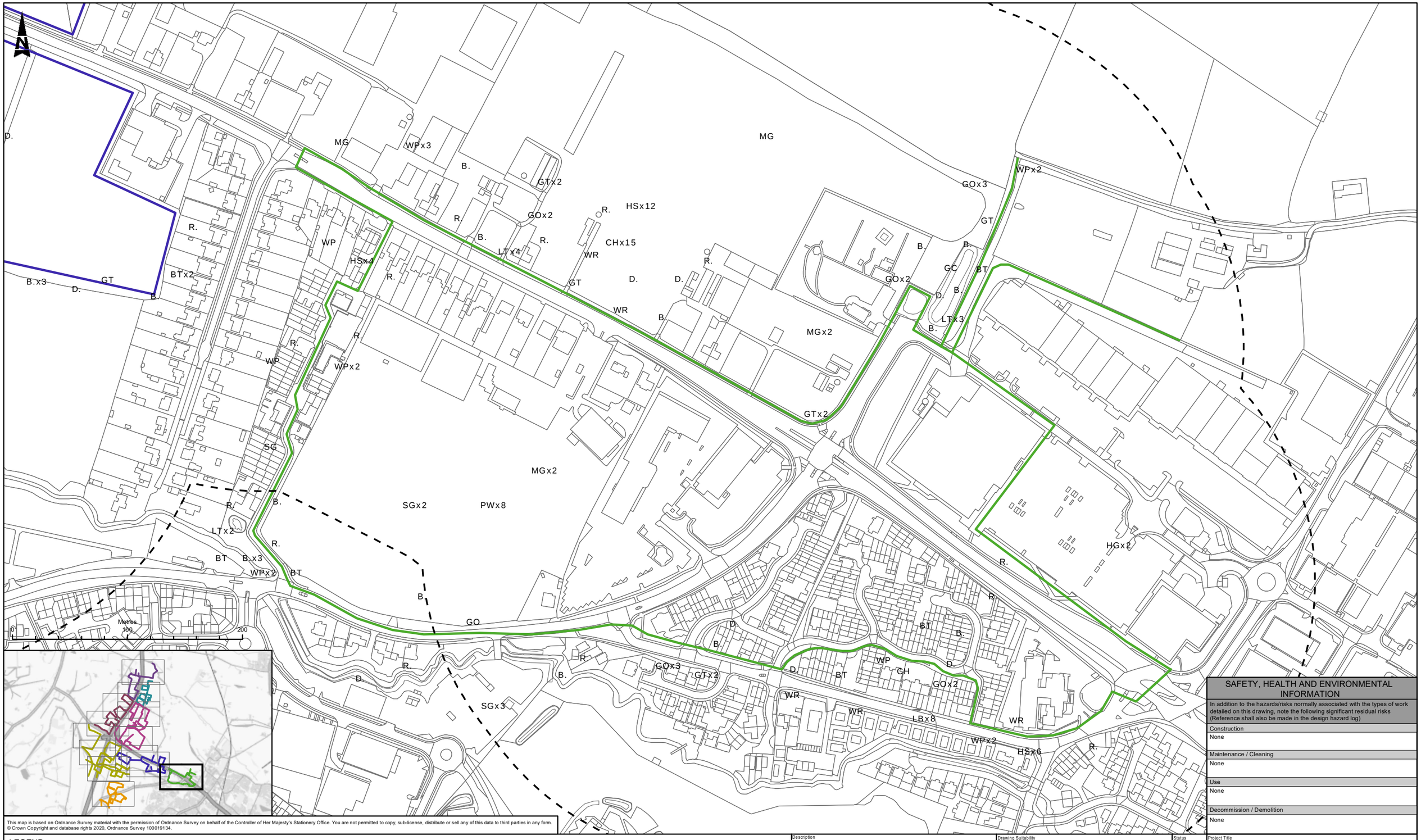
Decommission / Demolition
None

Project Title: M5 Junction 10 Improvement

Drawing Title: FIGURE 7.9F
WINTERING BIRD SURVEY RESULTS
FEBRUARY 2020

Drawing Number: GCCM5J10 - ATK - EBD - XX - GS - GI - 000024

Original Size:	Scale	Project Ref:	Sheet:	Rev:
A3	1:3,000	5197035	9 of 13	P01



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LEGEND

- 250M STUDY AREA
- TRANSECT 2
- TRANSECT 3
- TRANSECT 4
- TRANSECT 5
- TRANSECT 6
- TRANSECT 7
- TRANSECT 8
- TRANSECT 9

BEHAVIOURS

- FORAGING IN FLIGHT
- FLYING

SPECIES (BTO CODES)

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GC	GOLDCREST	HS	HOUSE SPARROW	MA	MALLARD	RB	REED BUNTING	RN	RAVEN	WR	WREN
		J.	JAY					RO	ROOK		

Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
PUBLISHED	A1	P01	SD	LH	CC	MT	19/09/21

Drawing Suitability: PUBLISHED

Status: A1

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

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Maintenance / Cleaning
None

Use
None

Decommission / Demolition
None

Project Title: M5 Junction 10 Improvement

Drawing Title: FIGURE 7.9F
WINTERING BIRD SURVEY RESULTS
FEBRUARY 2020

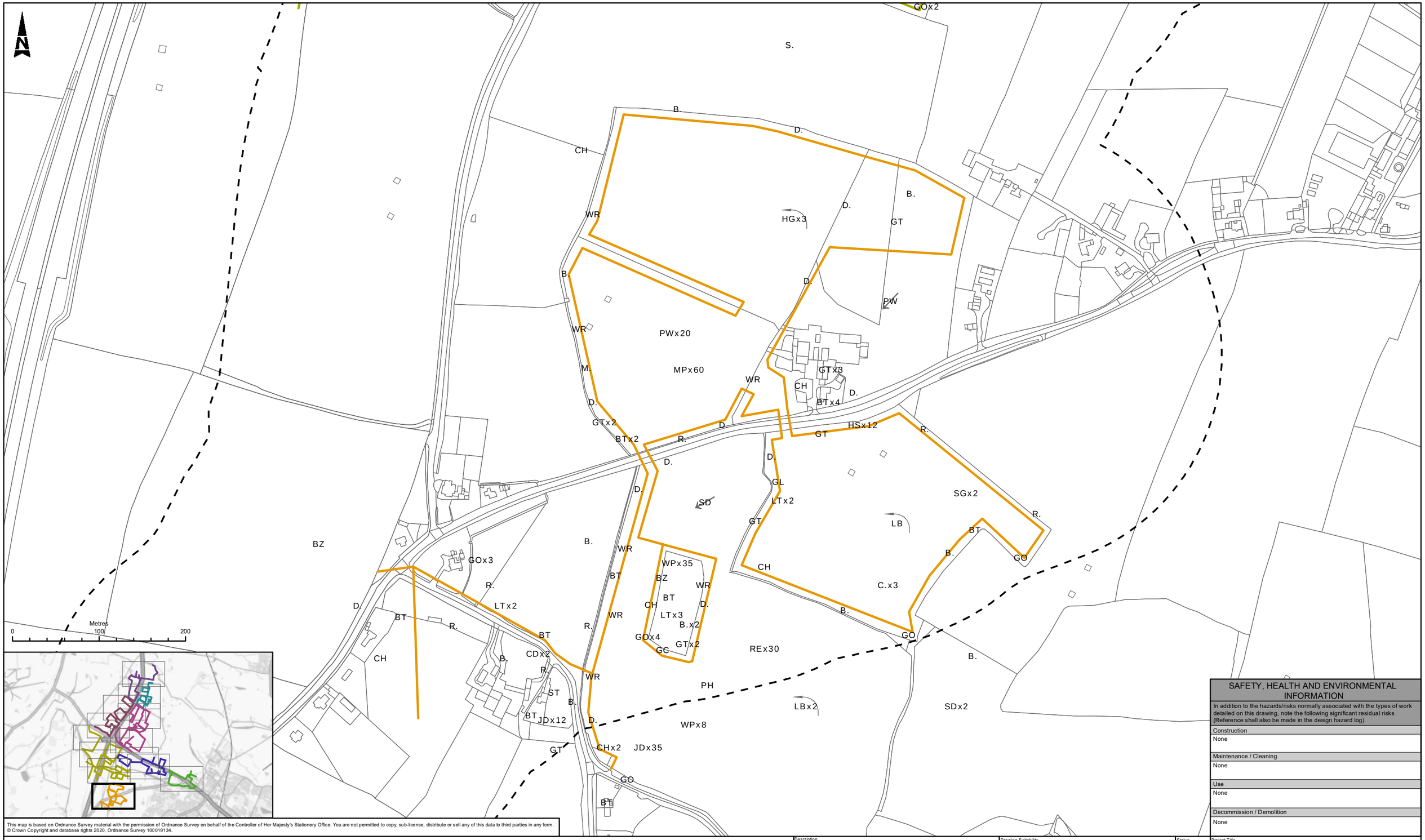
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Client: Gloucestershire County Council

Drawing Number: GCCM5J10 - ATK - EBD - XX - GS - GI - 000024
(Project | Originator | Volume | Location | Type | Number)

Original Size:	Scale	Project Ref:	Sheet:	Rev:
A3	1:3,000	5197035	10 of 13	P01



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LEGEND

- 250M STUDY AREA
- TRANSECT 2
- TRANSECT 3
- TRANSECT 4
- TRANSECT 5
- TRANSECT 6
- TRANSECT 7
- TRANSECT 8
- TRANSECT 9

BEHAVIOURS

- FORAGING IN FLIGHT
- FLYING

SPECIES (BTO CODES)

B.	BLACKBIRD	CD	COLLARED DOVE	GL	GREY WAGTAIL	JD	JACKDAW	MG	MAGPIE	S.	SKYLARK
BT	BLUE TIT	CA	CORMORANT	GO	GOLDFINCH	K.	KESTREL	MP	MEADOW PIPIT	SD	STOCK DOVE
BZ	BUZZARD	CH	CHAFFINCH	GR	GREENFINCH	KF	KINGFISHER	PW	PIED WAGTAIL	SG	STARLING
C.	CARRION CROW	CT	COAL TIT	GS	GREAT SPOTTED WOODPECKER	KT	RED KITE	PH	PHEASANT	SH	SPARROWHAWK
		D.	DUNNOCK	GT	GREAT TIT	LB	LESSER BLACK-BACKED GULL	R.	ROBIN	ST	SONG THRUSH
		FF	FIELDFARE	HG	HERRING GULL			RE	REDWING	WP	WOOD PIGEON
		G.	GREEN WOODPECKER	HS	HOUSE SPARROW	LT	LONG-TAILED TIT	RB	REED BUNTING	WR	WREN
		GC	GOLDCREST	J.	JAY	M.	MISTLE THRUSH	RN	RAVEN		
						MA	MALLARD	RO	ROOK		

Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
PUBLISHED	A1	P01	SD	LH	CC	MT	19/09/21

Drawing Suitability: PUBLISHED — Status: A1

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Client: Gloucestershire County Council

Project Title: M5 Junction 10 Improvement

Drawing Title: FIGURE 7.9F
WINTERING BIRD SURVEY RESULTS
FEBRUARY 2020

Drawing Number: Project | Originator | Volume
GCCM5J10 - ATK - EBD
XX - GS - GI - 000024
Location | Type | Number

Original Size:	Scale	Project Ref:	Sheet:	Rev:
A3	1:4,000	5197035	11 of 13	P01

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

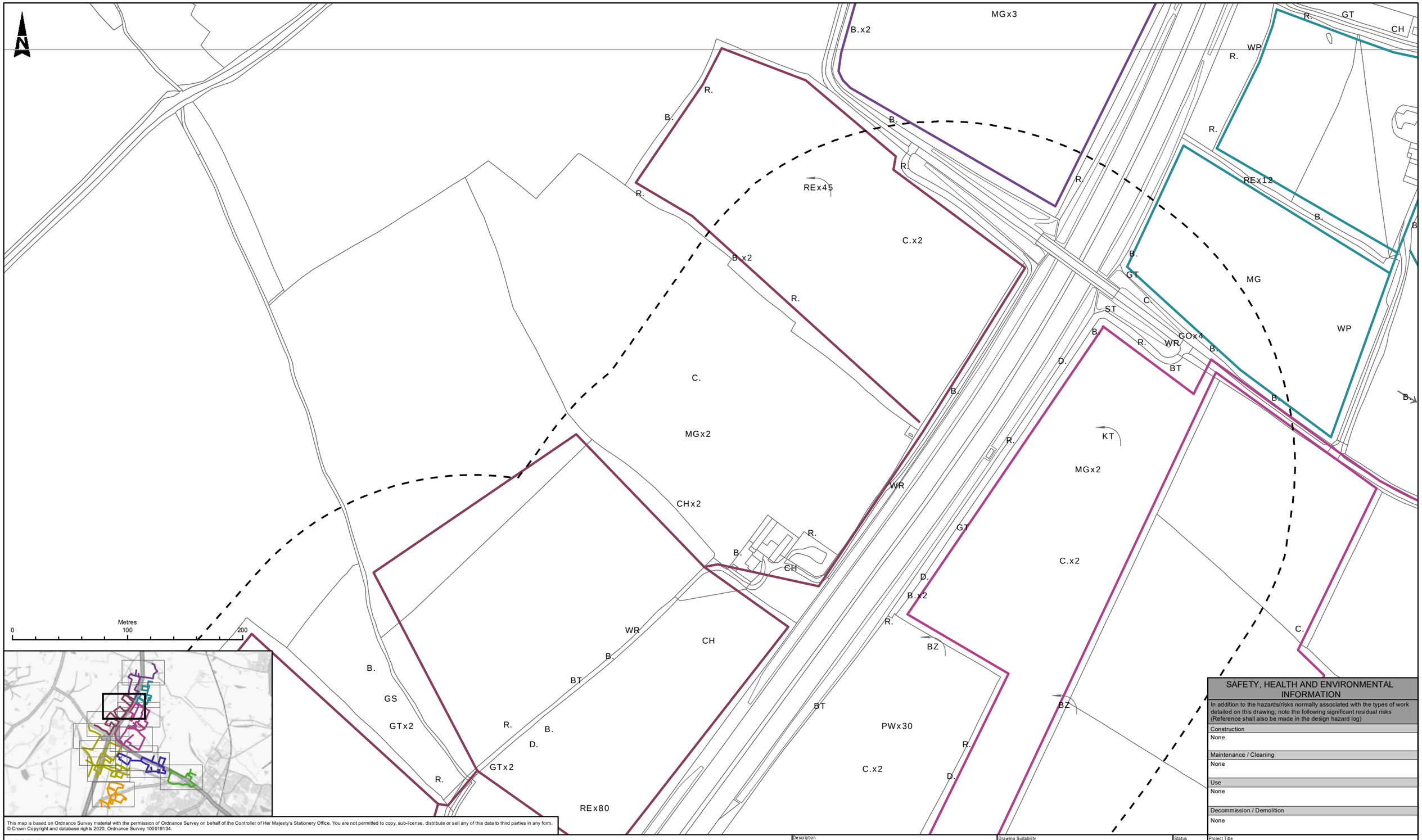
In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log)

Construction
None

Maintenance / Cleaning
None

Use
None

Decommission / Demolition
None



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LEGEND

- 250M STUDY AREA
- TRANSECT 2
- TRANSECT 3
- TRANSECT 4
- TRANSECT 5
- TRANSECT 6
- TRANSECT 7
- TRANSECT 8
- TRANSECT 9

BEHAVIOURS

- FORAGING IN FLIGHT
- FLYING

SPECIES (BTO CODES)

B.	BLACKBIRD	CD	COLLARED DOVE	GL	GREY WAGTAIL	JD	JACKDAW	MG	MAGPIE	S.	SKYLARK
BT	BLUE TIT	CA	CORMORANT	GO	GOLDFINCH	K.	KESTREL	MP	MEADOW PIPIT	SD	STOCK DOVE
BZ	BUZZARD	CH	CHAFFINCH	GR	GREENFINCH	KF	KINGFISHER	PW	PIED WAGTAIL	SG	STARLING
C.	CARRION CROW	CT	COAL TIT	GS	GREAT SPOTTED WOODPECKER	KT	RED KITE	PH	PHEASANT	SH	SPARROWHAWK
D.	DUNNOCK	FF	FIELDFARE	GT	GREAT TIT	LB	LESSER BLACK-BACKED GULL	R.	ROBIN	ST	SONG THRUSH
G.	GREEN WOODPECKER	GC	GOLDCREST	HG	HERRING GULL	LT	LONG-TAILED TIT	RE	REDWING	WP	WOOD PIGEON
				HS	HOUSE SPARROW	M.	MISTLE THRUSH	RB	REED BUNTING	WR	WREN
				J.	JAY	MA	MALLARD	RN	RAVEN		
								RO	ROOK		

Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
PUBLISHED	A1	P01	SD	LH	CC	MT	19/09/21

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log)

Construction
None

Maintenance / Cleaning
None

Use
None

Decommission / Demolition
None

Drawing Suitability: PUBLISHED
Status: A1

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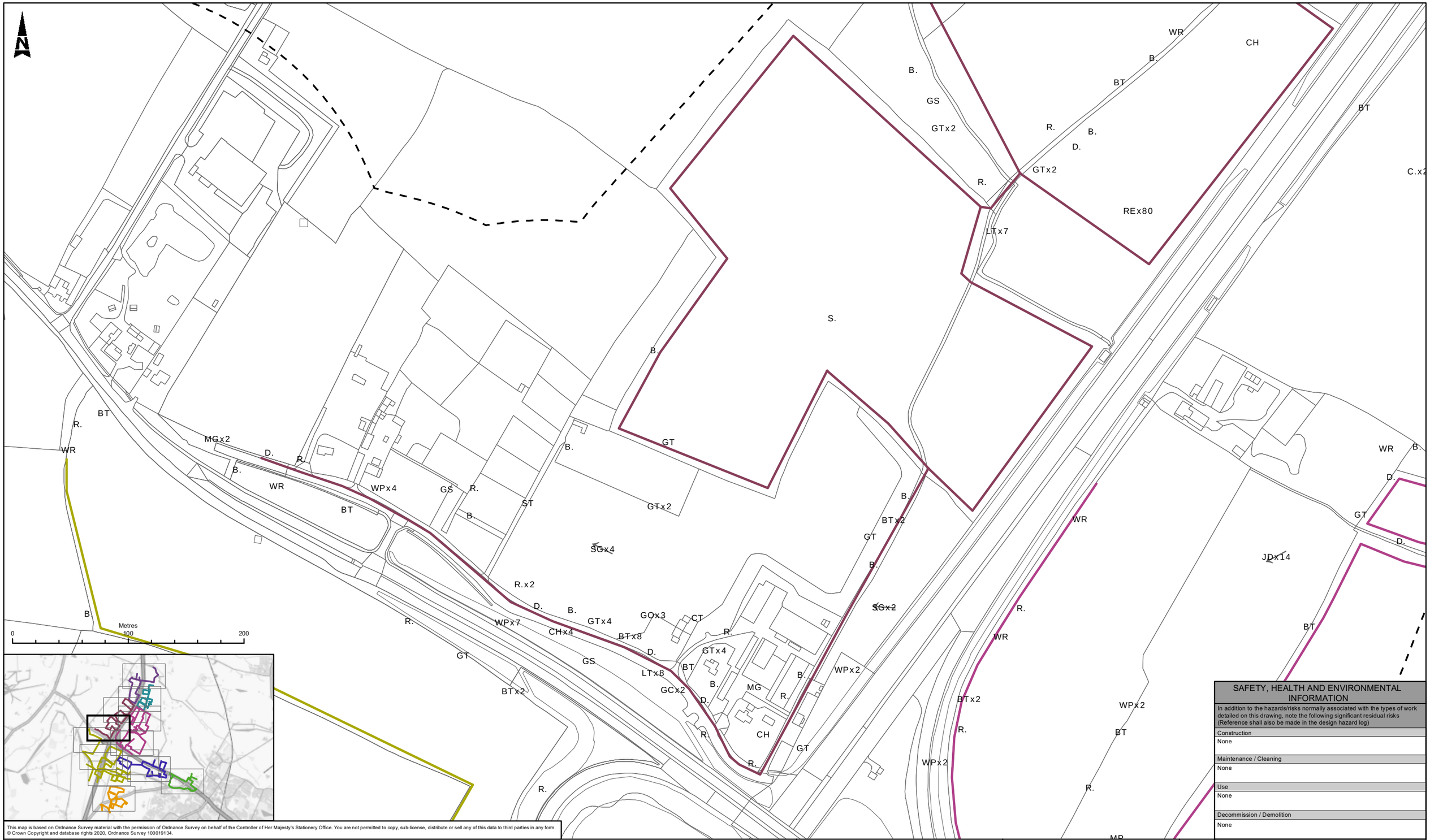
Client: Gloucestershire County Council

Project Title: M5 Junction 10 Improvement

Drawing Title: FIGURE 7.9F
WINTERING BIRD SURVEY RESULTS
FEBRUARY 2020

Drawing Number: Project | Originator | Volume | Location | Type | Number
GCCM5J10 - ATK - EBD
XX - GS - GI - 000024

Original Size:	Scale	Project Ref:	Sheet:	Rev:
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LEGEND

- 250M STUDY AREA
- TRANSECT 2
- TRANSECT 3
- TRANSECT 4
- TRANSECT 5
- TRANSECT 6
- TRANSECT 7
- TRANSECT 8
- TRANSECT 9

BEHAVIOURS

- FORAGING IN FLIGHT
- FLYING

SPECIES (BTO CODES)

B.	BLACKBIRD	CD	COLLARED DOVE	GL	GREY WAGTAIL	JD	JACKDAW	MG	MAGPIE	S.	SKYLARK
BT	BLUE TIT	CA	CORMORANT	GO	GOLDFINCH	K.	KESTREL	MP	MEADOW PIPIT	SD	STOCK DOVE
BZ	BUZZARD	CH	CHAFFINCH	GR	GREENFINCH	KF	KINGFISHER	PW	PIED WAGTAIL	SG	STARLING
C.	CARRION CROW	CT	COAL TIT	GS	GREAT SPOTTED WOODPECKER	KT	RED KITE	PH	PHEASANT	SH	SPARROWHAWK
D.	DUNNOCK	FF	FIELDFARE	GT	GREAT TIT	LB	LESSER BLACK-BACKED GULL	R.	ROBIN	ST	SONG THRUSH
G.	GREEN WOODPECKER	GC	GOLDCREST	HG	HERRING GULL	LT	LONG-TAILED TIT	RE	REDWING	WP	WOOD PIGEON
				HS	HOUSE SPARROW	M.	MISTLE THRUSH	RB	REED BUNTING	WR	WREN
				J.	JAY	MA	MALLARD	RN	RAVEN		
								RO	ROOK		

Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
PUBLISHED	A1	P01	SD	LH	CC	MT	19/09/21

Drawing Suitability: PUBLISHED
Status: A1

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Client: Gloucestershire County Council

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log)

Construction: None

Maintenance / Cleaning: None

Use: None

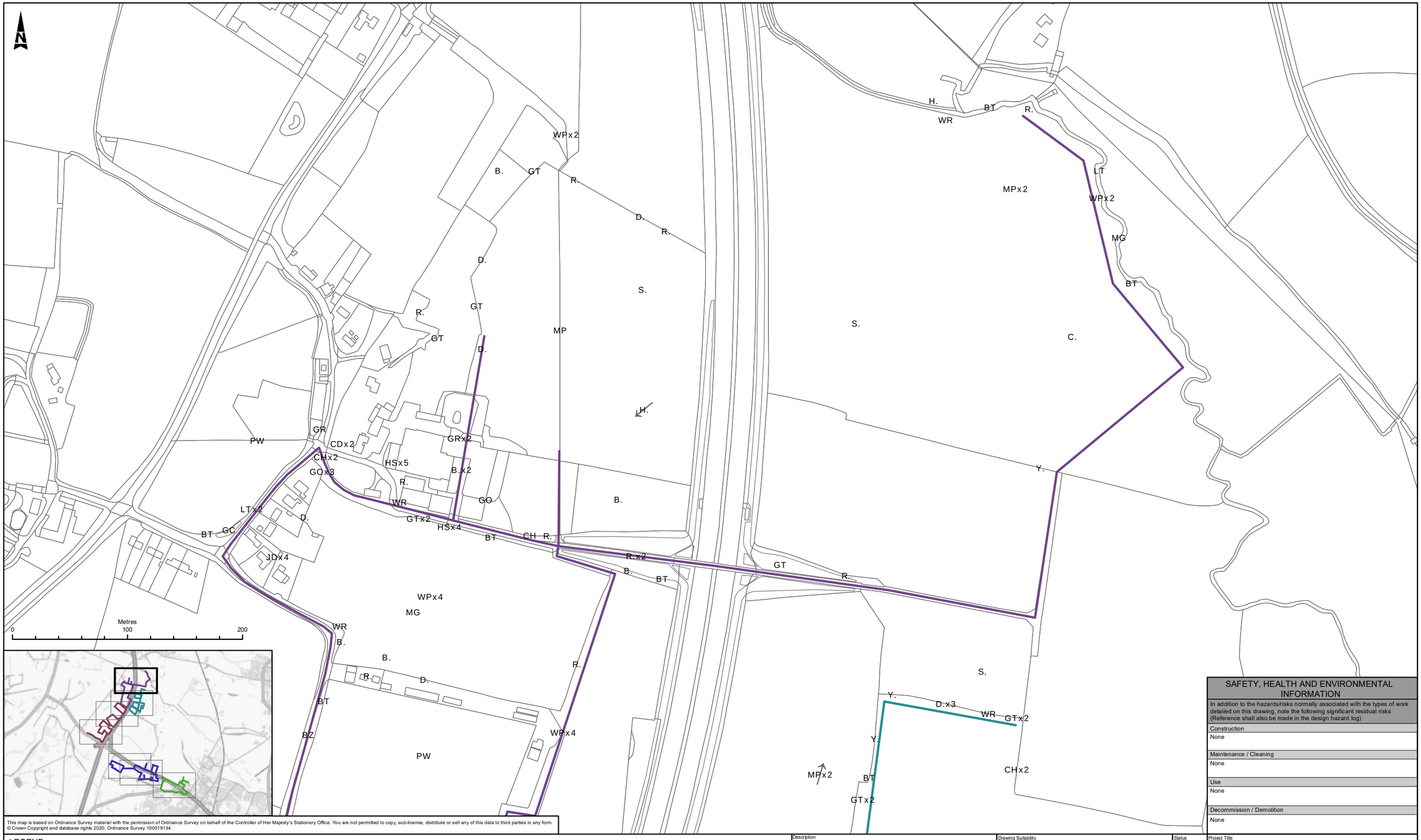
Decommission / Demolition: None

Project Title: M5 Junction 10 Improvement

Drawing Title: FIGURE 7.9F
WINTERING BIRD SURVEY RESULTS
FEBRUARY 2020

Drawing Number: Project | Originator | Volume
GCCM5J10 - ATK - EBD
XX - GS - GI - 000024
Location | Type | Number

Original Size:	Scale	Project Ref:	Sheet:	Rev:
A3	1:3,000	5197035	13 of 13	P01



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LEGEND

- 250M STUDY AREA
- TRANSECT 2
- TRANSECT 3
- TRANSECT 6
- TRANSECT 7
- TRANSECT 9

BEHAVIOURS

- FORAGING IN FLIGHT
- FLYING

SPECIES (BTO CODES)

B.	BLACKBIRD	CC	CHIFFCHAFF	GR	GREENFINCH	LT	LONG-TAILED TIT	RE	REDWING
BT	BLUE TIT	CD	COLLARED DOVE	GT	GREAT TIT	M.	MISTLE THRUSH	RN	RAVEN
BZ	BUZZARD	CH	CHAFFINCH	H.	GREY HERON	MG	MAGPIE	S.	SKYLARK
C.	CARRION CROW	D.	DUNNOCK	HG	HERRING GULL	MA	MALLARD	SD	STOCK DOVE
		FF	FIELDFARE	HS	HOUSE SPARROW	MP	MEADOW PIPIT	SG	STARLING
		G.	GREEN WOODPECKER	J.	JAY	PW	PIED WAGTAIL	ST	SONG THRUSH
		GC	GOLDCREST	JD	JACKDAW	PH	PHEASANT	WP	WOOD PIGEON
		GO	GOLDFINCH	LB	LESSER BLACK-BACKED GULL	R.	ROBIN	WR	WREN
								Y.	YELLOWHAMMER

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log)

Construction
None

Maintenance / Cleaning
None

Use
None

Decommission / Demolition
None

Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
PUBLISHED	A1	P01	SD	LH	CC	MT	20/09/21

Drawing Suitability: PUBLISHED
Status: A1

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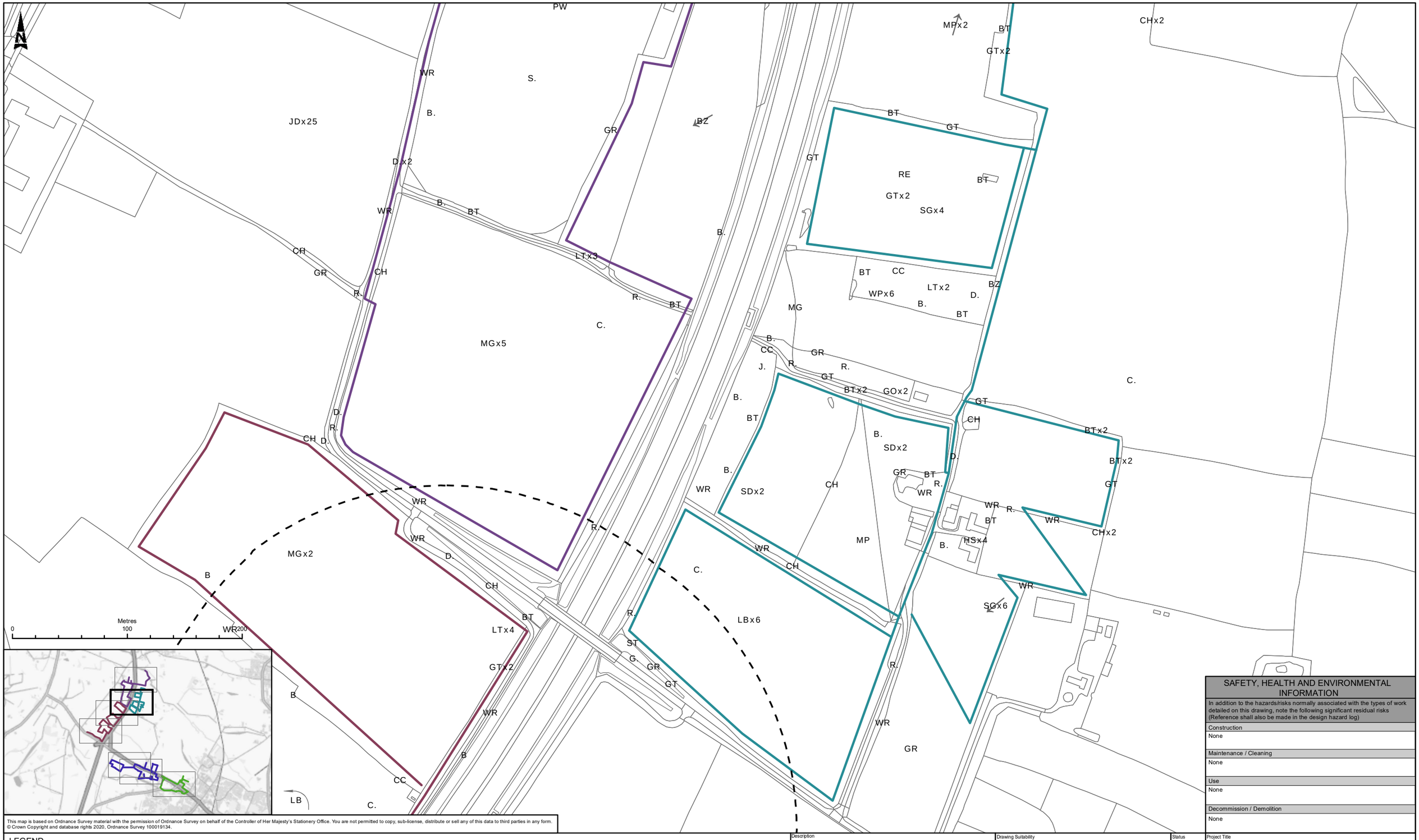
Client: Gloucestershire County Council

Project Title: M5 Junction 10 Improvement

Drawing Title: FIGURE 7.9G
WINTERING BIRD SURVEY RESULTS
MARCH 2020

Drawing Number: GCCM5J10 - ATK - EBD - XX - GS - GI - 000025

Original Size:	Scale	Project Ref:	Sheet:	Rev:
A3	1:3,000	5197035	1 of 7	P01



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LEGEND

- 250M STUDY AREA
- TRANSECT 2
- TRANSECT 3
- TRANSECT 6
- TRANSECT 7
- TRANSECT 9

BEHAVIOURS

- FORAGING IN FLIGHT
- FLYING

SPECIES (BTO CODES)

B.	BLACKBIRD	CC	CHIFFCHAFF	GR	GREENFINCH	LT	LONG-TAILED TIT
BT	BLUE TIT	CD	COLLARED DOVE	GT	GREAT TIT	M.	MISTLE THRUSH
BZ	BUZZARD	CH	CHAFFINCH	H.	GREY HERON	MG	MAGPIE
C.	CARRION CROW	D.	DUNNOCK	HG	HERRING GULL	MA	MALLARD
		FF	FIELDFARE	HS	HOUSE SPARROW	MP	MEADOW PIPIT
		G.	GREEN WOODPECKER	J.	JAY	PW	PIED WAGTAIL
		GC	GOLDCREST	JD	JACKDAW	PH	PHEASANT
		GO	GOLDFINCH	LB	LESSER BLACK-BACKED GULL	R.	ROBIN

RE	REDWING						
RN	RAVEN						
S.	SKYLARK						
SD	STOCK DOVE						
SG	STARLING						
ST	SONG THRUSH						
WP	WOOD PIGEON						
WR	WREN						
Y.	YELLOWHAMMER						

Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
PUBLISHED	A1	P01	SD	LH	CC	MT	20/09/21

Drawing Suitability: PUBLISHED

Status: A1

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log)

Construction
None

Maintenance / Cleaning
None

Use
None

Decommission / Demolition
None

Project Title: M5 Junction 10 Improvement

Drawing Title: FIGURE 7.9G
WINTERING BIRD SURVEY RESULTS
MARCH 2020

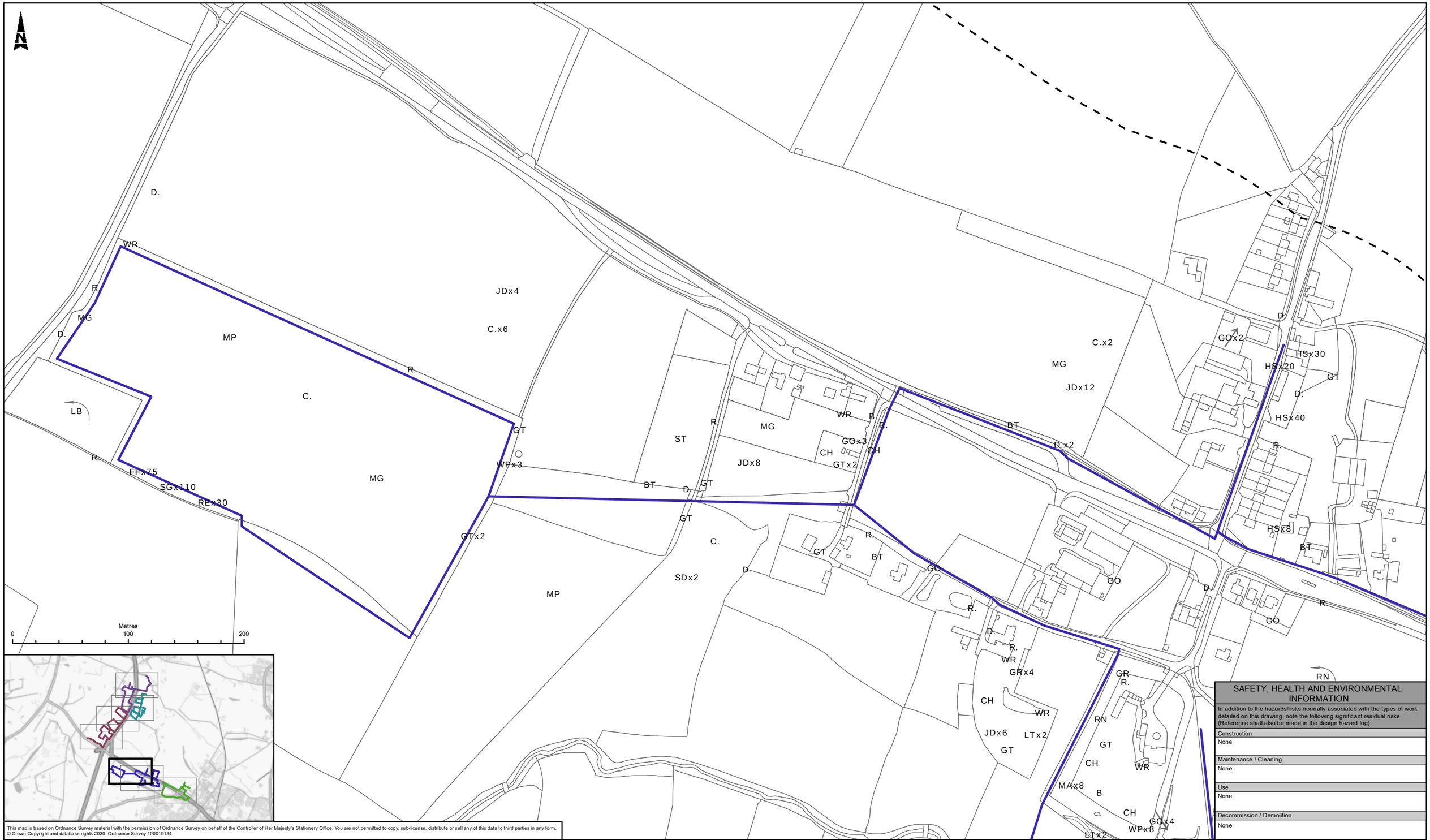
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Client: Gloucestershire County Council

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GCCM5J10 - ATK - EBD
XX - GS - GI - 000025

Original Size:	Scale	Project Ref:	Sheet:	Rev:
A3	1:3,000	5197035	2 of 7	P01



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LEGEND

- 250M STUDY AREA
- TRANSECT 2
- TRANSECT 3
- TRANSECT 6
- TRANSECT 7
- TRANSECT 9

BEHAVIOURS

- FORAGING IN FLIGHT
- FLYING

SPECIES (BTO CODES)

B.	BLACKBIRD	CC	CHIFFCHAFF	GR	GREENFINCH	LT	LONG-TAILED TIT
BT	BLUE TIT	CD	COLLARED DOVE	GT	GREAT TIT	M.	MISTLE THRUSH
BZ	BUZZARD	CH	CHAFFINCH	H.	GREY HERON	MG	MAGPIE
C.	CARRION CROW	D.	DUNNOCK	HG	HERRING GULL	MA	MALLARD
		FF	FIELDFARE	HS	HOUSE SPARROW	MP	MEADOW PIPIT
		G.	GREEN WOODPECKER	J.	JAY	PW	PIED WAGTAIL
		GC	GOLDCREST	JD	JACKDAW	PH	PHEASANT
		GO	GOLDFINCH	LB	LESSER BLACK-BACKED GULL	R.	ROBIN
						WR	WREN
						Y.	YELLOWHAMMER

Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
PUBLISHED	A1	P01	SD	LH	CC	MT	20/09/21

Drawing Suitability: PUBLISHED

Status: A1

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Client: Gloucestershire COUNTY COUNCIL

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log)

Construction
None

Maintenance / Cleaning
None

Use
None

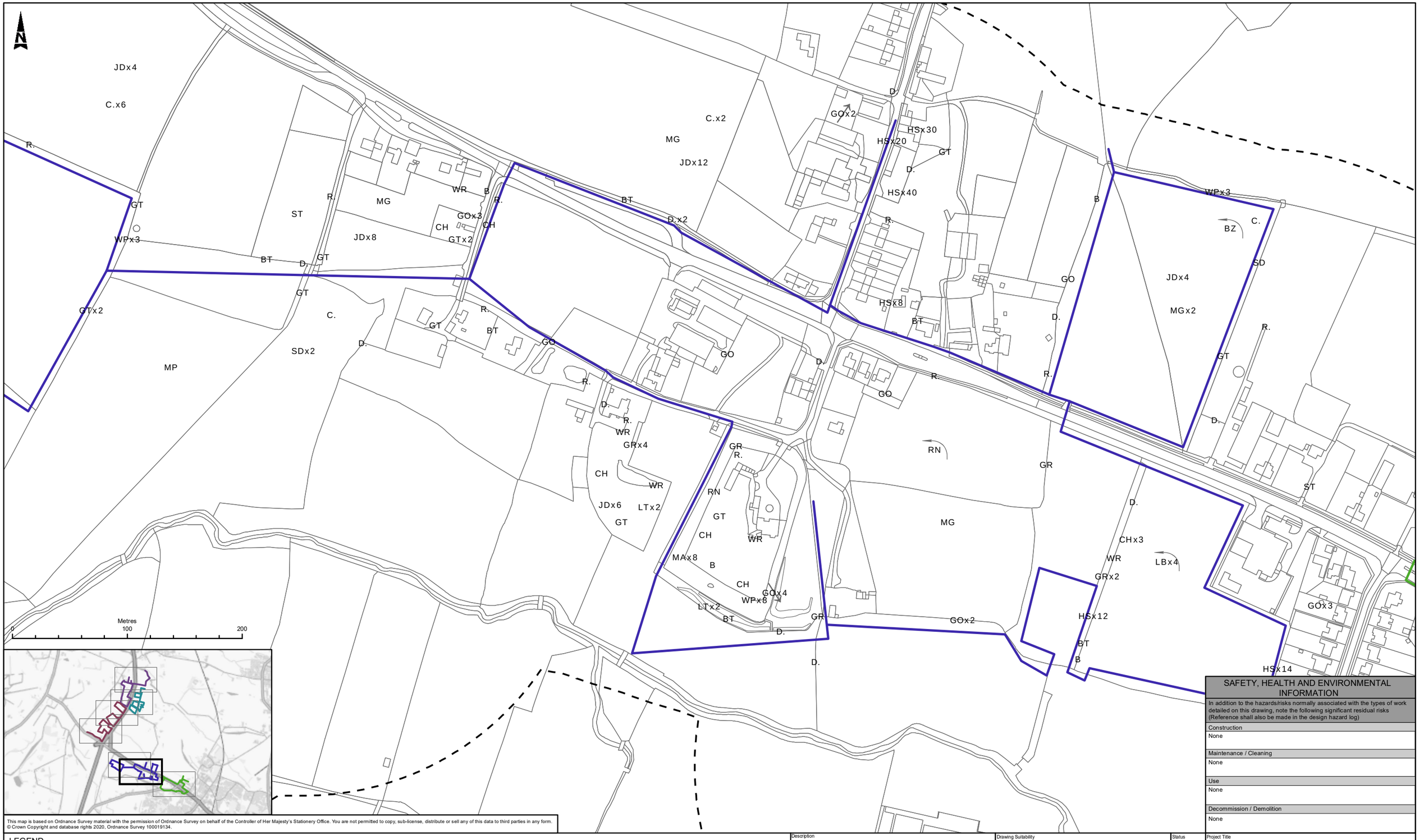
Decommission / Demolition
None

Project Title: M5 Junction 10 Improvement

Drawing Title: FIGURE 7.9G
WINTERING BIRD SURVEY RESULTS
MARCH 2020

Drawing Number: GCCM5J10 - ATK - EBD - XX - GS - GI - 000025

Original Size:	Scale	Project Ref:	Sheet:	Rev:
A3	1:3,000	5197035	3 of 7	P01



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LEGEND

- 250M STUDY AREA
- TRANSECT 2
- TRANSECT 3
- TRANSECT 6
- TRANSECT 7
- TRANSECT 9

BEHAVIOURS

- FORAGING IN FLIGHT
- FLYING

SPECIES (BTO CODES)

B.	BLACKBIRD	CC	CHIFFCHAFF	GR	GREENFINCH	LT	LONG-TAILED TIT
BT	BLUE TIT	CD	COLLARED DOVE	GT	GREAT TIT	M.	MISTLE THRUSH
BZ	BUZZARD	CH	CHAFFINCH	H.	GREY HERON	MG	MAGPIE
C.	CARRION CROW	D.	DUNNOCK	HG	HERRING GULL	MA	MALLARD
		FF	FIELDFARE	HS	HOUSE SPARROW	MP	MEADOW PIPIT
		G.	GREEN WOODPECKER	J.	JAY	PW	PIED WAGTAIL
		GC	GOLDCREST	JD	JACKDAW	PH	PHEASANT
		GO	GOLDFINCH	LB	LESSER BLACK-BACKED GULL	R.	ROBIN

RE	REDWING						
RN	RAVEN						
S.	SKYLARK						
SD	STOCK DOVE						
SG	STARLING						
ST	SONG THRUSH						
WP	WOOD PIGEON						
WR	WREN						
Y.	YELLOWHAMMER						

Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
PUBLISHED	A1	P01	SD	LH	CC	MT	20/09/21

Drawing Suitability: PUBLISHED

Status: A1

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log)

Construction
None

Maintenance / Cleaning
None

Use
None

Decommission / Demolition
None

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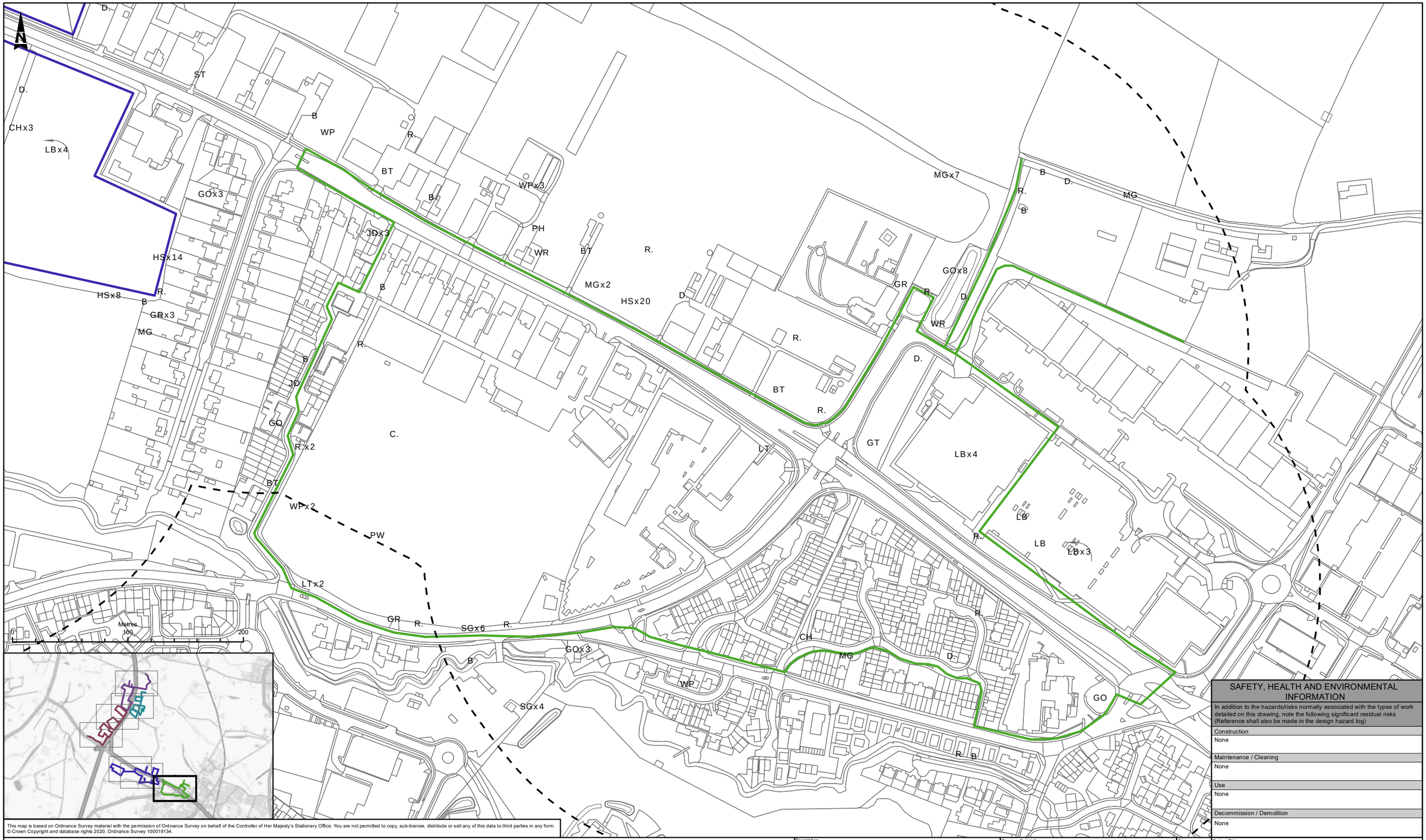
Client: Gloucestershire County Council

Project Title: M5 Junction 10 Improvement

Drawing Title: FIGURE 7.9G
WINTERING BIRD SURVEY RESULTS
MARCH 2020

Drawing Number: GCCM5J10 - ATK - EBD | XX - GS - GI - 000025

Original Size:	Scale	Project Ref:	Sheet:	Rev:
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LEGEND

- 250M STUDY AREA
- TRANSECT 2
- TRANSECT 3
- TRANSECT 6
- TRANSECT 7
- TRANSECT 9

BEHAVIOURS

- FORAGING IN FLIGHT
- FLYING

SPECIES (BTO CODES)

B.	BLACKBIRD	CC	CHIFFCHAFF	GR	GREENFINCH	LT	LONG-TAILED TIT
BT	BLUE TIT	CD	COLLARED DOVE	GT	GREAT TIT	M.	MISTLE THRUSH
BZ	BUZZARD	CH	CHAFFINCH	H.	GREY HERON	MG	MAGPIE
C.	CARRION CROW	D.	DUNNOCK	HG	HERRING GULL	MA	MALLARD
		FF	FIELDFARE	HS	HOUSE SPARROW	MP	MEADOW PIPIT
		G.	GREEN WOODPECKER	J.	JAY	PW	PIED WAGTAIL
		GC	GOLDCREST	JD	JACKDAW	PH	PHEASANT
		GO	GOLDFINCH	LB	LESSER BLACK-BACKED GULL	R.	ROBIN
						WR	WREN
						Y.	YELLOWHAMMER

RE	REDWING						
RN	RAVEN						
S.	SKYLARK						
SD	STOCK DOVE						
SG	STARLING						
ST	SONG THRUSH						
WP	WOOD PIGEON						
WR	WREN						
Y.	YELLOWHAMMER						

Description

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date

Description

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date

Description

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date

Description

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date

Description
PUBLISHED

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
A1	P01	SD	LH	CC	MT	20/09/21

Drawing Suitability: PUBLISHED

Status: A1

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Client: Gloucestershire County Council

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log)

Construction
None

Maintenance / Cleaning
None

Use
None

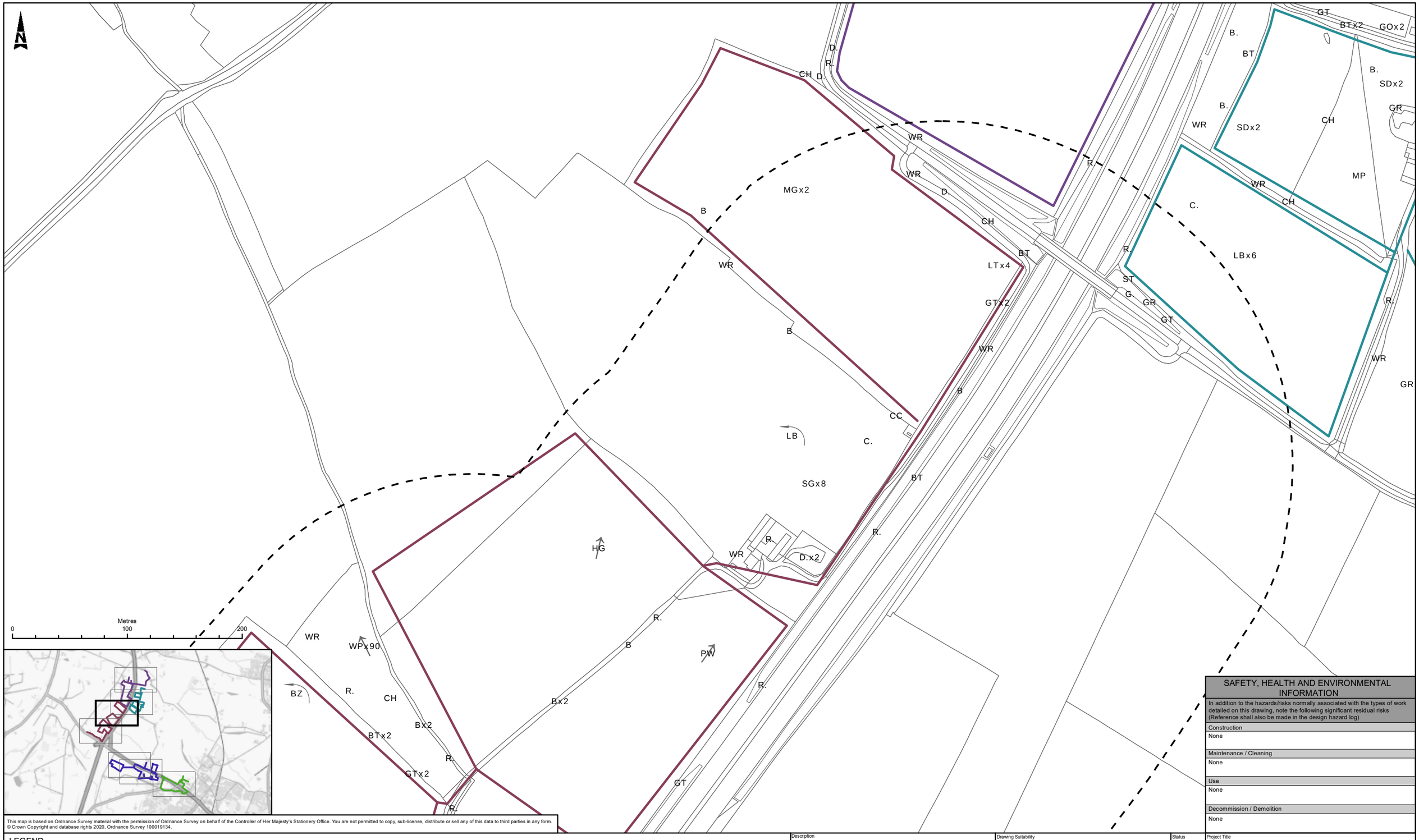
Decommission / Demolition
None

Project Title: M5 Junction 10 Improvement

Drawing Title: FIGURE 7.9G
WINTERING BIRD SURVEY RESULTS
MARCH 2020

Drawing Number: Project | Originator | Volume | Location | Type | Number
GCCM5J10 - ATK - EBD
XX - GS - GI - 000025

Original Size:	Scale	Project Ref:	Sheet:	Rev:
A3	1:3,000	5197035	5 of 7	P01



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LEGEND

- 250M STUDY AREA
- TRANSECT 2
- TRANSECT 3
- TRANSECT 6
- TRANSECT 7
- TRANSECT 9

BEHAVIOURS

- FORAGING IN FLIGHT
- FLYING

SPECIES (BTO CODES)

B.	BLACKBIRD	CC	CHIFFCHAFF	GR	GREENFINCH	L T	LONG-TAILED TIT	RE	REDWING
BT	BLUE TIT	CD	COLLARED DOVE	GT	GREAT TIT	M.	MISTLE THRUSH	RN	RAVEN
BZ	BUZZARD	CH	CHAFFINCH	H.	GREY HERON	MG	MAGPIE	S.	SKYLARK
C.	CARRION CROW	D.	DUNNOCK	HG	HERRING GULL	MA	MALLARD	SD	STOCK DOVE
		F F	FIELDFARE	HS	HOUSE SPARROW	MP	MEADOW PIPIT	SG	STARLING
		G.	GREEN WOODPECKER	J.	JAY	PW	PIED WAGTAIL	ST	SONG THRUSH
		GC	GOLDCREST	J D	JACKDAW	P H	PHEASANT	WP	WOOD PIGEON
		GO	GOLDFINCH	LB	LESSER BLACK-BACKED GULL	R.	ROBIN	WR	WREN
								Y.	YELLOWHAMMER

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log)

Construction
None

Maintenance / Cleaning
None

Use
None

Decommission / Demolition
None

Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
	PUBLISHED						
	A1	P01	SD	LH	CC	MT	20/09/21

Drawing Suitability: PUBLISHED
Status: A1

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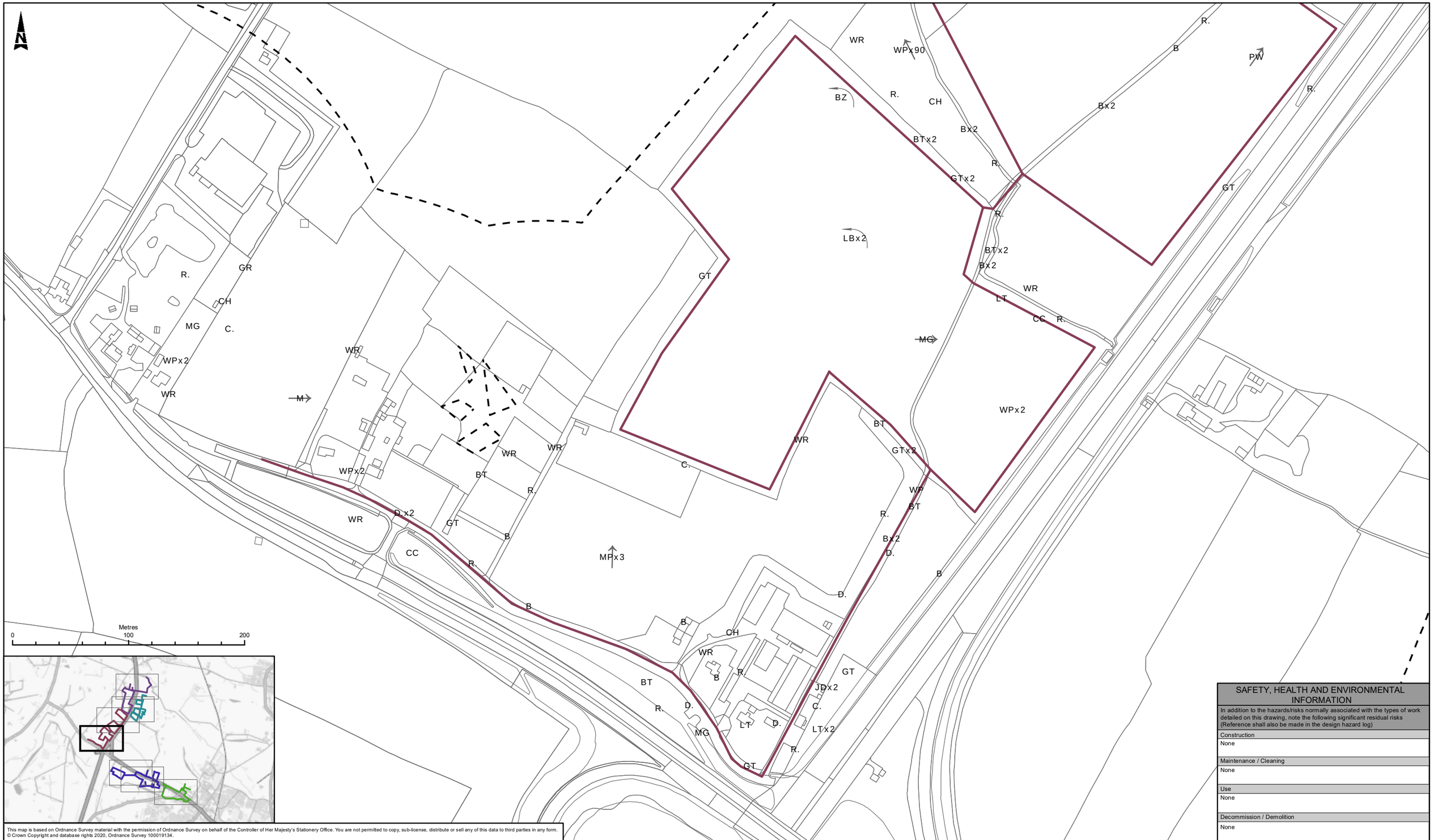
Client: Gloucestershire County Council

Project Title: M5 Junction 10 Improvement

Drawing Title: FIGURE 7.9G
WINTERING BIRD SURVEY RESULTS
MARCH 2020

Drawing Number: Project | Originator | Volume
GCCM5J10 - ATK - EBD
XX - GS - GI - 000025
Location | Type | Number

Original Size:	Scale	Project Ref:	Sheet:	Rev:
A3	1:3,000	5197035	6 of 7	P01



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LEGEND

- 250M STUDY AREA
- TRANSECT 2
- TRANSECT 3
- TRANSECT 6
- TRANSECT 7
- TRANSECT 9

BEHAVIOURS

- FORAGING IN FLIGHT
- FLYING

SPECIES (BTO CODES)

B.	BLACKBIRD	CC	CHIFFCHAFF	GR	GREENFINCH	LT	LONG-TAILED TIT
BT	BLUE TIT	CD	COLLARED DOVE	GT	GREAT TIT	M.	MISTLE THRUSH
BZ	BUZZARD	CH	CHAFFINCH	H.	GREY HERON	MG	MAGPIE
C.	CARRION CROW	D.	DUNNOCK	HG	HERRING GULL	MA	MALLARD
		FF	FIELDFARE	HS	HOUSE SPARROW	MP	MEADOW PIPIT
		G.	GREEN WOODPECKER	J.	JAY	PW	PIED WAGTAIL
		GC	GOLDCREST	JD	JACKDAW	PH	PHEASANT
		GO	GOLDFINCH	LB	LESSER BLACK-BACKED GULL	R.	ROBIN

RE	REDWING	WR	WREN
RN	RAVEN	Y.	YELLOWHAMMER
S.	SKYLARK		
SD	STOCK DOVE		
SG	STARLING		
ST	SONG THRUSH		
WP	WOOD PIGEON		

Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
PUBLISHED	A1	P01	SD	LH	CC	MT	20/09/21

Drawing Suitability: PUBLISHED — Status: A1

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SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log)

Construction: None

Maintenance / Cleaning: None

Use: None

Decommission / Demolition: None

Project Title: M5 Junction 10 Improvement

Drawing Title: FIGURE 7.9G
WINTERING BIRD SURVEY RESULTS
MARCH 2020

Drawing Number: Project | Originator | Volume
GCCM5J10 - ATK - EBD
XX - GS - GI - 000025
Location | Type | Number

Original Size:	Scale	Project Ref:	Sheet:	Rev:
A3	1:3,000	5197035	7 of 7	P01

Appendix B. Dates, times, and weather conditions of each survey

Date	Start/end time	Temperature (°C)	Wind (Beaufort)[25]	Rain[26]	Cloud (Octas)[27]
September 2019					
04/09/2019	09:45/13:45	15-17	2-4	0	1-3
05/09/2019	09:30/16:30	15-16	3	0	6-8
06/09/2019	09:50/14:45	15	2	0	8
12/09/2019	09:40/14:30	16	2	0	8
13/09/2019	09:45/13:30	14	2	0	1
October 2019					
08/10/2019	09:10/15:00	13	2-3	0	1-3
09/10/2019	08:55/15:15	10-14	2	0	3-6
10/10/2019	09:00/14:00	14-15	2-4	0-1	8
16/10/2019	09:00/15:45	12-15	2-3	0	3-7
November 2019					
19/11/2019	09:30/15:10	4-5	2	0	5-8
20/11/2019	08:30/13:45	8	3	0	6
21/11/2019	08:30/13:00	5-6	3	0	8
27/11/2019	08:30/13:00	9	2	0	2
December 2019					
11/12/2019	08:45-14:45	5-6	2	0-1	3
12/12/2019	08:30-11:45	7	3	0-2	8
13/12/2019	08:45-14:45	6	2-4	0	4-7
19/12/2019	10:45-13:30	11	4	0-2	4-8
January 2020					
14/01/2020	08:40-13:30	7	2-3	0-1	6-7

[25] Wind speed score of 0-12 against Beaufort scale: 0 = calm, 2 = light breeze, 4 = Moderate breeze, 6 = strong breeze, 7 = High wind, 9 = Strong gale, 12 = Hurricane
[26] Precipitation inte0nsity on scale of 0-5: 0 = Dry, 1 = Light drizzle, 2 = Light rain, 3 = Moderate rain, 4 = Heavy rain, 5 = Torrential rain.
[27] Cloud cover on a scale of 0-8: 0 = Sky completely clear, 4 = Sky half cloudy, 8 = Sky completely cloudy

Date	Start/end time	Temperature (°C)	Wind (Beaufort)[25]	Rain[26]	Cloud (Octas)[27]
15/01/2020	08:45-13:15	7	2	0	8
16/01/2020	08:10-13:30	7-9	2-4	2	1-8
24/01/2020	08:05-11:00	6	0-1	0	8
February 2020					
11/02/2020	08:00-12:30	4-6	4	0-1	2
14/02/2020	08:15-13:00	3-6	2	0	3
17/02/2020	08:00-13:15	4-5	4	0-1	5-6
21/02/20	07:50-10:15	6	3		8
March 2020					
13/03/2020	08:00–11:00	7-8	2	0	3-8
20/03/2020	07:50-12:45	6-8	2-3	0	6

Appendix C. Survey Results

Species	Priority Species (Conservation/legal status)	Number per visit							Peak Count
		September	October	November	December	January	February	March	
Barn owl (***Tyto alba***)	Schedule 1	1							1
Blackbird (***Common Blackbird***)		22	58	131	146	147	128	46	147
Blackcap (***Sylvia atricapilla***)		4		2					4
Black-headed gull (***Chroicocephalus ridibundus***)	Amber List BoCC	40	2		211	60			211
Blue tit (***Cyanistes caeruleus***)		93	71	93	48	105	111	42	111
Buzzard (***Buteo buteo***)		21	20	11	12	10	11	5	21
Carrion crow (***Corvus corone***)		30	37	132	75	124	139	62	139
Chaffinch (***Fringilla coelebs***)		8	15	136	108	151	172	68	172
Chiffchaff (***Phylloscopus collybita***)		17	4	1				5	17
Coal tit (***Periparus ater***)		1	1	3		2	1		3
Collared dove (***Streptopelia decaocto***)		20	24	11	14	5	8	2	24

Species	Priority Species (Conservation/legal status)	Number per visit							Peak Count
		September	October	November	December	January	February	March	
Cormorant (***Phalacrocorax carbo***)						1	2		2
Dunnock (***Prunella modularis***)	Amber List BoCC, SPI	20	50	76	58	36	70	43	76
Feral pigeon (***Columba livia***)		55							55
Fieldfare (***Turdus pilaris***)	Schedule 1, Red List BoCC			177	342	410	45	115	410
Goldcrest (***Regulus regulus***)		1	1	10	6	3	8	1	10
Goldfinch (***Carduelis carduelis***)		36	92	73	24	82	51	37	92
Great spotted woodpecker (***Dendrocopos major)***		9	4	7	8	6	8		9
Great tit (***Parus major***)		33	72	52	47	76	88	42	88
Green woodpecker (***Picus viridis***)		3		2	2	5	4	1	5
Greenfinch (***Chloris chloris***)		1	3	2		1	10	24	24
Grey heron (***Ardea cinerea***)		4		1		1		2	4
Grey wagtail (***Motacilla cinerea***)	Red List BoCC	4	6	2	2	1	4		6
Herring gull (***Larus argentatus***)	Red List BoCC, SPI, Ram nf	306		21	133	22	45	1	306

Species	Priority Species (Conservation/legal status)	Number per visit							Peak Count
		September	October	November	December	January	February	March	
House martin (***Delichon urbicum***)	Amber List BoCC	14	1						14
House sparrow (***Passer domesticus***)	Red List BoCC, SPI	94	88	166	85	145	138	165	166
Jackdaw (***Coloeus monedula***)		203	206	106	81	177	133	69	206
Jay (***Garrulus glandarius***)		2	2	3	2	3	2	1	3
Kestrel (***Falco tinnunculus***)	Amber List BoCC	4	4	7	3	1	1		7
Kingfisher (***Alcedo atthis***)	Schedule 1, Annex 1, Amber List BoCC		1			1	1		1
Lapwing (***Vanellus vanellus***)	Red List BoCC, SPI, SPA					2			2
Lesser black-backed gull (***Larus fuscus***)	Amber List BoCC, Ram fc	148	2		7	3	42	23	148
Lesser whitethroat (***Curruca curruca***)		1							1
Linnet (***Linaria cannabina***)	Red List BoCC, SPI, GBAP		34	2					34
Little grebe (***Tachybaptus ruficollis***)				3					3
Long-tailed tit (***Aegithalos caudatus***)		63	79	101	65	122	58	23	122
Magpie (***Pica pica***)		41	43	54	44	42	38	32	54

Species	Priority Species (Conservation/legal status)	Number per visit							Peak Count
		September	October	November	December	January	February	March	
Mallard (***Anas platyrhynchos***)	Amber List BoCC, SPA		6		2	6	9	8	9
Meadow pipit (***Anthus pratensis***)	Amber List BoCC	2	41	86	22	119	83	12	119
Mistle thrush (***Turdus viscivorus***)	Red List BoCC	7	1	7	7	5	4	1	7
Moorhen (***Gallinula chloropus***)				4		3			4
Pheasant (***Phasianus colchicus***)		1		8	9	3	2	1	9
Pied wagtail (***Motacilla alba***)		2	13	26	50	35	70	4	70
Raven (***Corvus corax***)		1	1	3		2	5	2	5
Red kite (***Milvus milvus***)	Schedule 1, Annex 1						1		1
Red-legged partridge (***Alectoris rufa***)				1					1
Redstart (***Phoenicurus phoenicurus***)	Amber List BoCC	1							1
Redwing (***Turdus iliacus***)	Schedule 1, Red List BoCC	4	12	117	300	340	416	31	416
Reed bunting (***Emberiza schoeniclus***)	Amber List BoCC, SPI, GBAP			1		1	1		1
Robin (***Erithacus rubecula***)		109	124	126	80	157	127	64	157

Species	Priority Species (Conservation/legal status)	Number per visit							Peak Count
		September	October	November	December	January	February	March	
Rook (***Corvus frugilegus***)		138	231	110	100	98	40		231
Skylark (***Alauda arvensis***)	Red List BoCC, SPI, GBAP		37	12	2	6	13	5	37
Song thrush (***Turdus philomelos***)	Red List BoCC, SPI, GBAP		2	3	3	4	6	3	6
Sparrowhawk (***Accipiter nisus***)		3	1	2	1	1	1		3
Spotted flycatcher (***Muscicapa striata***)	Red List BoCC, SPI, GBAP	1							1
Starling (***Sturnus vulgaris***)	Red List BoCC, SPI	163	250	95	962	604	439	138	962
Stock dove (***Columba oenas***)	Amber List BoCC	47	1		17	24	5	7	47
Stonechat (***Saxicola rubicola***)			1	1		1			1
Swallow (***Hirundo rustica***)		70	22						70
Wheatear (***Oenanthe oenanthe***)		11							11
Willow warbler (***Phylloscopus trochilus***)	Amber List BoCC	3							3
Wood pigeon (***Columba palumbus***)		445	259	195	234	175	144	136	445
Wren (***Troglodytes troglodytes***)		6	29	40	31	34	46	35	46

Species	Priority Species (Conservation/legal status)	Number per visit							Peak Count
		September	October	November	December	January	February	March	
Yellowhammer (***Emberiza citrinella***)	Red List BoCC, SPI	4	5	1	1			3	5

Key:

Annex I: species listed on Annex I of the Directive 2009/147/EC (the Birds Directive)
Red List BoCC: species on the Red List of Birds of Conservation Concern 4
Amber List BoCC: species on the Amber List of Birds of Conservation Concern 4
SPI: species of principal importance for the conservation of biodiversity in England
GBAP: Species listed on the Gloucestershire Biodiversity Action Plan
SPA: Severn Estuary SPA qualifying feature (wintering assemblage species)
Ram: Severn Estuary Ramsar site feature of interest

- fc: species/populations identified subsequent to designation for possible future consideration under criterion 6
- nf: noteworthy fauna

Appendix 7.10 – Reptile survey

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Appendix A. Figure 7.10A Reptile Survey Results

Tables

Table 1-1 - Summary of Relevant Legislation
Table 2-1 - Weather Conditions During Each Survey Period

1. Introduction

1.1. Terms of Reference

1.1.1. Atkins, a member of the SNC Lavalin Group, was commissioned by Gloucestershire County Council (GCC) to undertake reptile surveys to inform the Environmental Statement (ES) for the M5 Junction 10 Improvements Scheme (hereafter referred to as 'the Scheme').

1.1.2. The purpose of the reptile surveys was to determine whether populations of reptiles are present within the Scheme; provide recommendations to enable compliance with legislltion and policy; and, if necessary, identify the need for avoidance, mitigation, compensation or enhancement measures.

1.1.3. This Technical Appendix summarises the results of the reptile surveys undertaken to date, including the methods used, results of the desk study field surveys, and provides an evaluation of the nature conservation value of reptiles within the survey area.

1.1.4. This report provides factual information to support the ES, which will accompany the planning application for the Scheme.

1.2. Legislation

1.2.1. Relevant legislation in relation to reptiles is provided in Table 1-1 below.

Table 1-1 - Summary of Relevant Legislation

Species	Legislation	Offences	Guidance
Adder (***Vipera berus***) Common lizard (***Zootoca vivipara***) Grass snake (***Natrix helvetica***) Slow worm (***Anguis fragilis***)	Wildlife and Countryside Act 1981 (as amended) S.9(1) and S.9(5)	Intentionally kill or injure any common reptile species	No licence is required. However, an assessment for the potential of a site to support reptiles should be undertaken prior to any development works which have potential to affect these animals. Guidance documents: NE Standing Advice for protected species 2013.

2. Methodology

2.1. Desk study

2.1.1. The Magic website[1] was reviewed to identify statutory designated nature conservation sites within 2 km of the Scheme citing reptiles as a reason for designation. Desk study records of non-statutory designated sites for nature conservation within 1 km of the Scheme were requested from Gloucestershire Centre for Environmental Records (GCER) in September 2019 and again in April 2021, to identify those sites citing reptiles as a reason for designation.

2.1.2. GCER also provided recent records[2] of reptiles from within 1 km of the Scheme.

2.2. Field survey

2.2.1. Terrestrial ecology walkover surveys were undertaken on 16th, 17th, 20th, 22nd and 23rd May 2019; and on 23rd, 26th and 27th September 2019. This included an assessment of the habitats within and up to 250 m from the Scheme boundary for their suitability to support reptiles, and informed the scope of the reptile surveys.

2.2.2. The extent of the reptile survey was based on the zone of influence for this species group and included all suitable habitat within the Scheme boundary and a 250 m buffer extending out in all directions from the Scheme boundary where access allowed.

2.2.3. Presence/ likely absence surveys for common species of reptile[3] were carried out between 28th August and 3rd October 2019 and 17th August and 9th October 2020 in accordance with standard survey guidance[4][5][6] and Chartered Institute of Ecology and Environmental Management (CIEEM) competencies for undertaking reptile surveys[7].

2.2.4. A total of 1102 artificial refuges, consisting of roofing felt and corrugated metal sheets ('tins') measuring approximately 0.5 m^2, were laid out in 39 survey transects within suitable habitat between 28th August and 30th August 2019 and on 17th August 2020. Of these transects, 25 are within the study area of the current Scheme (K, J, I, Z, H, G, F, AD, AF, E, C, D, B, A, AH, AI, AN, AM, AL, AK, AJ, AP, AS, 1 and 2). Reptile transects are shown on Figure 7.10A in Appendix A.The refuges were left to bed in for ten days to give reptiles a chance to locate them. Other suitable refuge features already present on the site that could be used by reptiles (e.g. litter and logs) were also checked where present.

2.2.5. Seven checks of the artificial refuges were undertaken in suitable weather conditions (taken to be daytime air temperatures between 9°C and 18°C with little or no wind or precipitation) between 9th September and 3rd October 2019 and 28th August and 9th October 2020.. Surveyors initially checked the upper surface of reptile mats to identify any reptiles basking. The refuges were then lifted to identify any reptiles present underneath. Notes of any reptiles identified including numbers, species, sex age and notable identification features were recorded.

2.2.6. The weather conditions during each survey period are summarised in the Table 2-1 below:

[1] Defra. c2019. Magic Map Application. [Online]. [Accessed July 2021]. Available from: https://magic.defra.gov.uk/MagicMap.aspx
[2] Records of observations within the last 10 years.
3 Due to the restricted ranges of smooth snake and sand lizard, these species are not considered within this report.
4 Froglife (1999) Reptile Survey: an introduction to planning, conducting and interpreting surveys for snake and lizard conservation. Froglife advice sheet 10.
5 Design Manual for Roads and Bridges. 2019. Sustainability and Environment Design. LD 118 Biodiversity Design (formerly LA 118). Online: https://www.standardsforhighways.co.uk/dmrb/search/9317652b-4cb8-4aaf-be57-b96d324c8965
6 Sewell D., Griffiths R., Beebee T., Foster J., & Wilkinson J. (2013). Survey protocols for the British herpetofauna. Version 1.0.
7 CIEEM (2014) Competencies for Species Survey: Reptiles. The Chartered Institute of Ecology and Environmental Management.

Table 2-1 - Weather Conditions During Each Survey Period

Date	Survey transects checked (Transects K, J, I, Z, H, G, F, AD, AF, E, C, D, B, A, AH, AI, AN, AM, AL, AK, AJ, AP, AS, 1 and 2 are within the current study area)	Start/ end time	Start/ end temperature (ºC)	Start/ end wind[8]	Start/ end precipitation[9]	Start/ end cloud cover[10]
09/09/2019	AD, AF, AP, AS	10:20/12:10	13.0/15.0ºC	1/1	1/0	8/8
10/09/2019	A, B, C, D, E, F, G, H, I, J, K, L, M, P, Q, Z, AA, AB, AH, AI, AJ, AK, AL, AM, AN	10:00/15:30	17.0/20.0ºC	1/1	0/0	7/5
11/09/2019	R, S, T, U, V, W, X, Y	11:00/15:00	17.0/20.0ºC	2/2	0/0	7/5
12/09/2019	A, B, C, D, E, F, G, H, L, M, P, Q, AB, AD, AF, AH, AI, AM, AN, AS	10:45/15:00	18.0/20.0ºC	4/5	0/0	6/2
13/09/2019	R, S, T, U, V, W, X, Y, Z, AA, AJ, AK, AL, AP	09:40/13:40	15.0/18.0ºC	1/1	0/0	2/2
16/09/2019	I, J, K, Z, AA, AD, AF, AH, AI, AJ, AK, AL, AM, AN, AP, AS	10:00/16:00	17.0/19.0ºC	1/1	0/1	8/8
17/09/2019	A, B, C, D, E, F, G, H, L, M, P, Q, R, S, T, U, V, W, X, Y, AB	09:50/15:00	13.0/18.0ºC	1/1	3/3	0/0
18/09/2019	I, J, K	13:00/14:00	17.0/17.5ºC	1/1	0/0	0/0
20/09/2019	I, J, K, R, S, T, U, V, W, X, Y, Z, AA, AD, AP, AS	08:45/12:40	13.0/19.0ºC	1/1	0/0	1/0
23/09/2019	A, B, C, D, E, F, G, H, L, M, P, Q, AB, AJ, AK, AL, AM, AN	10:00/15:00	16.0/18.0ºC	1/3	0/2	6/8
25/09/2019	A, B, C, D, E, F, G, AD, AF, AH, AI	10:00/13:00	16.0/17.0ºC	2/1	0/4 Survey abandoned	6/6

[8] Wind speed score of 0-12 against Beaufort scale: 0 = calm, 2 = light breeze, 4 = Moderate breeze, 6 = strong breeze, 7 = High wind, 9 = Strong gale, 12 = Hurricane
[9] Precipitation intensity on scale of 0-5: 0 = Dry, 1 = Light drizzle, 2 = Light rain, 3 = Moderate rain, 4 = Heavy rain, 5 = Torrential rain.
[10] Cloud cover on a scale of 0-8: 0 = Sky completely clear, 4 = Sky half cloudy, 8 = Sky completely cloudy

Date	Survey transects checked (Transects K, J, I, Z, H, G, F, AD, AF, E, C, D, B, A, AH, AI, AN, AM, AL, AK, AJ, AP, AS, 1 and 2 are within the current study area)	Start/ end time	Start/ end temperature (ºC)	Start/ end wind[8]	Start/ end precipitation[9]	Start/ end cloud cover[10]
26/09/2019	A, B, C, D, E, F, G, H, I, J, K, L, M, P, Q, R, S, T, U, V, W, X, Y, Z, AA, AB, AD, AF, AH, AI, AJ, AK, AL, AM, AN, AP, AS	10:00/16:00	16.0/18.0ºC	3/6	0/0	3/5
30/09/2019	H, I, J, K, L, M, P, Q, R, S, T, U, V, W, X, Y, Z, AA, AB, AF, AH, AI, AJ, AK, AL, AM, AN, AP, AS	09:00/14:00	14.0/16.0ºC	1/1	0/1	7/8
01/10/2019	AB, AD	14:00/15:00	15.0/15.0ºC	3/3	0/0	7/8
02/10/2019	A, B, C, D, E, F, G, H, I, J, K, L, M, P, Q, R, S, T, U, V, W, X, Y, Z, AA, AF	10:00/16:00	10.0/14.0ºC	1/2	0/0	6/6
03/10/2019	AH, AI, AJ, AK, AL, AM, AN, AP, AS	10:15/12:45	9.0/11.0ºC	2/4	0/0	7/7
28/08/2020	1 and 2	09:30/11:30	15.0/18.0^{0}C	2/2	2/3- Dry and warm after rain shower. Survey began at this point, then heavy rain at end of survey	6/8
04/09/2020	1 and 2	08:30/11:30	17.0/18.0^{0}C	2/2	0/0	0/0
11/09/2020	1 and 2	08:30/11:30	14.0/16.0^{0}C	2/2	0/0	0/2
16/09/2020	1 and 2	08:00/11:00	11.0/16.0^{0}C	2/3	0/0	1/3
23/09/2020	1 and 2	14:00/16:30	14.0/14.0ºC	1/1	0/2	7/7
02/10/2020	1 and 2	09:30/11:30	9.0ºC/14.0ºC	1/1	0/0	2/3
09/10/2020	1 and 2	08:30/11:30	9.0 /14.0ºC	1/1	0/0	5/7

2.2.7. At the time of writing (August 2021) access had just been granted to two land parcels to the north west of the Scheme where access had previously been refused. Reptile surveys are proposed here in August and September 2021. This report will be updated to include these surveys, and will be submitted as part of the ES.

2.3. Assessment

2.3.1. The reptile population has been valued in a geographical context following the framework provided in LA 108[11]. The evaluation is based on the information gathered from the desk study and field surveys, using a combination of professional judgement and accepted criteria[12] (e.g. diversity, rarity and naturalness).

2.4. Limitations

2.4.1. In 2019, several reptile refugia were found to have been mown between deployment and the first check (in Transects B, E, G, W, AH and AI). In addition, livestock (cows, sheep and horses) were present in some of the fields (Transects I, J, L, R, S, U, V, Y, Z, AA, AF, AJ, AK, and AP). A few of the mats in Transect I and J were found to have been trampled or were missing (presuming to have been moved by cattle). However, the majority of the reptile mats in each transect were left intact throughout the whole survey period and this is not considered to be a significant limitation.

2.4.2. In 2019, on five occasions (10th, 11th, 12th, 16th and 20th Septembe 2019) the temperature exceeded the maximum optimum air temperature for undertaking reptile surveys at the end of the survey by one or two degrees. Given that the temperature at the start of the surveys was always within the recommended minimum and maximum temperature range, and that there was only a small increase in the recommended maximum air temperature, this is not considered to be a significant limitation.

2.4.3. On one occasion (25/09/2019) the survey was abandoned due to heavy rain, although it was dry at the start of the survey, and on another occasion (17/09/2019) the survey was undertaken in moderate rain. Whilst these conditions are not ideal, the remaining surveys were undertaken when there was no, or only light drizzle/ rain. Therefore, this is not considered to be a significant limitation.

2.4.4. To-date, the area north of Stanboro Lane could not be surveyed for reptiles due to no access permission given by the landowner (the most recent access request in August 2021 was refused). However, a reptile was recorded incidentally here during the walkover survey on 23/09/2019 (see 'Incidental Records' below). No reptile refugia were deployed on the verges of the M5 motorway due to safety concerns, however, suitable road verge habitats were surveyed by deploying reptile refugia along the edge of adjacent fields. Furthermore, it is considered that sufficient coverage of the survey area has been achieved, and that the habitats surveyed are representative of suitable reptile habitat present within areas not surveyed (such as the motorway verges and the are north of Stanboro Lane). As such, it is considered appropriate that the results of the reptile surveys are used to extrapolate the likely presence of reptiles across the Scheme.

2.4.5. Assuming planning submission in summer 2022, the reptile survey data from 2019 will be three years old. It is proposed to undertake update extended Phase 1 Habitat Surveys in targeted areas in order to determine whether any of the baseline conditions have changed significantly, and validate, or otherwise, the results described in this report. This report will be updated to include these surveys, and will be submitted as part of the ES.

2.4.6. Ecological surveys are limited by factors which affect the presence of plants and animals such as the time of year, migration patterns and behaviour. Therefore, the absence of any particular reptile species should not be taken as conclusive proof that the species is not present or that it will not be present in the future. However, the reptile surveys were undertaken in line with best practice guidance and within suitable weather conditions.

[11] Highways England. March 2020. LA 108 Biodiversity [Online]. [Accessed October 2020]. Available from: https://www.standardsforhighways.co.uk/dmrb/search?discipline=SUSTAINABILITY_AND_ENVIRONMENT
[12] Set out in Ratcliffe, D.A (1977). A Nature Conservation Review. Cambridge University Press.

2.4.7. The above limitations were not considered significant, and the conclusions drawn from the data are considered valid.

3. Results

3.1.1. The results described below are shown on Figure 7.10A in Appendix A.

3.1.2. There are no statutory or non-statutory designated nature conservation sites within the search areas (2 km and 1 km respectively) that cite reptiles as a reason for designation.

3.1.3. The data search provided by GCER included four records of reptiles within the last ten years, within 1 km of the Scheme:

- An adult and juvenile common lizard (unknown sex) were recorded in November 2014 in an outside wall of a house adjacent to the A4019, within the Scheme boundary. This area was included in the 2020 reptile surveys; and
- Two adult slow worms (unknown sex) were recorded in May 2014 at the edge of a residential housing area adjacent to agricultural fields approximately 800 m north east of the Scheme boundary.

3.1.4. Suitable habitats for grass snake, slow worm and common lizard are scattered throughout the study area. These species require foraging areas in proximity to basking sites and dense cover, so typical habitats include combinations of woodland edge, hedgerows, scrub, rough grassland, gardens and embankments. Suitable habitats identified comprised arable and improved grassland field boundaries, particularly where hedgerows were present; fields comprising rough, tussocky grassland; woodland edge habitat; and less managed habitat along the banks of the River Chelt, Minor Watercourse 4 and the Leigh Brook. Areas of particular note include:

- A complex of woodland, scrub, tall ruderal habitat, semi-improved neutral tussocky grassland and a pond at Colmans Farm to the north of the Scheme. This is now beyond the 250 m survey area;
- An earth mound covered in tall ruderal vegetation surrounding a farm compound just to the east of Withybridge Lane;
- A mosaic of rough grassland, scrub and orchard habitat just north of Stanboro Lane; and
- A derelict nursery comprising a mosaic of open areas with rough grassland, ruderal vegetation, fruit trees and scrub located to the north of the A4019 east of the M5 Junction 10.

3.1.5. During the 2019 surveys, grass snakes were recorded along three transects (Transects R, U and V) on three occasions, as follows:

- On 11/09/2019 one adult grass snake (unknown sex) was found on Transect R during the first check of reptile refugia along this transect. The refugia was located within a sheep-grazed rough grassland field with scattered scrub and adjacent to an area of woodland. There are several waterbodies and wet ditches within neighbouring fields;
- On 30/09/2019 one adult grass snake (unknown sex) was found on Transect U during the sixth check of reptile refugia along this transect. The refugia was located within a sheep-grazed grassland field adjacent to a waterbody bordered by dense scrub. There are several other waterbodies and wet ditches within neighbouring fields; and
- On 30/09/2019 one juvenile grass snake (unknown sex) was found on Transect V during the sixth check of reptile refugia along this transect. The refugia was located within a sheep-grazed rough grassland field adjacent to an area of scrub and woodland. There are several waterbodies and wet ditches within neighbouring fields.

3.1.6. These transects are all associated with Colmans Farm, which is now outside of the reptile survey area.

3.1.7. No other reptiles were recorded during the reptile surveys in 2019. In 2020, no reptiles were found on top of or underneath the reptile refugia during any of the survey visits.

3.1.8. Reptiles were recorded incidentally during other surveys on three occasions during 2019, as follows:

- A grass snake (unknown sex/age) was observed during a walkover survey on 20/05/2019. It was observed moving through dead leaves at the base of a treeline on the boundary of a derelict nursery to the north of the A4019 near Uckington, approximately 200 m north of the Scheme;
- A juvenile slow worm was recorded during a bird survey on 08/09/2019 within an area of woodland to the north of the A4019 near Uckington approximately 160m north of the Scheme; and
- A common lizard was recorded during a walkover survey on 23/09/2019 within a grazed pasture field close to an orchard north of Stanboro Lane.

4. Evaluation

4.1.1. No reptiles were found during the reptile surveys within the current survey area during the 2019 and 2020 surveys. However, incidental records were noted during the 2019 surveys.

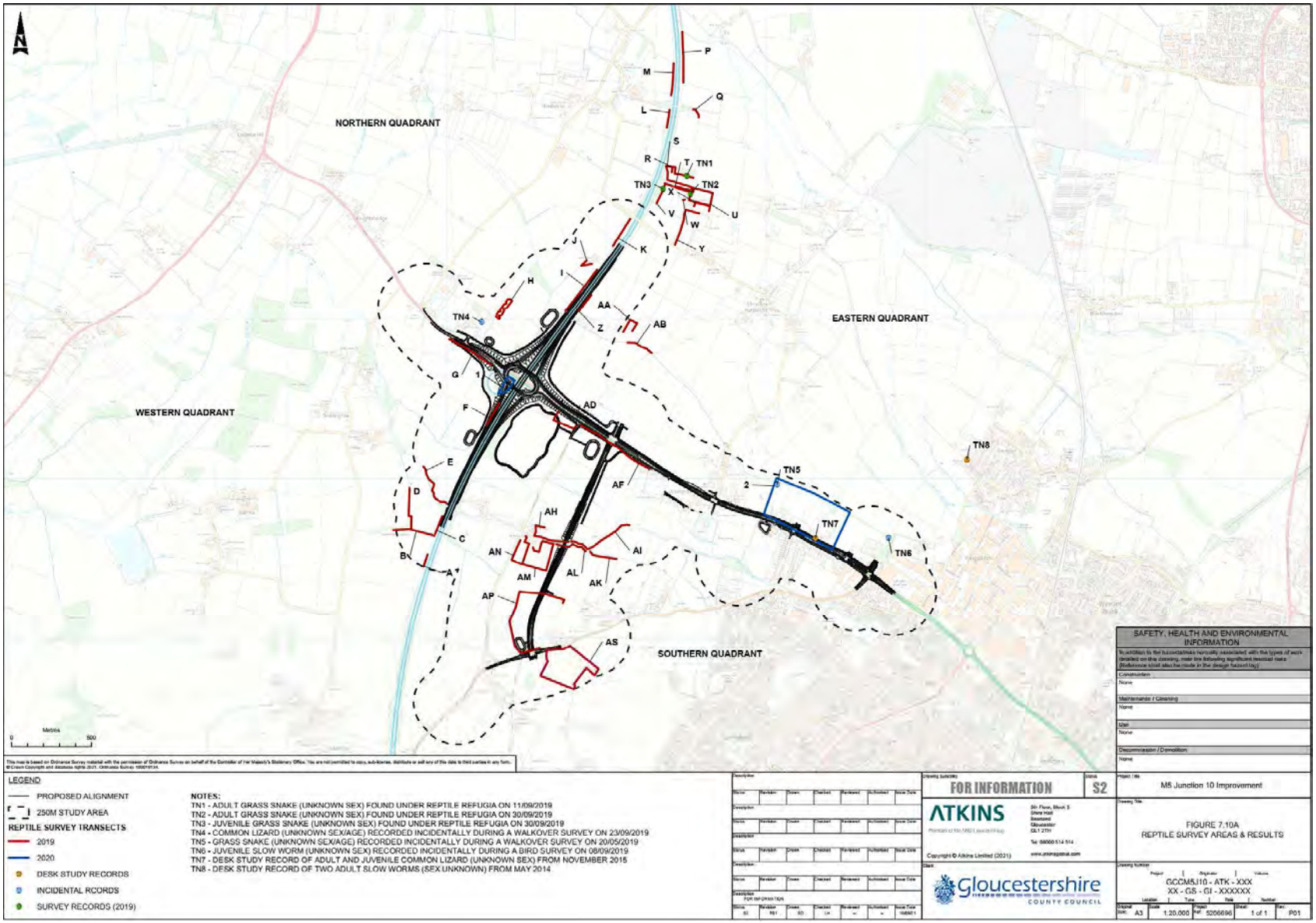
4.1.2. Slow-worm, common lizard and grass snake are protected under the Wildlife and Countryside Act 1981 (as amended) from killing and injury. All three species are species of Principal Importance for the conservation of biodiversity in England, as listed under Section 41 of the NERC Act (2006), but they are not Gloucestershire Biodiversity Action Plan species.

4.1.3. Given the low numbers of reptiles recorded incidentally, it is considered that only low numbers of grass snake, slow worm and common lizard are present during the survey area, and reptiles have been ascribed a preliminary value of Local nature conservation importance. This will be updated as necessary following the surveys planned for August and September 2021.

Appendix to Appendix 7.10

- Appendix A

Appendix A. Figure 7.10A Reptile Survey Results


NORTHERN QUADRANT
EASTERN QUADRANT
WESTERN QUADRANT
SOUTHERN QUADRANT
TN1
TN2
TN3
TN4
TN5
TN6
TN7
TN8
LEGEND
PROPOSED ALIGNMENT
250M STUDY AREA
REPTILE SURVEY TRANSECTS
2019
2020
DESK STUDY RECORDS
INCIDENTAL RCORDS
SURVEY RECORDS (2019)
NOTES:
TN1 - ADULT GRASS SNAKE (UNKNOWN SEX) FOUND UNDER REPTILE REFUGIA ON 11/09/2019
TN2 - ADULT GRASS SNAKE (UNKNOWN SEX) FOUND UNDER REPTILE REFUGIA ON 30/09/2019
TN3 - JUVENILE GRASS SNAKE (UNKNOWN SEX) FOUND UNDER REPTILE REFUGIA ON 30/09/2019
TN4 - COMMON LIZARD (UNKNOWN SEX/AGE) RECORDED INCIDENTALLY DURING A WALKOVER SURVEY ON 23/09/2019
TN5 - GRASS SNAKE (UNKNOWN SEX/AGE) RECORDED INCIDENTALLY DURING A WALKOVER SURVEY ON 20/05/2019
TN6 - JUVENILE SLOW WORM (UNKNOWN SEX) RECORDED INCIDENTALLY DURING A BIRD SURVEY ON 08/09/2019
TN7 - DESK STUDY RECORD OF ADULT AND JUVENILE COMMON LIZARD (UNKNOWN SEX) FROM NOVEMBER 2015
TN8 - DESK STUDY RECORD OF TWO ADULT SLOW WORMS (SEX UNKNOWN) FROM MAY 2014
SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION
FOR INFORMATION
S2
ATKINS
Gloucestershire COUNTY COUNCIL
M5 Junction 10 Improvement
FIGURE 7.10A
REPTILE SURVEY AREAS & RESULTS
GCCM5J10 - ATK - XXX
XX - GS - GI - XXXXXX
1:20,000
A3
P01

Appendix 7.11 – Great crested newt survey

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1. Introduction

1.1. Terms of Reference

1.1.1. Atkins, member of the SNC-Lavalin group, was commissioned by Gloucestershire County Council (GCC) to undertake great crested newt (*Triturus cristatus*) surveys to inform the Environmental Statement (ES) for the M5 Junction 10 Improvements Scheme (hereafter referred to as 'the Scheme').

1.1.2. The purpose of the great crested newt surveys was to determine whether great crested newts are likely to be present within the Scheme; provide recommendations to enable compliance with legislation and policy; and, if necessary, identify the need for avoidance, mitigation, compensation or enhancement measures.

1.1.3. This Technical Appendix summarises the results of the great crested newt surveys undertaken, including the methods used, results of the field surveys, and provides an evaluation of the nature conservation value of great crested newts within the survey area.

1.1.4. This report provides factual information to support the ES, which will accompany the planning application for the Scheme.

1.2. Legislation and Policy

1.2.1. Relevant legislation in relation to great crested newts is provided in Table 1-1 below.

Table 1-1 - Summary of Relevant Legislation

Species	Legislation	Offences	Licensing procedures and guidance
Great crested newt European protected species (EPS)	Conservation of Habitats and Species Regulations 2017 (as amended) Reg 43	Deliberately[1] capture, injure or kill a great crested newt; deliberate disturbance[2] of a great crested newt; deliberately take or destroy its eggs; or damage or destroy a breeding site or resting place used by a great crested newt.	Licences issued for development by Natural England. Guidance documents: • NE Standing Advice for protected species 2013; • European Protected Species: Mitigation Licensing- How to get a licence (NE 2013); • Great Crested Newt Mitigation Guidelines (English Nature 2001).

[1] Deliberate capture or killing is taken to include "accepting the possibility" of such capture or killing.
[2] Deliberate disturbance of animals includes in particular any disturbance which is likely a) to impair their ability (i) to survive, to breed or reproduce, or to rear or nurture their young, or (ii) in the case of animals of hibernating or migratory species, to hibernate or migrate; or b) to significantly affect the local distribution or abundance of the species to which they belong

Species	Legislation	Offences	Licensing procedures and guidance
	Wildlife and Countryside Act 1981 (as amended) S.9	Intentionally or recklessly obstruct access to any structure or place used for shelter or protection or disturb[3] a great crested newt in such a place.	Licences issued for science (survey), education and conservation by Natural England.

[3] Lower levels of disturbance not covered by the Conservation of Habitats and Species Regulations 2017 (as amended) remain an offence under the Wildlife and Countryside Act 1981 (as amended) although a defence is available where such actions are the incidental result of a lawful activity that could not reasonably be avoided.

2. Methodology

2.1. Desk Study

2.1.1. The Magic website[4] was reviewed to identify statutory designated nature conservation sites, designated on account of their great crested newt population, within 2 km of the Scheme. Details of non-statutory designated sites for nature conservation within 1 km of the Scheme were requested from Gloucestershire Centre for Environmental Records (GCER) in September 2019 and again in April 2021, to identify those non-statutory designated sites citing great crested newts as a reason for designation.

2.1.2. GCER also provided recent records[5] of great crested newts from within 1 km of the Scheme. The Magic website[6] was reviewed to identify granted great crested newt European Protected Species (EPS) licences[7] and great crested newt survey records within 1 km of the Scheme.

2.2. Field Survey

2.2.1. Surveys were led by suitably experienced ecologists (considered competent to undertake great crested newt surveys in accordance with the Chartered Institute of Ecology and Environmental Management (CIEEM)[8]), registered with Natural England to use Class Licence CL08 to survey great crested newt, who are members of CIEEM.

Defining the survey area

2.2.2. Ordnance Survey maps and publicly available aerial imagery were used to identify waterbodies within 500 m of the Scheme boundary, in order to establish if the land within and immediately surrounding the Scheme could be used as terrestrial habitat for great crested newts. This species typically uses suitable terrestrial habitat up to 500 m from a breeding pond[9]. However, there is a notable decrease in great crested newt abundance beyond a distance of 250 m from a breeding pond[10].

2.2.3. An extended Phase 1 habitat survey which was undertaken in 2018 by Ecus, and in 2019 by Atkins, identified habitats and features that could potentially support great crested newts within and up to 250 m from the Scheme.

Habitat Suitability Index

2.2.4. Habitat Suitability Index (HSI)[11] assessments were undertaken on in June 2019, June 2020, May 2021 and June 2021 accordance with good practice guidance[12].

2.2.5. The extent of the HSI assessments was based on the zone of influence for this species and included all waterbodies within 500 m of the Scheme where access allowed (the great

[4] Defra. c2019. Magic Map Application. [Online]. [Accessed July 2021]. Available from: https://magic.defra.gov.uk/MagicMap.aspx
[5] Records of observations within the last 10 years.
[6] Defra. c2019. Magic Map Application. [Online]. [Accessed July 2021]. Available from: https://magic.defra.gov.uk/MagicMap.aspx
[7] Licences granted by Natural England to permit activities that might otherwise cause a breach of the Conservation of Habitats and Species Regulations 2018, with respect to species protected by that legislation.
[8] https://cieem.net/resource/competencies-for-species-survey-css/
[9] English Nature (2001) Great Crested Newt Mitigation Guidelines.
[10] Natural England (2004) An assessment of the efficiency of capture techniques and the value of different habitats for the great crested newt. (ENRR:576) http://publications.naturalengland.org.uk/publication/134002.
[11] Evaluating the suitability of habitat for the Great Crested Newt (*Triturus cristatus*) Herpetological Journal 10 (4), 143-155 (2000). Oldham R.S., Keeble J., Swan M.J.S. & Jeffcote M. The great crested newt Habitat Suitability Index (HSI) is a quantitative measure of aquatic habitat quality for great crested newt. The HSI is a number between 0 and 1, derived from an assessment of ten habitat variables known to influence the presence of newts.
[12] Amphibian and Reptile Groups of the United Kingdom (2010) ARG UK Advice Note 5: Great Crested Newt Habitat Suitability Index. ARGUK

crested newt study area). Where major barriers to great crested newt dispersal (such as a large flowing watercourse or major roads) were present between a given waterbody and the Scheme, the waterbody was omitted from HSI assessment and further survey for great crested newts. Where the waterbody was considered to be completely unsuitable for great crested newts (for example, it was completely dry and had been dry for a considerable length of time, evidenced by the lack of any aquatic vegetation), the waterbody was omitted from HSI assessment and further survey for great crested newts.

2.2.6. The HSI is a quantitative predictor of habitat suitability for great crested newts. The HSI is a numerical index between 0 and 1, derived from an assessment of ten habitat variables known to influence the presence of great crested newts. These variables include (amongst others): geographic location, water body size and permanence, the presence of predatory fish and wildfowl, availability of suitable terrestrial habitat and the waterbody count within 1 km of the survey waterbody, and each variable is scored based on its level of suitability. A HSI of 1 indicates optimal habitat (high probability of great crested newt occurrence), whilst a HSI of 0 indicates very poor habitat (minimal probability of great crested newt occurrence). The HSI is calculated on a single water body basis but takes into account surrounding terrestrial habitat and local water body density. If a water body has a very low HSI score (<0.5) then there would typically be a minimal chance of great crested newt presence.

2.2.7. Table 2-1 below explains the categories for the waterbody scores.

Table 2-1 - Categorisation of HSI Scores

HSI score	Waterbody suitability
<0.5	Poor
0.5 – 0.59	Below average
0.6 – 0.69	Average
0.7 – 0.79	Good
>0.8	Excellent

2.2.8. As stated in good practice guidance[13], the HSI for great crested newts is not a substitute for great crested newt presence/likely absence surveys. In general, waterbodies with high HSI scores are more likely to support great crested newts than those with low scores. However, the system is not sufficiently precise to conclude that any particular waterbody with a high score will support great crested newts, or that any waterbody with a low score will not do so. There is a positive correlation between HSI scores, and the numbers of great crested newts observed. In general, high HSI scores are likely to be associated with greater numbers of great crested newts. The relationship is not sufficiently strong, however, to allow estimations of the numbers of newts in any particular waterbody.

Environmental DNA sampling

2.2.9. The environmental DNA (eDNA) survey involved the collection of water samples from suitable waterbodies within the great crested newt study area to be tested for the presence of great crested newt DNA, which would indicate the species is present in a particular waterbody.

[13] English Nature (2001) Great Crested Newt Mitigation Guidelines.

2.2.10. Suitably experienced ecologists with at least one great crested newt survey licenced surveyor present undertook eDNA sampling of a number of waterbodies in June 2019, June 2020, May 2021 and June 2021.

2.2.11. Surveys followed the Natural England approved methodology described by Biggs, et al. (2014)[14]. Field sampling equipment was supplied as sterile kits by the laboratory that was to carry out the DNA analysis (ADAS and SureScreen Scientifics). In total, 20 water samples were collected from each waterbody sampled. Areas that may be used by great crested newts for displaying or egg-laying were selected for sampling and the sampling was carried out in daylight hours and in dry weather. Following completion of the sampling, the collected water samples were stored under suitable conditions (as set-out in the approved methodology) before being sent to the laboratory for testing[15]. Results are reported in three categories: positive results (where great crested newt DNA is confirmed as present); indeterminate results (where eDNA sampling was inconclusive), and negative results (where no great crested newt DNA is confirmed as present).

2.3. Assessment

2.3.1. The importance of great crested newts in relation to the Scheme has been valued in a geographical context following the framework provided in LA 108[16]. The evaluation is based on the information gathered from the desk study and field surveys, using a combination of professional judgement and accepted criteria[17] (e.g. diversity, rarity and naturalness).

2.4. Limitations

2.4.1. The search for waterbodies within 500 m of the Scheme was undertaken by using Ordnance Survey plans and aerial imagery only. These sources may not show all waterbodies within 500 m of the Scheme boundary (for example, some garden ponds may not be shown on maps or aerial images) and, therefore, some waterbodies may not have been identified and have not been included in the surveys. However, it is considered that the majority of established waterbodies will have been identified as a result of this approach, and this is considered sufficient to determine the presence or likely absence of great crested newts within or adjacent to the Scheme.

2.4.2. Full access to the study area was not available for the field surveys. Pond 22 could not be accessed due to the presence of a fence and extremely dense vegetation around the waterbody. The presence of great crested newts is assumed here given the proximity of other waterbodies (pond 23 and pond 24) with confirmed great crested newt presence.

2.4.3. Landowners refused access to a number of waterbodies, including pond 28, pond 29, pond 39, pond 40, drain 5, drain 6 and drain 7.

2.4.4. From a review of documents to support a nearby outline planning application (Elms Park, Northwest Cheltenham (reference16/04000/OUT)[18]), pond 28 appears to be absent. Pond 29 was described as being approximately 4 m by 6 m and utilised for slurry/manure storage in 2012 and 2014, taking rainwater and accumulated slurry from yards and buildings at Swindon Farm. On this basis, it was not considered suitable for supporting great crested newts. From an internet search, pond 39 appears to be a fishing lake and is, therefore, highly unlikely to be suitable for supporting great crested newts. Pond 40 is

[14] Biggs J., Ewald N., Valentini A., Gaboriaud C., Griffiths R.A., Foster J., Wilkinson J., Arnett A., Williams P. & Dunn F. (2014). Analytical and methodological development for improved surveillance of the Great Crested Newt. Defra Project WC1067. Freshwater Habitats Trust: Oxford.
[15] SureScreen Scientifics is a participant in Natural England's eDNA proficiency testing scheme and achieved 80% in blind tests undertaken in 2020. ADAS is a participant in Natural England's eDNA proficiency testing scheme and has achieved perfect scores in blind tests undertaken in 2017, 2018, 2019 and 2020.
[16] Highways England. March 2020. LA 108 Biodiversity [Online]. [Accessed October 2020]. Available from: https://www.standardsforhighways.co.uk/dmrb/search?discipline=SUSTAINABILITY_AND_ENVIRONMENT
[17] Set out in Ratcliffe, D.A (1977). A Nature Conservation Review. Cambridge University Press.
[18] Bloor Homes/Persimmon Homes Elms Park, Northwest Cheltenham, Phase 1 and Protected Species Survey Appendix J1 (August 2015)

located approximately 30 m east of pond 39, within the same land parcel. The information gathered indicates that pond 28, pond 29, pond 39 and pond 40 are either no longer present, or are unlikely to be suitable for supporting great crested newts. Nevertheless, if access can be obtained in future, these waterbodies will be surveyed to confirm this assessment.

2.4.5. Drain 5, drain 6 and drain 7 were surveyed in 2019 as part of the otter and water vole habitat suitability assessment. Drain 5 and drain 6 were completely dry and no aquatic vegetation was recorded. Drain 7 was not present (no ground depression, standing water or aquatic vegetation was present) when the Site was visited. On this basis, these three drains have been scoped out of the great crested newt assessment.

2.4.6. During the eDNA surveys the waterbody perimeter accessible for sampling was less than 75% for the following 14 waterbodies: pond 17, pond 23, pond 24, pond 25, pond 26, pond 27, drain 8, drain, drain 14, drain 15, drain 17, drain 19, drain 20 and drain 22). However, as the areas that could be accessed were considered to be suitable for great crested newt utilisation this is not considered to impact the validity of the survey.

2.4.7. During the eDNA surveys more than 50% of samples were taken in very shallow water (less than 10 cm in depth) for the following waterbodies: drain 13, drain 13a, drain 14, drain 15, drain 17, drain 19, drain 20, drain 21 and drain 22. However, as this reflects the depth of the drains it is not considered to impact the validity of the survey.

2.4.8. Assuming the planning application is submitted in summer 2022, the great crested newt survey data from 2019 will be three years old. It is proposed to undertake update extended Phase 1 habitat surveys in targeted areas in order to determine whether any of the baseline conditions have changed significantly, and validate, or otherwise, the results described in this report. This report will be updated to include these surveys and will be submitted as part of the ES.

2.4.9. Population size class assessment surveys have not yet been undertaken of waterbodies with confirmed great crested newt presence. The need for these in 2022 will be reviewed, depending on the licensing route chosen: ‘traditional’ Natural England licensing route or the district level licensing scheme which Gloucestershire has recently become a part of. If the latter is chosen, then population size class assessments would not be required.

2.4.10. Ecological surveys are limited by factors which affect the presence of plants and animals such as the time of year, migration patterns and behaviour. Therefore, the absence of any particular species should not be taken as conclusive proof that the species is not present or that it will not be present in the future. However, the great crested newt surveys were undertaken in line with best practice guidance and the conclusions drawn from the data are considered valid.

3. Results

3.1. Desk Study

3.1.1. There are no designated sites within the search area designated specifically, or in part, for great crested newts. Additionally, no Natural England great crested newt EPS licences were identified within the study area for the Scheme.

3.1.2. GCER provided one recent record of great crested newts within the study area:

- Hayden Road Allotments (SO917244) 420 m south of the Scheme in 2014.

3.1.3. Thirty-seven waterbodies were identified within 500 m of the Scheme, as shown on Figure 7.11A in Appendix A.

3.2. Field Survey

Habitat Suitability Index

3.2.1. Out of the 37 waterbodies identified within 500 m of the Scheme, two of these (pond 41 and pond 42) were scoped out as they are located on the opposite side of the River Chelt from the Scheme. The River Chelt is a large, flowing watercourse which is considered to represent a barrier to great crested newt dispersal.

3.2.2. As described in the Limitations section, it was not possible to access eight waterbodies, and HSI assessments of these waterbodies were not possible (pond 22, pond 28, pond 29, pond 39, pond 40, drain 5, drain 6, and drain 7). Drain 5, drain 6 and drain 7 were surveyed in 2019 as part of the otter and water vole habitat suitability assessment. Drain 5 and drain 6 were completely dry and no aquatic vegetation was recorded. Drain 7 was not present (no ground depression, standing water or aquatic vegetation was present) when the site was visited. On this basis, these three drains have been scoped out of the great crested newt assessment.

3.2.3. A further six waterbodies were scoped out as they were dry at the time of the survey and had clearly been dry for some time, so were not considered suitable for supporting great crested newts. These include pond 30, drain 4, drain 9, drain 11, drain 12 and drain 16. Drain 3 was also scoped out as it was completely saturated in dense algae which provided no suitable egg laying material, no open water for newts to display and would have inhibited newt movement. Therefore, it was not considered suitable for supporting great crested newts.

3.2.4. HSI assessments were not undertaken of these scoped out waterbodies but were undertaken of the remaining 20 waterbodies.

3.2.5. Five waterbodies were classed as having poor suitability, six as below average suitability, seven as average suitability, one as good suitability, and one as excellent suitability. The full HSI assessments are included in Appendix B, along with a description of each waterbody, and photos of each waterbody are included in Appendix C.

Environmental DNA

3.2.6. Water samples were taken from 19 of the 20 waterbodies surveyed. No samples were taken from drain 10 as it was not safe for the surveyors to take water samples from, being filled with litter and contaminated with human waste. Due to the highly polluted nature of drain 10, it is not considered suitable for supporting great crested newts and has been scoped out from further assessment. Of the 19 waterbodies sampled, five returned positive eDNA results for great crested newts; 14a, 15, 17, 23 and 24.

Summary of Results

3.2.7. Table 3-1 below summaries the results of the great crested newt surveys carried out.

Table 3-1 - Summary of great crested newt survey results

Waterbody Reference	Date Surveyed	Distance from Works (m)	HSI Score and Suitability	eDNA Result
Pond 14a	05/06/19	490	0.47 (poor)	Positive
Pond 15	05/06/19	480	0.53 (below average)	Positive
Pond 17	06/06/19	470	0.82 (excellent)	Positive
Pond 23	14/06/19	5	0.66 (average)	Positive
Pond 24	14/06/19	60	0.71 (good)	Positive
Pond 25	11/05/21	Adjacent	0.49 (poor)	Negative
Pond 26	22/06/19	200	0.58 (below average)	Negative
Pond 27	22/06/19	230	0.53 (below average)	Negative
Pond 31	06/06/19	110	0.56 (below average)	Negative
Drain 8	12/05/21	Within the Scheme	0.64 (average)	Negative
Drain 10	11/05/21		0.41 (poor)	N/A
Drain 13	11/05/21	10	0.64 (average)	Negative
Drain 13a	11/05/21	257	0.6 (average)	Negative
Drain 14	11/05/21	Within the Scheme	0.67 average)	Negative
Drain 15	11/05/21	Within the Scheme	0.64 (average)	Negative
Drain17	11/05/21	50	0.61 (average)	Negative
Drain 19	14/05/21	368	0.58 (below average)	Negative

Waterbody Reference	Date Surveyed	Distance from Works (m)	HSI Score and Suitability	eDNA Result
Drain 20	14/05/21	Within the Scheme	0.44 (poor)	Negative
Drain 21	12/05/12	Within the Scheme	0.4 (poor)	Negative
Drain 22	16/06/21	Within the Scheme	0.52 (below average)	Negative

3.2.8. Pond 22 is located approximately 6 m south of the Scheme, 16 m west of Pond 23, and approximately 100 m north-west of Pond 24, and connected to both of these waterbodies by suitable terrestrial habitat comprising trees and scrub. On this basis, the presence of great crested newts is assumed at Pond 22.

3.2.9. Although they could not be surveyed, the information gathered indicates that pond 28, pond 29, pond 39 and pond 40 are either no longer present, or are unlikely to be suitable for supporting great crested newts.

3.2.10. The remaining 12 waterbodies within the great crested newt study area were scoped out of further assessment.

4. Evaluation

4.1.1. The waterbodies where great crested newts have been confirmed, or are assumed, can be grouped into two metapopulations[19]:

- Ponds 14a, 15 and 17 form one metapopulation located approximately 470 m north of the Scheme. Ponds 17a and 10, which are now beyond the great crested newt study area, but which were surveyed and confirmed to support great crested newts when the Scheme design extended further north, are also likely to be part of this metapopulation.
- Ponds 22, 23 and 24 form another metapopulation located immediately south of the Scheme at Uckington.

4.1.2. The survey results indicate that the study area supports two great crested newt metapopulations. One of these is located some distance from the Scheme, at the edge of the great crested newt study area for the Scheme. Given this distance, the study area is unlikely to be of particular importance to this metapopulation. The other metapopulation is located immediately south of the Scheme, and the great crested newt study area is likely to be important in maintaining this metapopulation.

4.1.3. Great crested newts receive the highest level of protection, being a EPS. Great crested newts are also a species of Principal Importance for the conservation of biodiversity in England, as listed under Section 41 of the NERC Act (2006) and are identified as a priority species in the Gloucestershire County Council Biodiversity Action Plan[20].

4.1.4. Surveys have shown that great crested newts are widespread throughout the South Midlands, being present in around a third (32%) of ponds in the South Midlands region, although this varies in places it is usually higher than the national average (13%)[21].

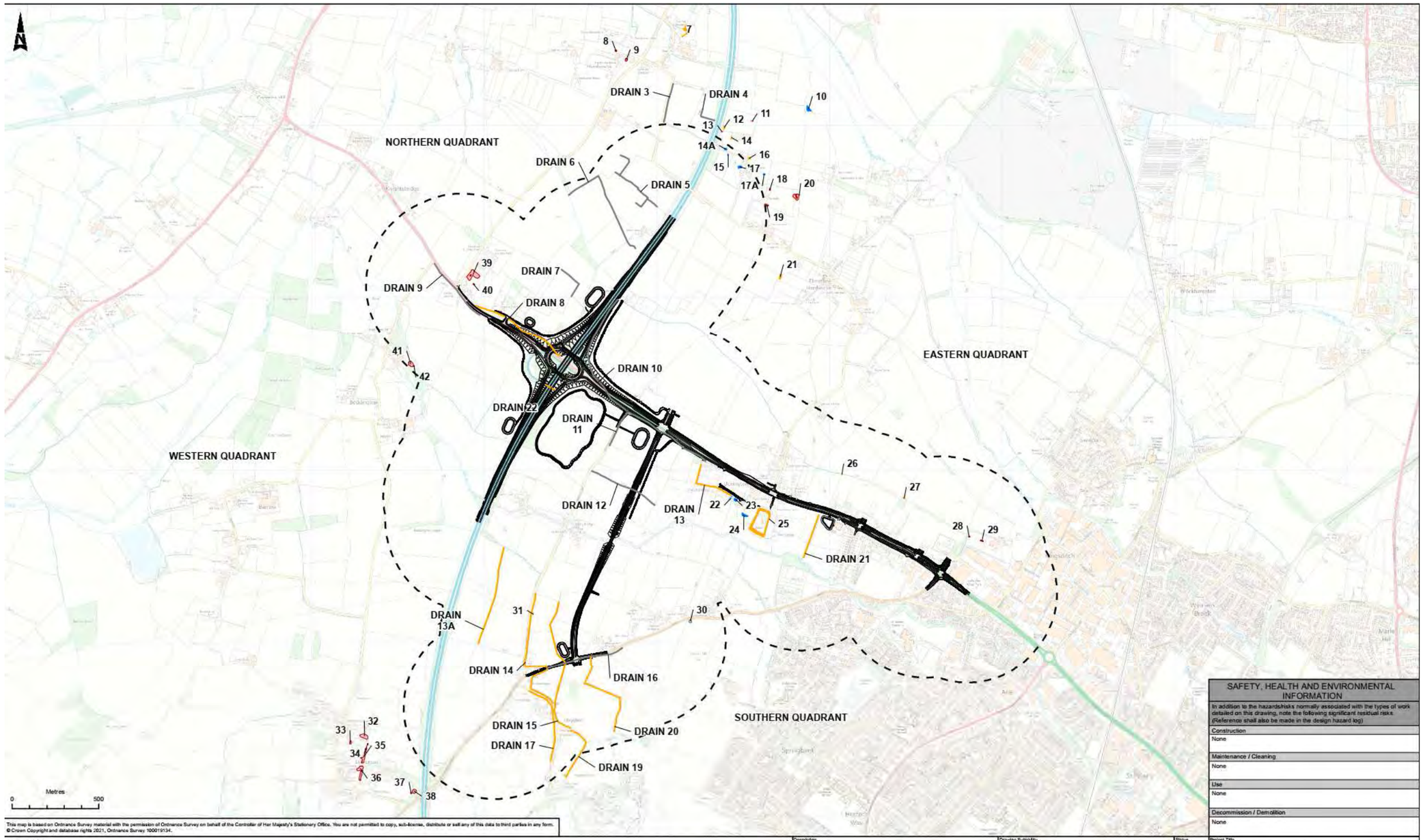
4.1.5. Despite being widespread in the region, given their high level of protection, and the proximity, and therefore the potential importance of the study area for great crested newts, this species has been ascribed a value of County nature conservation importance.

[19] Groups of spatially separated waterbodies, generally within 500 m of one another and linked by suitable terrestrial habitat, where presence has been confirmed or assumed and interchange of individual great crested newts is likely or possible.
[20] Gloucestershire Biodiversity Partnership (2000) Summary of the Biodiversity Action Plan for Gloucestershire
[21] Gloucestershire County Council, the great crested newt district licensing scheme document available to download from: gcn_district_licence_option_note_gcc.pdf (gloucestershire.gov.uk)

Appendices to Appendix 7.11

- Appendix A
- Appendix B
- Appendix C

Appendix A. Figure 7.11A Great crested newt survey results


NORTHERN QUADRANT
EASTERN QUADRANT
WESTERN QUADRANT
SOUTHERN QUADRANT
DRAIN 3
DRAIN 4
DRAIN 5
DRAIN 6
DRAIN 7
DRAIN 8
DRAIN 9
DRAIN 10
DRAIN 11
DRAIN 12
DRAIN 13
DRAIN 13A
DRAIN 14
DRAIN 15
DRAIN 16
DRAIN 17
DRAIN 19
DRAIN 20
DRAIN 21
DRAIN 22
7
8
9
10
11
12
13
14
14A
15
16
17
17A
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
Metres
0
500
LEGEND
PROPOSED ALIGNMENT
500M STUDY AREA
GCN SURVEY WATERCOURSES AND DRAINS
E-DNA TEST NEGATIVE
SCOPED OUT
GCN SURVEY WATERBODIES
E-DNA TEST POSITIVE
ASSUMED PRESENCE
E-DNA TEST NEGATIVE
DRY AT TIME OF SURVEY
NO DATA
SCOPED OUT
SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION
In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks: (Reference shall also be made in the design hazard log)
Construction
None
Maintenance / Cleaning
None
Use
None
Decommission / Demolition
None
FOR INFORMATION
S2
M5 Junction 10 Improvement
FIGURE 7.11A
GREAT CRESTED NEWT SURVEY
RESULTS
GCCM5J10 - ATK - XXX
XX - GS - GI - XXXXXX
A3
1:20,000
5206696
1 of 1
P01

Appendix B. Habitat Suitability Index (HSI) Results

Waterbody Reference	Waterbody description	Date undertaken	SI1 - Location	SI2 - Pond area (m^2)	SI3 - Pond drying	SI4 - Water quality	SI5 - Shade	SI6 - Fowl	SI7 - Fish	SI8 - Ponds	SI9 - Terrestrial habitat	SI10 - Macrophytes	HSI	Waterbody suitability
Pond 14a	Mostly dry due to grass and rush growth	05/06/19	A	<50	Dries annually	Moderate	100	Absent	Absent	13+	Good	100	**0.47**	**Poor**
Pond 15	Mostly dry due to grass and rush growth	05/06/19	A	<50	Dries annually	Moderate	40	Absent	Absent	13+	Good	100	**0.53**	**Below average**
Pond 17	Densely vegetated around edges. Reed mace and duckweed dominate in pond.	06/06/19	A	250	Never dries	Moderate	20	Minor	Possible	13+	Good	80	**0.82**	**Excellent**
Pond 23	Dense vegetation on half of the bank, mown grass on the other half of the bank. Duckweed dominates pond surface.	14/06/19	A	200	Never dries	Good	80	Minor	Possible	7	Moderate	0	**0.66**	**Average**
Pond 24	Steep sided bank. Dense scrub on half of the bank, mown grass on the other half of the bank. Duckweed dominates pond surface.	14/06/19	A	350	Never dries	Good	80	Minor	Possible	7	Moderate	5	**0.71**	**Good**
Pond 25	Very large moat surrounding a house. Outer circumference is approximately 450 m, inner circumference is approximately 350 m. Water was clear and > 1 m depth in the centre.	11/05/21	A	>2000	Never dries	Good	80	Major	Absent	6	Moderate	5	**0.49**	**Poor**
Pond 26	Small pond connected to field ditch. Pond dry but ditch surveyed.	22/06/19	A	<50	Sometimes dries	Moderate	90	Absent	Absent	10	Good	40	**0.58**	**Below average**
Pond 27	Very shaded, shallow pond. Stagnant water in area of scrub in the corner of a field.	22/06/19	A	<50	Rarely dries	Moderate	100	Absent	Absent	9	Good	0	**0.53**	**Below average**
Pond 31	In a field with grasses growing in pond and scrub and a hedgerow adjacent.	06/06/19	A	<50	Sometimes dries	Moderate	20	Absent	Absent	1	Moderate	30	**0.56**	**Below average**
Drain 8	Shallow and narrow drainage ditch, dry in places. Surrounded by trees and scrub.	12/05/21	A	100	Sometimes dries	Moderate	50	Absent	Absent	1	Good	10	**0.64**	**Average**
Drain 10	Very shallow and narrow drainage ditch with very steep banks next to busy road layby.	11/05/21	A	250	Sometimes dries	Bad	90	Absent	Absent	5	Poor	20	**0.41**	**Poor**
Drain 13	Shallow and narrow drainage ditch between fields. Very steep in places.	11/05/21	A	150	Sometimes dries	Moderate	90	Absent	Absent	5	Moderate	30	**0.64**	**Average**
Drain 13a	Shallow drainage ditch in between two fields. Very steep banks with scrub growing over drain in places.	11/05/21	A	50	Sometime dries	Moderate	90	Absent	Absent	3	Moderate	80	**0.60**	**Average**
Drain 14	Drainage ditch between road and field. Steep banks and had dense aquatic vegetation.	11/05/21	A	100	Sometime dries	Moderate	75	Absent	Absent	3	Moderate	95	**0.67**	**Average**
Drain 15	Drainage ditch between two fields. Dry in places with scrub growing over drain.	11/05/21	A	100	Sometimes dries	Moderate	95	Absent	Absent	7	Moderate	70	**0.64**	**Average**
Drain 17	Shallow and narrow drainage ditch between road and field. Steep banks.	11/05/21	A	100	Rarely dries	Poor	90	Absent	Absent	7	Moderate	15	**0.61**	**Average**
Drain 19	Drainage ditch between track and field. Some areas of dense vegetation.	14/05/21	A	150	Sometimes dries	Moderate	80	Absent	Minor	7	Moderate	10	**0.58**	**Below average**

Waterbody Reference	Waterbody description	Date undertaken	SI1 - Location	SI2 - Pond area (m^2)	SI3 - Pond drying	SI4 - Water quality	SI5 - Shade	SI6 - Fowl	SI7 - Fish	SI8 - Ponds	SI9 - Terrestrial habitat	SI10 - Macrophytes	HSI	Waterbody suitability
Drain 20	Very shallow and polluted drainage ditch between track and field. Dense vegetation.	14/05/21	A	<50	Dries annually	Poor	10	Absent	Absent	7	Moderate	0	**0.44**	**Poor**
Drain 21	Very shallow drainage ditch within hedgerow between fields.	12/05/12	A	<50	Dries annually	Moderate	100	Absent	Absent	4	Moderate	0	**0.4**	**Poor**
Drain 22	Service culvert underneath motorway. Shallow water in corrugated metal pipe.	16/06/21	A	50	Sometimes dries	Poor	95	Absent	Absent	7	Good	5	**0.52**	**Below average**

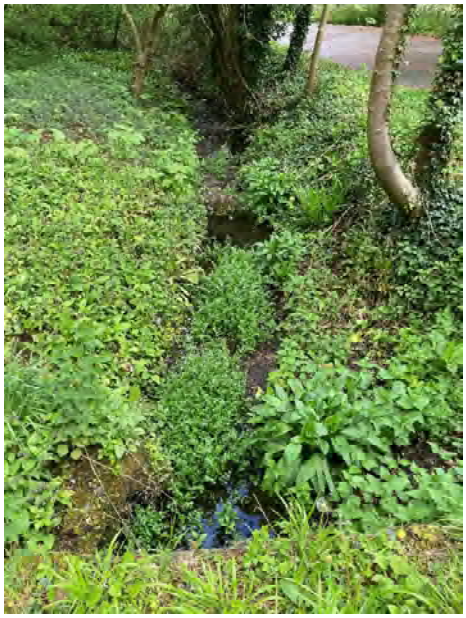
Appendix C. Waterbody Photographs

Waterbody Reference	Photograph
Pond 14a	
Pond 15	

Waterbody Reference	Photograph
Pond 17	
Pond 23	

Waterbody Reference	Photograph
Pond 24	
Pond 25	

Waterbody Reference	Photograph
Pond 26	
Pond 27	

Waterbody Reference	Photograph
Pond 31	
Drain 8	

Waterbody Reference	Photograph
Drain 10	
Drain 13	

Waterbody Reference	Photograph
Drain 13a	
Drain 14	

Waterbody Reference	Photograph
Drain 15	
Drain 19	

Waterbody Reference	Photograph
Drain 20	
Drain 21	

Waterbody Reference	Photograph
Drain 22	

Appendix 7.12 – Aquatic ecology survey

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1. Introduction

1.1. Terms of reference

1.1.1. Atkins Limited (Atkins) was commissioned by Gloucestershire County Council (GCC) to undertake an ecology assessment for the Environmental Statement (ES) for the M5 Junction 10 Improvement Scheme (hereafter referred to as 'the Scheme').

1.1.2. As part of the ecology assessment, an aquatic ecology desk study and field surveys were undertaken to determine a baseline for aquatic features and associated species (aquatic invertebrates, aquatic macrophyte and fish) present within the Scheme; provide recommendations to enable compliance with legislation and policy; and, if necessary, identify the need for avoidance, mitigation, compensation or enhancement measures.

1.1.3. This Technical Appendix summarises the results of the aquatic ecology desk study and surveys undertaken, including the methods used, results of the field surveys, and provides an evaluation of the nature conservation value of aquatic features within the study area.

1.1.4. This report provides factual information to support the ES, which will accompany the planning application for the Scheme.

1.2. Legislation and policy

1.2.1. Relevant legislation in relation to aquatic habitats and species is provided in Table 1-1 below (excluding protected species e.g. otter and water vole which is provided in their respective appendices). Other overarching ecological legislation e.g. the National Planning Policy Framework (NPPF) are summarised within Chapter 7 of the PEIR.

Table 1-1 - Summary of relevant legislation

Legislation	Summary
The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017	The Water Environment Regulations (2017), known as the Water Framework Directive (WFD) is the leading legislation on the duties of regulators (Environment Agency in England) in relation to environmental permitting, abstraction, and impoundment of water. Its principal aims are to protect and improve the water environment and promote the sustainable use of water, as follows: • To prevent deterioration of the status of water bodies; • To protect, enhance and restore all water bodies with the aim of achieving 'good status' by 2027 at the latest; • To progressively reduce or phase out the release of individual pollutants or groups of pollutants and cease or phase out emissions, discharges and losses of priority hazardous substances; • To prevent or limit the entry of pollutants to groundwater; and • To comply with the requirements of all WFD Protected Areas.
Salmon and Freshwater Fisheries Act 1975	The Act dictates which methods of fishing for salmon, trout and freshwater fish are an offense and deals with offences associated with the discharge of matter or effluent that is poisonous or injurious to fish, spawn, spawning areas or food of fish. The Act also details offences associated with the wilful disturbance of any spawn or spawning fish, or any bed, bank or shallow on which any spawn or spawning fish may be.

Legislation	Summary
The Eels (England and Wales) Regulations 2009	The Regulations give powers to the regulators (the Environment Agency and Natural Resources Wales) to implement recovery measures of European eel stocks in all freshwater and estuarine waters in England and Wales.

2. Methodology

2.1. Desk study

Screening area

2.1.1. Screening for the presence of aquatic receptors (watercourses, ponds and lakes) was undertaken within the Scheme[1] plus 150 meters (m) from the Scheme boundary[2] (hereafter referred to as the 'screening area').

2.1.2. This ensures the following:

- Aquatic habitats within the Scheme boundary that may be affected by the proposed Scheme are identified, for example a watercourse that is crossed or a pond that is located within the works area. Effects could arise through, for example, direct/indirect habitat loss, physical modification, disturbance and/or changes to water quality/quantity;
- Hydrologically connected receiving watercourses and any dependant ponds, lakes and designated sites which are potentially at risk due to propagation of effects from watercourses affected are included within the screening area (see Ecological Zone of Influence (EZoI);
- Additional aquatic habitats located not more than 150 m from the Scheme boundary that, whilst not within the works area, may still be at risk from disturbance due to their proximity to the Scheme. This could be through, for example, overland pollution or mobilisation of fine sediment from the working area.

2.1.3. Watercourses, ponds and lakes that are not in direct hydrological connectivity with an aquatic receptor within the screening area, are sufficiently isolated as to have negligible risk of impact from a construction or operation impact source.

Ecological Zone of Influence

2.1.4. The EZoI for ponds, lakes and aquatic designated sites that are not hydrologically connected to a watercourse located within the screening area, is defined as the screening area itself. This is the extent over which these receptors could be affected by the Scheme, through mechanisms identified in Paragraph 2.1.2.

2.1.5. The EZoI for watercourses within the screening area (and by extension any hydrologically connected ponds, lakes or designated sites) is larger. Potential ecological impacts originate within the screening area during construction and/or operation of the Scheme. However, impacts have the potential to propagate within watercourses, beyond the screening area (for example through hydrological transport of construction pollutants). The extent to which impacts may propagate defines the EZoI for watercourses and any dependent ponds, lakes or designated sites.

2.1.6. In the absence of published guidance that defines the EZoI for watercourse receptors, the EZoI has been defined with reference to the design elements of the Scheme, working practices required to construct it and the author's knowledge of similar Schemes.

2.1.7. The Scheme does not act to fundamentally change hydromorphological processes (e.g. through permanent abstraction or transfer of water, or extensive channel realignment), water quality (e.g. through new discharges that are unattenuated and/or carry pollutants) or aquatic species movement (e.g. through construction of permanent watercourse barriers) relative to baseline conditions. Potential impacts may arise at the point of

[1] The term Scheme refers to the physical extent of the permanent works including maintenance rights, together with land required temporarily to construct the works.
[2] The Scheme boundary delineates the Scheme area.

construction due to activities required to construct individual design elements. However, these are typically either localised (for example, riparian habitat loss/degradation), temporary (for example for the duration of construction) and/or subject to standard pollution prevention and control measures that serve to constrain the EZoI.

2.1.8. In the unlikely event of an uncontrolled pollution or sediment mobilisation incident within a watercourse, effects are considered likely to be ameliorated (through deposition or dilution) and/or intercepted within 2 km of their origin.

2.1.9. The EZoI for watercourses is therefore considered to be 2 km (measured in linear watercourse extent) from the Scheme boundary. This is considered to be an appropriate and conservative EZoI within which the assessment assumes potential for effects.

Study areas

2.1.10. Study areas are defined on the basis of the EZoI for aquatic receptors.

2.1.11. The study area for watercourses located within the screening area, and any hydrologically connected ponds, lakes and aquatic designated sites, is defined as 2 km (measured in linear watercourse extent) from the Scheme boundary (hereafter referred to as the 2 km study area).

2.1.12. The study area for ponds, lakes and aquatic designated sites (falling within the screening area), which are not hydrologically connected to a watercourse within the screening area, is defined as the Scheme plus 150 m from the Scheme boundary (hereafter referred to as the 150 m study area).

2.1.13. When taken together these areas are hereafter referred to as the combined study area.

Identification of aquatic receptors

2.1.14. All watercourses, ponds and lakes within the combined study area were identified from geospatial analysis using contemporary Ordnance Survey (OS). The Esri World Topographic Map and OS Open Rivers Layer were used as the primary sources for identifying potentially ecologically important watercourses, ponds and lakes within the screening area. Aerial imagery was used to confirm the presence/absence of aquatic features in cases of uncertainty.

2.1.15. Watercourses, ponds and lakes were assigned unique identifiers (watercourse names for main rivers, drain numbers and codes for smaller ordinary watercourses and pond numbers for standing water bodies). It should be noted that since watercourses are longitudinal features within the landscape, they may interact with the Scheme at more than one location, e.g. crossed by structures at two separate locations, and falling within 150 m of the Scheme at another location. Where this occurs specific details are provided in the reporting below.

Watercourses

2.1.16. Watercourses are defined as either:

- Main River:
  - A watercourse shown on the statutory Main River map dataset. These are typically larger streams and rivers, but some of them are small watercourses of significance. They include certain structures that control or regulate the flow of water in, into or out of the channel.
  - The Environment Agency has permissive powers, but not a duty, to carry out maintenance, improvement or construction work on designated Main Rivers. The Environment Agency has powers to regulate the activities of others affecting main rivers and their flood plains under the Environmental Permitting Regulations 2016, the Water Resources Act 1991 and land drainage bylaws.

- Canal:
  - A manmade watercourse typically characterised by artificial banks, uniform profiles and often relatively heavily used for navigational purposes; and
  - The Canal & River Trust hold a number of objects and powers over the canal network, notably to preserve, protect, operate, and manage inland waterways.
- Ordinary Watercourse:
  - All other watercourses are defined as Ordinary Watercourses. The Lead Local Flood Authority (LLFA) or, if within an Internal Drainage District, the Internal Drainage Board (IDB) have similar permissive powers to maintain and improve Ordinary Watercourses.
  - The LLFA or IDB have powers to regulate works under the provisions of the Land Drainage Act 1991 and local bylaws.
  - Ordinary Watercourses include rivers, streams, land and roadside ditches, drains, cuts, culverts, dikes, sluice, sewers (other than public sewers within the meaning of the Water Industry Act 1991) and passages through which water flows.

2.1.17. Where available, the name of the watercourse is provided as it appears on OS mapping. If the watercourse is unnamed, it has been identified as such, and a unique identifier has been created. Watercourses, as named are shown in Figure 7.12A in Appendix B.

Ponds and lakes

2.1.18. For the purposes of this assessment, standing water bodies have been classified as either:

- Ponds:
  - Artificial or natural standing water bodies less than 2 ha (20,000 m^2) in size.
- Lakes:
  - Artificial or natural standing water bodies greater than 2 ha (20,000 m^2) in size.

2.1.19. Ponds, as coded are shown in Figure 7.12A in Appendix B.

Existing background data sources

Publicly available data

2.1.20. Several publicly available data sources of direct relevance to aquatic receptors within the combined study area include:

- Environment Agency Severn River Basin Management Plan (RBMP);
- Environment Agency Catchment Data Explorer[3];
- Environment Agency Fish and Ecology Data Explorer for aquatic invertebrates, aquatic macrophytes and fish[4];
- Natural England's Multi-Agency Geographic Information for the Countryside (MAGIC) interactive map[5], which delineates statutory designated sites of importance for nature conservation;

[3] https://environment.data.gov.uk/catchment-planning/ [Accessed: August 2021].
[4] https://environment.data.gov.uk/ecology/explorer/ [Accessed: August 2021].
[5] https://magic.defra.gov.uk/magicmap.aspx [Accessed: August 2021].

- Environment Agency River Habitat Survey monitoring data from the Government data website[6];
- Contemporary OS mapping[7].

Supplementary data requests

2.1.21. A data request was made to the Gloucestershire Centre for Environmental Records (GCER; local biodiversity records centre) for environmental records within 2 km of the Scheme.

2.1.22. Records for protected and notable species recorded in the last ten years within a 1 km and 2 km buffer were requested. Non-statutory sites within the same 1 km buffer were also requested.

Scheme data sources

2.1.23. Other data associated with the Scheme have also informed this assessment. Scheme data sources of direct relevance to aquatic receptors include:

- Scheme Habitat Suitability Index (HSI)[8] data for ponds and lakes (index used in the evaluation of pond habitat quality specifically for great crested newts).

Data screening

2.1.24. All background data were screened for relevance to the Scheme in terms of location, date and period of record. The following criteria were applied to determine the suitability of individual records for inclusion in the baseline:

- Data must have been collected within the combined study area; and
- Data must have been collected within the past five years (20 years for Environment Agency River Habitat Survey (RHS) data).

2.1.25. Aquatic species data collected over five years ago may not be representative of current community composition since changes in the aquatic environment and aquatic communities are likely to have occurred over time. The five-year cut-off reduces the potential for broad-scale habitat changes, and corresponding changes in aquatic communities, to have occurred since the data was collected.

2.1.26. The cut-off for RHS data differs from the cut-off for aquatic species data. Watercourse habitat structure/modification in urban settings (i.e. the Scheme environs) is generally less likely to change through time than the species it supports. As such, habitat records of up to 20 years have been included for those watercourses that have not evidently undergone significant recent modification e.g. straightening to form part of a field boundary.

Consultation

2.1.27. Early consultation meetings with the Environment Agency were undertaken on 16 January 2020 and 15 July 2021 as part of PCF Stage 2 and PCF Stage 3 assessments.

2.1.28. Further to these meetings, the Environment Agency provided consultation responses outlining key points for consideration. These include the need for consideration of connectivity to downstream watercourses and functionally linked habitats; presence of protected and notable species, including migratory and non-migratory fish species; opportunities for enhancements to aquatic habitats (watercourses and wetlands); and the need for a WFD assessment.

[6] https://data.gov.uk/data/search [Accessed: August 2021].
[7] https://www.bing.com/maps [Accessed: August 2021].
[8] Oldham R.S., Keeble J., Swan M.J.S. and Jeffcote, M., 2000. Evaluating the suitability of habitat for the Great Crested Newt (Triturus cristatus). Herpetological Journal,10(4), pp. 143-155.

Detailed assessment and survey screening criteria

2.1.29. The Chartered Institute of Ecology and Environmental Management (CIEEM) (2018)[9] identifies the requirement for EcIA to rationalise which ecological features should be subject to detailed assessment. It is not necessary for EcIA to carry out detailed assessment of features that are sufficiently widespread, unthreatened, and resilient to project impacts.

2.1.30. CIEEM (2018) also identifies that ecological features subject to detailed assessment will be those that are both considered to be important and potentially significantly affected by the Scheme. Features should be scoped out of detailed assessment either because they are not important enough to warrant further consideration in the Environmental Impact Assessment (EIA) process or because they will not be significantly affected.

2.1.31. For each aquatic feature identified within the screening area, screening criteria were applied to determine whether the receptor should be subject to detailed assessment and specific survey to inform the ecological baseline. These criteria are described in the following sections.

2.1.32. Details of the outcomes of this survey screening exercise for watercourses, ponds and lakes are provided in 3.1 of this report, respectively.

2.2. Field surveys

Screening for surveys

Watercourse walkover survey

2.2.1. All watercourses identified within the screening area were visited as part of a walkover survey by an experienced freshwater ecologist where access was available. The aim of the walkover survey was to assist in identifying important ecological features, and support screening for detailed assessment.

2.2.2. Wherever possible, survey locations were aligned to key points of interaction with the Scheme (e.g. crossing points) where there is greatest potential for effects.

Detailed watercourse surveys (habitat and species) and assessment screening

2.2.3. Watercourses were screened for detailed assessment based on the developing Scheme design and the following criteria:

- The watercourse is considered a potentially important ecological feature (i.e. potentially of Local ecological importance or greater; and
- The watercourse is to be lost/crossed/diverted or potentially experience a significant change in water quality or quantity as a result of the Scheme (e.g. extension of existing culverts).

2.2.4. Watercourses identified for detailed assessment were screened as requiring further habitat and species survey (namely RHS, River Corridor Survey (RCS), aquatic macroinvertebrate, aquatic macrophyte and fish survey) based on the following criteria:

- There were no suitable existing recent background or Scheme ecological data on the watercourse within the 2 km study area; and
- The watercourse exhibited suitable habitat that would justify the detailed survey type, based on the walkover survey findings.

[9] CIEEM (2018) Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine version 1.1. Chartered Institute of Ecology and Environmental Management, Winchester.

Pond surveys

2.2.5. No lakes were identified within the screening area. Therefore, only ponds are discussed in the following sections.

2.2.6. Ponds were screened in for survey based on the following criteria:

- The pond is to be lost by any mechanism (drainage, land take to construction etc.) or may experience a significant change in water quality or quantity as a result of the Scheme (e.g. severance of feeder surface/groundwater pathways to the pond/lake) based on available design information; and
- The pond is considered to be potentially ecologically important (i.e. potentially of Local ecological importance or greater), based on a review of physical habitat data collected during Habitat Suitability Index (HSI) survey;
- Its hydrological characteristics make it suitable for survey within the prescribed Predictive System for Multimetrics (PSYM) survey window.

Proportionality of survey effort

2.2.7. Surveys were undertaken only in the absence of suitable existing background data (for example Environment Agency biological monitoring data), ensuring that survey effort was proportionate to the requirement for robust ecological assessment. Existing background data were reviewed to identify the validity of its use (spatially and temporally) in place of the requirement for additional Scheme specific survey.

Survey Methods

Watercourse walkover survey

2.2.8. Watercourses identified as being potentially affected were visited at the point of interaction with the Scheme (i.e. a proposed crossing point) and, where feasible, 250 m up and downstream of these interactions. During the survey, habitat characteristics were recorded following habitat descriptors outlined in RHS methodology, as listed below:

- substrates (e.g. sand/silt, gravel, pebble, cobble, boulders;
- vegetation type (e.g. submerged fine leaved, submerged broad leaved, marginal reeds);
- flow type (e.g. smooth, rippled, unbroken waves);
- approximate channel dimensions and water depths;
- presence and extent of channel and bank re-sectioning; and
- presence of any existing crossing structures, weirs or outfalls.

2.2.9. The aquatic ecology walkover survey was designed to assess the suitability of the watercourses for fish and other aquatic species, as well as determine the requirement for further detailed surveys at later project stages.

River Habitat Survey

2.2.10. For watercourses identified as requiring RHS, based on the criteria outlined in Section 2.1, RHS were undertaken alongside RCS.

2.2.11. Surveys were undertaken using the standard methods described in River Habitat Survey in Britain and Ireland – Field Survey Guidance Manual[10].

[10] Hendry, K., and Cragg-Hine, D. (1997) Restoration of Riverine Salmon Habitats: A Guidance Manual. Fisheries Technical Manual 4. R&D Technical Report W44. Environment Agency, Bristol.

2.2.12. A full 500 m RHS was undertaken for each point of interaction identified as requiring survey, where the length of accessible open channel allowed.

2.2.13. All RHS were undertaken in July 2020, by an RHS accredited freshwater ecologist[11].

2.2.14. The results of RHS were used to calculate Habitat Modification Scores (HMS). The HMS provides a measure of artificial modification to the river channel morphology. To calculate the HMS for a survey site, points are allocated for the presence and extent of artificial features such as culverts/weirs and modifications such as re-profiling and reinforcement of the channel and banks.

2.2.15. Further details of Habitat Modification Score (HMS) calculations are provided in Appendix A.1 of this report.

River Corridor Survey (RCS)

2.2.16. For watercourses identified as requiring RCS (based on the criteria outlined in Section 2.1), surveys were undertaken at existing and proposed Scheme crossing points using the standard methods described in the River Corridor Surveys Methods and Procedures (Conservation Technical Handbook)[12] .

2.2.17. Where possible, RCS reaches were centered on the Scheme crossings points. Where this was not feasible (e.g. due to access constraints), surveys were undertaken as close as possible to the existing or proposed crossing point.

2.2.18. Where the length of accessible open channel allowed, a full 500 m RCS was undertaken for each point of interaction identified as requiring survey.

2.2.19. For each RCS the aquatic, marginal, bank and adjacent land zones were mapped (including the presence of any aquatic macrophytes) and at least one representative cross-section was drawn for each site. Reference photographs were also taken.

2.2.20. All RCS were undertaken during July 2020 by competent freshwater ecologists.

Aquatic macroinvertebrates

2.2.21. Aquatic macroinvertebrate surveys were undertaken at representative locations within each of the watercourses screened as requiring survey. Samples were collected downstream of the Scheme interface with the watercourse so that the location is in the direction in which most effects will propagate. Where access allowed and habitat was suitable, samples were also collected upstream to further characterise the community and provide a control site to support future construction monitoring.

2.2.22. Aquatic macroinvertebrate samples were collected using a standard three-minute kick-sampling technique in accordance with RIVPACS[13] standard sampling protocols[14].

2.2.23. Samples were preserved in the field in 99% Industrial Denatured Alcohol (IDA) and returned to the laboratory for analysis. Environmental variables required to generate RIVPACS community predictions were recorded, thus ensuring that should a full suite of WFD classification be required in the future, the data collected was fit for purpose. For each sample, the following biological metrics were calculated:

[11] EA Accredited RHS Surveyor Number: FA022
[12] National Rivers Authority (1992). River Corridor Surveys. Methods and Procedures. Conservation Technical Handbook No. 1.
[13] RIVPACS is the River Invertebrate Prediction & Classification Systems model implemented within the RICT (River Invertebrate Classification Tool) used by the Environment Agency to determine WFD invertebrate classifications.
[14] EU Star UK (2006) RIVPACS Macroinvertebrate Sampling Protocol. Available at: http://www.eu-star.at/pdf/RivpacsMacroinvertebrateSamplingProtocol.pdf [Accessed: April 2021].

Whalley Hawkes Paisley Trigg (WHPT)[15]

- The WHPT metric was developed by the statistical analysis of a large and comprehensive database of field samples, as an update to the Biological Monitoring Working Party (BMWP[16]) scoring system.
- Much like the former BMWP scoring system, WHPT was developed primarily as a means of assessing water quality and does not necessarily correlate intimately with conservation importance. The method has been designed to detect the impact of organic enrichment on aquatic macroinvertebrates. It is also known to be sensitive to toxic pollution. It may also detect the impact of other pressures or combinations of pressures.
- The list of scoring taxa for WHPT is more extensive than the BMWP list, due both to the inclusion of additional taxa and splitting of some BMWP species aggregates. WHPT scoring utilises abundance data rather than just presence/absence as in BMWP.
- The metric is underpinned by sensitivity scores, based on tolerance to organic pollutants. Theoretically, a site with good water quality should result in a higher WHPT than a site with poor water quality.
- The number of scoring aquatic macroinvertebrate taxa (NTAXA) is simply the number of scoring taxa recorded in the site sample and the average score per taxon (ASPT) is the WHPT divided by NTAXA.
- ASPT tends to be less influenced by seasonal community changes and is the most appropriate index of the three by which to monitor a site over time. In general, ASPT scores above 5 represent macroinvertebrate communities living in good water quality. Lower scores are indicative of macroinvertebrate communities suffering from stress due to reduced water quality.
- In combination, the scores can also be used to infer watercourse condition in terms of habitat complexity.

Proportion of Sediment-sensitive Invertebrates (PSI)[17]

- The PSI is based on the known ecological responses of different aquatic macroinvertebrate species or family groups to the accumulation of sediment on riverine substrata.
- Those taxa that are known to benefit from, or that are largely unaffected by sedimentation, are given a high score, known as a Sediment Sensitivity Rating (SSR). Those taxa that are known to suffer from the accumulation of sediment are given a low SSR. The metric also depends on the relative abundance of different taxa and so is not just dependent on “presence-absence”, but also on the numbers of different taxa recorded.
- The PSI score describes the percentage of sediment-sensitive taxa present in a sample with high values indicating a greater proportion (percentage) of silt intolerant macroinvertebrate species present within the aquatic macroinvertebrate community sampled i.e. the less a site is affected by silt the greater the PSI score. Scores range from 0 to 100 with categories from naturally sedimented/un-sedimented to heavily sedimented.

[15] WFD-UKTAG (2014), River Assessment Method. Benthic Invertebrate Fauna. Invertebrates (General Degradation): Whalley, Hawkes, Paisley & Trigg metric in River Invertebrate Classification Tool (RICT) UKTAG Method Statement. ISBN: 978-1-906934-62-0.
[16] Biological Monitoring Working Party (1978). Final report: assessment and presentation of the quality of rivers in Great Britain. Unpublished report, Department of the Environment, Water Data Unit.
[17] Extence, C.A., Chadd, R.P., England, J., Dunbar, M.J., Wood, P.J. and Taylor, E.D. (2013). The assessment of fine sediment accumulation in rivers using macro-invertebrate community response. River Research and Applications, 29, pp. 17-55.

Lotic invertebrate Index for Flow Evaluation (LIFE)[18]

- This metric was developed as a means of assessing flow as a stressor on the aquatic macroinvertebrate community. Macroinvertebrate taxa (family and species levels) are assigned to a flow group depending on their documented flow preferences (current velocity) ranging from I (Rapid) to VI (Drought Resistant).
- The calculation of a community LIFE score is underpinned by flow scores. These are derived with reference to an abundance/flow group matrix such that both the abundance and flow preference of recorded taxa is taken into account. Abundance categories are defined by standard Environment Agency categories.
- LIFE score categories identify the community as having a low, moderate or high sensitivity to flow reduction. With a lower score indicating a community made up of proportionally more taxa with a preference for low flows.

Community Conservation Index (CCI)[19]

- The CCI is used to assess community conservation value and highlights specific species of conservation importance based on the Joint Nature Conservation Committee (JNCC) threat categories (after Wallace, 1991[20]).
- Community score categories range from low (i.e. a site that supports only common species and/or a community of low taxon richness) to very high (a community potentially of national significance and may merit statutory protection) conservation value. It should be noted that the CCI does not directly align with nature conservation value.

2.2.24. Following identification, the macroinvertebrate species list for each survey site was checked against known conservation designations using the sources below:

- Joint Nature-Conservation Committee (JNCC) Conservation Designations for UK Taxa[21]
- Natural History Museum UK Species Data[22]
- National Biodiversity Network (NBN) Atlas[23]

2.2.25. A full schedule and broad interpretation of biological metric scores and species designations are provided in the baseline section of this appendix.

Aquatic macrophytes

2.2.26. Aquatic macrophyte surveys were undertaken along reaches screened as requiring survey in accordance with:

- Water Quality Guidance Standards for the Surveying of Aquatic Macrophytes in Running Waters[24]

2.2.27. Aquatic macrophyte surveys were conducted along a 100 m reach screened as requiring survey. Surveys were typically conducted downstream of the of the Scheme interface with the watercourse so that the location is in the direction in which most effects will propagate.

[18] Extence, C.A., Balbi, D.M. and Chadd, R.P. (1999). River flow indexing using British benthic macroinvertebrates: A framework for setting hydroecological objectives. Regulated Rivers: Research and Management 15, pp. 543-574.
[19] Chadd, R.P. and Extence, C.A. (2004). *The conservation of freshwater macroinvertebrate populations: a community-based classification Project*. Aquatic Conservation: Marine and Freshwater Ecosystems, 14, pp. 597–624.
[20] Wallace, I.D. (1991). A review of the Trichoptera of Great Britain. Research and Survey in Nature Conservation No. 32. Nature Conservancy Council: Peterborough.
[21] JNCC (2020) Conservation designations for UK taxa [online] Available at: https://hub.jncc.gov.uk/assets/478f7160-967b-4366-acdf-8941fd33850b [Accessed: August 2021].
[22] Natural History Museum (2021) UK Species Data [online] Available at: https://www.nhm.ac.uk/our-science/data.html [Accessed: August 2021].
[23] National Biodiversity Network (2021) NBN Atlas [online] Available at: https://nbnatlas.org/ [Accessed: August 2021].
[24] CEN - EN 14184. Water Quality Guidance Standards for the Surveying of Aquatic Macrophytes in Running Waters.

In addition, predictor variables as described in LEAFPACS2[25] were collected for each 100 m survey, thus ensuring that should a full site WFD classification be required in future, the data collected was fit for this purpose.

2.2.28. An estimate was made of the percentage cover of each species recorded and a corresponding cover value assigned. Species list and cover values were then used to calculate the following biological metrics using the LEAFPACS2[26] survey metric calculator:

- River Macrophyte Nutrient Index (RMNI): The RMNI is designed to categorise a macrophyte community's preference to nutrient levels. Scores range from 1 to 10 with scores of 1 representing plant communities with preference for very low levels of nutrients and 10 representing communities with a preference for (or tolerance of) enriched conditions;
- Total number of taxa recorded (TTAXA): A diversity score based on the total number of macrophyte taxa recorded from the field survey;
- Number of aquatic taxa (NTAXA): A diversity score indicating the number of truly aquatic macrophyte taxa recorded from the field survey;
- Number of aquatic plant functional groups (NFG): A diversity score indicating the number of functional macrophyte groups within the plant community, from a predefined list of 24 different functional groups. Only truly aquatic taxa are included;
- Cover of green filamentous algae (ALG): The percentage cover of green filamentous algae over the whole of the surveyed section of the river.

2.2.29. Aquatic macrophyte survey data including species records, abundance and biological metrics are provided in Section 3.2 of this Technical Appendix.

Fish

2.2.30. Electric fishing surveys were undertaken along reaches screened as requiring survey in accordance with current industry standards:

- BS EN 14962:2006 / BS 6068-5.40:2006 Water quality – Guidance on the scope and selection of fish sampling methods;
- BS EN 14011:2003 / BS 6068-5.32:2003 Water quality – Sampling of fish with electricity;
- Environment Agency (2010) Electric fishing in rivers. Operational Instruction 144_03;
- CEH (2002) Guidelines for Electric Fishing Best Practice R&D Technical Report W2-054/TR.

2.2.31. The upstream and downstream extent of each survey reach (100 m) was defined and isolated using stop-nets. A minimum of one electric fishing run, working in an upstream direction was undertaken at each survey reach, thus aligning the survey with the requirements for determining WFD fish status using the Fisheries Classification Scheme 2[27] (FCS2) model.

2.2.32. The use of stop-nets allowed for a catch depletion methodology to be applied where three catch depletion runs were undertaken along each survey reach. Stunned fish were removed using hand nets and stored in aerated fish holding tanks before being returned to the watercourse following recovery.

[25] UKTAG, 2014. Guide to Macrophytes in Rivers River LEAFPACS2. [pdf] Available at: http://www.wfduk.org/sites/default/files/Media/Characterisation%20of%20the%20water%20environment/Biological%20Method%20Statements/River%20Macrophytes%20UKTAG%20Method%20Statement.pdf [Accessed: August 2021].
[26] Environment Agency, 2014. River LEAFPACS2 Survey Metric calculator. [online] Available at: https://www.wfduk.org/resources/riversmacrophytes [Accessed: August 2021].
[27] WFD-UKTAG, 2008. UKTAG Rivers Assessment Methods. Fish Fauna (Fisheries Classification Scheme 2 (FCS2)).

2.2.33. Fish captured were identified to species, counted and either fork length or total length measured to the nearest mm (depending on species caught). Where catch returns from multi-run surveys facilitated, standardised population estimates based on Carle and Strub (1978[28]), were calculated and expressed as number of individuals of a species per 100 m^2 of watercourse channel.

2.2.34. Certain species have been classified as minor[29] species, these are defined as small-bodied fish that often occur in high abundance, including stone loach (*Barbatula barbatula*), bullhead (*Cottus gobio*), minnow (*Phoxinus phoxinus*) and three-spined stickleback (*Gasterostreus aculeatus*). Where these occur in high abundance, they are generally noted as either present or absent at the survey site.

2.2.35. Fish survey data including species and counts by electric fishing run number are provided in Appendix A.5 of this Technical Appendix.

Pond surveys

2.2.36. No ponds were screened as requiring survey based on no impact pathways being identified, therefore a detailed methodology of PSYM pond survey has not been provided within this appendix.

Assessment

2.2.37. The aquatic receptors have been valued in a geographical context following the framework provided in Design Manual for Roads and Bridges (DMRB) guidance note LA 108 - Biodiversity[30]. The evaluation is based on the information gathered from the desk study and field surveys, using a combination of professional judgement and accepted criteria[31] (e.g. diversity, rarity and naturalness).

Limitations

2.2.38. During the aquatic walkover survey, there was limited access upstream on the Leigh Brook due to dense vegetation (hedgerow) along the watercourse obscuring views. As such, detailed surveys were undertaken downstream of the M5 where access was better and the various survey methods could be applied.

2.2.39. Not all watercourses were visited during walkover survey. This was partly due to access restrictions and partly due to changes in Scheme design following the walkover survey which brought additional watercourses into the study area. All Main Rivers within the 2 km study area were visited and of the Ordinary Watercourses only Drain 9, 11, 21 and 22 were not seen. Through thorough review of aerial photographs, it is assumed that the drains which were not visited are of similar character to the other agricultural and roadside drainage features within the Scheme area. All drains observed during the walkover had similar profiles (typically <1-2 m wide), were heavily managed and typically overgrown with terrestrial vegetation, they had straightened planforms and remain dry for at least part of the year. As such, it is considered reasonable at this PEIR stage to assume that the additional drain features which were unable to be visited are of a similar value.

[28] Carle, F.L. and Strub, M.R., 1978. A new method for estimating population size from removal data. Biometrics, 34, pp. 621-830.
[29] Environment Agency, 2014. Flow and Level Criteria for Coarse Fish and Conservation Species. Science Report SC020112/SR.
[30] Highways England. March 2020. LA 108 Biodiversity [Online] [Accessed: June 2021]. Available from: https://www.standardsforhighways.co.uk/dmrb/search?discipline=SUSTAINABILITY_AND_ENVIRONMENT
[31] Set out in Ratcliffe, D.A (1977). A Nature Conservation Review. Cambridge University Press.

3. Results

3.1. Desk study

Watercourse screening outcomes

3.1.1. A total of 23 watercourses were identified within the combined study area during the initial screening exercise. This includes four Main Rivers, and 19 Ordinary Watercourses. No canals were identified within the screening area.

3.1.2. Watercourses identified within the screening area are presented in Table 3-1. Since watercourses are longitudinal features within the landscape, they may interact with the Scheme at more than one location e.g. crossed by the Scheme in separate locations and falling within the screening area of the Scheme or another location.

3.1.3. Of these watercourses, 14 were taken forward for detailed assessment, based on application of screening criteria outlined in Section 2.1. Screening criteria and outcomes are summarised in Table 3-1.

Table 3-1 - Watercourse screening outcomes

Watercourse name	Watercourse type	Potentially important ecological feature for EIA	Potential impact pathway identified?	Assessment screening outcome
River Chelt	Main River	Yes	Yes	In
Leigh Brook	Ordinary Watercourse[32]	Yes	Yes	In
River Swilgate	Main River	Yes	No	Out
Hatherley Brook	Main River	Yes	No	Out
Dean Brook	Main River	Yes	No	Out
MW3	Ordinary Watercourse	Yes	In	In
MW4	Ordinary Watercourse	Yes	No	Out
Drain 4	Ordinary Watercourse	Yes	No	Out
Drain 5	Ordinary Watercourse	Yes	No	Out
Drain 6	Ordinary Watercourse	Yes	No	Out
Drain 7	Ordinary Watercourse	Yes	No	Out
Drain 8	Ordinary Watercourse	Yes	Yes	In
Drain 9	Ordinary Watercourse	Yes	Yes	In

[32] Designated as Main River approximately 2.25 km downstream from the Red Line Boundary (outside of the combined study area).

Watercourse name	Watercourse type	Potentially important ecological feature for EIA	Potential impact pathway identified?	Assessment screening outcome
Drain 10	Ordinary Watercourse	Yes	Yes	In
Drain 11	Ordinary Watercourse	Yes	Yes	In
Drain 12	Ordinary Watercourse	Yes	Yes	In
Drain 13	Ordinary Watercourse	Yes	No	Out
Drain 14	Ordinary Watercourse	Yes	Yes	In
Drain 15	Ordinary Watercourse	Yes	Yes	In
Drain 16	Ordinary Watercourse	Yes	Yes	In
Drain 17	Ordinary Watercourse	Yes	No	Out
Drain 20	Ordinary Watercourse	Yes	Yes	In
Drain 21	Ordinary Watercourse	Yes	Yes	In
Drain 22	Ordinary Watercourse	Yes	Yes	In

3.1.4. Further details of those watercourses taken forward for detailed assessment are provided in Table 3-2 along with details of the key Scheme interaction points identified for each watercourse. Those features screened out were either outside of the Red Line Boundary for the Scheme and do not have any hydrological connectivity to the works or were on the edge of the Red Line Boundary, but not under any footprint of the works, and also having no hydrological connectivity to Scheme impacts.

Table 3-2 - Scheme interaction points for watercourses taken forward to assessment

Watercourse name	Type of interaction	Interaction location	Scheme component/impact
River Chelt	Crossed by the Scheme	SO 90743 24593	New crossing associated with the Link Road (River Chelt Bridge)
	Crossed by the Scheme	SO 90020 24812	No change to existing river crossing (River Chelt Culvert)
Leigh Brook	Crossed by the Scheme	SO 90759 26016	Culvert extension (Barn Farm Culvert)
	Drainage	SO 91283 25787	Adjacent to an attenuation basin. Potential new drainage outfall
MW3	Drainage	SO 90090 25186	Adjacent to an attenuation basin. Potential new drainage outfall

Watercourse name	Type of interaction	Interaction location	Scheme component/impact
Drain 8	Crossed by the Scheme	SO 90130 25883	Realignment under Scheme footprint
Drain 9	Underneath Scheme footprint	SO 90011 25881	Realignment under Scheme footprint
Drain 10	Crossed by the Scheme	SO 90710 25443	Realignment under Scheme footprint
Drain 11	Crossed by the Scheme	SO 90813 25311	Realignment under Scheme footprint
Drain 12	Crossed by the Scheme	SO 90870 24886	New crossing associated with the Link Road
Drain 14	Crossed by the Scheme	SO 90359 23855	Culvert extension
Drain 15	Crossed by the Scheme	SO 90458 23904	Culvert extension and potential new drainage outfall
Drain 16	Underneath Scheme footprint	SO 90366 23844	Realignment under Scheme footprint
Drain 20	Underneath Scheme footprint	SO 90616 23905	Habitat loss under Scheme footprint
Drain 21	Within Red Line Boundary (RLB)	SO 91893 24520	Channel regrading and potential new drainage outfall
Drain 22	Crossed by Scheme	SO 90379 25481	Culvert extension (Piff's Elm Culvert)

Standing water body screening outcomes

3.1.5. A total of 17 ponds were identified within the combined study area. No additional hydrologically connected ponds or lakes were identified within the 2 km study area.

3.1.6. On precautionary basis, these ponds have been assessed as potentially important ecological features and may provide habitat on a local scale, even if habitat quality is poor.

3.1.7. Ponds identified within the 150 m study area are presented in Table 3-3.

Table 3-3 - Standing water body screening outcomes

Water body ID	Location	Potentially important ecological feature for EIA	Potential impact pathway identified?	Assessment screening outcome
Pond 1	SO 91418 28338	Yes	No	Out
Pond 11	SO 91545 27023	Yes	No	Out
Pond 12	SO 91389 26983	Yes	No	Out
Pond 13	SO 91376 26961	Yes	No	Out
Pond 14	SO 91430 26925	Yes	No	Out
Pond 14a	SO 91398 26859	Yes	No	Out
Pond 15	SO 91411 26826	Yes	No	Out

Water body ID	Location	Potentially important ecological feature for EIA	Potential impact pathway identified?	Assessment screening outcome
Pond 22	SO 91425 24843	Yes	No	Out
Pond 23	SO 91454 24830	Yes	No	Out
Pond 24	SO 91504 24742	Yes	No	Out
Pond 25	SO 91572 24648	Yes	No	Out
Pond 28	SO 92807 24616	Yes	No	Out
Pond 31	SO 90281 24169	Yes	No	Out
Pond 37	SO 89576 23129	Yes	No	Out
Pond 38	SO 89594 23139	Yes	No	Out
Pond 39	SO 89932 26139	Yes	No	Out
Pond 40	SO 89946 26079	Yes	No	Out

3.1.8. No impact pathways have been identified for ponds identified within the study area taking account of embedded mitigation, therefore no ponds have been taken forward for further assessment.

Existing background data

Designated sites

3.1.9. No statutory or non-statutory designated watercourses, ponds or lakes were identified within 2 km of the Scheme, noting that the River Chelt and Leigh brook are tributaries of the River Severn, where they may support the designating features of the Severn Estuary SAC and Ramsar site approximately 40 km downstream of the Site. Namely, species such as river lamprey (*Lampetra fluviatilis)* European eel (*Anguilla anguilla*).

Biological records search

3.1.10. GCER returned no records for aquatic macroinvertebrates, aquatic macrophytes or fish species within 2 km of the Scheme.

Environment Agency monitoring data

3.1.11. No temporally (< 5 years old) or spatially (within 2 km) suitable Environment Agency data was available for watercourses identified within the 2 km study area. Some data > 5 years old is available for the River Chelt and had briefly been summarised within the baseline section for additional context.

Survey screening outcomes

Watercourses

3.1.12. All watercourses taken forward for assessment were screened as requiring walkover survey as per the approach outlined in Paragraph 2.2.1.

3.1.13. Additionally, the River Chelt and Leigh Brook met the survey screening criteria for detailed surveys as outlined in Table 3-4. Survey locations were focused on the Scheme crossing points outlined in Table 3-2. Unique survey ID codes have been assigned to each survey e.g. WCID09_FH.

3.1.14. It should be noted that the Leigh Brook did not meet the screening criteria for fish survey, given the habitat within the site was not deemed suitable for the survey methodology.

3.1.15. Furthermore, no other watercourses (drains and minor watercourses) met the screening criteria for detailed ecological surveys, principally due to the features not exhibiting suitable habitat for the detailed survey type as reviewed during walkover. Walkover data is considered sufficient to characterise these watercourses to inform a robust assessment.

3.1.16. Watercourse survey locations are shown on Figure 7.12B within Appendix B.

Table 3-4 - Survey locations

Survey ID	Survey reach NGR	Survey type	Date
River Chelt			
WCID09_RHS	SO 90182 24760 – SO 89869 25052	River Habitat Survey	27/07/2020
WCID10_RHS	SO 90963 24606 – SO 90490 24660	River Habitat Survey	27/07/2020
WCID09_RCS	SO 90260 24783 – SO 89891 24979	River Corridor Survey	29/07/2020
WCID10_RCS	SO 90867 24558 - SO 90497 24654	River Corridor Survey	29/07/2020
WCID09_MI_A	SO 90184 24781	Macroinvertebrate	13/10/2020
WCID09_MI_B	SO 89915 24885	Macroinvertebrate	13/10/2020
WCID10_MI_A	SO 90859 24556	Macroinvertebrate	13/10/2020
WCID10_MI_B	SO 90605 24615	Macroinvertebrate	13/10/2020
WCID09_MP	SO 90096 24787 - SO 90042 24796	Macrophyte	29/07/2020
WCID10_MP	SO 90714 24607 – SO 90625 2461	Macrophyte	29/07/2020
WCID09_FH	SO 90140 24760 – SO 90053 24787	Fish	29/07/2021
WCID10_FH	SO 90645 24606 – SO 90518 24634	Fish	28/07/2020
Leigh Brook			
WCID02_RHS	SO 90737 26057 – SO 90546 26433	River Habitat Survey	27/07/2020
WCID02_RCS	SO 90745 26051 – SO 90560 26407	River Corridor Survey	28/07/2020
WCID02_MI	SO 90667 26090	Macroinvertebrate	13/10/2020
WCID02_MP	SO 90742 26044 – SO 90642 26106	Macrophyte	28/07/2020

Ponds

3.1.17. Existing ponds were screened out of requiring both detailed assessment and survey (specifically PSYM survey), as no ponds lie directly underneath the footprint and/or are otherwise impacted by the Scheme. This assumes the embedded construction mitigation is followed, principally around pollution prevention.

3.2. Baseline watercourse conditions

3.2.1.

3.2.2. Table 3-5 and Table 3-6 outline baseline characterisation of the River Chelt and Leigh Brook as supported by existing background records and survey data.

3.2.3. Baseline characterisation for other ordinary watercourses taken forward for detailed assessment, are presented under the corresponding heading within this section, with photographs presented in Table 3-7.

3.2.4. Existing baseline conditions are considered in relation to each watercourse receptor to determine its overall ecological valuation for the purpose of impact assessment.

3.2.5. Original data from survey undertaken in support of the ecological valuations are presented in the corresponding appendices.

Table 3-5 - River Chelt

Watercourse: River Chelt
 Photo 1: River Chelt upstream of M5 (SO 90816 24584) (left) Photo 2: River Chelt downstream of M5 (SO 89914 24887) (right)
WFD Characterisation Where the Scheme interacts with the River Chelt, it is designated as two different WFD water bodies, as presented below: Chelt– source to M5 (GB109054032820) Classified WFD Water Body – Yes Hydromorphological designation – heavily modified Overall Ecological Status – Moderate (2019 Classification) – Overall Biological Quality Elements – Good; ▪ Fish – High; ▪ Invertebrates – Good; ▪ Macrophytes and Phytobenthos combined – Good; Hydromorphological supporting elements – Supports Good Reasons for Not Achieving Good – Physical modification associated with flood protection and urbanisation. Chelt – M5 to confluence River Severn (GB109054032810) Classified WFD Water Body – Yes Hydromorphological designation – not designated artificial or heavily modified Overall Ecological Status – Poor (2019 Classification) – Overall Biological Quality Elements – Poor;

Watercourse: River Chelt

- Fish – Not classified for 2019. Poor in 2014;
- Invertebrates – Good;
- Macrophytes and Phytobenthos combined – Poor.

Hydromorphological supporting elements – Supports Good

Reasons for Not Achieving Good – Mixture of poor livestock and nutrient management resulting in diffuse pollution, sewage discharge, septic tanks and transport drainage.

Background records

Existing background data: Desk study returned no temporally (< 5 years old) or spatially (within 2 km) suitable Environment Agency data for aquatic macrophytes, macroinvertebrates or fish. Moreover, no records for RHS were identified.

Environment Agency fish survey records (>5 years old) indicate that the populations of the Chelt in proximity to the Scheme (records from monitoring sites located within 2.5 km of the M5 crossing) are predominately composed of minor coarse fish species e.g. bullhead (*Cottus gobio*), gudgeon (*Gobio gobio*) and 3-spined stickleback (*Gasterosteus aculeatus*). Of note are records of brown trout (*Salmo trutta*) and European eel (*Anguilla Anguilla*). European eel is a Critically Endangered species on the International Union for Conservation of Nature (IUCN) Red List of Threatened Species (2010), and along with brown trout is a species of Principal Importance under section 41 of the Natural Environment and Rural Communities (NERC) Act 2006, and a UK Biodiversity Action Plan (BAP; 2007) priority fish species. Brown trout is also a species of Principal Importance under section 41 of the NERC Act 2006 and a UK BAP (2007) priority fish species.

Atlantic salmon (*Salmo salar*) as well as major coarse fish species such as barbel (*Barbus barbus*), roach (*Rutilus rutilus*) and dace (*Leuciscus leuciscus*) are also present in the River Chelt, but typically in its lower reaches nearer to the confluence with the River Severn. Atlantic salmon have been recorded on one occasion in low numbers (4 recorded at survey) in 2014, approximately 8.1 km downstream from the Scheme. Atlantic salmon is a European Commission Habitats Directive Annex II and V species, a species of Principal Importance under section 41 of the NERC Act 2006 and a UK BAP (2007) priority fish species.

No designated sites were identified within 2 km of the Scheme. However, the River Chelt is a tributary of the River Severn, and subsequently may support the designated features of the Severn Estuary SAC, despite the distance from this designation (approximately 40 km downstream).

River Habitat Survey

Both reaches of the River Chelt exhibited modifications due to channel realignment and over-deepening. In-channel habitat was homogenous across the reaches with low substrate variability and flow types, in particular at the location of the existing M5 crossing. Within the reach in which the new River Chelt Bridge is proposed (WCID10), there was greater in-channel habitat complexity due to the presence of un-vegetated side bars, large woody debris and greater variability in flow types. Both reaches had a lack of trees along their riparian zones.

Survey code: WCID09_RHS

Watercourse: River Chelt

Representative Channel Dimensions: Water depth: 0.1 m; water width: 2.2 m; bankfull width: 4.5 m

Habitat Modification Score (HMS): 3,605

Habitat Modification Class (HMC): 5 (severely modified)

Summary: A lowland river flowing through predominantly agricultural land characterised by tilled land and broadleaved plantation. There is evidence of historical channel realignment and over deepening associated with the surrounding land-use. Channel substrate was uniform (gravel-pebble and sand), with low energy flow types, bank profiles (including eroding cliff habitats), however channel features are absent. Few aquatic macrophyte functional groups (indicators of vegetative river habitat diversity) were recorded, which is unexpected for a lowland river. Tree cover (and therefore channel shading and other wooded habitat features) is relatively sparse.

Survey Code: WCID10_RHS

Representative Channel Dimensions: Water depth: 0.15 m; water width: 2.4 m; bankfull width: 5.1 m

Habitat Modification Score (HMS): 2,120

Habitat Modification Class (HMC): 5 (severely modified)

Summary: A lowland river flowing through predominantly tilled, rough pasture and suburban land use. There is evidence of historical channel realignment and over deepening associated with the surrounding land-use, in addition to impoundment facilitated by a weir. Channel substrate was uniform (gravel-pebble and sand), with low and high energy flow types, bank profiles (including eroding cliff habitats), and channel features such as un-vegetated side bars and a mature island, with large woody debris contributing to habitat complexity. Few aquatic macrophyte functional groups (indicators of vegetative river habitat diversity) were recorded. Tree cover (and therefore channel shading and other wooded habitat features) is relatively sparse.

River Corridor Survey

Survey code: WCID09_RCS

Summary: The River Chelt flows through an area of arable farmland (both banks) with a series of farm buildings predominantly on the right bank towards the upstream end of the reach. A farm access bridge and associated weir is present across the channel in line with these buildings. The channel within this reach also flows under the M5 motorway carriageway and there is a footpath running along the left bank. Channel incision along the survey reach is evidenced through steep banks and a few sections of eroding cliffs. No pipes, outfalls or tributaries were identified at survey. Around the M5 motorway culvert and the farm access bridge there is some artificial bank protection. In-channel macrophytes were limited to a few patches of water crowfoot (*Ranunculus* Sect. *Batrachium* sp.) and water starwort (*Callitriche* sp.). Patches of marginal vegetation were relatively common on both banks mainly comprised of branched bur-reed (*Sparganium erectum*) and scattered reed canary-grass (*Phalaris arundinacea*) along the margins. Less frequent patches of fool's watercress (*Apium nodiflorum*), brooklime (*Veronica beccabunga*), soft rush (*Juncus effusus*), hard rush (*J. inflexus*), water figwort (*Scrophularia auriculata*) and pendulous sedge (*Carex pendula*) were also present.

Bank vegetation was dominated by grasses and ruderal communities such as creeping bent grass (*Agrostis stolonifera*), great willowherb (*Epilobium hirsutum*) and gypsywort (*Lycopus europaeus*). The invasive non-native species Himalayan balsam (*Impatiens glandulifera*) was also recorded within the reach.

Individual bankside trees were occasionally present, with patches of broadleaved woodland on both banks adjacent to the M5 motorway. Trees comprised a mix of ash (*Fraxinus excelsior*), Scots pine (*Pinus sylvestris*), beech (*Fagus sylvatica*), sycamore (*Acer pseudoplatanus*), crack-willow (*Salix fragilis*) and hawthorn (*Crataegus monogyna*). Brambles (*Rubus fruticosus* agg.) were also present within and adjacent to the broadleaf woodland.

In-channel habitat was relatively homogenous, with no features such as mid-channel bars or islands and only one riffle associated with the weir structure.

Survey code: WCID10_RCS

Watercourse: River Chelt

Summary: The River Chelt runs through an area of residential housing (right bank) and farmland (left bank). Channel incision along the survey reach is evidenced through sequences of stable and unstable cliffs. The banks are fenced throughout, where they are artificially reinforced with man-made stone wall revetment. No pipes, outfalls or tributaries were identified at survey. There is also a footpath on the left bank, with road a road along 200 m of its course. In-channel macrophytes were limited to a few patches of water crowfoot. Filamentous algae (mainly *Cladophora glomerata*) was frequent, with small stones supporting the encrusting alga *Gongrosira encrustans*. Little marginal vegetation was recorded, mainly with scattered reed canary-grass or branched bur-reed along the margins and a few locations where deposition of silt has enabled species such as great willowherb, hybrid watercress (*Nasturtium × sterilis*), redshank (*Persicaria maculosa*), water figwort and brooklime to colonise. Bank vegetation was dominated by tall ruderal communities such as great burdock (*Arctium lappa*), false oat-grass (*Arrhenatherum elatius*), large bindweed (*Calystegia sylvatica*), spear thistle (*Cirsium vulgare*), bristly ox-tongue (*Helinthotheca echioides*), hogweed (*Heracleum sphondylium*) and the invasive non-native species Himalayan balsam. These communities were present between stands of trees that included hazel (*Corylus avellana*), ash (*Fraxinus excelsior*) and crack willow, as well as a line of planted balsam poplars (*Populus cf. trichocarpa*) and a single crab apple (*Mauls sylvestris*). Where erosion has occurred, the banks were limited to complexes of bryophytes mainly *Pohlia melanodon* and *Lunularia cruciata* and a small stand of *Marchantia polymorpha subsp. ruderalis*. In-channel habitat was homogenous, with no features such as mid-channel bars, islands or pools/riffles present.

Aquatic Macroinvertebrates

There was commonality across the four sites on the River Chelt in terms of the range of macroinvertebrate families supported and the assemblage's high sensitivity to flow reduction. Only one site (WCID09_MI_B) had a community stressed by poor water quality as indicated by a lower WHPT ASPT score. The River Chelt at the existing M5 crossing (WCID09_MI_A) was the only site to support macroinvertebrate communities of 'Fairly High' conservation value, with all other sites being of 'Low' conservation value. The non-native New Zealand mud snail (*Potamopygrus antipodarum*) was recorded at all of the survey sites.

Specific details are provided under the corresponding survey site headings.

Survey Code: WCID09_MI_A

The community is species rich with 37 taxa, representing 23 families recorded.

Key community biological metrics (refer to Section 2.2 for descriptions of biological metrics): WHPT (NTAXA): 21; WHPT ASPT: 5.43; LIFE (Species) 7.54; PSI (Species): 59.3.

Biological metrics are indicative of good habitat (moderately sedimented channel) and water quality, with the macroinvertebrate assemblages highly sensitive to reduced flows.

This site had the highest CCI score (10.21), identifying the community as being of 'Fairly High' conservation value. This is due primarily to the high taxon richness and the presence of a notable aquatic beetle which is scarce within the UK (*Gyrinus urinator*).

Survey Code: WCID09_MI_B

The community is species rich with 38 taxa, representing 23 families recorded.

Key community biological metrics: WHPT (NTAXA): 22; WHPT ASPT: 4.73; LIFE (Species): 7.61; PSI (Species): 55.6.

Biological metrics are indicative of good habitat and water quality, with the macroinvertebrate assemblages highly sensitive to reduced flows and indicated a moderately sedimented channel.

The CCI score of 4.41 identifies the community as being of 'Low' conservation value, supporting only commonly occurring taxa.

Survey Code: WCID10_MI_A

Watercourse: River Chelt

The community is moderately species rich with 29 taxa, representing 21 families recorded.

Key community biological metrics: WHPT (NTAXA): 19; WHPT ASPT: 5.33; LIFE (Species): 7.76; PSI (Species): 62.5.

Biological metrics are indicative of good habitat and water quality, with the macroinvertebrate assemblages highly sensitive to reduced flows and indicated a slightly sedimented channel.

The CCI score of 4.07 identifies the community as being of 'Low' conservation value, supporting only commonly occurring taxa.

Survey Code: WCID10_MI_B

The community is comparatively species poor with 22 taxa, representing 16 families recorded.

Key community biological metrics: WHPT (NTAXA): 15; WHPT ASPT: 5.20; LIFE (Species): 8.33; PSI (Species): 79.4.

Biological metrics are indicative of good habitat and water quality, with the macroinvertebrate assemblages highly sensitive to reduced flows and indicated a slightly sedimented channel.

The CCI score of 8.89 identifies the community as being of 'Moderate' conservation value due primarily to the presence of a leech species of restricted distribution (*Trocheta pseudodina*).

Aquatic Macrophytes

A limited number of species (10) with low percentage cover were recorded at survey across the two surveyed reaches. Survey WCID09 yielded the greatest number of species (nine), with survey WCID10 yielding only one species. The species recorded are typical of a lowland river with no uncommon or protected species recorded. See below for detailed survey results.

Survey code: WCID09_MP

Survey yielded a total of nine species. Green algae (*Enteromorpha intestinalis*, *Ulva flexuosa/intestinalis*)), fool's watercress (*Apium nodiflorum*), floating sweet-grass (*Glyceria fluitans* agg), amphibious bistort (*Persicaria amphibia*), watercress (*Rorippa nasturtium-aquaticum agg*) and brooklime (*Veronica beccabunga*) all had a percentage cover of <1% at survey. Reed canary grass (*Phalaris arundinacea*) had a percentage cover of 1-2.5 %, with blanket weed agg (*Cladophora glomerata, Rhizoclonium hierglyphicum*) and crowfoot species (*Ranunculus sp (r. sect batrachian sp or hybrid indet*)) having the greatest percentage cover at 2.5-5 %.

Survey code: WCID10_MP

The macrophyte assemblage here was species poor, with one emergent species recorded: branched bur-reed (*Sparganium erectum*), which had a percentage cover of <1%.

Fish

There was commonality in habitat availability for fish species across the survey reaches with both reaches exhibiting similar width and depth character and being predominately composed of glide habitat, although riffles were also present. The upper survey reach (WCID10_FH) was slightly more complex in that it also supported run habitat, but also a higher percentage of finer substrate. Both reaches are therefore considered to provided appropriate habitat for lithophilic species. Such species were yielded at survey e.g. stone loach (*Barbatula barbatula*), bullhead (*Cottus gobio*) and chub (*Squalius cephalus*), with the downstream reach immediately upstream of the existing M5 crossing supporting a higher abundance and range of species (see below). No salmonids were recorded despite the habitat observed being likely suitable for brown trout (*Salmo trutta*). Eel, lamprey and bullhead are all notable fish species with eel being listed as critically endangered on the ICUN red list and a species of principal importance under section 41 of the NERC Act 2006. Eel as well as river lamprey are also UKBAP priority species. While brook / river lamprey and bullhead are Annex 2 species[33] under the Habitats Directive. River lamprey is also listed as an Annex 5 species[34] under the Habitats Directive.

[33] Animal and plant species of Community interest (i.e. endangered, vulnerable, rare or endemic in the European Community) whose conservation requires the designation of special areas of conservation. Note that the contents of this annex have been updated in April 2003 following the Treaty of Accession.
[34] Animal and plant species of Community interest whose taking in the wild and exploitation may be subject to management measures.

Watercourse: River Chelt
Survey code WCID09_FH **Summary**: Fish survey at this site yielded seven species. Minor species were dominant with stone loach (*Barbatula barbatula*), bullhead (*Cottus gobio*) and minnow (*Phoxinus phoxinus*) recorded in high numbers. Three-spined stickleback (*Gasterostreus aculeatus*) were also recorded but in low numbers. Chub (*Squalius cephalus*), brook / river lamprey (*Lampetra* spp.) ammocoetes (juvenile life-stage) and eel (*Anguilla anguilla*) were also recorded. Habitat records for the fish survey reach identified the dominance of riffle and glide habitat. Survey code: WCID10_FH **Summary**: Only three species were recorded at survey, namely, bullhead, 3-spined stickleback and eel, which with the exception of bullhead, were recorded in low numbers.

Table 3-6 - Leigh Brook

Watercourse: Leigh Brook
 Photo 3 and Photo 4: Downstream of the M5 (SO 90579 26345 and SO 90650 26140)
WFD Characterisation The Leigh Brook within the 2 km study area is classified as the Leigh Bk – source to conf. R. Chelt WFD water body (GB 109054039770). Leigh Bk – source to conf. R. Chelt WFD (GB109054039770) Classified WFD Water Body – Yes Hydromorphological designation - not designated artificial or heavily modified Overall Ecological Status – Moderate (2019 Classification) – Overall Biological Quality Elements of WFD Waterbody – Moderate ▪ Fish – Not assessed ▪ Invertebrates – Good ▪ Macrophytes and Phytobenthos combined – Moderate Hydromorphological supporting elements – Supports Good Reasons for Not Achieving Good – Diffuse pollution associated with poor nutrient and livestock management, sewage discharge and urban development.
River Habitat Survey (Survey code: WCID02_RHS)

Watercourse: Leigh Brook

Representative Channel Dimensions: Water depth: 0.8m; water width: 0.8 m; bankfull width: 3.2 m

Habitat Modification Score (HMS): 2,120

Habitat Modification Class (HMC): 5 (severely modified)

Summary: A lowland stream flowing through predominantly agricultural land characterised by improved grasslands and broadleaved plantations. The Leigh Bk flows into the River Chelt, which is itself a direct tributary of the River Severn. There is evidence of historical channel modifications associated with realignment and over deepening. Limited bed substrates (gravel-pebble and silt), low energy flow types, and re-sectioned bank profiles. Few macrophyte functional groups (indicators of vegetative river habitat diversity) were recorded. Tree cover (and therefore channel shading and other wooded habitat features) is relatively sparse.

Background records

None available within 2 km.

River Corridor Survey (Survey code: WCID02_RCS)

Summary: The Leigh Brook corridor runs through an area of improved pasture, with abundant barley (*Hordeum secalinum*) and some wall barley (*H. murinum*), particularly on the right bank. In the downstream section of the survey the watercourse flows alongside a small part of a barley field with a diverse arable weed flora, including broad-leaved spurge (*Euphorbia platyphyllos*) which is rare and declining in Gloucestershire. No pipes, outfalls or tributaries were identified at survey. In-channel vegetation was limited to a few isolated patches of fool's-watercress (*Apium nodiflorum*) and some bittersweet (*Solanum dulcamara*). No marginal vegetation was recorded due to heavy shading. Bank vegetation was dominated by trees throughout, composed of hawthorn (*Crataegus monogyna*), crack willow (*Salix × fragilis*) and ash (*Fraxinus excelsior*), including some mature pollards. In-channel habitat was homogenous, with no features (such as mid-channel bars and islands) or pools/riffles present. One access track bridge was recorded.

Aquatic Macroinvertebrate Survey (Survey Code: WCID02_MI)

The community is comparatively species poor with 19 taxa, representing 17 families recorded.

Key community biological metrics for the sampling site (refer to Section 2.2 for descriptions of biological metrics): WHPT (NTAXA): 15; WHPT ASPT: 3.96; LIFE (Species): 6.30; PSI (Species): 10.3.

Biological metrics are indicative of poor habitat and water quality, with a community that has a low sensitivity to reduced flow velocity conditions and indicative of a channel that is heavily sedimented.

The CCI score of 4.20 identifies the community as being of 'Low' conservation value, supporting only commonly occurring taxa.

The non-native New Zealand mud snail (*Potamopygrus antipodarum*) is a dominant component of the species assemblage.

Aquatic Macrophyte Survey (Survey code: WCID02_MP)

The macrophyte community was species poor, with one species, fool's watercress (*Apium nodiflorum*), recorded with <1% cover in the survey reach.

Fish Survey

The Leigh Brook was not screened in for detailed fish survey due to the channel not exhibiting suitable habitat for the survey type within the site.

Priority Habitat Assessment

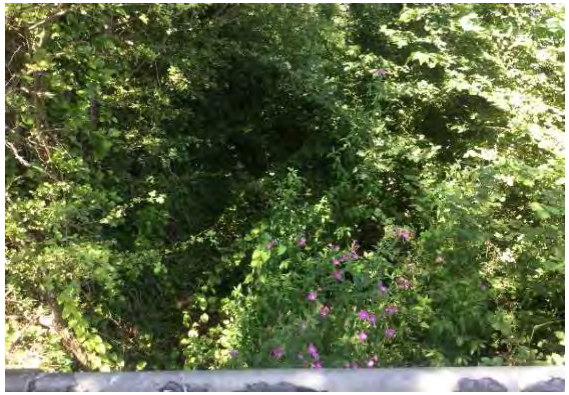
The Leigh Brook within the Scheme is over 2 km from its furthest source, and therefore does not qualify as 'headwater' under the Priority Habitat definition. The Leigh Brook is 'Significantly Modified' based on the River Habitat Survey and can be concluded that it has been 'significantly altered from its natural state'. It meets no other listed criteria and is therefore not defined as Priority Habitat under the published definition.

Other watercourses

3.2.6. Other watercourses taken forward for assessment as presented in Table 3-7, were characterised as minor tributary systems and heavily managed drainage ditches with limited habitat complexity, typically choked with terrestrial herbs and scrub (indicating their ephemeral nature) and/or shaded by trees. Their straightened planforms exhibited a limited range of habitat typologies for aquatic species. They are considered likely to provide only limited value for aquatic species when temporarily acting to convey surface water flows.

3.2.7. Drain 9, 11, 21 and 22 were unable to be visited during walkover survey but are assumed to be of similar character to other ditches on site which were visited given the similarities between the other drains across the Scheme.

Table 3-7 - Photographs of ordinary watercourses (excluding Leigh Brook as unable to be visited during walkover survey)

 **Photo 5: Drain 8 (SO 90279 25796)**	 **Photo 6: Drain 10 (SO 90773 25383)**	 **Photo 7: Drain 10 (SO 90773 25383)**
 Photo 8: Drain 12 (SO 90817 24898)	 Photo 9: Drain 12 (SO 90817 24898)	 Photo 10: view looking north towards Drain 14 and the B4634 (SO 90284 23728)

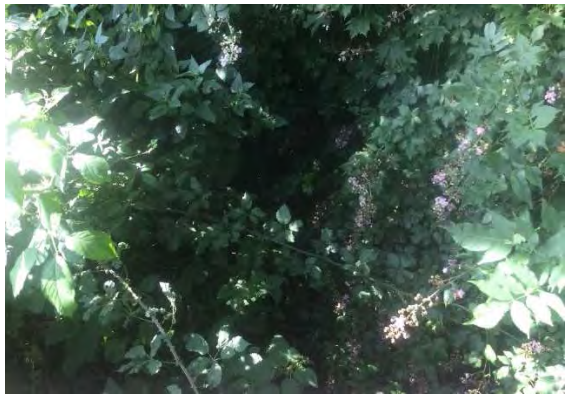


Photo 9: Drain 15 (SO 90407 23646)



Photo 10: Drain 15 along field boundary
(SO 90416 23664)



Photo 11: Drain 16 at confluence with Drain 20. Drain 16 is culverted under farm access track at this location, but runs parallel to the Old Gloucester Road B4634 acting as road drainage
(SO 90620 23925)



Photo 12: Looking south towards Drain 20 from the Old Glouster Road B4634 and Drian 16
(SO 90620 23925)



Photo 13: MW3 looking cross stream
(SO 89964 25217)



Photo 14: MW3 looking downstream
(SO 90089 25184)

4. Evaluation

4.1.1. Biodiversity features are valued following DMRB guidance[35] (see Chapter 7 of the PEIR for further details). The evaluation is based on the information gathered from the desk study and field survey using a combination of professional judgement and accepted criteria[36] (e.g. diversity, rarity and naturalness). Criteria set out in Gloucestershire's Key Wildlife Site Handbook[37] have also been taken into account during the evaluation.

4.1.2. The valuations applied to aquatic receptors consider the receptor importance in the context of both intrinsic habitat quality and the species it has been identified to support.

4.1.3. Consequently, aquatic receptors (habitats) supporting notable species are afforded an ecological valuation which is, at a minimum, commensurate with the conservation value of the habitat and/or species which they support. In this way, mitigation requirements (for example, control of construction works) are associated with the receptor supporting the notable species (e.g. a watercourse), rather than the species itself (e.g. a aquatic macrophyte or aquatic macroinvertebrate). This reduces the potential for uncertainty in mitigation application for future phases, with named receptors (River or Pond X) requiring prescribed mitigation.

4.1.4. Features that have been identified to be of less than local importance are not considered to be important ecological features and as such have not be considered within the impact assessment within the ES.

4.1.5. Table 3-8 shows the receptor evaluation results and a justification for the ascribed value.

Table 3-8 - Watercourse importance valuation

Watercourse name	Importance	Justification
River Chelt	County	Based on the information from desk study and field survey data concerning the presence and composition of aquatic species within the 2 km study area, its Main River designation, the presence of qualifying features of the Severn Estuary SAC/Ramsar/SSSI site downstream, in addition to the availability of suitable habitat and connectivity with the wider catchment, the River Chelt has been valued to be of County importance.
Leigh Brook	Local	Based on the information from desk study and field survey data concerning presence and composition of aquatic species within the 2 km study area, the absence of any site designations and the availability of suitable habitat and connectivity with the wider catchment, the Leigh Brook has been valued to be of Local importance.
Other ordinary watercourses (MW3, Drain 8, Drain 9, Drain 10, Drain 11, Drain 12, Drain 14, Drain 15, Drain 16, Drain 20, Drain 21 and Drain 22)	Local	Based on the information that is currently available concerning habitat condition and function, the predominantly agricultural setting, and the availability of suitable habitat for aquatic species (in particular aquatic macroinvertebrates), all drains screened in for assessment have been valued to be of Local importance.

[35] Advice note LA 108 Biodiversity Revision 1 (March 2020).
[36] Set out in Ratcliffe, D.A (1977). A Nature Conservation Review. Cambridge University Press.
[37] Gloucestershire Centre for Environment Records (2015) Gloucestershire Key Wildlife Sites Handbook.

Appendices to Appendix 7.12

- **Appendix A**
- Appendix B

Appendix A. Field survey data

A.1. River Habitat Survey

A.1.1. Habitat Modification Score (HMS) and Habitat Modification Class (HMC)

The Habitat Modification Score (HMS) is an indication of artificial modification to river channel morphology. To calculate the HMS for a site, points are allocated for the presence and extent of artificial features such as culverts and weirs and also modifications caused by the re-profiling and reinforcement of banks. Greater and more severe modifications result in a higher score. The cumulative points total provides the Habitat Modification Score (HMS).

A Habitat Modification Class (HMC) protocol has been developed which allocates the condition of the channel in a site to one of five modification classes, based on the total score (1 = near-natural; 5 = severely modified), as shown in the coloured tables within the HMS sheets below. Higher HMS scores reflect more artificial intervention and modification of the river channel within a site.

A.1.2. HMS sheets

River Chelt (WCID09_RHS)

Survey: WCID09_RHS
RHS Habitat Modification Score & Habitat Modification Class Scoring System

A	Spot check channel modification - Culverts	0
B	Sweep-up artificial features - Culverts	400
	HMS: Culverts sub-score	**400**
C	Spot check bank material	80
D	Spot check bank modification - RI	0
E	Sweep-up bank profiles - RI	0
F	Sweep-up artificial features - revetments	0
G	Spot check channel substrate	0
H	Spot check channel modification - RI	200
	HMS: Bank & bed reinforcement sub-score	**280**
I	Spot check bank modification - RS	800
J	Sweep-up bank profiles - RS	0
K	Spot check channel modification - RS	2000
L	Sweep-up channel modification - over deepened	0
	HMS: Bank & bed reisectioning sub-score	**2800**
M	Spot check bank modification - Berms (BM)	0
N	Spot check bank modification - EM	0
O	Sweep-up bank profiles - Artificial two-stage	0
P	Sweep-up bank profiles - Embanked	0
Q	Sweep-up bank profiles - set back embankment	0
	HMS: Berms & embankments sub-score	**0**
R	Sweep-up artificial features - weirs/dams/sluices	0
	HMS: Weirs/dams/sluices sub-score	**0**
S	Sweep-up artificial features - bridges	100
	HMS: Bridges sub-score	**100**
T	Spot check bank modification - poaching (PC or PC(B))	0
U	Sweep-up bank profiles - poached	**0**
	HMS: Poaching sub-score	**0**
V	Sweep-up artificial features - fords	**0**
	HMS: Fords sub-score	**0**
W	Sweep-up artificial features - outfall	**25**
X	Sweep-up artificial features - deflectors	**0**
	HMS: Outfall/deflectors sub-score	**25**
	Total HMS	**3605**

HMC	HMC Description	HMS Score
1	Pristine/semi-natural	0 - 16
2	Predominantly unmodified	17 - 199
3	Obviously modified	200 - 499
4	Significanly modified	500 - 1399
5	Severely modified	1400 +

River Chelt (WCID10_RHS)

Survey: WCID10_RHS
RHS Habitat Modification Score & Habitat Modification Class Scoring System

A	Spot check channel modification - Culverts	0
B	Sweep-up artificial features - Culverts	400
	HMS: Culverts sub-score	**400**
C	Spot check bank material	80
D	Spot check bank modification - RI	40
E	Sweep-up bank profiles - RI	0
F	Sweep-up artificial features - revetments	0
G	Spot check channel substrate	0
H	Spot check channel modification - RI	200
	HMS: Bank & bed reinforcement sub-score	**320**
I	Spot check bank modification - RS	800
J	Sweep-up bank profiles - RS	0
K	Spot check channel modification - RS	400
L	Sweep-up channel modification - over deepened	0
	HMS: Bank & bed reisectioning sub-score	**1200**
M	Spot check bank modification - Berms (BM)	0
N	Spot check bank modification - EM	0
O	Sweep-up bank profiles - Artificial two-stage	0
P	Sweep-up bank profiles - Embanked	0
Q	Sweep-up bank profiles - set back embankment	0
	HMS: Berms & embankments sub-score	**0**
R	Sweep-up artificial features - weirs/dams/sluices	0
	HMS: Weirs/dams/sluices sub-score	**0**
S	Sweep-up artificial features - bridges	200
	HMS: Bridges sub-score	**200**
T	Spot check bank modification - poaching (PC or PC(B))	0
U	Sweep-up bank profiles - poached	**0**
	HMS: Poaching sub-score	**0**
V	Sweep-up artificial features - fords	**0**
	HMS: Fords sub-score	**0**
W	Sweep-up artificial features - outfall	**0**
X	Sweep-up artificial features - deflectors	**0**
	HMS: Outfall/deflectors sub-score	**0**
	Total HMS	**2120**

HMC	HMC Description	HMS Score
1	Pristine/semi-natural	0 - 16
2	Predominantly unmodified	17 - 199
3	Obviously modified	200 - 499
4	Significanly modified	500 - 1399
5	Severely modified	1400 +

Leigh Brook (WCID02_RHS)

Survey: WCID02_RHS
RHS Habitat Modification Score & Habitat Modification Class Scoring System

A	Spot check channel modification - Culverts	0
B	Sweep-up artificial features - Culverts	0
	HMS: Culverts sub-score	**0**
C	Spot check bank material	0
D	Spot check bank modification - RI	0
E	Sweep-up bank profiles - RI	0
F	Sweep-up artificial features - revetments	0
G	Spot check channel substrate	0
H	Spot check channel modification - RI	0
	HMS: Bank & bed reinforcement sub-score	**0**
I	Spot check bank modification - RS	320
J	Sweep-up bank profiles - RS	0
K	Spot check channel modification - RS	1600
L	Sweep-up channel modification - over deepened	0
	HMS: Bank & bed reisectioning sub-score	**1920**
M	Spot check bank modification - Berms (BM)	0
N	Spot check bank modification - EM	0
O	Sweep-up bank profiles - Artificial two-stage	0
P	Sweep-up bank profiles - Embanked	0
Q	Sweep-up bank profiles - set back embankment	0
	HMS: Berms & embankments sub-score	**0**
R	Sweep-up artificial features - weirs/dams/sluices	0
	HMS: Weirs/dams/sluices sub-score	**0**
S	Sweep-up artificial features - bridges	200
	HMS: Bridges sub-score	**200**
T	Spot check bank modification - poaching (PC or PC(B))	0
U	Sweep-up bank profiles - poached	**0**
	HMS: Poaching sub-score	**0**
V	Sweep-up artificial features - fords	**0**
	HMS: Fords sub-score	**0**
W	Sweep-up artificial features - outfall	**0**
X	Sweep-up artificial features - deflectors	**0**
	HMS: Outfall/deflectors sub-score	**0**
	Total HMS	**2120**

HMC	HMC Description	HMS Score
1	Pristine/semi-natural	0 - 16
2	Predominantly unmodified	17 - 199
3	Obviously modified	200 - 499
4	Significanly modified	500 - 1399
5	Severely modified	1400 +

A.2. River Corridor Survey

A.2.1. RCS key

Standard RCS symbols, as provided in the River Corridor Surveys Methods and Procedures (Conservation Technical Handbook), were used for RCS mapping. A key to these symbols, extracted from the handbook, is shown below.

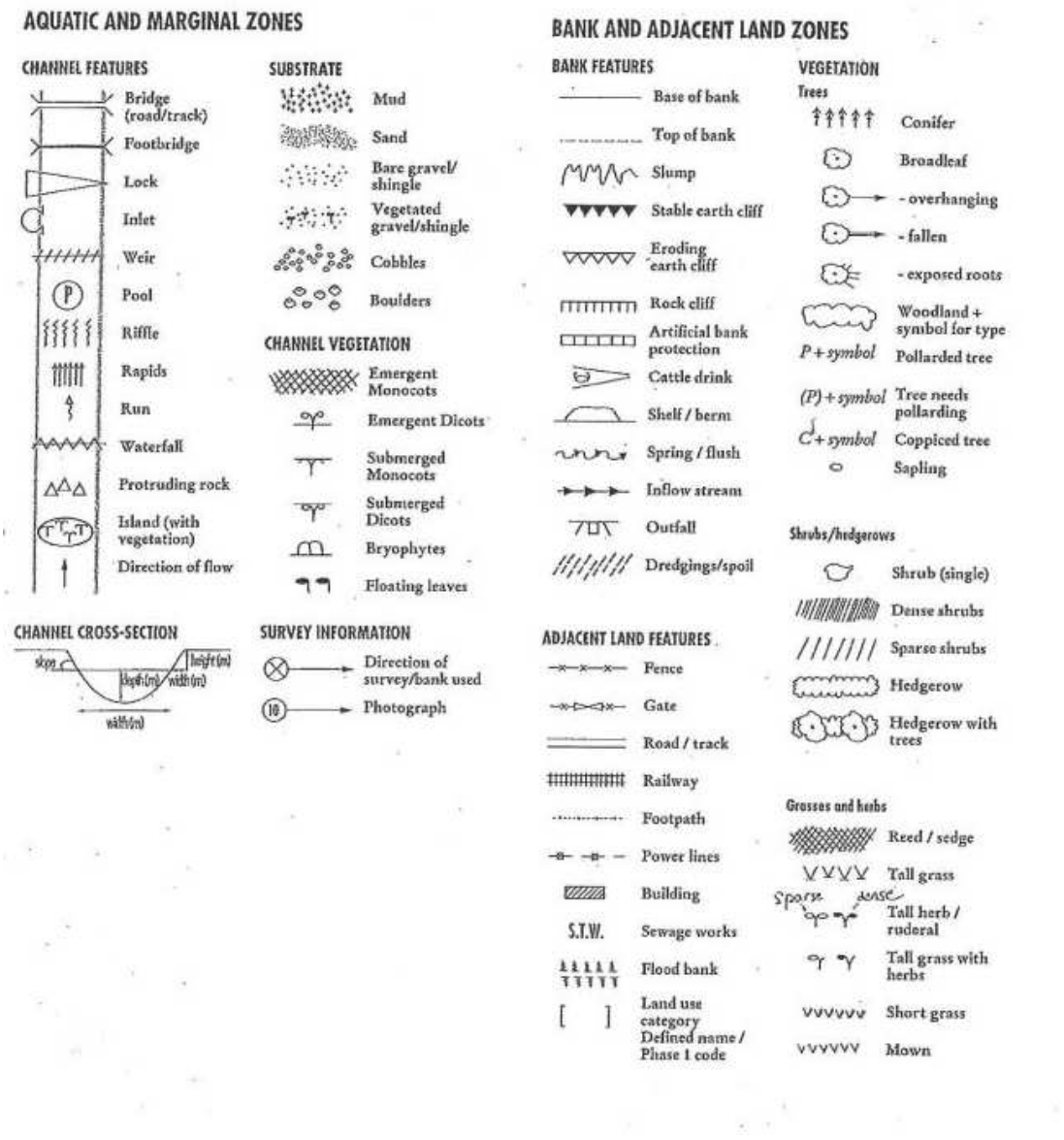


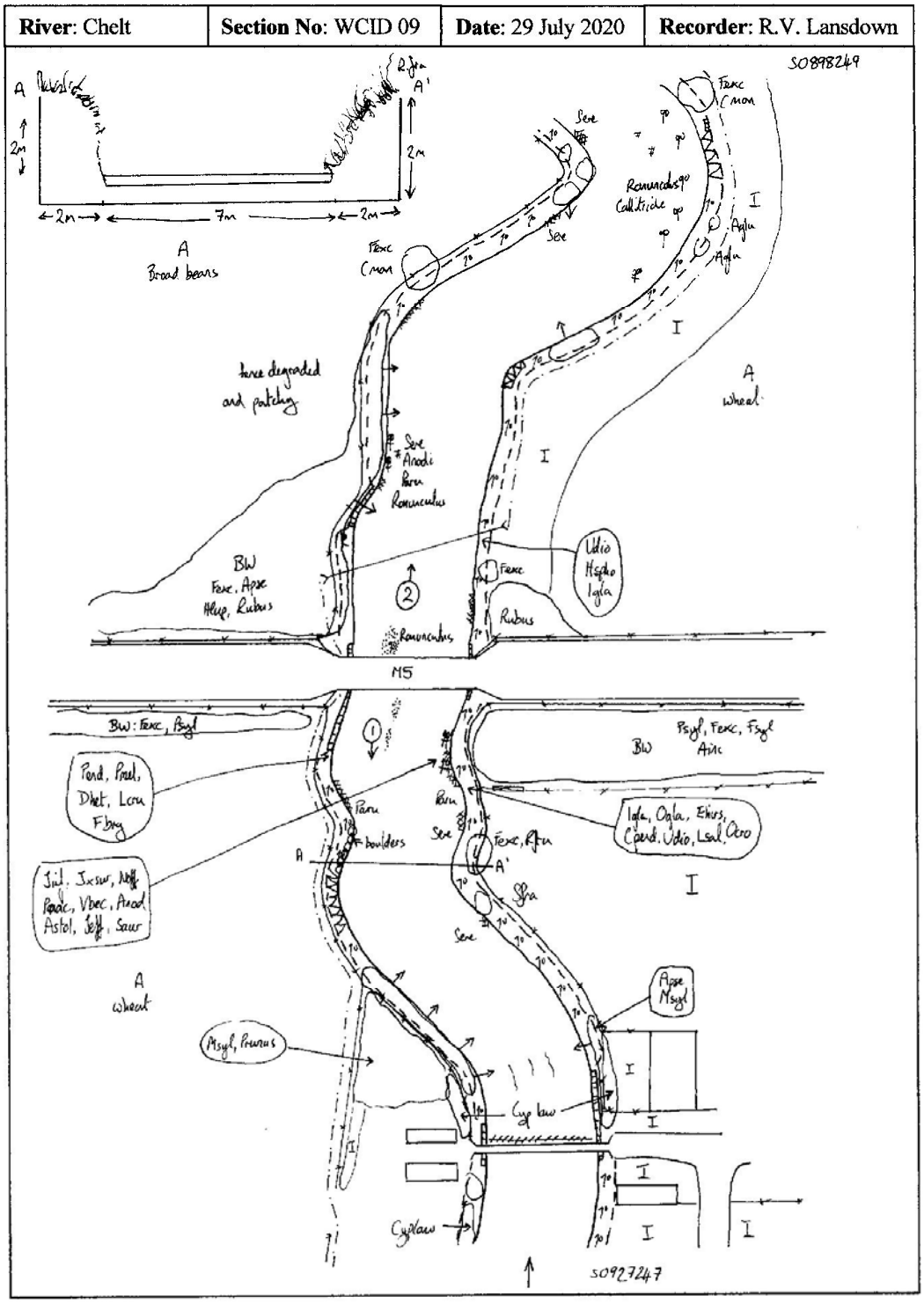
Photo locations shown on the RCS maps do not correspond with the photographs presented in this report. Additional photographs of each survey reach are available and can be provided on request.

Plant species are recorded using an abbreviated version of their scientific name, using the following convention: first letter of the generic name followed by the first three letters of the species name.

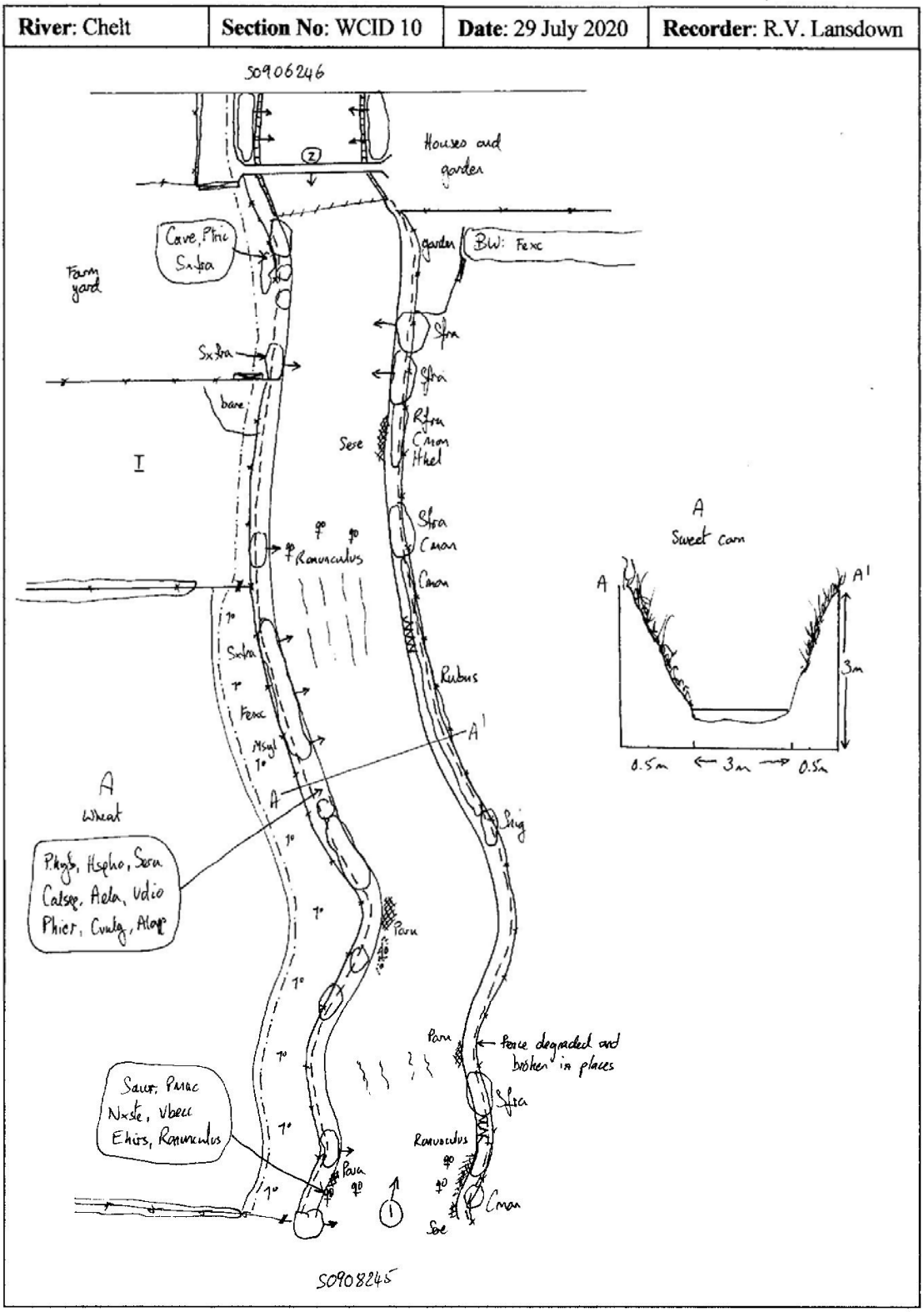
Plants not identified to species are recorded using the genus name followed by sp.

A.2.2. RCS field survey sheets

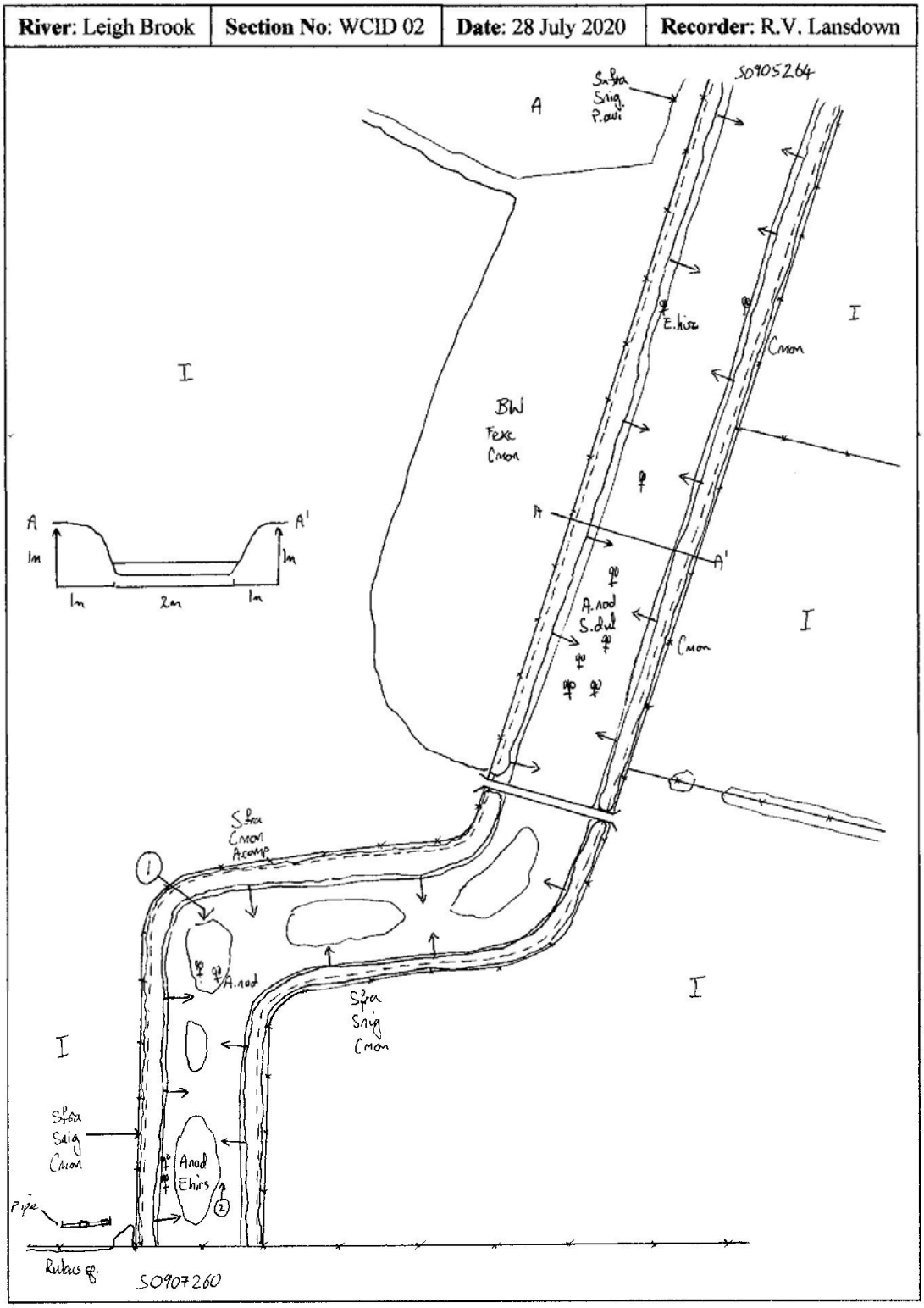
River Chelt (WCID09_RCS)



River Chelt (WCID10_RCS)



Leigh Brook (WCID02_RCS)



A.3. Aquatic macroinvertebrates

A.3.1. Biotic indices

Watercourse	Sample Date and Survey Code	ASPT	N-Taxa	LIFE score (family)	LIFE Score (Species)	CCI Score	PSI Species Score	Species PSI Interpretation	PSI Family Score	Family PSI Interpretation	WHPT ASPT	WHPT N-Taxa
River Chelt	13/10/2020 WCID09_MI_A	5.25	20	7.17	7.54	10.21	59.3	Moderately Sedimented	54.3	Moderately Sedimented	5.43	21
River Chelt	13/10/2020 WCID09_MI_B	4.70	20	6.95	7.61	4.41	55.6	Moderately Sedimented	43.6	Moderately Sedimented	4.73	22
River Chelt	13/10/2020 WCID10_MI_A	4.95	19	7.06	7.76	4.07	62.5	Slightly Sedimented	54.3	Moderately Sedimented	5.33	19
River Chelt	13/10/2020 WCID10_MI_B	4.54	13	7.82	8.33	8.89	79.4	Slightly Sedimented	76.0	Slightly Sedimented	5.20	15
Leigh Brook	13/10/2020 WCID02_MI	3.92	13	5.75	6.30	4.20	10.3	Heavily Sedimented	7.4	Heavily Sedimented	3.96	15

A.3.2. Taxa list

Watercourse	River Chelt	River Chelt	River Chelt	River Chelt	Leigh Brook
Survey Code	WCID10_MI_A	WCID10_MI_B	WCID09_MI_A	WCID09_MI_B	WCID02_MI
Sample Date	13/10/2020	13/10/2020	13/10/2020	13/10/2020	13/10/2020
Sample Method	Kick/Sweep 3 mins	Kick/Sweep 3 mins	Kick/Sweep 3 mins	Kick/Sweep 3 mins	Kick/Sweep 3 mins
Analysis	Species	Species	Species	Species	Species
Taxa Name					
Polycelis nigra/tenuis				1	38

Watercourse	River Chelt	River Chelt	River Chelt	River Chelt	Leigh Brook
Survey Code	WCID10_MI_A	WCID10_MI_B	WCID09_MI_A	WCID09_MI_B	WCID02_MI
Sample Date	13/10/2020	13/10/2020	13/10/2020	13/10/2020	13/10/2020
Sample Method	Kick/Sweep 3 mins	Kick/Sweep 3 mins	Kick/Sweep 3 mins	Kick/Sweep 3 mins	Kick/Sweep 3 mins
Analysis	Species	Species	Species	Species	Species
Taxa Name					
Dugesia lugubris/polychroa				3	
Dugesia tigrina				4	
Dendrocoelum lacteum					1
Potamopyrgus antipodarum	12	4	4	12	628
Radix balthica	56		53	4	
Bathyomphalus contortus			1		
Pisidium sp.	1	1		1	56
Oligochaeta	6	2	83	76	6
Glossiphonia complanata					3
Helobdella stagnalis				2	
Erpobdella octoculata	1				1
Trocheta pseudodina (bykowskii)		1			
Trocheta subviridis					1
Hydracarina	1		3	3	1
Oribatei					2
Asellus aquaticus	1			48	68
Proasellus meridianus			8		

Watercourse	River Chelt	River Chelt	River Chelt	River Chelt	Leigh Brook
Survey Code	WCID10_MI_A	WCID10_MI_B	WCID09_MI_A	WCID09_MI_B	WCID02_MI
Sample Date	13/10/2020	13/10/2020	13/10/2020	13/10/2020	13/10/2020
Sample Method	Kick/Sweep 3 mins	Kick/Sweep 3 mins	Kick/Sweep 3 mins	Kick/Sweep 3 mins	Kick/Sweep 3 mins
Analysis	Species	Species	Species	Species	Species
Taxa Name					
Crangonyx pseudogracilis					3
Gammarus pulex	1			1	1
Gammarus pulex/fossarum	78	50	29	67	8
Gammarus fossarum	6	2	1		
Baetis sp.			1		
Baetis rhodani	4	1	1	4	
Baetis atlanticus/rhodani	80	77	5	22	
Baetis scambus/fuscatus	4	1	11	2	
Baetis vernus			2	4	
Serratella ignita		1	3		
Caenis luctuosa/macrura	2		4		
Pyrrhosoma nymphula			1		
Calopteryx splendens			3	1	
Calopteryx virgo			1		
Haliplus sp.				1	
Nebrioporus elegans			1		
Stictotarsus duodecimpustulatus	1		1		

Watercourse	River Chelt	River Chelt	River Chelt	River Chelt	Leigh Brook
Survey Code	WCID10_MI_A	WCID10_MI_B	WCID09_MI_A	WCID09_MI_B	WCID02_MI
Sample Date	13/10/2020	13/10/2020	13/10/2020	13/10/2020	13/10/2020
Sample Method	Kick/Sweep 3 mins	Kick/Sweep 3 mins	Kick/Sweep 3 mins	Kick/Sweep 3 mins	Kick/Sweep 3 mins
Analysis	Species	Species	Species	Species	Species
Taxa Name					
Platambus maculatus			2	1	
Agabus group (Agabus sp., Ilybius chalconatus & Ilybius melanocornis)					2
Gyrinus urinator			1		
Hydrophilidae					1
Elmis aenea	24	19	66	21	
Limnius volckmari	24	39	26	12	
Oulimnius sp.	9	1	38	21	
Oulimnius tuberculatus			15		
Rhyacophila sp.	2	3	4	1	
Rhyacophila dorsalis		2	3		
Hydroptila sp.				2	
Polycentropus flavomaculatus	1		2		
Polycentropus irroratus			1		
Hydropsyche pellucidula	1		3	5	
Hydropsyche siltalai	6	7	14	13	
Micropterna sequax					2

Watercourse	River Chelt	River Chelt	River Chelt	River Chelt	Leigh Brook
Survey Code	WCID10_MI_A	WCID10_MI_B	WCID09_MI_A	WCID09_MI_B	WCID02_MI
Sample Date	13/10/2020	13/10/2020	13/10/2020	13/10/2020	13/10/2020
Sample Method	Kick/Sweep 3 mins	Kick/Sweep 3 mins	Kick/Sweep 3 mins	Kick/Sweep 3 mins	Kick/Sweep 3 mins
Analysis	Species	Species	Species	Species	Species
Taxa Name					
Sericostoma personatum	1				
Athripsodes albifrons group (bilineatus & commutatus)	2			2	
Mystacides sp.	1				
Mystacides azurea			1		
Diptera			1		
Tipula sp.		1			
Antocha vitripennis	1				
Dicranota sp.	8	4		3	
Psychodidae					3
Ceratopogonidae		1	1		
Simuliidae	212	148	18	636	
Chironomidae	20	4	37	66	17
Dolichopodidae		2			
Limnophora sp.				2	

A.4. Aquatic macrophytes

A.4.1. Aquatic macrophyte survey data

	Watercourse		River Chelt	River Chelt	Leigh Brook
	Survey code		WCID09_MP	WCID10_MP	WCID02_MP
scoring taxa	Apium nodiflorum		1		1
	Cladophora glomerata/Rhizoclonium hieroglyphicum		4		
	Glyceria fluitans agg		1		
	Persicaria amphibia		1		
	Phalaris arundinacea		3		
	Ranunculus (sect Batrachian) sp or hybrid indet1		4		
	Rorippa nasturtium-aquaticum agg.		1		
	Sparganium erectum			1	
	Ulva flexuosa		1		
	Veronica beccabunga		1		
additional taxa recorded	Use this space to enter records of additional species				
	Agrostis stolonifera		✓		
	Epilobium hirsutum		✓		✓
	Lunularia cruciata			✓	
	Pohlia melanodon			✓	
	Scrophularia auriculata			✓	
	Marchantia polymorpha subsp. *ruderalis*			✓	
	Equisetum arvense		✓		
	Gongrosira encrustans		✓		
	Juncus effusus		✓		
	Persicaria maculosa		✓		
Metrics	**RMNI**		**7.91**	**8.34**	**8.64**
	NTAXA		**5.00**	**1.00**	**1.00**
	NFG		**4.00**	**0.00**	**1.00**
	ALG		**3.85**	**0.00**	**0.00**
General info	**Date**		29.7.20	29.7.20	28.7.20
	Site name		WCID09	WCID10	WCID02
	Start time		11:00	10:00	15:30
	NGR start (u/s)		SO 90042 24796	SO 90714 24607	SO 90742
	NGR middle		SO 90087 24783	SO 90670 24606	SO 90682
	NGR end (d/s)		SO 90096 24787	SO 90625 24617	SO 90642
	% Wadeable		80	50	100
Environmental variables	**Total % cover of macrophytes**		3	1	<1
	% cover of filamentous algae		3	3	0
	Width (m) %	<1	0	0	0
		1 - 5	100	100	100
		5 -10	0	0	0
		10-20	0	0	0
		> 20	0	0	0
	Depth (m) %	< 0.25	80	40	100
		0.25 - 0.5	15	10	0
		0.5 - 1	5	50	0
		> 1	0	0	0
	Substrate %	Peat	0	0	0
		Silt/clay	19	60	100
		Sand	1	0	0
		Pebbles/gravel	80	40	0
		Boulder/cobbles	0	0	0
		Bedrock	0	0	0
	Habitat %	Pool	0	0	0
		Riffle	0	0	0
		Run	0	0	0
		Slack	100	100	100
	Shading %	LB	100	30	0
			0	0	0
			0	70	100
		RB	100	30	0
			0	0	0
			0	70	100
	Clarity %	Clear	0	0	100
		Turbid	0	0	0
		Cloudy	100	100	0
	Bed stability %	Solid/firm	0	40	0
		Unstable	0	0	0
		Stable	100	0	0
		Soft/sinking	0	60	100
	Typicality **A**=data not affected or effects limited to<25% of site **B**=records form 25-50% of site affected **C**=records from 50% of site affected)		**A**	**A**	**A**

A.5. Fish

A.5.1. Electric fishing survey data

River Chelt (WCID09_FH)

Total numbers caught per species per run

	Species						
	Minnow (MN)	Stone loach (STL)	Bullhead (BH)	Three-spined stickleback (SB3)	Chub (CH)	Brook / river lamprey ammocoetes (B/RL AMM)	Eel (EEL)
Run 1	151	25	111	1	2	2	2
Run 2	82	5	32	2	0	0	4
Run 3	75	10	21	0	0	0	0

Average lengths in mm caught per species per run

	Species						
	Minnow (MN)	Stone loach (STL)	Bullhead (BH)	Three-spined stickleback (SB3)	Chub (CH)	Brook / river lamprey ammocoetes (B/RL AMM)	Eel (EEL)
Run 1	55.28	55.08	30.4	36	58	77.5	200
Run 2	N/A*	78.6	N/A*	36.5	N/A**	N/A**	128.75
Run 3	N/A*	82.4	N/A*	N/A**	N/A**	N/A**	N/A**

* no lengths recorded

** none recorded in run

River Chelt (WCID10_FH)

Total numbers caught per species per run

	Species						
	Minnow (MN)	Stone loach (STL)	Bullhead (BH)	Three-spined stickleback (SB3)	Chub (CH)	Brook / river lamprey ammocoetes (B/RL AMM)	Eel (EEL)
Run 1	0	0	86	0	0	0	1
Run 2	0	0	34.18	0	0	0	0
Run 3	0	0	173	16	0	0	1

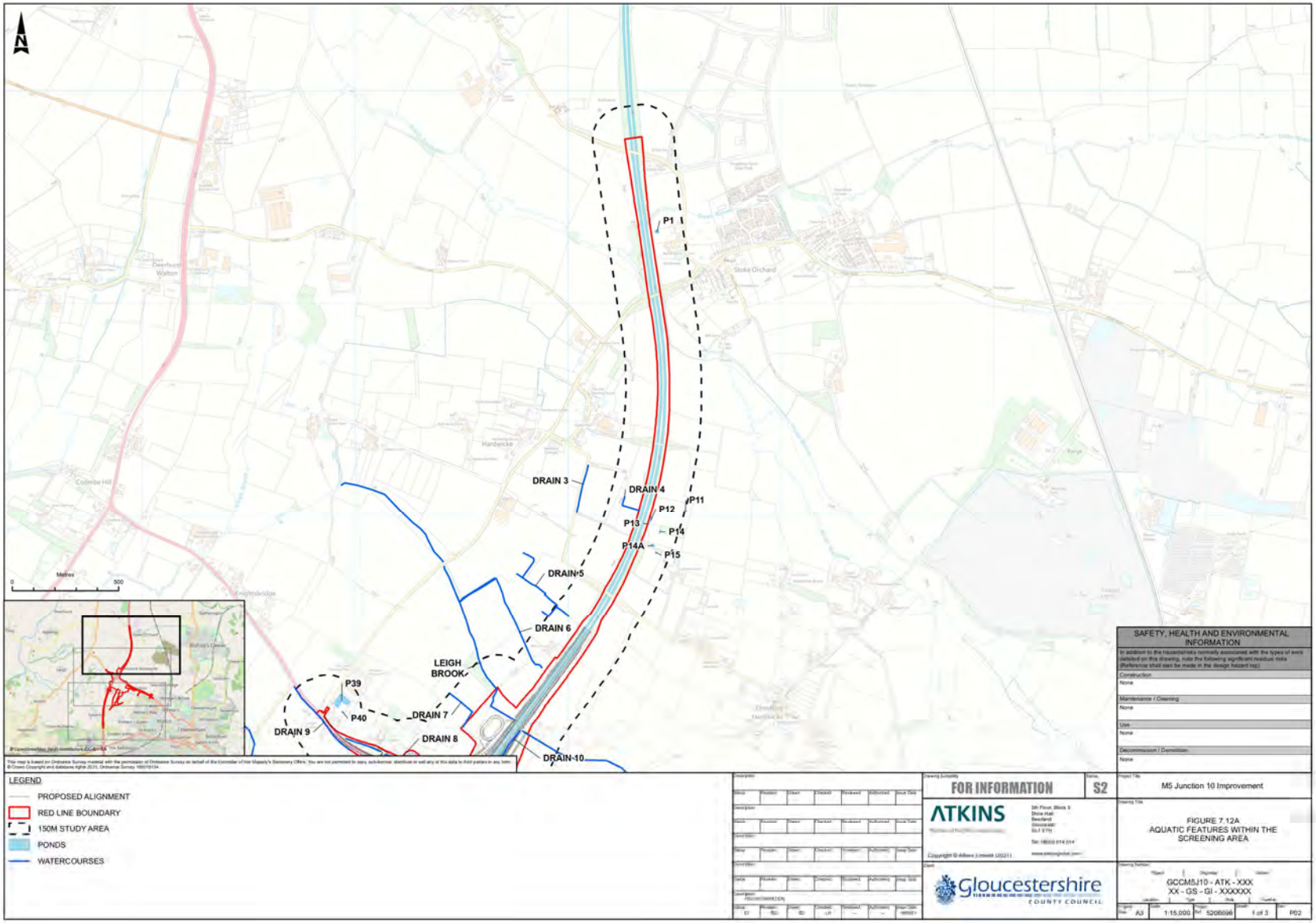
Average lengths in mm caught per species per run

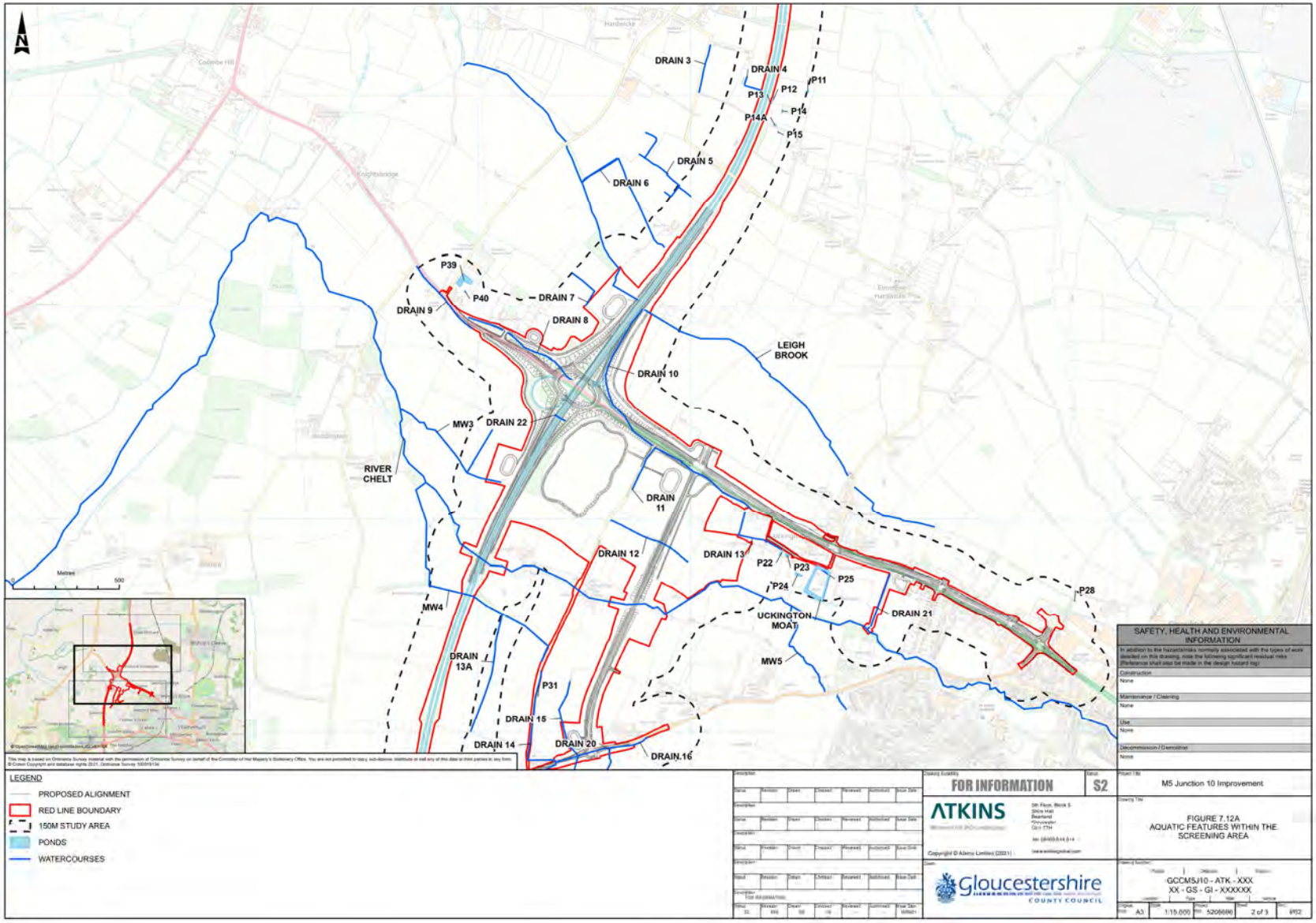
	Species						
	Minnow (MN)	Stone loach (STL)	Bullhead (BH)	Three-spined stickleback (SB3)	Chub (CH)	Brook / river lamprey ammocoetes (B/RL AMM)	Eel (EEL)
Run 1	N/A**	N/A**	35.9	N/A**	N/A**	N/A**	125
Run 2	N/A**	N/A**	57	N/A**	N/A**	N/A**	N/A**
Run 3	N/A**	N/A**	37.95	40.69	N/A**	N/A**	300

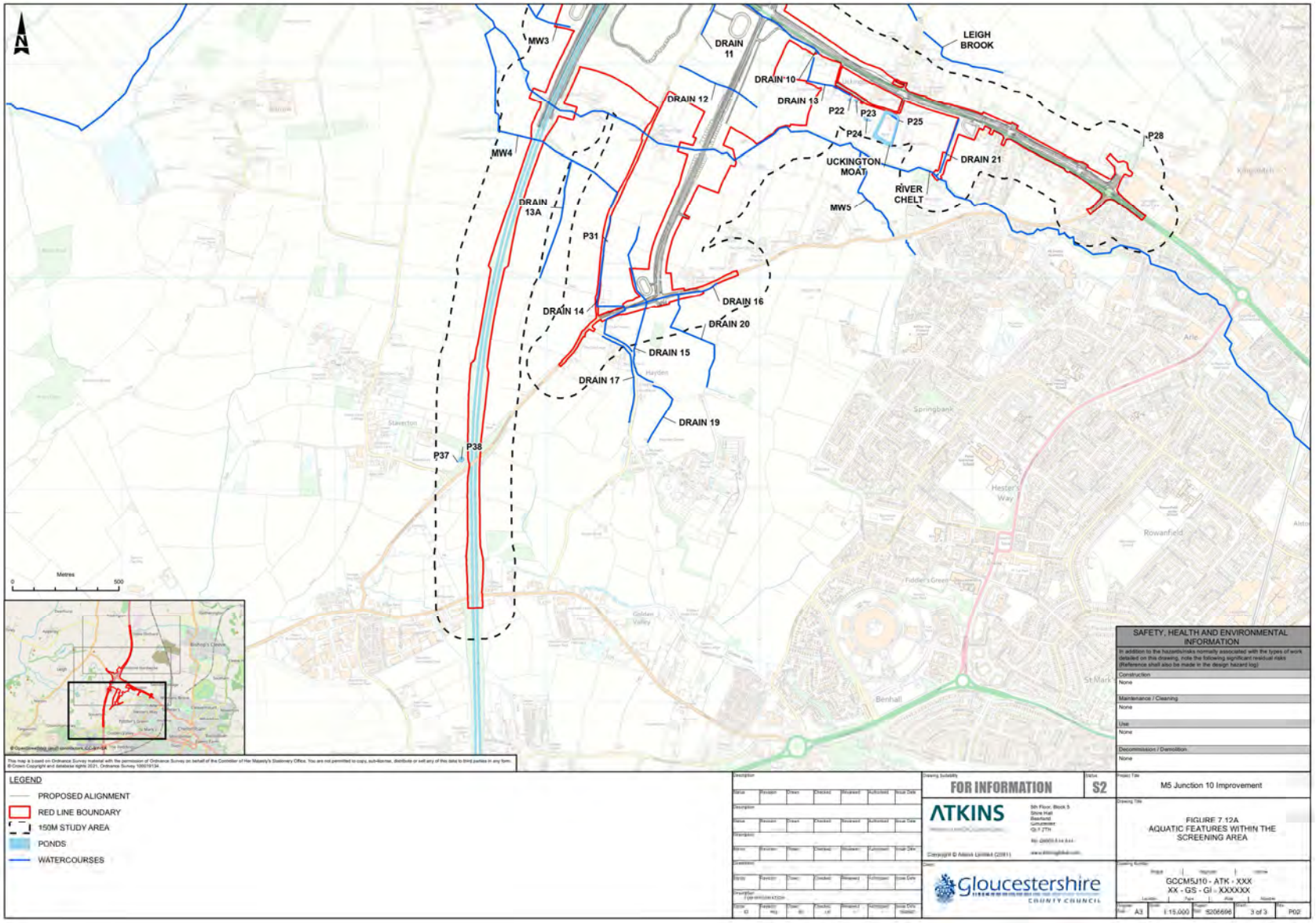
** none recorded in run

Appendix B. Aquatic ecology figures

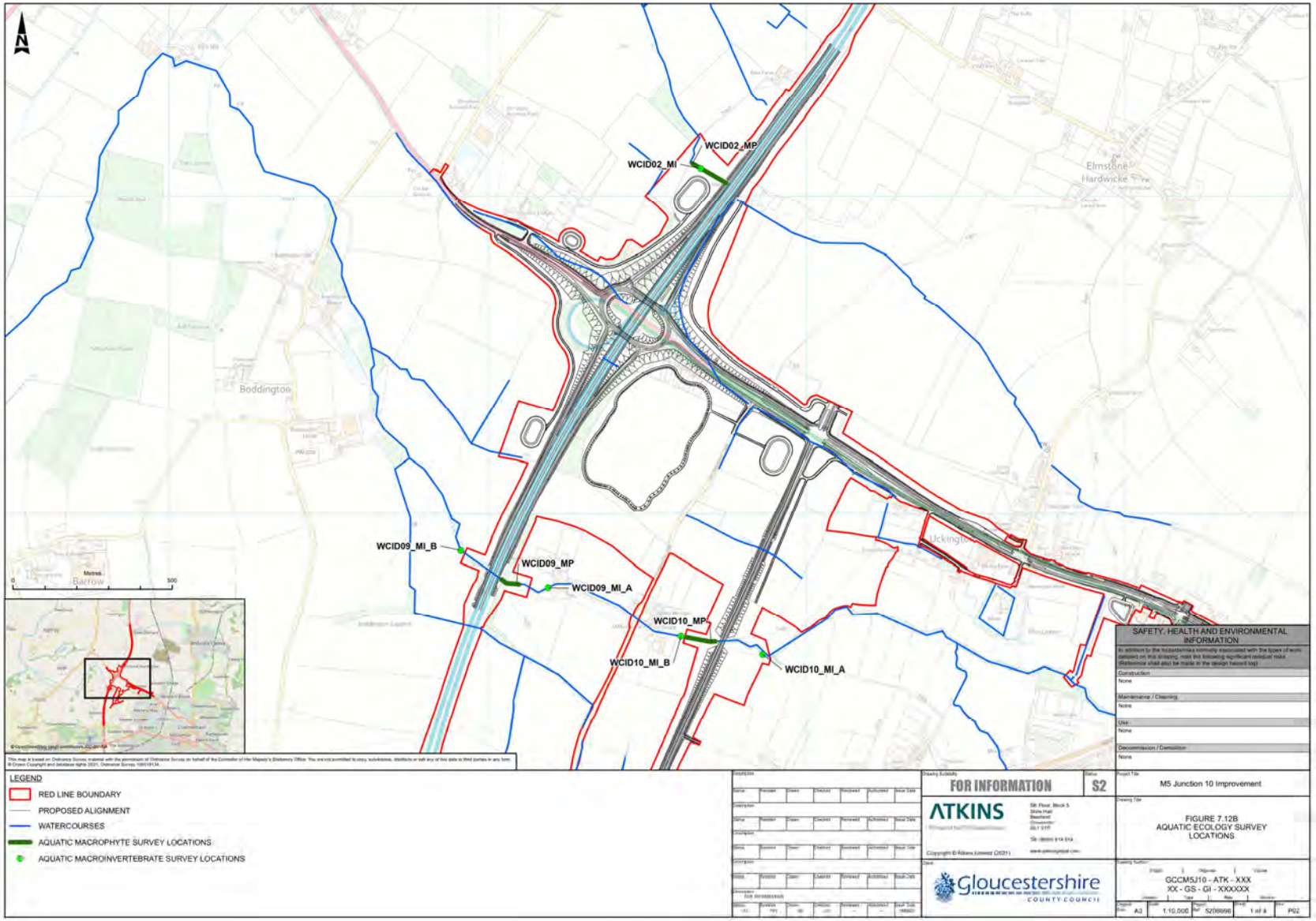
A.6. Figure 7.12A

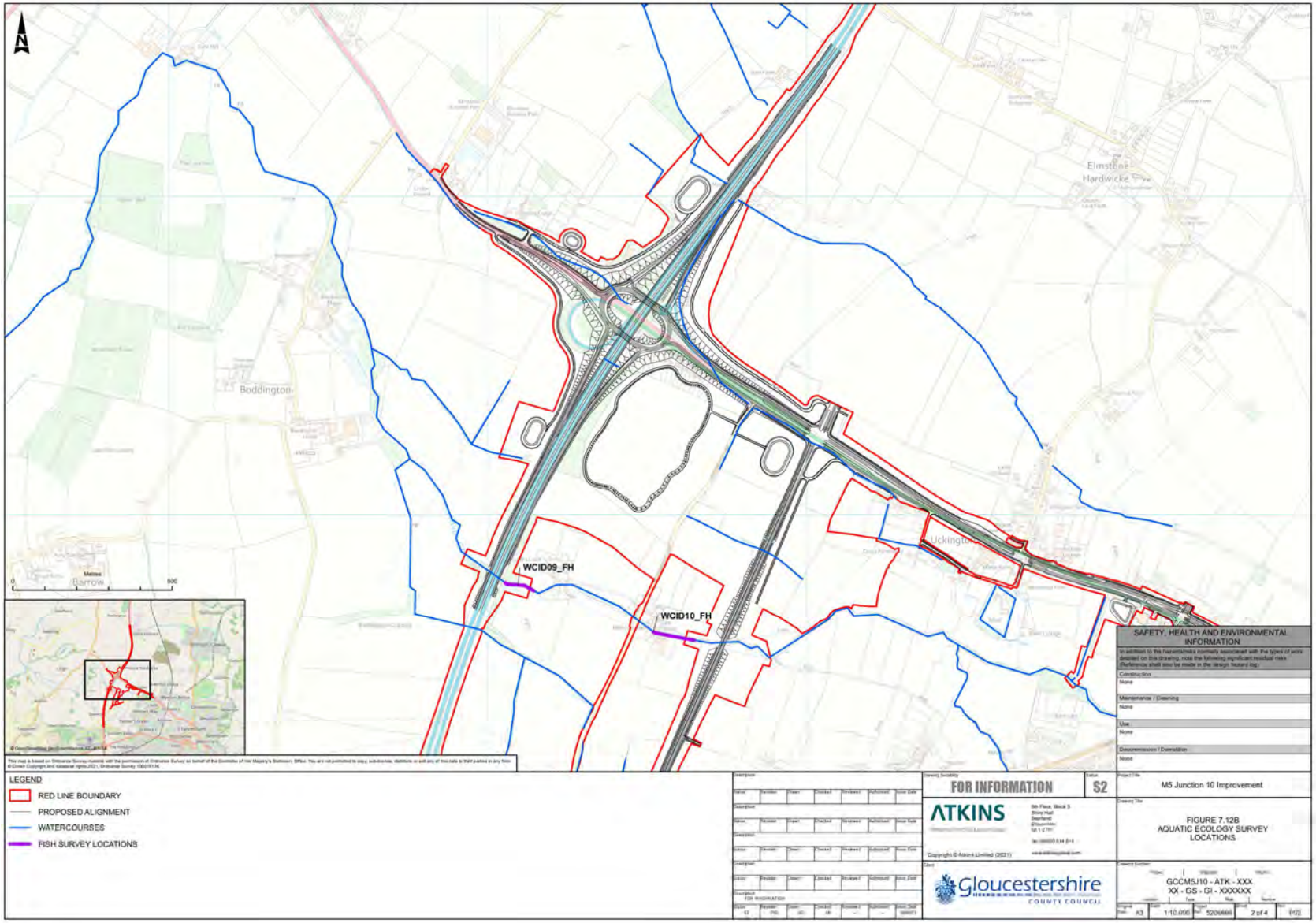

P1
P11
P12
P13
P14
P14A
P15
DRAIN 3
DRAIN 4
DRAIN 5
DRAIN 6
DRAIN 7
DRAIN 8
DRAIN 9
DRAIN 10
LEIGH BROOK
P39
P40
LEGEND
PROPOSED ALIGNMENT
RED LINE BOUNDARY
150M STUDY AREA
PONDS
WATERCOURSES
SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION
FOR INFORMATION
S2
ATKINS
M5 Junction 10 Improvement
FIGURE 7.12A
AQUATIC FEATURES WITHIN THE SCREENING AREA
GCCM5J10 - ATK - XXX
XX - GS - GI - XXXXX
A3
1:15,000
P02

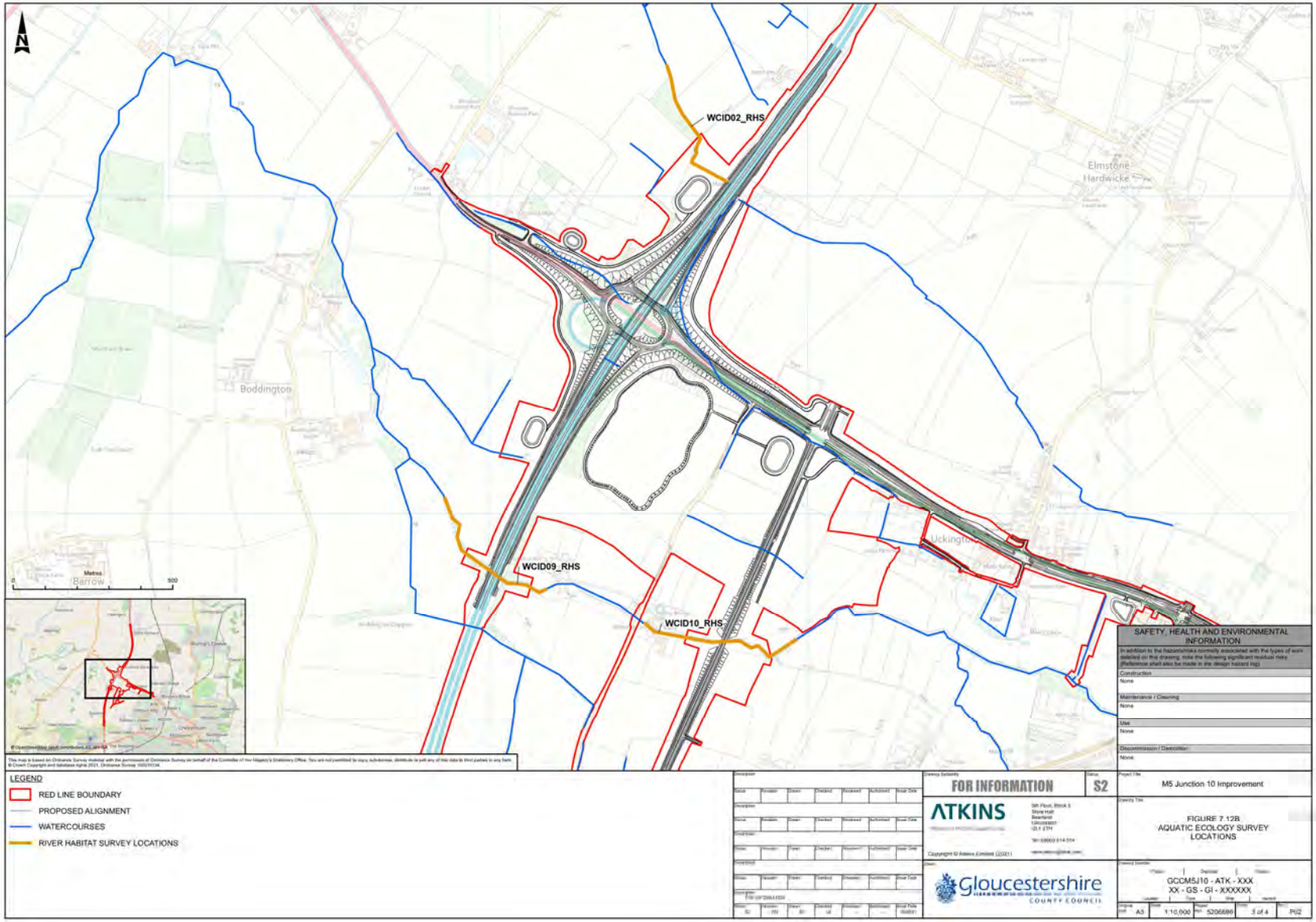

DRAIN 3
DRAIN 4
P11
P12
P13
P14
P14A
P15
DRAIN 5
DRAIN 6
P39
P40
DRAIN 7
DRAIN 9
DRAIN 8
LEIGH BROOK
DRAIN 10
MW3
DRAIN 22
RIVER CHELT
DRAIN 11
DRAIN 12
DRAIN 13
P22
P23
P24
P25
P28
MW4
UCKINGTON MOAT
DRAIN 21
DRAIN 13A
MW5
P31
DRAIN 15
DRAIN 14
DRAIN 20
DRAIN 16
LEGEND
PROPOSED ALIGNMENT
RED LINE BOUNDARY
150M STUDY AREA
PONDS
WATERCOURSES
SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION
FOR INFORMATION
S2
M5 Junction 10 Improvement
FIGURE 7.12A
AQUATIC FEATURES WITHIN THE SCREENING AREA
ATKINS
Gloucestershire COUNTY COUNCIL

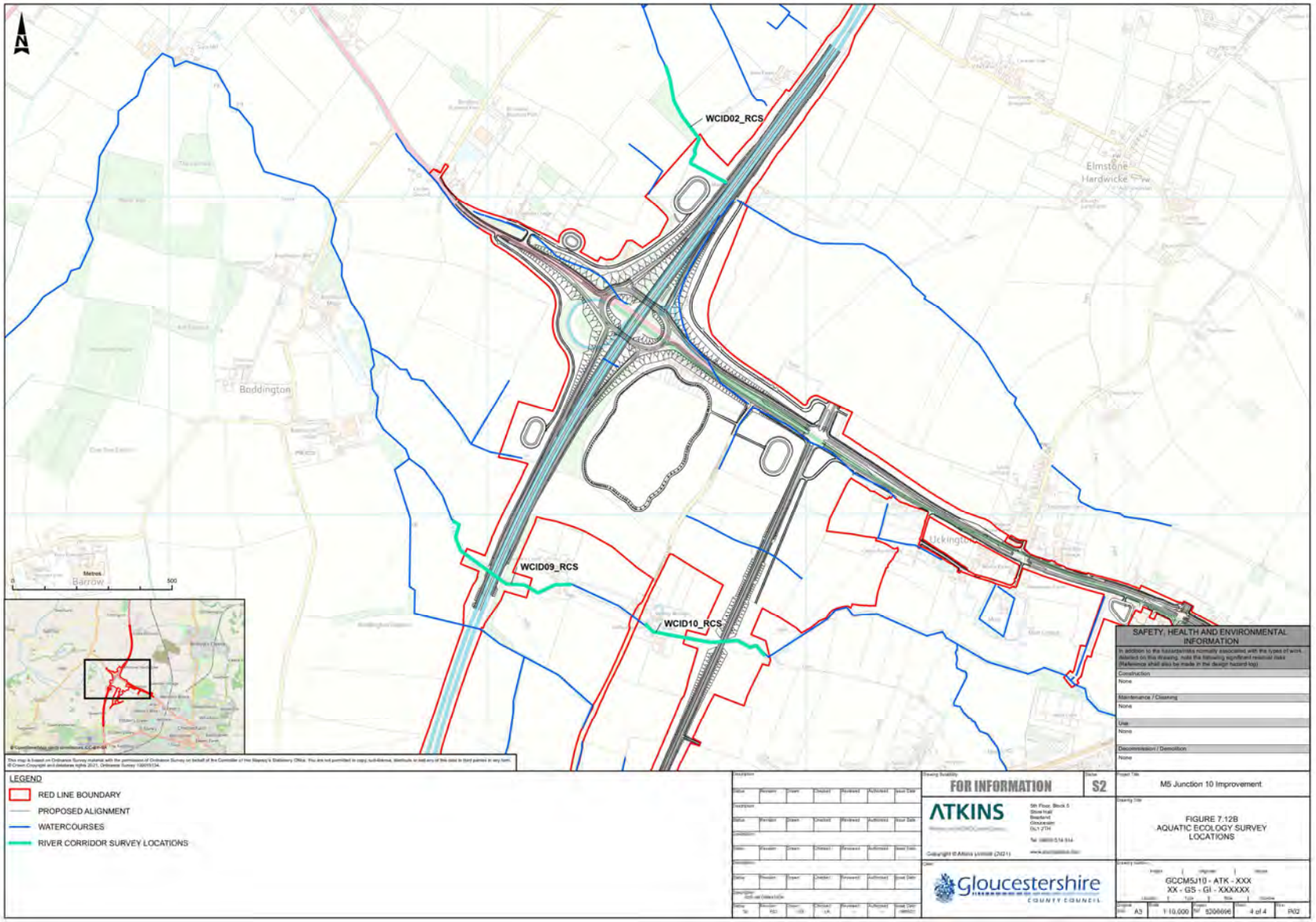

MW3
DRAIN 11
LEIGH BROOK
DRAIN 10
DRAIN 12
DRAIN 13
P22
P23
P25
P24
P28
MW4
UCKINGTON MOAT
DRAIN 21
RIVER CHELT
DRAIN 13A
MW5
P31
DRAIN 16
DRAIN 14
DRAIN 20
DRAIN 15
DRAIN 17
DRAIN 19
P38
P37
Metres
0
500
LEGEND
PROPOSED ALIGNMENT
RED LINE BOUNDARY
150M STUDY AREA
PONDS
WATERCOURSES
SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION
Construction
None
Maintenance / Cleaning
None
Use
None
Decommission / Demolition
None
FOR INFORMATION
S2
ATKINS
M5 Junction 10 Improvement
FIGURE 7.12A
AQUATIC FEATURES WITHIN THE SCREENING AREA
Gloucestershire COUNTY COUNCIL
GCCM5J10 - ATK - XXX
XX - GS - GI - XXXXXX
A3
1:15,000
S206696
3 of 3
P02

A.7. Figure 7.12B


WCID02_MP
WCID02_MI
WCID09_MI_B
WCID09_MP
WCID09_MI_A
WCID10_MP
WCID10_MI_B
WCID10_MI_A
Boddington
Elmstone Hardwicke
Ullenhall
Barrow
LEGEND
RED LINE BOUNDARY
PROPOSED ALIGNMENT
WATERCOURSES
AQUATIC MACROPHYTE SURVEY LOCATIONS
AQUATIC MACROINVERTEBRATE SURVEY LOCATIONS
SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION
FOR INFORMATION
S2
ATKINS
M5 Junction 10 Improvement
FIGURE 7.12B
AQUATIC ECOLOGY SURVEY
LOCATIONS
GCCM5J10 - ATK - XXX
XX - GS - GI - XXXXXX


WCID09_FH
WCID10_FH
Boddington
Elmstone Hardwicke
Barrow
LEGEND
RED LINE BOUNDARY
PROPOSED ALIGNMENT
WATERCOURSES
FISH SURVEY LOCATIONS
SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION
FOR INFORMATION
S2
M5 Junction 10 Improvement
FIGURE 7.12B
AQUATIC ECOLOGY SURVEY
LOCATIONS
ATKINS
Gloucestershire
COUNTY COUNCIL


WCID02_RHS
WCID09_RHS
WCID10_RHS
Boddington
Elmstone Hardwicke
Ullenhall
Earlswood
Metres
0
500
LEGEND
RED LINE BOUNDARY
PROPOSED ALIGNMENT
WATERCOURSES
RIVER HABITAT SURVEY LOCATIONS
SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION
Construction
None
Maintenance / Cleaning
None
Use
None
Decommission / Demolition
None
FOR INFORMATION
S2
ATKINS
Gloucestershire COUNTY COUNCIL
M5 Junction 10 Improvement
FIGURE 7.12B
AQUATIC ECOLOGY SURVEY LOCATIONS
GCCM5J10 - ATK - XXX
XX - GS - GI - XXXXXX
A3
1:10,000
5206689
3 of 4
P02


WCID02_RCS
WCID09_RCS
WCID10_RCS
Boddington
Elmstone Hardwicke
Metres
0
500
LEGEND
RED LINE BOUNDARY
PROPOSED ALIGNMENT
WATERCOURSES
RIVER CORRIDOR SURVEY LOCATIONS
SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION
Construction
None
Maintenance / Cleaning
None
Use
None
Decommission / Demolition
None
FOR INFORMATION
S2
ATKINS
M5 Junction 10 Improvement
FIGURE 7.12B
AQUATIC ECOLOGY SURVEY LOCATIONS
Gloucestershire COUNTY COUNCIL
GCCM5J10 - ATK - XXX
XX - GS - GI - XXXXXX
A3
1:10,000
4 of 4
P02

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1. Introduction

1.1. Purpose of the Report

1.1.1. This report presents the results of the Habitats Regulations Assessment (HRA) Stage 1: Screening of likely significant effects (LSE) and Stage 2 Appropriate Assessment for the M5 Junction 10 Improvements Scheme.

1.1.2. It has been prepared for statutory consultation and will form part of the Preliminary Environmental Information Report (PEIR) for the Scheme. It is also intended as a standalone report.

1.2. Scheme Background

1.2.1. M5 Junction 10 is located 48 miles to the south of Birmingham, five miles to the south of Tewkesbury, four miles to the north-west of Cheltenham, and eight miles to the north-east of Gloucester. It is the northernmost of four junctions serving the Gloucester and Cheltenham urban areas.

1.2.2. This places the junction in a strategically important location for the region, particularly as northern and western Cheltenham are the sites of a number of large retail parks and employment areas, and the location of planned future housing and nationally significant business development.

1.2.3. Gloucestershire faces significant challenges to achieve its vision for economic growth. A Joint Core Strategy (JCS)[1] – a partnership between Gloucester City Council, Cheltenham Borough Council (CBC) and Tewkesbury Borough Council (TBC) has been formed to produce a co-ordinated strategic development plan to show how the region will develop during the period 2011 - 2031. This includes a shared spatial vision targeting 35,175 new homes and 39,500 new jobs by 2041. Major development of new housing (c.9,000 homes) and employment land (c.100ha) is proposed in strategic and safeguarded allocations in the West and North West of Cheltenham, much of which lies within TBC's boundary as the Local Planning Authority. This development, in turn, is linked to wider economic investment, including a government supported and nationally significant 45 ha Cyber Central UK adjacent to GCHQ in West Cheltenham, as part of the Golden Valley Development, which also comprises the Garden Community Development. The Cyber Central UK hub is predicted to support c.7,500 jobs.

1.2.4. Cheltenham currently experiences significant congestion at peak times, which has led to air quality issues at various locations across the town and led to the creation of an Air Quality Management Area (AQMA) within Cheltenham (approximately 4 km south-east of the Scheme). The existing M5 Junction 10 only provides access and egress to and from the north, with no connectivity to M5 south. This drives existing traffic across Cheltenham through various routes to access and leave the M5 from the south which contributes significantly to existing traffic flows in the town. To unlock the housing and job opportunities, a highways network is needed that has the capacity to accommodate the increased traffic it will generate, within a sustainable transport context.

1.2.5. An all-movements junction has been identified as a key infrastructure requirement to enable the housing and economic development proposed by the Gloucestershire Local Enterprise Partnership's (GLEP) Strategic Economic Plan and is central to the transport network sought by the council in the adopted Gloucestershire Local Transport Plan. The planned housing and economic growth have been included in the adopted JCS. Highways England also identified that improvements to M5 Junction 10 are a critical requirement to maintain the safe and efficient operation of the M5 corridor in their Birmingham to Exeter Route Strategy, whilst enabling the planned development and

[1] Gloucester City, Cheltenham Borough and Tewkesbury Borough (Adopted December 2017) Joint Core Strategy 2011 - 2031

economic growth around Cheltenham, Gloucester and Tewkesbury. A Business Case was submitted in March 2019 to Homes England to the Housing Infrastructure Fund (HIF), wherein an investment case was made for the following infrastructure improvements. Funding was successfully awarded by Homes England in March 2020:

- Element 1: Improvements to Junction 10 on the M5 and a new road linking Junction 10 to west Cheltenham;
- Element 2: A38/A4019 Junction Improvements at Coombe Hill;
- Element 3: A4019 widening, east of Junction 10; and
- Element 4: An upgrade to Arle Court Park and Ride.

1.2.6. Elements 1 and 3 comprise the M5 Junction 10 Improvements Scheme. The upgrade to Arle Court Park and Ride (now known as the Arle Court Transport Hub) and the junction improvements at Coombe Hill were included as part of the package of improvements funded by Homes England. Because they are located some distance from M5 Junction 10 and do not form part of the proposed improvement of the junction, Gloucestershire County Council (GCC) has decided to take these two elements forward as separate packages of work in order to accelerate the programme for these elements and will deliver them through separate planning strategies.

1.2.7. The following infrastructure improvements, which together make up the M5 Junction 10 Improvements Scheme, are as follows:

- An all-movements junction at M5 Junction 10;
- A new West Cheltenham Link Road east of Junction 10 from the A4019; and
- Widening of the A4019 to the east of Junction 10.

1.3. Scheme Description

1.3.1. Improvements to M5 Junction 10 are to increase the capacity of the junction, and to upgrade the currently northbound only junction to an all-movements junction. To enable travel both south and north on the M5, the two existing Junction 10 exit slip roads will be removed, and four new slip roads will be constructed to provide access and egress to the M5 in all directions.

1.3.2. A new elongated oval shaped roundabout junction will be constructed over the M5, centred either side of the existing overbridge, which is to be demolished. The A4019 is realigned to provide an appropriate entry angle to the new roundabout. A dedicated route for cyclists and pedestrians will be provided through the junction.

1.3.3. The West Cheltenham Link Road (the 'Link Road') is a proposed new two-lane road, with a segregated cycleway and footway, from the B4634 to the A4019. The Link Road is intended to provide greater connectivity between the reconfigured M5 Junction 10 and both the West Cheltenham Strategic Allocation, Safeguarded Land and the Proposed Cyber Park. To connect the Link Road with the existing A4019 (to the north) and the B4634 (to the south), two new junctions will be constructed

1.3.4. The A4019 is currently a dual carriageway over the M5 Junction, returning to single carriageway near the junction to serve the turning to Withybridge Lane. As part of the highway improvements incorporated into the Scheme, the widening will be extended to continue from the M5 Junction 10 to an eastern extent at the Gallagher Retail Park, where the Scheme would tie into the existing dual carriageway. Widening through Uckington will be to the southern side of the A4019. Widening east of Uckington will be to the northern side of the A4019.

1.3.5. The Scheme will also include a cycleway and footway adjacent to the A4019, which will cover the full extents of the proposed A4019 widening and also provide connectivity for these facilities through the proposed M5 Junction 10 improvements to the access point with Stanboro Lane (west of M5 Junction 10).

1.4. HRA Consultation

1.4.1. Natural England was consulted on an Interim HRA Screening Report[2] and has provided comment (comments received 15 April 2021, see letter from Natural England in Appendix L, as well as Atkins response to the comments). Comments have been addressed in this report.

[2] Atkins (November 2019) M5 Junction 10 Improvement, Interim HRA Screening Report

2. HRA Methodology

2.1. Overview of HRA

2.1.1. HRA is required by Regulation 63 the Conservation of Habitats and Species Regulations 2017 (as amended)[3] for all plans and projects which may have likely significant effects on a European Site[4] and are not directly connected with or necessary to the management of the European Site. The Scheme is not directly connected with, or necessary to, the nature conservation management of any European Sites.

2.1.2. European Sites include Special Areas of Conservation (SAC) and Special Protection Areas (SPA). HRA is also required, as a matter of UK Government policy, for potential SPAs (pSPA), candidate SACs (cSAC) and listed and proposed Wetlands of International Importance (Ramsar sites and pRamsar sites) for the purposes of considering plans and projects, which may affect them[5]. Hereafter, all the above designated nature conservation sites are referred to as 'European Sites.'

2.1.3. The stages of the HRA process are as follows:

- Stage 1 – Screening: To test whether a plan or project either alone or in combination with other plans and projects is likely to have a significant effect on a European Site;
- Stage 2 – Appropriate Assessment: To determine whether, in view of a European Site's conservation objectives, the plan or project (either alone or in combination with other projects and plans) would have an adverse effect (or risk of this) on the integrity of the site with respect to the site structure, function and conservation objectives. If adverse impacts are anticipated, potential mitigation measures to alleviate impacts should be proposed and assessed;
- Stage 3 – Assessment of alternative solutions: Where a plan is assessed as having an adverse impact (or risk of this) on the integrity of a European Site, there should be an examination of alternatives (e.g. alternative locations and designs of development); and,
- Stage 4 – Assessment where no alternative solutions remain and where adverse impacts remain: In exceptional circumstances (e.g. where there are imperative reasons of overriding public interest), compensatory measures to be put in place to offset negative impacts.

2.1.4. This report comprises Stage 1 and Stage 2 of the HRA process.

2.2. Stage 1 Screening

2.2.1. All available information about the Scheme was gathered in order to identify the nature of potential impacts arising from the project during construction and operation.

2.2.2. With regards to determining the European Sites to include in the Screening assessment ('Scoping'), the guidance in paragraph 3.7 of LA 115[6] states HRA screening shall be completed where the Scheme:

- Is within 2 km of a European Site or functionally linked land

[3] As amended by The Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019
[4] Following the changes made to the Conservation of Habitats and Species Regulations 2017 (as amended) by the Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019, SACs and SPAs in the UK no longer form part of the EU's Natura 2000 ecological network and now form part of a UK national site network. In this document they are still referred to as European Sites
[5] National Planning Policy Framework. Ministry of Housing, Communities and Local Government. February 2019.
[6] Design Manual for Roads and Bridges Volume 11, Section 4: LA 115 Habitats Regulations Assessment (formerly HD 44/09). Online: http://www.standardsforhighways.co.uk/ha/standards/dmrb/vol11/section4/LA%20115%20Habitats%20Regulations%20assessment%20-web.pdf [Accessed 21/10/19].

- Is within 30 km of a SAC where bats are a qualifying feature
- Crosses or lies adjacent to, upstream of, or downstream of, a watercourse which is designated as a European Site
- Has a potential hydrological or hydrogeological linkage to a European Site containing a groundwater dependent terrestrial ecosystem (GWDTE); or
- Has an Affected Road Network (ARN) which triggers the need for assessment of air quality impacts[7]. Further detail around the establishment of the ARN is included in the Air Quality chapter (Chapter 5).

2.2.3. In addition, paragraph 3.7.2 states that additional European Sites should be subject to screening where other forms of ecological connectivity exist between them and the Scheme.

2.2.4. Information on the qualifying features was obtained from the Natural England website[8] and the Joint Nature Conservation Committee (JNCC) website[9]. Condition assessment information for the underpinning Sites of Special Scientific Interest (SSSI) was obtained from the Natural England website[10] to provide important contextual information.

2.2.5. The Habitats Regulations requires assessment of the potential for likely significant effects of the project 'in combination' with other projects and plans. This refers to the cumulative effects which will or might result from the addition of the effects of other relevant plans or projects to the effects of the subject plan or project.

2.2.6. The Habitats Regulations Handbook[11] advises that any plans or projects at the following stages may be relevant to an in-combination assessment:

- Applications lodged but not yet determined
- Projects subject to periodic review e.g., annual licences, during the time that their renewal is under consideration
- Refusals subject to appeal procedures and not yet determined
- Projects authorised but not yet started
- Projects started but not yet completed
- Known projects that do not require external authorisation
- Proposals in adopted plans
- Proposals in finalised draft plans formally published or submitted for final consultation, examination or adoption.

Assessing Likely Significant Effects

2.2.7. A critical part of the HRA Screening process is determining whether the proposals are likely to have a significant effect on European Sites and, therefore, if they will require an Appropriate Assessment. The concept of 'likely significant effect' as embodied in Article 6(3) of the Habitats Directive and regulation 61(1) of the Habitats Regulations is well established in law and guidance and embraces the precautionary principle.

2.2.8. The European Court Waddenzee judgement[12] provides clarification regarding the term 'likely'. It concludes that 'any plan or project not directly connected with or necessary to the management of the site is to be subject to an appropriate assessment of its

[7] Design Manual for Roads and Bridges Volume 11, Section 4: LA 115 Habitats Regulations Assessment (formerly HD 44/09). Online: http://www.standardsforhighways.co.uk/ha/standards/dmrb/vol11/section4/LA%20115%20Habitats%20Regulations%20assessment%20-web.pdf [Accessed 21/10/19].
[8] http://publications.naturalengland.org.uk/category/5755515191689216 [Accessed: 21/10/19].
[9] https://sac.jncc.gov.uk/site/ [Accessed: 21/10/19].
[10] https://designatedsites.naturalengland.org.uk/SiteSearch.aspx [Accessed: 21/10/19].
[11] Tyldesley, D., and Chapman, C., (2013) The Habitats Regulations Assessment Handbook, January 2018 edition UK: DTA Publications Limited www.dtapublications.co.uk.
[12] Case C – 127/02 Waddenzee, reference for a preliminary ruling from the Raad van State: Landelijke Vereniging tot Behoud van de Waddenzee, Nederlandse Vereniging tot Bescherming van Vogels v Staatssecretaris van Landbouw, Natuurbeheer en Visserij, 7th September 2004.

implications for the site in view of the site's conservation objectives if it cannot be excluded, on the basis of objective information, that it will have a significant effect on that site, either individually or in combination with other plans or projects.'

2.2.9. Clarification has also been provided through case law on the meaning of 'likely' in relation to Bagmoor Wind Ltd v The Scottish Ministers[13]. '*The word 'likely' in the regulation is not to be construed as an expression of probability, in a legal sense, but as a description of the existence of a risk (or possibility*).' Consequently, if the possibility of a significant effect cannot be excluded based on objective information, an Appropriate Assessment will be required.

2.2.10. The European Court Waddenzee judgement also provides further clarification regarding the term 'significant': 'where a plan or project not directly connected with or necessary to the management of a site is likely to undermine the site's conservation objectives, it must be considered likely to have a significant effect on that site. The assessment of that risk must be made in the light *inter alia* of the characteristics and specific environmental conditions of the site concerned by such a plan or project.'

2.2.11. The Bagmoor Wind case also provides guidance on the term 'objective.' It states: '*Objective, in this context, means information based on clear verifiable fact rather than subjective opinion*.' The Habitats Regulations Handbook states: "*It will not normally be sufficient for an applicant merely to assert that the plan or project will not have an adverse effect on a site, nor will it be appropriate for a competent authority to rely on reassurances based on supposition or speculation. On the other hand, there should be credible evidence to show that there is a real rather than a hypothetical risk of effects that could undermine the site's conservation objectives. Any serious possibility of a risk that the conservation objectives could be undermined should trigger an 'appropriate assessment'*."

2.2.12. The test for likelihood of significant effects requires that consideration is given to potential impact pathways. This requires information to be obtained on both the Scheme and the European Site. In the absence of a potential impact pathway, it can be concluded that no likely significant effect would arise. Relevant aspects (effects) of the Scheme have been checked against all features of the relevant European Sites (i.e. screened) to determine whether a likely significant effect may arise.

2.2.13. Sources of information may include evidence from projects where similar operations have affected sites with similar qualifying features and conservation objectives and the judgement of relevant specialists that an effect is likely, as well as survey data collected to date for a particular project. In line with the precautionary principle, where there is uncertainty and/or information is lacking in relation to the capacity of the effect to undermine the site's conservation objectives, it must be assumed that there will be an effect, unless further information can be made available to eliminate any areas of doubt.

2.2.14. Supplementary Advice[14] from Natural England describes the measures necessary to achieving the Conservation Objectives for a European site. Based on Supplementary Advice on Conservation Objectives (SACOs), potential effects on the Conservation Objectives for a European site can include, but are not limited to, the following:

- Habitat loss and fragmentation
- Species disturbance (visual, noise, vibration)
- Changes to water quality
- Changes to air quality
- Changes to surface and groundwater hydrology
- Introduction of Invasive Non-Native Species (INNS)
- Recreation.

[13] Bagmoor Wind Limited v The Scottish Ministers, Court of Sessions [2012] CSIH 93.
[14] Natural England. (2015) *Conservation objectives for land-based protected sites in England: how to use the site advice* [online]. Available from <https://www.gov.uk/guidance/conservation-objectives-for-land-based-protected-sites-in-england-how-to-use-the-site-advice> (accessed November 2020).

2.2.15. The implication of the Court of Justice of the European Union (CJEU) judgement referred to as People Over Wind (Peter Sweetman v Coillte Teoranta, Case C-323/17) is that competent authorities cannot take account of any *"measures that are intended to avoid or reduce the harmful effects of the envisaged project on the site concerned"*, when considering at the HRA screening stage whether the plan or project is likely to have an adverse effect on a European Site. The effect of this is that the screening stage must be undertaken on a precautionary basis with no regard to any proposed integrated or additional avoidance or reduction measures. Where the likelihood of significant effects cannot be excluded on the basis of objective information, the competent authority must proceed to carry out an Appropriate Assessment to establish whether the plan or project will affect the integrity of the European Site, which can include at that stage consideration of the effectiveness of the proposed avoidance or reduction measures.

2.2.16. Subsequent case law[15] included a statement that elements that 'are not the mitigating or protective measures which featured in the People Over Wind ruling' and 'are properly characterised as integral features of the project…' should reasonably be included in a HRA screening decision. This view was not subsequently challenged in 2019[16].

2.2.17. Case law in 2017 referred to as the 'Wealden Judgement'[17] prompted Natural England to make their internal guidance on assessing the effects of road traffic emissions on European Sites, public[18]. The guidance provides further information on the in-combination assessment at screening stage with regard to air quality effects.

2.3. Appropriate Assessment

2.3.1. For European sites where LSE is predicted, or it cannot be concluded that there is no LSE, an Appropriate Assessment must be undertaken. The purpose of the Appropriate Assessment is to establish whether there are elements of the project which could have an adverse effect on the integrity of the European sites. The integrity of a European site is defined as:

- "…the coherent sum of the site's ecological structure, function and ecological processes, across its whole area, which enables it to sustain the habitats, complex of habitats and/or populations of species for which the site is designated."[19]

2.3.2. Where necessary, mitigation measures will be put forward to address any adverse effects on integrity of the European sites. These may need to be considered during the designing of the Scheme.

2.3.3. The Appropriate Assessment will:

- Outline the elements of the Scheme that were identified as having an LSE on one or more qualifying features of a European Site;
- Obtain additional desk study data as necessary and characterise the LSE, e.g. whether short/long term, reversible or irreversible, and in relation to the proportion/ importance of the interest affected, and the overall effect on the European Site's Conservation Objectives. This has been done in sufficient detail to ensure all impacts have been considered and sufficiently appraised;
- Assess the effects of the Scheme on the Conservation Objectives of the relevant qualifying features; and,

[15] R (Langton) v SSEFRA & Natural England: [2018] EWHC 2190)
[16] R (Langton) v SSEFRA & Natural England: [2019] EWCA Civ 1562
[17] Case no: CO/3943/2016 – Between Wealden District Council and Secretary of State for Communities and Local Government, Lewes District Council and South Downs National Park Authority and Natural England.
[18] Natural England (2018). Natural England's approach to advising competent authorities on the assessment of road traffic emissions under the Habitats Regulations.
[19] Managing Natura 2000 sites - The provisions of Article 6 of the Habitats Directive 92/43/EEC (2019) Available from <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52019XC0125(07)>. (accessed November 2020).

- Determine whether the integrity of the European site(s) will be affected, taking into account proposed mitigation measures.

3. Identification of European Sites and Coarse Screening

3.1. Scoping the European Sites

3.1.1. Three European Sites have been identified which meet one or more of the screening criteria set out in paragraph 2.2.2. These are detailed below and shown on Figure 7.13A in Appendix A.

Wye Valley and Forest of Dean Bat Sites SAC

3.1.2. The Wye Valley and Forest of Dean Bat Sites SAC is located within 30 km of the Scheme, and supports bats as qualifying features. The SAC represents a complex of 13 component SSSIs on the border between England and Wales. The nearest of the SAC site (Blaisdon Hall SSSI) is located 21 km west of the Scheme. The SAC has a combined total area of approximately 145 ha. Qualifying features of the SAC include:

- 1303 Lesser horseshoe bat (*Rhinolophus hipposideros*) – the greatest concentration of this species in the UK (26% of the national population). The site has been selected on the grounds of the exceptional breeding population, and the majority of sites within the complex are maternity roosts. The bats are believed to hibernate in the many disused mines in the area[20].
- 1304 Greater horseshoe bat (*R. ferrumequinum*) – the site represents the northern part of its range (6% of the UK population). The site contains the main maternity roost for bats in this area, which are believed to hibernate in the many disused mines in the Forest.

Walmore Common SPA/Ramsar

3.1.3. Walmore Common SPA/Ramsar has been included as there is the potential for functionally linked land associated with this European Site to be affected by the Scheme. Walmore Common SPA/Ramsar is located 17.5 km south west of the Scheme. The site has a combined total area of 53 ha, consisting of damp grassland and ditches which flood regularly during the winter. This site qualifies under Article 4.1 of the Directive (79/409/EEC) by supporting populations of European importance of the following species listed on Annex I of the Directive:

- Wintering Bewick's swan (*Cygnus columbianus bewickii*) – Walmore Common historically supported internationally important numbers of Bewick's swans during the winter months, and when the SPA was classified in 1991 it represented 3% of the total British wintering population and 1.5% of the European's population (104 birds). The population has since declined significantly to a five-year peak mean of 55 individuals in 2000/1-2004/05[21]. 1.4% of the wintering population in Great Britain (5-year peak mean 1991/2 - 1995/6).

Severn Estuary SAC/SPA/Ramsar

3.1.4. All watercourses which are crossed by the scheme (River Chelt, Leigh Brook, and their tributaries) eventually flow into the River Severn, which is approximately 7.5 km downstream from the closest Scheme interaction. From the nearest confluence point, where the River Chelt joins the River Severn, just upstream of Wainlode Cliff, the Severn

[20] sac.jncc.gov.uk/site/UK0014794
[21] Natural England (October 2018) European Site Conservation Objectives: Supplementary Advice on Conserving and Restoring Site Features. Walmore Common Special Protection Area (SPA). Site code UK9007051.

Estuary SAC/SPA/Ramsar designations boundary is a further 40 km downstream (a total distance of approximately 47.5 km downstream of the Scheme).

3.1.5. The Severn Estuary is designated as a SAC, SPA and Ramsar.

3.1.6. Qualifying features of the SAC include[22]:

- 1130 Estuaries – one of the best areas in the UK
- 1140 Mudflats and sandflats not covered by seawater at low tide – one of the best areas in the UK
- 1330 Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) – one of the best areas in the UK
- 1110 Sandbanks which are slightly covered by seawater all the time – the site is thought to support a significant presence of this habitat
- 1170 Reefs – the site is thought to support a significant presence of this habitat
- 1095 Sea lamprey (*Petromyzon marinus*) – one of the best areas in the UK
- 1099 River lamprey (*Lampetra fluviatilis*) – one of the best areas in the UK
- 1103 Twaite shad (*Alosa fallax*) – one of the best areas in the UK.

3.1.7. Qualifying features of the SPA include[23]:

- This site qualifies under Article 4.1 of the Directive (79/409/EEC) by supporting populations of European importance of the following species listed on Annex I of the Directive:
- Wintering Bewick's swan – 280 individuals representing at least 4.0% of the wintering population in Great Britain (5 year peak mean 1991/2 - 1995/6).
- The site also qualifies under Article 4.2 of the Directive (79/409/EEC) by supporting populations of European importance of the following migratory species:
- Passage population of ringed plover (*Charadrius hiaticula*) – 655 individuals representing at least 1.3% of the Europe/Northern Africa wintering population (5 year peak mean 1991/2 - 1995/6).
- Wintering population of curlew (*Numenius arquata*) – 3903 individuals representing at least 1.1% of the wintering Europe population -breeding population (5 year peak mean 1991/2 - 1995/6).
- Wintering population of dunlin (*Calidris alpina alpina*) – 44,624 representing at least 3.2% of the wintering Northern Siberia/Europe/Western Africa population (5 year peak mean 1991/2 - 1995/6).
- Wintering population of pintail (*Anas acuta*) – 599 individuals representing at least 1.0% of the wintering Northwestern Europe population (5 year peak mean 1991/2 - 1995/6),
- Wintering population of redshank (*Tringa totanus*) – 2330 individuals representing at least 1.6% of the wintering Eastern Atlantic - wintering population (5 year peak mean 1991/2 - 1995/6).
- Wintering population of shelduck (*Tadorna tadorna*) – 3330 individuals representing at least 1.1% of the wintering Northwestern Europe population (5 year peak mean 1991/2 - 1995/6).
- Regular assemblages of over 20,000 wildfowl[24], which qualify the site as a wetland of international importance. Over winter, the area regularly supports

[22] https://sac.jncc.gov.uk/site/UK0013030
[23] Stroud, D.A., Chambers, D., Cook, S., Buxton, N., Fraser, B., Clement, P., Lewis, P., McLean, I., Baker, H. & Whitehead, S. (eds). 2001. The UK SPA network: its scope and content. JNCC, Peterborough.
[24] Over winter, the area regularly supports 93,986 individual waterfowl (5 year peak mean 1991/2 - 1995/6), including: gadwall (*Anas strepera*), shelduck, pintail, dunlin, curlew, redshank, Bewick's swan, wigeon (*Anas penelope*), lapwing (*Vanellus vanellus*), teal (*Anas crecca*), mallard (*Anas platyrhynchos*), shoveler (*Anas clypeata*), pochard (*Aythya ferina*), tufted duck (*Aythya fuligula*), grey plover (*Pluvialis squatarola*), white-fronted goose (*Anser albifrons albifrons*) and whimbrel (*Numenius phaeopus*).

93,986 individual waterfowl (5 year peak mean 1991/2 - 1995/6) including: gadwall, shelduck, pintail, dunlin, curlew, redshank, Bewick's swan, wigeon, lapwing, teal, mallard, shoveler, pochard, tufted duck, grey plover, white-fronted goose.

3.1.8. Qualifying features of the Ramsar include[25]:

- Estuarine habitats (Ramsar Criterions 1 and 3)
- Migratory fish (Ramsar Criterions 4 and 8) including:
- Atlantic salmon
- Sea trout
- Sea lamprey
- River lamprey
- Allis shad
- Twaite shad
- European eel
- The fish of the whole estuarine and river system is one of the most diverse in Britain, with over 110 species recorded. Salmon, sea trout, sea lamprey, river lamprey, allis shad, twaite shad and European eel use the Severn Estuary as a key migration route to their spawning grounds in the many tributaries that flow into the estuary[26]. The site is important as a feeding and nursery ground for many fish species particularly allis shad and twaite shad. In addition, the Severn Estuary has the largest European eel run in Great Britain[27].
- Internationally important populations of wintering birds (Ramsar Criterion 6) including:
- Tundra swan
- Bewick's swan
- White fronted-goose
- Shelduck
- Gadwall
- Dunlin
- Common redshank
- Wintering waterfowl assemblage of international importance (Ramsar Criterion 5)
- Breeding lesser black-backed gull (*Larus fuscus graellsii*) was identified subsequent to designation for possible future consideration under Ramsar Criterion 6 - 4167 apparently occupied nests representing an average of 2.8% of the western Europe/Mediterranean/west African breeding population (Seabird 2000 Census).

3.2. Coarse Screening

Wye Valley and Forest of Dean Bat Sites SAC

3.2.1. Wye Valley and Forest of Dean Bat Sites SAC is located 21 km from the Scheme at the closest point, separated by towns, villages and major roads. This is well beyond the zone of influence for any Scheme impacts relating to direct habitat loss, habitat degradation, habitat fragmentation or disturbance (via noise/vibration or artificial lighting).

3.2.2. The distance is also considered to be too great for there to be a significant functional linkage between the Scheme and the qualifying feature bat populations. This is because

[25] https://jncc.gov.uk/jncc-assets/RIS/UK11081.pdf
[26] Natural England and the Countryside Council for Wales (2009). The Severn Estuary/Mor Hafren European Marine Site
[27] Natural England and the Countryside Council for Wales (2009). The Severn Estuary/Mor Hafren European Marine Site

the distance is at least seven times larger than the core sustenance zones[28] identified by the Bat Conservation Trust (BCT)[29] for lesser horseshoe bats (2 km) and greater horseshoe bats (3 km)[30].

3.2.3. In terms of bat behaviour in this SAC specifically, flight lines and feeding grounds within the wider ecological network are critical in supporting the SAC. Lesser horseshoe bats tend to forage within two to three kilometres of their roost, with density of bats associated with the SAC declining sharply after this[31]. In the winter, the foraging range is thought to be around half this. A conservation objective of the SAC is to maintain a wide area of supporting habitat for bats, with the Site Improvement Plan[32] suggesting the creation of a feeding area of a radius of approximately 4 km around maternity roosts[33]. A radiotracking study of greater horseshoe bats in Dean Hall, a constituent SSSI of the SAC, found that bats forage up to 9 km from the roost using a number of night roosts during the feeding period[34]. At a distance of 21 km at the nearest point, these foraging areas for bats associated with the SAC are significantly less than this.

3.2.4. In fragmented areas, linear features are essential for providing corridors between foraging areas for the lesser and greater horseshoe bat populations that this SAC supports[35]. There is no continuous connectivity such as hedgerows or watercourses between the SAC and the Scheme. Furthermore, greater horseshoe bats are vulnerable to the effects of urbanisation and use of insecticide, therefore are less likely to be found in the more urban areas associated with the Scheme[36].

3.2.5. In addition, the SAC is beyond the ARN for the Scheme, and as a result will not be impacted by air quality pollution impacts.

3.2.6. The site has been scoped out from further assessment, as it is considered that there is no route or mechanism for a LSE on the interest features and therefore the integrity of the site. Given the fact no impacts are anticipated on this site, the potential for in combination effects with other plans or projects was also ruled out. Further detail is included in the Screening Matrix in Appendix B.

Walmore Common SPA/Ramsar

3.2.7. Walmore Common SPA and Ramsar is located 17.5 km south west of the Scheme. Although this is a considerable distance, the agricultural habitats present within the Scheme extent have the potential to support the qualifying populations of Bewick's swan which are associated with the SPA. It is therefore not considered appropriate to rule out an LSE on the Walmore Common SPA at this Coarse Screening stage, and it has therefore been subject to further, more detailed assessment for screening in Section 4 of this report.

Severn Estuary SAC/SPA/Ramsar

3.2.8. The Scheme has direct hydrological connection to the Severn Estuary designations. There is potential for functional linkage between the Scheme and the qualifying feature

[28] The area surrounding a communal bat roost within which habitat availability and quality will have a significant influence on the resilience and conservation status of the colony using the roost.
[29] Collins, J. (ed.) (2016) Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd edn). The Bat Conservation Trust, London.
[30] CSZs specific to the Wye Valley and Forest of Dean Bat Sites SAC have not been published.
[31] Countryside Council for Wales (2008). Core Management Plan Including Conservation Objectives for Wye Valley and Forest of Dean Bat SAC
[32] Improvement Programme for England's Natura 2000 Sites (2015). Site Improvement Plan: Wye Valley and the Forest of Dean Bat Sites
[33] Improvement Programme for England's Natura 2000 Sites (2015). Site Improvement Plan: Wye Valley and the Forest of Dean Bat Sites
[34] Improvement Programme for England's Natura 2000 Sites (2015). Site Improvement Plan: Wye Valley and the Forest of Dean Bat Sites
[35] Countryside Council for Wales (2008). Core Management Plan Including Conservation Objectives for Wye Valley and Forest of Dean Bat SAC
[36] Countryside Council for Wales (2008). Core Management Plan Including Conservation Objectives for Wye Valley and Forest of Dean Bat SAC

populations of migratory fish, as these species can all migrate over 40 km upstream where there are no barriers, such as weirs or waterfalls[37,38]. In addition, there is also a possible functional linkage between the Scheme and the qualifying bird species that the Ramsar supports. It is therefore not considered appropriate to rule out an LSE on the Severn Estuary SAC, SPA or Ramsar site at this Coarse Screening stage, and it has therefore been subject to further, more detailed assessment for screening in Section 4 of this report.

[37] Maitland, P.S. (2003). Ecology of the River, Brook and Sea Lamprey. Conserving Natura 2000 Rivers Ecology Series No. 5. English Nature, Peterborough.
[38] Maitland, P.S. & Hatton-Ellis, T.W. (2003). Ecology of the Allis and Twaite Shad. Conserving Natura 2000 Rivers Ecology Series No. 3. English Nature, Peterborough.

4. Stage 1: Screening for Likely Significant Effects

4.1. Walmore Common SPA/Ramsar

4.1.1. Further details on Walmore Common SPA/Ramsar are presented in the Screening Matrix in Appendix C and Appendix D.

Baseline Survey Information

4.1.2. Monthly wintering and migratory bird surveys were undertaken within 250 m of the Scheme from September 2019 to March 2020 inclusive.

4.1.3. The method employed for wintering bird surveys broadly conformed to that used for the Common Bird Census (CBC) survey, devised and run between 1962 and 2000 by the British Trust for Ornithology (BTO) as detailed in in Gilbert et al. (1998) and Bibby et al. (2000)[39]. CBC uses a mapping method in which a series of visits are made to a site during the wintering season, and observations of birds, by sight or sound, are recorded on a map during a walked transect.

4.1.4. Seven survey visits were carried out, one each month from September 2019 to March 2020. This was considered proportionate for a relatively localised road improvement Scheme, allowing sufficient observations of birds to produce clusters of registrations and minimising the risk of overlooking scarce and/or priority species. Eight representative transects of varying lengths were surveyed, which gave suitable coverage of the study area. Six of these transects are within the study area of the current Scheme. The direction in which the transect was walked was varied between visits to optimise detection and minimise recording bias.

4.1.5. The surveyor, with the aid of binoculars, recorded all observations of birds by either sight or sound by walking through the Survey Area at a slow and steady pace. The positions of the recorded birds were plotted as accurately as possible on a suitably scaled base map, i.e. a 'visit map'. Standard BTO codes and symbols were used for mapping species (including sex and age, e.g. juvenile, immature or adult) and bird activity where relevant (including foraging, loafing and in flight).

4.1.6. During the surveys, no Bewick's swans, the qualifying feature of the SPA, were identified.

4.1.7. Gloucestershire Centre for Environmental Records (GCER) was contacted to obtain recent records[40] of protected and notable species within 1 km of the Scheme. No records of Bewick's swan were provided. In addition, a review of existing literature was conducted, which indicated that the agricultural grassland habitats surrounding the Scheme are not key areas for populations of Bewick's swan[41].

Stage 1 Screening Conclusions

4.1.8. No functional linkage between Walmore Common SPA/Ramsar and the Scheme study area has been identified, and therefore no likely significant effects have been identified for the Walmore Common SPA/Ramsar. Given the fact that no impacts are anticipated on this site, the potential for in combination effects with other plans or projects was also ruled out.

[39] Gilbert, G., Gibbon, D.W. and Evans J. (1998). Bird Monitoring Methods: A Manual of Techniques for Key UK Species. Royal Society for the Protection of Birds, The Lodge, Sandy, Bedfordshire; Bibby C.J. Burgess, N.D. Hill D.A. Mustoe S. and Lambton S. (2000). Bird Census Techniques. Academic Press London
[40] Records of observations within the last 10 years.
[41] Robinson, JA, K Colhoun, JG McElwaine & EC Rees (2004). Bewick's Swan *Cygnus columbianus bewickii* (Northwest Europe population) in Britain and Ireland 1960/61 – 1999/2000. Waterbird Review Series, The Wildfowl & Wetlands Trust/Joint Nature Conservation Committee, Slimbridge.

4.2. Severn Estuary SAC/SPA/Ramsar

4.2.1. Further details on the designations are presented in the Screening Matrix in Appendices E, F and G.

Baseline Survey Information

Bird Surveys

4.2.2. Monthly wintering and migratory bird surveys were undertaken within 250 m of the Scheme from September 2019 to March 2020 inclusive, as described under Section 4.2, above.

4.2.3. During these surveys, two qualifying species of the Severn Estuary SPA were recorded: lapwing (two individuals) and mallard (peak count of nine individuals).

4.2.4. A recent study[42] was also reviewed, which identifies functionally linked land associated with the Severn Estuary SPA. The maps which accompany this study do not identify that these species regularly move between the SPA and the study area. However, the study also indicates that lapwing have been recorded within the Survey Area (in the vicinity of Boddington Manor Farm, adjacent to the Scheme) in numbers which reached or exceeded the equivalent of the 1% SPA population criterion for importance on at least one occasion.

4.2.5. Lesser black-backed gull were recorded in reasonably high numbers on one occasion (a peak count of 148 in September 2019).

Fish Surveys

4.2.6. No Environment Agency data was available from within the last five years from within 2 km of the Scheme. However, a review of Environment Agency fish data from a wider area from the last ten years was undertaken. Six sites were identified on the River Chelt which have been surveyed within the last ten years. All six of these sites were identified as supporting varying life stages of European eel. This is summarised in the table below.

Table 4-1 - Review of Environment Agency Sites

Site ID	Description	Qualifying Species Present
10409	6.5 km upstream of the existing M5 crossing with the River Chelt. Last survey conducted on 22nd July 2014	European eel
51163	5.4 km downstream from the existing M5 crossing on the River Chelt. Last surveyed 11th September 2013	European eel
51183	1.6 km upstream from the existing M5 crossing with the River Chelt. Last surveyed 11th September 2013	European eel
51184	1.7 km upstream from the existing M5 crossing with the River Chelt. Last surveyed 11th September 2013	European eel
54023	4.9 km downstream from the existing M5 crossing with the River Chelt. Last surveyed 23rd July 2014	European eel elvers European glass eels

[42] Link Ecology Ltd (September 2020) Identification of land with proven or possible functional linkages with the Severn Estuary SSSI/SPA Phase 5 (Gloucestershire and Worcestershire) A report to Natural England.

Site ID	Description	Qualifying Species Present
56463	5.4 km upstream from the existing M5 crossing with the River Chelt. Last surveyed 22nd July 2014	European eel elvers

4.2.7. The aquatic walkover survey, undertaken on the 23 and 24 July 2019, focused around the point of interaction with the Scheme (i.e. proposed crossing point of a watercourse) and, where feasible, 250 m up and downstream of these interactions.

4.2.8. During the walkover survey, habitat characteristics were recorded broadly following habitat descriptors outlined in the River Habitat Survey (RHS) methodology[43], which includes substrates, vegetation types, flow types, approximate channel dimensions and presence of artificial features (channel/bank re-sectioning and/or existing crossing structures, weirs or outfalls).

4.2.9. Following review of background records, other scheme data, and observations from the walkover survey, further detailed aquatic species and habitat surveys were undertaken on watercourses which exhibited suitable habitat considered likely to support valuable assemblages of aquatic species. These surveys included:

- River Habitat Survey (RHS)[44]
- River Corridor Survey (RCS)[45]
- Macrophytes (LEAFPACS)
- Macroinvertebrates[46]
- Fish (electric fishing)[47]

4.2.10. Surveys conducted on the River Chelt in 2020 identified the presence of European eel at two locations (SO 90140 24760 - SO 90053 24787 and SO 90645 24606 – SO 90518 24634) on 28 and 29 July 2020.

4.2.11. Two brook/river lamprey ammocoetes (young/larvae) were recorded in the downstream survey site (SO 90140 24760 – SO 90053 24787) on 29 July 2020. It is difficult to distinguish between brook and river lamprey when in the ammocoete stage. As a precaution, they are assumed to be river lamprey.

4.2.12. Of the watercourses that would be directly affected by the Scheme, only the River Chelt is considered to provide suitable spawning and recruitment habitat for fish. All the other watercourses, including Leigh Brook, are heavily modified drainage ditches and are not considered to provide suitable habitat for qualifying features of the SAC/Ramsar.

Construction and Operation Phase Impacts

4.2.13. There is potential functional linkage between the agricultural grassland habitats within and surrounding the Scheme and the wintering and migratory bird qualifying species of the Severn Estuary SPA/Ramsar. As such, there is the potential for temporary/permanent loss of functionally linked land outside of a designated site but used by qualifying features of the designated site.

[43] Environment Agency (2003) River Habitat Survey in Britain and Ireland - Field Survey Guidance Manual and National Rivers Authority (1992). River Corridor Surveys: Methods and Procedures.
[44] Environment Agency, 2003. River Habitat Survey in Britain and Ireland. Field Survey Guidance Manual.
[45] National Rivers Authority, 1992. River Corridor Surveys: Methods and Procedures. Conservation Technical Handbook.
[46] Aquatic macroinvertebrate samples were collected using a standard three-minute kick-sampling technique in accordance with River Invertebrate Prediction & Classification Systems (RIVPACS) standard sampling protocols. RIVPACS is the model implemented within the RICT (River Invertebrate Classification Tool) used by the Environment Agency to determine WFD invertebrate classifications. Reference: EU Star UK (2006) RIVPACS Macroinvertebrate Sampling Protocol. Available at: http://www.eu-star.at/pdf/RivpacsMacroinvertebrateSamplingProtocol.pdf (accessed April 2021)
[47] UKTAG (2008). River Assessment Methods: Fish Fauna (Fisheries Classification Scheme 2) by Water Framework Directive - United Kingdom Technical Advisory Group (WFD-UKTAG): https://www.wfduk.org/sites/default/files/Media/Characterisation%20of%20the%20water%20environment/Biological%20Method%20Statements/river%20fish.pdf

4.2.14. Works required during construction and operation have the potential to disturb qualifying bird species using functionally linked land in the vicinity of the Scheme through noise, vibration, lighting and/or visual disturbance.

4.2.15. Habitat loss and disturbance could also result in habitat fragmentation/barrier effects, with qualifying bird species unable to disperse or move through their environment as a result of habitat severance or deterred from using normal routes to feeding/roosting/breeding grounds.

4.2.16. Changes in air quality may have an adverse effect on sensitive habitats within designated sites, or within functionally linked land, and consequent ecological effects on qualifying bird species that rely on these habitats. Such impacts may arise from dust from construction related activities, or vehicle exhaust emissions of oxides of nitrogen (NOx) from construction traffic, particularly heavy-duty vehicles. Operational phase air quality impacts may arise as a result of increases in traffic volume.

4.2.17. There is potential for functional linkage between the Scheme and the qualifying feature fish populations of the SAC/Ramsar, as these species can all migrate over 40 km upstream where there are no barriers such as weirs or waterfalls[48]. Desk study data and fish surveys have confirmed the presence of European eel, a feature of the Severn Estuary Ramsar, and river lamprey, a feature of the Severn Estuary SAC and Ramsar, within the River Chelt within the Scheme. As such, there is potential for short-term impacts to these species within or surrounding the Scheme as a result of noise or vibration disturbance during construction of the new Link Road, in particular the construction of the new bridge over the River Chelt. The new bridge abutments will be set back from the banks of the River Chelt by 4 m. Foundation design work is still ongoing, but it is assumed that piling will be required in the construction of the bridge. In addition, a temporary River Chelt crossing will be required during construction. Although there will be no new permanent in-river structures that would impact on passage of European eel and river lamprey along the River Chelt, disturbance during construction could result in habitat fragmentation/barrier effects, with European eel and river lamprey unable to disperse or move along the River Chelt as a result of such disturbance. During the desk study and fish surveys, no other qualifying fish species were identified. On this basis, other qualifying fish species are assumed to be absent, or present in only low numbers.

4.2.18. There is potential for hydrological impacts to habitats within designated sites, or to functionally linked habitats. Given the direct hydrological connection between the Scheme and the Severn Estuary SAC/SPA/Ramsar (as all watercourses which are crossed by the Scheme, including the River Chelt, Leigh Brook and their tributaries, eventually flow into the River Severn) there is potential for impacts to downstream qualifying habitats and species within the SAC, and downstream habitats within the SPA/Ramsar that support qualifying species. There is also the potential for impacts to fish, particularly European eel and river lamprey, and functionally linked habitat within or surrounding the Scheme as a result of a pollution event during construction and operation. Such impacts could arise through changes to water quality as a result of mobilization of suspended sediments leading to silt laden runoff entering watercourses; and potential for accidental contamination associated with the spillage or leakage of fuels, lubricants and other chemicals required for construction. In particular, such impacts could occur during the construction of the new bridge over the River Chelt, the temporary River Chelt crossing, and the extension of the Leigh Brook culvert.

Detailed Assessment of Likely Significant Effects

4.2.19. Table 4-3 below investigates the potential impacts identified on the qualifying features of the Severn Estuary SAC/SPA/Ramsar, using existing information about the Scheme and taking into account the baseline survey information described above. To avoid repetition

[48] Maitland, P.S. (2003). Ecology of the River, Brook and Sea Lamprey. Conserving Natura 2000 Rivers Ecology Series No. 5. English Nature, Peterborough.

as far as possible, qualifying features are grouped into habitats, migratory fish and wintering and passage birds.

Table 4-2 - Assessment of Likely Significant Effects for Severn Estuary SAC/SPA/Ramsar

Qualifying Feature	Potential Impacts	Potential exposure to hazard and mechanism of effect/impact if known	Potential for LSE
Habitats within the SAC/Ramsar site designation (Estuaries, mudflats and sandflats, Atlantic salt meadows, sandbanks, reefs)	Hydrological impacts to downstream qualifying habitats within the SAC/Ramsar, which also support qualifying species, as a result of a pollution event during construction and operation	The habitats associated with the River Severn designation are greater than 40 km downstream of the Scheme. Although there is a direct hydrological connection between the Scheme and the Severn Estuary SAC, at such a distance, it is considered that the potential for direct impacts via release of pollutants from the Scheme during construction and operation would be eliminated by dilution. DMRB guidance LA 113 states that "for assessment of impacts associated with soluble pollutants, outfalls within 1 km (measured along the watercourse) shall be aggregated for the purposes of cumulative assessment[49]". It therefore follows that soluble pollutants are considered to be sufficiently diluted beyond 1 km. Although not relied upon for the screening conclusions, pollution prevention methods will be in place including standard water protection measures to avoid chemical or sediment pollution of any watercourses. Works will proceed following standard good practice working methods for environmental protection which will adhere to the Guidance for Pollution Prevention (GPPs)[50] and the Construction Industry Research and Information Association[51] (CIRIA) C715 Environmental good practice. These will be secured via a CEMP. The drainage strategy to be implemented by the Scheme incorporates Sustainable Drainage Systems (SuDS) to mitigate the pollution risk associated with road runoff as well as accidental spills. However, given the relatively small size of the proposed works in comparison with the distance, size and mixing of the receptor designations, risks of significant spillage of chemical contaminant or silt pollution could be discounted even without any additional pollution controls.	No
	Changes in air quality to qualifying habitats within the SAC/Ramsar during construction and operation	The Institute of Air Quality Management (IAQM) guidance document 'Guidance on the assessment of dust from demolition and construction[52]' states that where an ecological receptor is beyond 50 m of the boundary of the site, or beyond 50 m of the route(s) used by construction vehicles on the public highway, up to 500 m from the site entrance(s), no significant effect as a result of dust is likely. DMRB guidance[53] states that at a distance of beyond 200 m from a construction activity, construction dust risk potential is minimal. The designated site is beyond such distances. The SAC/Ramsar is more than 200 m from the ARN for the Scheme, and as a result will not be impacted by air quality pollution impacts during operation.	No
Migratory fish species that are qualifying features of the SAC/Ramsar (Sea lamprey, river lamprey, twaite shad, Atlantic salmon, sea trout, Allis shad, European eel)	Hydrological impacts to functionally linked habitat within the River Chelt as a result of a pollution event during construction and operation	Survey results and desk study records indicate that European eel and river lamprey are present in the vicinity of the Scheme. In the absence of mitigation, pollution impacts as a result of the Scheme could impact migratory European eel associated with the Severn Estuary Ramsar designation and river lamprey associated with the Severn Estuary SAC and Ramsar designations.	Yes
	Disturbance to qualifying fish species using functionally linked habitat within the River Chelt as a result of noise or vibration disturbance during construction. Such impacts could also result in habitat fragmentation/barrier effects	Survey results and desk study records indicate that European eel and river lamprey are present in the vicinity of the Scheme. In the absence of mitigation, disturbance impacts as a result of the Scheme during construction could impact migratory European eel associated with the Severn Estuary Ramsar designation and river lamprey associated with the Severn Estuary SAC and Ramsar designations. The Scheme will not introduce a physical barrier to fish migration.	Yes

[49] Highways England (2020). Design Manual for Roads and Bridges LA 113 Road drainage and the water environment.
[50] https://www.netregs.org.uk/environmental-topics/guidance-for-pollution-prevention-gpp-documents/guidance-for-pollution-prevention-gpps-full-list/
[51] CIRIA (2006), CIRIA C648 Control of water pollution from linear construction projects Technical guidance. London.
[52] Institute of Air Quality Management (IAQM) (2014) Guidance on the assessment of dust from demolition and construction activities
[53] Highways England (2019). Design Manual for Roads and Bridges. LA 105 Air Quality

Qualifying Feature	Potential Impacts	Potential exposure to hazard and mechanism of effect/impact if known	Potential for LSE
Wintering and migratory birds that are qualifying features of the SPA/Ramsar (Bewick's swan, ringed plover, curlew, dunlin, pintail, redshank, shelduck, gadwall, wigeon, lapwing, teal, mallard, shoveler, pochard, tufted suck, grey plover, white-fronted goose, tundra swan, black backed gull)	Hydrological impacts to supporting habitats within designated sites, or to functionally linked habitats as a result of a pollution event during construction and operation	The habitats associated with the River Severn designation are approximately 40 km downstream of the Scheme. Although there is a direct hydrological connection between the Scheme and the Severn Estuary SAC, at such a distance, it is considered that the potential for direct impacts via release of pollutants from the Scheme during construction and operation would be eliminated by dilution. Although not relied upon for the screening conclusions, pollution prevention methods will be in place including standard water protection measures to avoid chemical or sediment pollution of any watercourses. Works will proceed following standard good practice working methods for environmental protection which should adhere to GPPs[54] and the CIRIA C715 Environmental good practice. These will be secured via a CEMP. The drainage strategy to be implemented by the Scheme incorporates SuDS to mitigate the pollution risk associated with road runoff as well as accidental spills[55]. However, given the relatively small size of the proposed works in comparison with the distance, size and mixing of the receptor designations, risks of significant spillage of chemical contaminant or silt pollution could be discounted even without any additional pollution controls. As discussed above, the results of the wintering and migratory bird surveys and desk study indicate that qualifying bird species do not regularly use or are dependent on the habitat in the vicinity of the Scheme.	No
	Changes in air quality to supporting habitats within designated sites, or to functionally linked habitats during construction and operation	The Institute of Air Quality Management (IAQM) guidance document 'Guidance on the assessment of dust from demolition and construction[56]' states that where an ecological receptor is beyond 50 m of the boundary of the site, or beyond 50 m of the route(s) used by construction vehicles on the public highway, up to 500 m from the site entrance(s), no significant effect as a result of dust is likely. DMRB guidance[57] states that at a distance of beyond 200 m from a construction activity, construction dust risk potential is minimal. The designated site is beyond such distances, and the results of the wintering and migratory bird surveys and desk study indicate that qualifying bird species do not regularly use or are dependent on the habitat in the vicinity of the Scheme. The SPA/Ramsar is more than 200 m from the ARN for the Scheme, and as a result will not be impacted by air quality pollution impacts during operation.	No
	Temporary/permanent loss of functionally linked land; disturbance to qualifying bird species using functionally linked land; habitat fragmentation/barrier effects	The wintering and migratory bird surveys recorded two qualifying species of the Severn Estuary SPA: lapwing (two individuals) and mallard (peak count of nine individuals). Given the low numbers recorded they are unlikely to be a significant component of the SPA populations. Furthermore, at this distance from the SPA (located over 20 km south west of the Scheme at the nearest point), it is considered highly unlikely that the individuals recorded within the study area are part of the SPA qualifying feature populations. The maps that accompany a recent study[58] that was reviewed do not identify that these species regularly move between the SPA and the study area. However, the study also indicates that lapwing have been recorded within the Survey Area (in the vicinity of Boddington Manor Farm, adjacent to the Scheme) in numbers which reached or exceeded the equivalent of the 1% SPA population criterion for importance on at least one occasion. No lapwing were recorded at this location during the wintering and passage bird surveys, and as the study indicates that there are no regular movements between the SPA and this location it is therefore considered that this area is not regularly used by or of significant importance for lapwing. Lesser black-backed gull recorded in reasonably high numbers on one occasion (a peak count of 148 in September 2019). It is considered that these individuals are likely to be from breeding populations within urban areas such as Cheltenham and/or Gloucester, which are closer to the Scheme than the Ramsar site breeding colonies at Steep Holm and Flat Holm[59] (approximately 90 km south west). Cheltenham Borough Council states that "Lesser Black-Backed Gulls nest in the residential areas of Cheltenham and on industrial units in the Kingsditch area"[60]. The JNCC Seabird Monitoring Programme online database states that the Gloucestershire Urban Gulls Cheltenham site (85627) supported 273 lesser black-backed gull apparently occupied territories in 2011 (year of last count) and the Gloucester City: Gloucester site (86737) supported 2230 lesser black-backed gull apparently occupied nests in 2009 (year of last count)[61]. It follows that the lesser black-backed gulls recorded are unlikely to be part of the Ramsar qualifying feature population. The habitats within the Survey Area are not considered to provide a role in maintaining the SPA or Ramsar populations or functionally linked to any SPAs or Ramsar sites.	No

[54] https://www.netregs.org.uk/environmental-topics/guidance-for-pollution-prevention-gpp-documents/guidance-for-pollution-prevention-gpps-full-list/
[55] CIRIA (2006), CIRIA C648 Control of water pollution from linear construction projects Technical guidance. London.
[56] Institute of Air Quality Management (IAQM) (2014) Guidance on the assessment of dust from demolition and construction activities
[57] Highways England (2019). Design Manual for Roads and Bridges. LA 105 Air Quality
[58] Link Ecology Ltd (September 2020) Identification of land with proven or possible functional linkages with the Severn Estuary SSSI/SPA Phase 5 (Gloucestershire and Worcestershire) A report to Natural England.
[59] Burton, N.H.K., Musgrove, A.J., Rehfisch, M.M., and Clark N.A. (2010) Birds of the Severn Estuary and Bristol Channel: Their current status and key environmental issues. Marine Pollution Bulletin 61 (2010) 115–123
[60] Cheltenham Borough Council (2018) Urban Gulls Scrutiny Task Group Report. Available at https://democracy.cheltenham.gov.uk/documents/s27390/2018_12_04_CAB_Urban_Gulls_scrutiny_report.pdf
[61] Available at https://app.bto.org/seabirds/public/index.jsp

4.3. Conclusion of Stage 1 Screening

4.3.1. The evidence presented in this report indicates that: hydrological impacts to functionally linked habitat within the River Chelt as a result of a pollution event during construction and operation, and consequent detrimental effects to migratory European eel and river lamprey associated with the Severn Estuary Ramsar and SAC cannot be ruled out. In addition, disturbance impacts to migratory European eel and river lamprey associated with the Severn Estuary Ramsar and SAC using functionally linked habitat within the River Chelt during construction cannot be ruled out. The screening assessment has concluded that without mitigation, there is potential for LSE to occur on European eel, a qualifying feature of the Severn Estuary Ramsar designation, and river lamprey, a qualifying feature of the Severn Estuary SAC and Ramsar designations. On the basis of the above assessment, LSE alone cannot be ruled out. Therefore, an Appropriate Assessment is required.

4.3.2. LSE alone has been ruled out for the remaining potential impacts identified in Table 4-2. Consideration has been given to whether there is potential for LSE in combination with other projects and plans, in relation to the following potential impacts:

- Hydrological impacts to downstream qualifying habitats, or supporting habitats, within the Severn Estuary SAC/SPA/Ramsar.
- Changes in air quality to qualifying habitats within the SAC/Ramsar, or supporting habitats within the SAC/Ramsar/SPA, or to functionally linked habitats.
- Loss of functionally linked habitat used by qualifying SPA/Ramsar bird species; disturbance to qualifying bird species using functionally linked land and habitat fragmentation/barrier effects to qualifying bird species.

4.3.3. As discussed in Table 4-2, hydrological impacts via the release of pollutants from the Scheme into the watercourse network upstream of the Severn Estuary designations would be eliminated by dilution over the distance of at least 40 km that any pollutants would have to travel. The Scheme would therefore not add to any water quality effects associated with other plans or projects.

4.3.4. As discussed in Table 4-2, the potential for changes in air quality to qualifying habitats within the SAC/Ramsar, or supporting habitats within the SAC/Ramsar/SPA, or to functionally linked habitats, has been discounted. This is on the basis of the distance between the designated sites and any construction activity and the ARN, and the results of the wintering and migratory bird surveys, which indicate that habitats in the vicinity of any construction activity and the ARN are not functionally linked to the Severn Estuary SPA/Ramsar designations. The Scheme would therefore not add to any air quality effects associated with other plans or projects.

4.3.5. As discussed in Table 4-2, the habitats within the Survey Area are not considered to provide a role in maintaining the SPA or Ramsar populations of qualifying bird species, or functionally linked to any SPAs or Ramsar sites. The Scheme would therefore not add to any effects on qualifying bird features associated with other plans or projects.

5. Appropriate Assessment

5.1.1. This section presents information required for an Appropriate Assessment of the LSE on the European sites in view of their Conservation Objectives and to make a decision, based on evidence, whether the integrity of the European sites will be adversely affected.

5.1.2. The HRA Screening assessment concluded that in the absence of mitigation, pollution impacts to the River Chelt during construction and operation, and disturbance impacts to qualifying European eel and river lamprey using the River Chelt during construction may have an LSE on these qualifying species of the Severn Estuary SAC and Ramsar site.

5.1.3. The following sections provide a more detailed examination of the potential effects arising from the Scheme on the qualifying features identified above and, where appropriate, outlines suitable mitigation and concludes as to whether the Scheme will have an adverse effect on the integrity of the European sites, taking into consideration such mitigation.

5.2. European Eel and River Lamprey

5.2.1. European eels are critically endangered[62], with raised pollution levels cited as a major cause of their decline[63]. The river lamprey has declined in Britain over the last hundred years and although not yet classified as threatened, the species has disappeared from many rivers due to pollution, river engineering and various impassable barriers (weirs, dams, etc.) [64]. Pollution impacts could result in injury or mortality to European eels and river lamprey, or their prey species, or damage functionally linked habitat within the River Chelt.

5.2.2. Disturbance to European eel within the River Chelt could occur when this species is migrating upstream between February and July, or downstream between October and November, as a result of noise or vibration during construction. Similarly, disturbance to river lamprey within the River Chelt could occur when this species is migrating upstream to spawning grounds during winter and spring, where mating takes place in March and April, and downstream between July and September[65]. For river lamprey, given that the field survey recorded ammocoetes, indicating that a spawning ground is present close to the Scheme, the key period is considered to be the spawning period in winter and spring. Such impacts could result in habitat fragmentation/barrier effects, with European eels and river lamprey unable to disperse or move along the River Chelt as a result of such disturbance.

5.2.3. The conservation objectives for the Severn Estuary SAC have been reviewed. The conservation objectives are as follows:

5.2.4. Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring:

- The extent and distribution of qualifying natural habitats and habitats of qualifying species
- The structure and function (including typical species) of qualifying natural habitats)
- The structure and function of the habitats of qualifying species

[62] Jacoby, D. & Gollock, M. 2014. Anguilla anguilla. The IUCN Red List of Threatened Species 2014: e.T60344A45833138. http://dx.doi.org/10.2305/IUCN.UK.2014-1.RLTS.T60344A45833138.en
[63] Guhl, B., Stürenberg, FJ. & Santora, G. Contaminant levels in the European eel (*Anguilla anguilla*) in North Rhine-Westphalian rivers. *Environ Sci Eur* **26,** 26 (2014). https://doi.org/10.1186/s12302-014-0026-1
[64] Maitland, P. (2003) Ecology of the River, Brook and Sea Lamprey. Conserving Natura 2000, Ecology Series No.5. English Nature, Peterborough.
[65] Maitland, P. (2003) Ecology of the River, Brook and Sea Lamprey. Conserving Natura 2000, Ecology Series No.5. English Nature, Peterborough.

- The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely
- The populations of qualifying species
- The distribution of qualifying species within the site

5.2.5. Without appropriate mitigation, the Scheme could compromise the following conservation objectives of the Severn Estuary SAC[66]: The extent and distribution of habitats of qualifying species; the structure and function of the habitats of qualifying species; the populations of qualifying species; and the distribution of qualifying species within the site.

5.2.6. For river lamprey specifically, this feature will be considered to be in favourable condition when, subject to natural processes, each of the following conditions are met[67]:

- The migratory passage of both adult and juvenile river lamprey through the Severn Estuary between the Bristol Channel and any of their spawning rivers is not obstructed or impeded by physical barriers, changes in flows, or poor water quality.
- The size of the river lamprey population in the Severn Estuary and the rivers which drain into it, is at least maintained and is at a level that is sustainable in the long term.
- The abundance of prey species forming the river lamprey's food resource within the estuary, is maintained.
- Toxic contaminants in the water column and sediment are below levels which would pose a risk to the ecological objectives described above.

5.2.7. Conservation objectives are not available for the Severn Estuary Ramsar site. The overarching objective of the Ramsar Convention is to stem the loss and progressive encroachment on wetlands now and in the future.

5.3. Mitigation

5.3.1. To mitigate the potential for a pollution incident to occur during construction, works will proceed following standard good practice working methods for environmental protection which will adhere to GPPs[68] and CIRIA C715[69] Environmental good practice. These will be secured via a CEMP followed by the Principal Contractor. Measures include:

- All debris arising from the construction and works will be effectively encapsulated and removed from site
- No pollutants will enter drainage or run-off to a watercourse
- The contractor will ensure that they have a robust Pollution Response Plan in place before works start
- Any pollution incident will be contained and cleaned up immediately and reported
- No storage of oils or chemicals will be allowed within 10 m of a watercourse.

5.3.2. To mitigate the potential for a pollution incident to occur during operation, the drainage strategy to be implemented by the Scheme incorporates SuDS to mitigate the pollution risk associated with road runoff as well as accidental spills.

5.3.3. To mitigate the potential for disturbance to migratory fish species using functionally linked habitat within the River Chelt, the following measures will be put in place. These will be

[66] NB. The Severn Estuary SAC and Ramsar are in part designated for their populations of migratory fish. No specific conservation objectives are noted for Ramsar sites
[67] Natural England and Countryside Council for Wales' (June 2009) Advice given under Regulation 33(2)(a) of the Conservation (Natural Habitats, &c.) Regulations 1994, as amended.
[68] https://www.netregs.org.uk/environmental-topics/guidance-for-pollution-prevention-gpp-documents/guidance-for-pollution-prevention-gpps-full-list/
[69] CIRIA (2006), CIRIA C648 Control of water pollution from linear construction projects Technical guidance. London.

secured via a CEMP followed by the Principal Contractor and overseen by a suitably qualified and experienced Ecological Clerk of Works (ECoW):

- All haul roads, lay down areas and compounds will be located at least 15 m from watercourses, except where access is required to specific locations for works to bridges/culverts for example.
- Soft start procedures will be implemented, to gradually increase the sound/vibration intensity over a period of time. The aim is to deter European eels and river lamprey before the full volume/vibration intensity is reached so that noise exposure is reduced. Soft start up methods will be employed on plant being used for the in-channel works/works adjacent to watercourses identified as suitable for fish at the start of each working day to ensure sudden disturbance to fish and other wildlife is minimised as far as practically possible. Piling activities adjacent to watercourses suitable for fish are limited to a relatively small geographical area at the proposed River Chelt Bridge.
- Start up and run down of plant will be undertaken at least 20 m from the watercourse where practicable. At this stage there is not expected to be a need to pump water from any temporary dammed area, further minimising noise from the works area. If in-channel works are to be required these will minimise noise as far as possible and ensure maintenance of flow within channel to facilitate ongoing fish movement/passage. Furthermore, appropriate screening of any pumping equipment during dewatering activities will be implemented (2mm screens) to avoid any potential entrainment of fish during the works.
- It should also be stated that as mobile species (albeit confined to the watercourses), any fish subject to disturbance have the ability to temporarily move away from the source. This may temporarily and locally displace fish from feeding and shelter resources within the project site but is unlikely to cause any reduced fitness or individual mortality that could result in a long term or population level effect
- Wherever possible, works will be timed outside the key ecologically sensitive periods for European eel and river lamprey. This is considered to be the migratory period for European eel (upstream migration February to July, downstream migration October to November[70]) and the upstream migration and spawning period for river lamprey (winter and spring).
- No night-time (taken to be between 30 minutes prior to sunset until 30 minutes following sunrise) vibration work will occur during migratory periods. If night working is essential, minimal and directional lighting should be used
- Ecologically sensitive design of structures such as culverts will be incorporated into the Scheme, to main connectivity, continuity of flow, and natural substrate establishment.

5.4. Conclusion

5.4.1. Provided the above mitigation is adhered to, it is concluded that the Scheme alone will not have a significant adverse effect on the integrity of the European eel or river lamprey qualifying features of the Severn Estuary SAC and Ramsar. The potential impacts were assessed at appropriate assessment and suitable mitigation measures put in place to reduce the impacts. It is concluded that with these there is sufficient mitigation within the Scheme that adverse impacts to the site integrity of the European Site are not predicted, and further assessment is not required.

[70] https://www.fishsec.org/2020/05/15/eel-migration-report-provides-insights-but-also-highlights-data-gaps/

5.5. In-combination Assessment

5.5.1. Taking into account the mitigation measures, the following potential impacts would have no adverse effects on the site integrity of the Severn Estuary SAC/Ramsar in relation to:

- Hydrological impacts to functionally linked habitat for European eel and river lamprey within the River Chelt as a result of a pollution event during construction.
- Disturbance/fragmentation/barrier effects to European eel and river lamprey within functionally linked habitat within the River Chelt as a result of noise or vibration during construction.

5.5.2. However, an insignificant residual effect cannot be ruled out and a review of other relevant projects and plans to identify potential cumulative effects with the Scheme has been undertaken.

5.5.3. The following County Council and District Council websites and planning portals have been reviewed for information on any plans or projects that may add to the effects of the Scheme on the Severn Estuary SAC/Ramsar and, therefore, may have an in-combination effect with the Scheme.

- Gloucestershire County Council
- Forest of Dean District Council
- Cheltenham Borough Council
- Tewkesbury Borough Council
- Gloucester City Council
- Stroud District Council.

5.5.4. The Planning Inspectorate website[71] has also been reviewed.

5.5.5. This review is considered to be sufficient to inform the in-combination assessment for the HRA of the Scheme. The results are presented in Table 5-1.

[71] National Infrastructure Planning (planninginspectorate.gov.uk)

Table 5-1 - Assessment of Likely Significant Effects in Combination

Project or Plan	Findings	In-combination assessment
Gloucestershire County Council Minerals Local Plan HRA, March 2018[72]	The Severn Estuary is unlikely to be affected directly by on land mineral extraction however there could be significant indirect effects from changes to water flow patterns into the site. (Note: marine aggregate extraction could have implications for many of the sites features by disruption of the sedimentary systems and natural processes operating throughout the estuary). Waste sites pose a threat from pollution.	No LSE in-combination. Although the HRA also considers potential pollution impacts as a result of the Plan, this HRA gives no timescales of when mineral extraction may begin.
Gloucestershire County Council Waste Core Strategy HRA[73]	Waste Site 2a, Hurst Farm Lydney is approximately 300 m from the Severn Estuary designations. However, this reports dates to 2009 and no other reference to this site is made based on an internet search.	No LSE in-combination. From an internet search, it appears unlikely that this site was considered further. All other waste site options were approximately 10 km or more from the Severn Estuary designations
Gloucestershire County Council Local Transport Plan (LTP) HRA[74]	The HRA determined that a number of policies and schemes within the LTP could lead to LSE on the European sites considered, which includes the Severn Estuary Designations. However, as adverse effects can only be assessed at the relevant stage to the extent possible on the basis of the precision of the plan/ project, it is considered that a meaningful in-combination assessment at individual European site level is not possible within this report. Potential impacts could include: Habitat loss and fragmentation; impacts on vegetation and freshwater due to pollution during construction and operation; excavations could change surface water and ground water hydrodynamics.	No LSE in-combination. Despite possible air quality, water quality and species disturbance impacts, the lack of timeframe for proposals coming forward means they are not reasonably foreseeable.

[72] https://www.gloucestershire.gov.uk/media/2100958/sub-5-mlp-for-glos-hra-main-report-for-the-publication-mlp.pdf
[73] https://www.gloucestershire.gov.uk/media/14870/cd45-site-options-habitat-regulations-assessment-hra-report-october-2009.pdf
[74] https://www.gloucestershire.gov.uk/media/2093548/habitats-regulations-assessment-v203-draft-appendix-d.pdf

Project or Plan	Findings	In-combination assessment
Gloucester City Plan 2011 – 2013 HRA[75]	The HRA identified various pressures on the Severn Estuary designations. This includes: Water quality, air quality, recreational pressures and habitat fragmentation. The current HRA considers the impacts of water quality on the designations. The Gloucester City Plan HRA states that there are many pathways for potential LSEs on water quality due to the water courses within the Gloucester area. However, due to the distance between the proposed site allocations and the Severn Estuary designations, LSEs are considered unlikely.	No LSE in-combination. The Plan activities and the Scheme are all a considerable distance from the Severn Estuary designations.
Forest of Dean District Council Allocations Plan Habitat Regulations Assessment (Appropriate Assessment) Report, March 2015[76]	The HRA identified the Severn Estuary Designations as having potential to be affected by the Allocations Plan. Potential for in-combination effects were identified in relation to allocations in the Sedbury area and the Lydney Harbour area on the Severn Estuary designation. Potential impacts included air quality (traffic emissions, dust), water level and quality, habitat loss and fragmentation, and disturbance. All adverse effects were ruled out given the mitigation provided by the Core Strategy, policies in the Allocations Plan and additional recommendations made in the HRA.	No LSE in-combination. Although the HRA also considers possible air quality, water quality and disturbance impacts upon the SAC, there is no timeframe for when development might come forward and as such is not reasonably foreseeable. Furthermore, all adverse impacts were ruled out based on mitigation, meaning that in-combination effects are unlikely.

[75] https://www.gloucester.gov.uk/media/4095/190910_gcp_hra-report_revised-screening-aa_final.pdf
[76] https://www.fdean.gov.uk/media/hjkd5rg0/hra-of-allocations-plan-march-2015.pdf

Project or Plan	Findings	In-combination assessment
Habitats Regulations Assessment of the Stroud Local Plan[77]	The Stroud District is not considered to be at risk in terms of provision of water supply, and there is no assessment proposed to underpin the emerging Local Plan in this regard. Water abstraction issues for the Severn Estuary were flagged by the previous HRA work, but not concluded to be significant.	No LSE in-combination. This HRA has not identified issues with regard to water quality at the Severn Estuary, therefore no in combination effects are anticipated
Cheltenham Local Plan Pre-Submission HRA[78]	The search area for the Cheltenham Local Plan Pre-Submission HRA was only 15 km, meaning that the Severn Estuary designations were not captured. It is therefore concluded that, on the basis of the search area established, effects on the Severn Estuary designations have been ruled out as a result of this plan. No in-combination effects are therefore anticipated.	No LSE in-combination.
Tewksbury Borough Plan 2011-2031 HRA[79]	The HRA identified potential impacts to water quality which could act in combination with the Scheme. All new development could result in changes to water quality and levels. It is concluded within this report that it is unlikely that individual development sites would result in significant effects.	No LSE in-combination. Although the HRA also considers possible air quality, water quality and disturbance impacts upon the SAC, there is no timeframe for when development might come forward and as such is not reasonably foreseeable. Furthermore, the HRA concluded that significant effects were unlikely.

[77] Hoskin, R., Liley, D. Saunders, P. & Panter, C. (2019) Habitats Regulations Assessment of the Stroud Local Plan. Unpublished report for Stroud District Council
[78] Cheltenham Local Plan: Pre-Submission Habitats Regulations Assessment (HRA) Revised Screening & Appropriate Assessment (AA) Report (2018)
[79] https://www.tewkesbury.gov.uk/pre-submission-tewkesbury-borough-plan

Project or Plan	Findings	In-combination assessment
Gloucester, Cheltenham and Tewkesbury Joint Core Strategy (JCS) HRA[80]	The HRA identified the Severn Estuary designations as having potential to be affected by the Plan. Potential impacts included damage or disturbance to supporting habitats for mobile species outside of the designated sites, as well as water quality impacts in-combination with other plans and projects, although the Plan states that such impacts are more appropriately dealt with at the individual project level.	No LSE in-combination. Although the HRA considers possible water quality and damage/disturbance impacts upon the designated sites, there is no timeframe for when development might come forward and as such is not reasonably foreseeable. Furthermore, the Plan states that such impacts are more appropriately dealt with at the individual project level.

5.5.6. Based on the findings above, no adverse effects on the site integrity of the Severn Estuary SAC/Ramsar in combination with other plans or projects are anticipated.

[80] LUC (2011) Habitats Regulations Assessment Screening of Gloucester, Cheltenham and Tewkesbury Joint Core Strategy 'Developing the Preferred Option Consultation Document.'

6. Conclusion

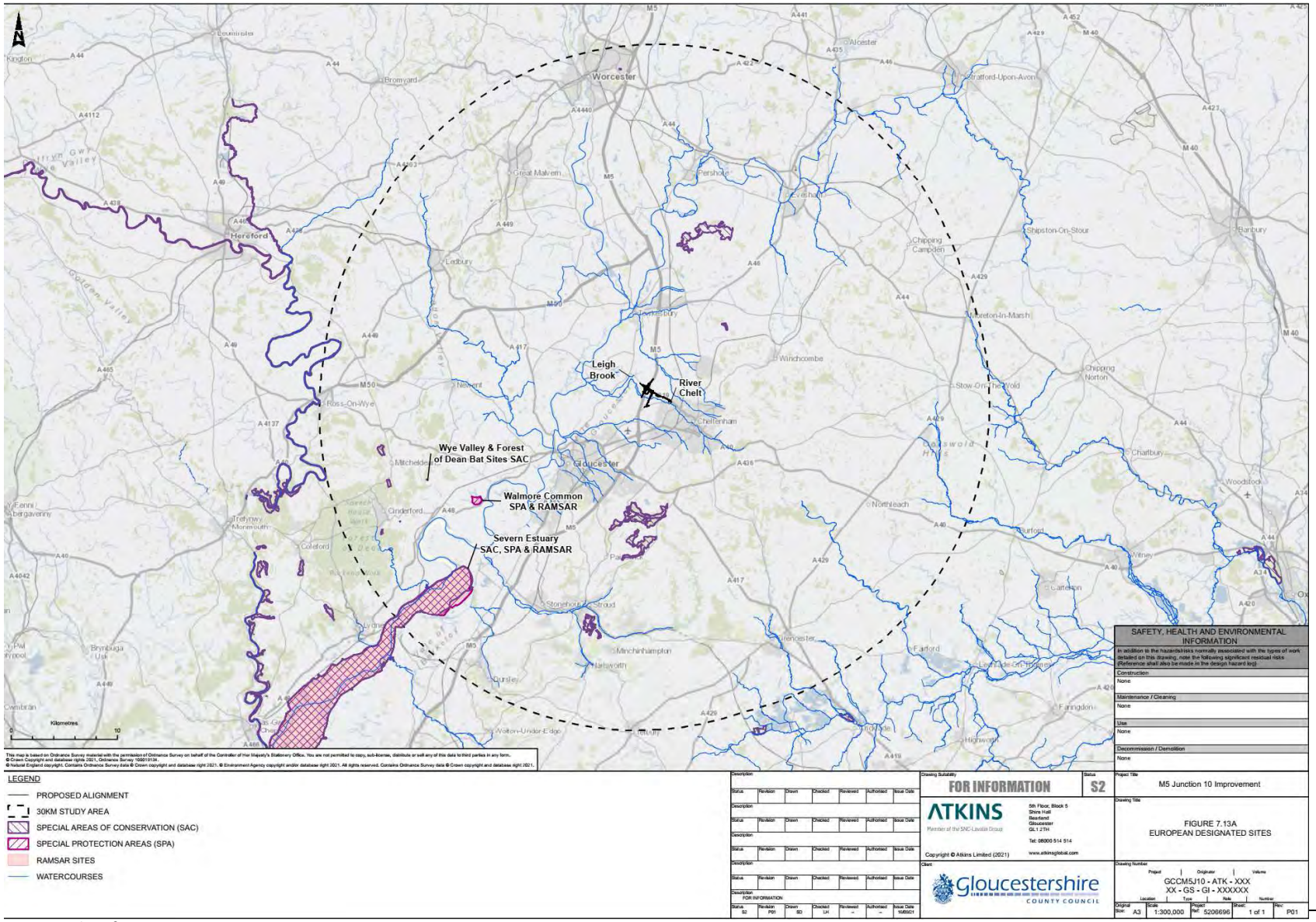
6.1.1. No likely significant effects on any European Sites have been identified, either for the Scheme alone, or in combination with other plans or projects.

6.1.2. In accordance with LA 115, a 'Finding of No Significant Effects Report Matrix (Screening)' is included for each of the screened European Sites in Appendices H to K of this document.

Appendices to Appendix 7.13

- Appendix A
- Appendix B
- Appendix C
- Appendix D
- Appendix E
- Appendix F
- Appendix G
- Appendix H
- Appendix I
- Appendix J
- Appendix K
- Appendix L

Appendix A. Figure 7.13A – European Designated Sites


Worcester
Hereford
Gloucester
Cheltenham
Leigh Brook
River Chelt
Wye Valley & Forest of Dean Bat Sites SAC
Walmore Common SPA & RAMSAR
Severn Estuary SAC, SPA & RAMSAR
Kilometres
LEGEND
PROPOSED ALIGNMENT
30KM STUDY AREA
SPECIAL AREAS OF CONSERVATION (SAC)
SPECIAL PROTECTION AREAS (SPA)
RAMSAR SITES
WATERCOURSES
SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION
FOR INFORMATION
S2
M5 Junction 10 Improvement
FIGURE 7.13A
EUROPEAN DESIGNATED SITES
GCCM5J10 - ATK - XXX
XX - GS - GI - XXXXXX
A3
1:300,000
P01

Appendix B.Wye Valley and Forest of Dean Bat Sites SAC Screening Matrix

Wye Valley and Forest of Dean Bat Sites SAC Screening Matrix		
Project	M5 Junction 10 Improvements Scheme	
European Site under Consideration	Wye Valley and Forest of Dean Bat Sites SAC	
Date:	Author (Name/Organisation):	Verified (Name/Organisation)
August 2021	James Cook/Lizzie Hall Atkins	Jules Price Atkins
Description of Project Describe any likely direct, indirect or secondary impacts of the project (either alone or in combination with other plans or projects) on the European Site by virtue of:		
Size and scale (road type and probable traffic volume)	The M5 Junction 10 Improvements Scheme involves construction of a new, all-direction motorway junction; construction of a new two-lane road with segregated cycleway and footway, from the B4634 to the A4019 (the West Cheltenham Link Road, or Link Road); widening of the A4019 east of the M5 Junction 10 to the Gallagher Retail Park.	
Land-take	The Scheme would not require land-take from the SAC.	
Distance from the European Site or key features of the site (from edge of the project assessment corridor)	The Scheme is approx. 21 km north east of the nearest part of the SAC (Blaisdon Hall SSSI).	
Resource requirements (from the European Site or from areas in proximity to the site, where of relevance to consideration of impacts)	The Scheme does not require resources from the SAC.	
Emissions (e.g. polluted surface water runoff – both soluble and insoluble pollutants, atmospheric pollution)	There is no hydrological link between the Scheme and SAC, and therefore no impact pathway by which any water-borne pollution generated by the Scheme could give rise to adverse effects on the European Site. The SAC is located beyond the distance from any construction activity at which dust from demolition or construction would be a potential impact, and more than 200 m from the ARN. Therefore, no air quality impacts are anticipated.	
Excavation requirements (e.g. impacts of local hydrogeology)	At a distance of at least 21 km, excavation works associated with the Scheme will not impact the local hydrogeology of the SAC.	

Wye Valley and Forest of Dean Bat Sites SAC Screening Matrix	
Transportation requirements	Construction traffic will not be routed in the vicinity of the SAC.
Duration of construction, operation, etc	The Scheme would be constructed between 2023 and 2024.
Other	N/A
Description of avoidance and/or mitigation measures Describe any assumed (plainly established and uncontroversial) mitigation measures, including information on:	
Nature of proposals	No mitigation is proposed for the SAC.
Location	N/A
Evidence for effectiveness	N/A
Mechanism for delivery (legal conditions, restrictions or other legally enforceable obligations)	N/A
Characteristics of European Site(s) A brief description of the European Site to be produced, including information on:	
Name of European Site and its EU code	Wye Valley and Forest of Dean Bat Sites SAC (UK0014794)
Location and distance of the European Site from the proposed works	The nearest part of the SAC (Blaisdon Hall SSSI) is located approx. 21 km south west of the Scheme.
European Site size	144.82 ha (distributed between 13 component sites)
Key features of the European Site including the primary reasons for selection and any other qualifying interests	1303 Lesser horseshoe bat (*Rhinolophus hipposideros*) This complex of sites on the border between England and Wales contains by far the greatest concentration of lesser horseshoe bat in the UK, totalling about 26% of the national population. It has been selected on the grounds of the exceptional breeding population, and the majority of sites within the complex are maternity roosts. The bats are believed to hibernate in the many disused mines in the area. 1304 Greater horseshoe bat (*Rhinolophus ferrumequinum*) This complex of sites on the border between England and Wales represents greater horseshoe bat in the northern part of its range, with about 6% of the UK population. The site contains the main maternity roost for bats in this area, which are believed to hibernate in the many disused mines in the Forest.
Vulnerability of the European Site – any information available from the standard data forms on potential effect pathways	Principal threats and pressures comprise: • Other ecosystem modifications; • Outdoor sports and leisure activities; and • Human induced changes in hydraulic conditions.

Wye Valley and Forest of Dean Bat Sites SAC Screening Matrix	
European Site conservation objectives – where these are readily available	Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring: • The extent and distribution of the habitats of qualifying species; • The structure and function of the habitats of qualifying species; • The supporting processes on which the habitats of qualifying species rely; • The populations of qualifying species; and • The distribution of qualifying species within the site.
Assessment criteria Describe the individual elements of the project (either alone or in combination with other plans or projects) likely to give rise to impacts on the European Site.	
The Scheme is located approximately 21 km from the closest component SSSI of the SAC. The only potential impact pathway that has been identified is the potential for construction works to impact upon habitats that might be functionally linked to the SAC. The assessment below discusses this potential impact pathway in more detail.	
Initial assessment The key characteristics of the site and the details of the European Site should be considered in identifying potential impacts. Describe any likely changes to the site arising as a result of:	
Reduction of habitat area	The Scheme would not result in a reduction in habitat area from within the SAC. The Scheme would not affect functionally linked habitats either, as the distance is considered to be too great for there to be a significant functional linkage between the Scheme and the qualifying feature bat populations. This is because the distance is at least seven times larger than the core sustenance zones[81] identified by the Bat Conservation Trust (BCT)[82] for lesser horseshoe bats (2 km) and greater horseshoe bats (3 km). In terms of bat behaviour in this site specifically, flight lines and feeding grounds within the wider ecological network are critical in supporting the SAC. Lesser horseshoe bats tend to forage within two to three kilometres of their roost, with density of bats associated with the SAC declining sharply after this[83]. In the winter, the foraging range is thought to be around half this. A conservation objective of the SAC is to maintain a wide area of supporting habitat for bats, with the Site Improvement Plan suggesting the creation of a feeding area of a radius of approximately 4 km around maternity roosts[84]. A radiotracking study of greater horseshoe bats in Dean Hall, a

[81] The area surrounding a communal bat roost within which habitat availability and quality will have a significant influence on the resilience and conservation status of the colony using the roost.
[82] Collins, J. (ed.) (2016) Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd edn). The Bat Conservation Trust, London.
[83] Countryside Council for Wales (2008). Core Management Plan Including Conservation Objectives for Wye Valley and Forest of Dean Bat SAC
[84] Improvement Programme for England's Natura 2000 Sites (2015). Site Improvement Plan: Wye Valley and the Forest of Dean Bat Sites

Wye Valley and Forest of Dean Bat Sites SAC Screening Matrix	
	constituent SSSI of the SAC, found that bats forage up to 9 km from the roost using a number of night roosts during the feeding period[85]. At a distance of 21 km at the nearest point, these foraging areas for bats associated with the SAC are significantly less than this. Therefore, the Scheme will not impact any habitat for bats associated with the SAC. In addition, the site is beyond the affected road network, and as a result will not be impacted by air quality pollution impacts.
Disturbance to key species	The Scheme is too far from the SAC for there to be any direct disturbance. The Scheme would not result in disturbance of bats within functionally linked habitats either, as the distance is considered to be too great for there to be a significant functional linkage between the Scheme and the qualifying feature bat populations (see above).
Habitat or species fragmentation	The Scheme would not result in fragmentation of the SAC or any functionally linked habitats.
Reduction in species density	The Scheme would not result in a reduction in species density within the SAC.
Changes in key indicators of conservation value (water quality, etc)	The Scheme would not result in any changes in any key indicators of conservation value.
Climate change	Climate change is not listed as a threat or pressure in relation to this site.
Describe any likely impacts on the European Site as a whole in terms of:	
Interference with the key relationships that define the structure of the site	No likely significant effects on the structure (i.e. the distribution and abundance of habitats) of the SAC are anticipated as a result of the Scheme alone or in combination with other plans or projects.
Interference with key relationships that define the function of the site	No likely significant effects on the function (i.e. the capacity of the SAC to support the qualifying features) of the SAC are anticipated as a result of the Scheme alone or in combination with other plans or projects.
Indicate the significance as a result of the identification of impacts set out above in terms of:	
Reduction of habitat area	N/A
Disturbance to key species	N/A
Habitat or species fragmentation	N/A
Loss	N/A
Fragmentation	N/A
Disruption	N/A
Disturbance	N/A

[85] Improvement Programme for England's Natura 2000 Sites (2015). Site Improvement Plan: Wye Valley and the Forest of Dean Bat Sites

Wye Valley and Forest of Dean Bat Sites SAC Screening Matrix	
Change to key elements of the site (e.g. water quality, hydrological regime etc)	N/A
Describe from the above those elements of the project, or combination of elements, where the above impacts are likely to be significant or where the scale or magnitude of impacts is not known.	
N/A	
Outcome of screening stage	Not likely to be significant effects
Are the appropriate statutory environmental bodies in agreement with this conclusion (delete as appropriate and attach relevant correspondence).	TBC

Appendix C. Walmore Common SPA Screening Matrix

Walmore Common SPA Screening Matrix		
Project	M5 Junction 10 Improvements Scheme	
European Site under Consideration	Walmore Common SPA	
Date:	Author (Name/Organisation):	Verified (Name/Organisation)
August 2021	James Cook/Lizzie Hall Atkins	Jules Price Atkins
Description of Project Describe any likely direct, indirect or secondary impacts of the project (either alone or in combination with other plans or projects) on the European Site by virtue of:		
Size and scale (road type and probable traffic volume)	The M5 Junction 10 Improvements Scheme involves construction of a new, all-direction motorway junction; construction of a new two-lane road with segregated cycleway and footway, from the B4634 to the A4019 (the West Cheltenham Link Road, or Link Road); widening of the A4019 east pf the M5 Junction 10 to the Gallagher Retail Park.	
Land-take	The Scheme would not require land-take from the SPA.	
Distance from the European Site or key features of the site (from edge of the project assessment corridor)	The Scheme is 17.5 km north east of the SPA.	
Resource requirements (from the European Site or from areas in proximity to the site, where of relevance to consideration of impacts)	The Scheme does not require resources from the SPA.	
Emissions (e.g. polluted surface water runoff – both soluble and insoluble pollutants, atmospheric pollution)	There is no hydrological link between the Scheme and SPA, and therefore no impact pathway by which any water-borne pollution generated by the Scheme could give rise to adverse effects on the European Site. The SPA is located beyond the distance from any construction activity at which dust from demolition or construction would be a potential impact, and more than 200 m from the ARN. Therefore, no air quality impacts are anticipated.	
Excavation requirements (e.g. impacts of local hydrogeology)	At a distance of 17.5 km, excavation works associated with the Scheme will not impact the local hydrogeology of the SPA.	
Transportation requirements	Construction traffic will not be routed in the vicinity of the SPA.	

Walmore Common SPA Screening Matrix	
Duration of construction, operation, etc	The Scheme would be constructed between 2023 and 2024.
Other	N/A
Description of avoidance and/or mitigation measures Describe any assumed (plainly established and uncontroversial) mitigation measures, including information on:	
Nature of proposals	No mitigation is proposed for the SPA.
Location	N/A
Evidence for effectiveness	N/A
Mechanism for delivery (legal conditions, restrictions or other legally enforceable obligations)	N/A
Characteristics of European Site(s) A brief description of the European Site to be produced, including information on:	
Name of European Site and its EU code	Walmore Common SPA (UK9007051)
Location and distance of the European Site from the proposed works	The SPA is located 17.5 km south west of the Scheme.
European Site size	52.85 ha
Key features of the European Site including the primary reasons for selection and any other qualifying interests	This site qualifies under Article 4.1 of the Directive (79/409/EEC) by supporting populations of European importance of the following species listed on Annex I of the Directive: Over winter; • Bewick's swan (*Cygnus columbianus bewickii*), 104 individuals representing at least 1.5% of the wintering population in Great Britain (5 year peak mean 1991/2 - 1995/6).
Vulnerability of the European Site – any information available from the standard data forms on potential effect pathways	Principal threats and pressures comprise: • Human induced changes in hydraulic conditions; • Changes in biotic conditions; • Outdoor sports and leisure activities; and • Modification of cultivation practices.
European Site conservation objectives – where these are readily available	Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the aims of the Wild Birds Directive, by maintaining or restoring: • The extent and distribution of the habitats of the qualifying features; • The structure and function of the habitats of the qualifying features; • The supporting processes on which the habitats of the qualifying features rely;

Walmore Common SPA Screening Matrix	
	• The population of each of the of qualifying features; and • The distribution of the qualifying features within the site.
Assessment criteria Describe the individual elements of the project (either alone or in combination with other plans or projects) likely to give rise to impacts on the European Site.	
The Scheme is located 17.5 km from the SPA. The only potential impact pathway that has been identified is the potential for construction works to impact upon habitats that might be functionally linked to the SPA. The assessment below discusses this potential impact pathway in more detail.	
Initial assessment The key characteristics of the site and the details of the European Site should be considered in identifying potential impacts. Describe any likely changes to the site arising as a result of:	
Reduction of habitat area	The Scheme would not result in a reduction in habitat area from within the SPA. Monthly wintering and migratory bird surveys were undertaken within 250 m of the Scheme from September 2019 to March 2020 inclusive. No Bewick's swans (Walmore Common SPA qualifying feature) were observed within the survey area during this time. Gloucestershire Centre for Environmental Records (GCER) was contacted to obtain recent records[86] of protected and notable species within 1 km of the Scheme. No records of Bewick's swan were provided. In addition, a review of existing literature was conducted, which indicated that the agricultural grassland habitats surrounding the Scheme are not key areas for populations of Bewick's swan[87]. The results of the wintering and migratory bird surveys and desk study indicate that Bewick's swan does not regularly use and is not dependent on the habitat in the vicinity of the Scheme.
Disturbance to key species	The Scheme is too far from the SPA for there to be any direct disturbance. The Scheme would not result in disturbance of Bewick's swans within functionally linked habitats either, as there is not considered to be a significant functional linkage between the Scheme and the qualifying feature population (see above).
Habitat or species fragmentation	The Scheme would not result in fragmentation of the SPA or any significant functionally linked habitats.
Reduction in species density	The Scheme would not result in a reduction in species density within the SPA.
Changes in key indicators of conservation value (water quality, etc)	The Scheme would not result in any changes in any key indicators of conservation value.
Climate change	Climate change is not listed as a threat or pressure in relation to this site.

[86] Records of observations within the last 10 years.
[87] Robinson, JA, K Colhoun, JG McElwaine & EC Rees (2004). Bewick's Swan *Cygnus columbianus bewickii* (Northwest Europe population) in Britain and Ireland 1960/61 – 1999/2000. Waterbird Review Series, The Wildfowl & Wetlands Trust/Joint Nature Conservation Committee, Slimbridge.

Walmore Common SPA Screening Matrix	
Describe any likely impacts on the European Site as a whole in terms of:	
Interference with the key relationships that define the structure of the site	No likely significant effects on the structure (i.e. the distribution and abundance of habitats) of the SPA are anticipated as a result of the Scheme alone or in combination with other plans or projects.
Interference with key relationships that define the function of the site	No likely significant effects on the function (i.e. the capacity of the SPA to support the qualifying features) of the SPA are anticipated as a result of the Scheme alone or in combination with other plans or projects.
Indicate the significance as a result of the identification of impacts set out above in terms of:	
Reduction of habitat area	Not significant
Disturbance to key species	Not significant
Habitat or species fragmentation	Not significant
Loss	N/A
Fragmentation	N/A
Disruption	N/A
Disturbance	N/A
Change to key elements of the site (e.g. water quality, hydrological regime etc)	N/A
Describe from the above those elements of the project, or combination of elements, where the above impacts are likely to be significant or where the scale or magnitude of impacts is not known.	
N/A	
Outcome of screening stage	Not likely to be significant effects
Are the appropriate statutory environmental bodies in agreement with this conclusion (delete as appropriate and attach relevant correspondence).	TBC

Appendix D. Walmore Common Ramsar Screening Matrix

Walmore Common Ramsar Screening Matrix		
Project	M5 Junction 10 Improvements Scheme	
European Site under Consideration	Walmore Common Ramsar	
Date:	Author (Name/Organisation):	Verified (Name/Organisation)
August 2021	James Cook/Lizzie Hall Atkins	Jules Price Atkins
Description of Project Describe any likely direct, indirect or secondary impacts of the project (either alone or in combination with other plans or projects) on the European Site by virtue of:		
Size and scale (road type and probable traffic volume)	The M5 Junction 10 Improvements Scheme involves construction of a new, all-direction motorway junction; construction of a new two-lane road with segregated cycleway and footway, from the B4634 to the A4019 (the West Cheltenham Link Road, or Link Road); widening of the A4019 east pf the M5 Junction 10 to the Gallagher Retail Park.	
Land-take	The Scheme would not require land-take from the Ramsar.	
Distance from the European Site or key features of the site (from edge of the project assessment corridor)	The Scheme is 17.5 km north east of the Ramsar.	
Resource requirements (from the European Site or from areas in proximity to the site, where of relevance to consideration of impacts)	The Scheme does not require resources from the Ramsar.	
Emissions (e.g. polluted surface water runoff – both soluble and insoluble pollutants, atmospheric pollution)	There is no hydrological link between the Scheme and Ramsar, and therefore no impact pathway by which any water-borne pollution generated by the Scheme could give rise to adverse effects on the European Site. The Ramsar is located beyond the distance from any construction activity at which dust from demolition or construction would be a potential impact, and more than 200 m from the ARN. Therefore, no air quality impacts are anticipated.	
Excavation requirements (e.g. impacts of local hydrogeology)	At a distance of 17.5 km, excavation works associated with the Scheme will not impact the local hydrogeology of the Ramsar.	
Transportation requirements	Construction traffic will not be routed in the vicinity of the Ramsar.	

Walmore Common Ramsar Screening Matrix	
Duration of construction, operation, etc	The Scheme would be constructed between 2023 and 2024.
Other	N/A
Description of avoidance and/or mitigation measures Describe any assumed (plainly established and uncontroversial) mitigation measures, including information on:	
Nature of proposals	No mitigation is proposed for the Ramsar.
Location	N/A
Evidence for effectiveness	N/A
Mechanism for delivery (legal conditions, restrictions or other legally enforceable obligations)	N/A
Characteristics of European Site(s) A brief description of the European Site to be produced, including information on:	
Name of European Site and its EU code	Walmore Common Ramsar (UK9007051)
Location and distance of the European Site from the proposed works	The Ramsar is located 17.5 km south west of the Scheme.
European Site size	52.85 ha
Key features of the European Site including the primary reasons for selection and any other qualifying interests	This site qualifies under Article 4.1 of the Directive (79/409/EEC) by supporting populations of European importance of the following species listed on Annex I of the Directive: Over winter; • Bewick's swan (*Cygnus columbianus bewickii*), 43 individuals representing an average of 0.5% of the UK population (5 year peak mean 1998/9-2002/3)
Vulnerability of the European Site – any information available from the standard data forms on potential effect pathways	Factors (past, present, or potential) adversely affecting the site's ecological character: • No factors reported
European Site conservation objectives – where these are readily available	No specific conservation objectives found. The overarching objective of the Ramsar Convention is to stem the loss and progressive encroachment on wetlands now and in the future.
Assessment criteria Describe the individual elements of the project (either alone or in combination with other plans or projects) likely to give rise to impacts on the European Site.	
The Scheme is located 17.5 km from the Ramsar. The only potential impact pathway that has been identified is the potential for construction works to impact upon habitats that might be	

Walmore Common Ramsar Screening Matrix	
functionally linked to the Ramsar. The assessment below discusses this potential impact pathway in more detail.	
Initial assessment The key characteristics of the site and the details of the European Site should be considered in identifying potential impacts. Describe any likely changes to the site arising as a result of:	
Reduction of habitat area	The Scheme would not result in a reduction in habitat area from within the Ramsar. Monthly wintering and migratory bird surveys were undertaken within 250 m of the Scheme from September 2019 to March 2020 inclusive. No Bewick's swans (Walmore Common Ramsar qualifying feature) were observed within the survey area during this time. Gloucestershire Centre for Environmental Records (GCER) was contacted to obtain recent records[88] of protected and notable species within 1 km of the Scheme. No records of Bewick's swan were provided. In addition, a review of existing literature was conducted, which indicated that the agricultural grassland habitats surrounding the Scheme are not key areas for populations of Bewick's swan[89]. The results of the wintering and migratory bird surveys and desk study indicate that Bewick's swan does not regularly use and is not dependent on the habitat in the vicinity of the Scheme.
Disturbance to key species	The Scheme is too far from the Ramsar for there to be any direct disturbance. The Scheme would not result in disturbance of Bewick's swans within functionally linked habitats either, as there is not considered to be a significant functional linkage between the Scheme and the qualifying feature population (see above).
Habitat or species fragmentation	The Scheme would not result in fragmentation of the Ramsar or any significant functionally linked habitats.
Reduction in species density	The Scheme would not result in a reduction in species density within the Ramsar.
Changes in key indicators of conservation value (water quality, etc)	The Scheme would not result in any changes in any key indicators of conservation value.
Climate change	Climate change is not listed as a threat or pressure in relation to this site.
Describe any likely impacts on the European Site as a whole in terms of:	
Interference with the key relationships that define the structure of the site	No likely significant effects on the structure (i.e. the distribution and abundance of habitats) of the Ramsar are anticipated as a result of the Scheme alone or in combination with other plans or projects.
Interference with key relationships that define the function of the site	No likely significant effects on the function (i.e. the capacity of the SPA to support the qualifying features) of the Ramsar are

[88] Records of observations within the last 10 years.
[89] Robinson, JA, K Colhoun, JG McElwaine & EC Rees (2004). Bewick's Swan *Cygnus columbianus bewickii* (Northwest Europe population) in Britain and Ireland 1960/61 – 1999/2000. Waterbird Review Series, The Wildfowl & Wetlands Trust/Joint Nature Conservation Committee, Slimbridge.

Walmore Common Ramsar Screening Matrix	
	anticipated as a result of the Scheme alone or in combination with other plans or projects.
Indicate the significance as a result of the identification of impacts set out above in terms of:	
Reduction of habitat area	Not significant
Disturbance to key species	Not significant
Habitat or species fragmentation	Not significant
Loss	N/A
Fragmentation	N/A
Disruption	N/A
Disturbance	N/A
Change to key elements of the site (e.g. water quality, hydrological regime etc)	N/A
Describe from the above those elements of the project, or combination of elements, where the above impacts are likely to be significant or where the scale or magnitude of impacts is not known.	
N/A	
Outcome of screening stage	Not likely to be significant effects
Are the appropriate statutory environmental bodies in agreement with this conclusion (delete as appropriate and attach relevant correspondence).	TBC

Appendix E.Severn Estuary SAC Screening Matrix

Severn Estuary SAC Screening Matrix		
Project	M5 Junction 10 Improvements Scheme	
European Site under Consideration	Severn Estuary SAC	
Date:	Author (Name/Organisation):	Verified (Name/Organisation)
August 2021	James Cook/Lizzie Hall Atkins	Jules Price Atkins
Description of Project Describe any likely direct, indirect or secondary impacts of the project (either alone or in combination with other plans or projects) on the European Site by virtue of:		
Size and scale (road type and probable traffic volume)	The M5 Junction 10 Improvements Scheme involves construction of a new, all-direction motorway junction; construction of a new two-lane road with segregated cycleway and footway, from the B4634 to the A4019 (the West Cheltenham Link Road, or Link Road); widening of the A4019 east pf the M5 Junction 10 to the Gallagher Retail Park.	
Land-take	The Scheme would not require land-take from the SAC.	
Distance from the European Site or key features of the site (from edge of the project assessment corridor)	The Scheme is 21 km north east of the SAC, or approx. 40 km via the shortest hydrological connection.	
Resource requirements (from the European Site or from areas in proximity to the site, where of relevance to consideration of impacts)	The Scheme does not require resources from the SAC.	
Emissions (e.g. polluted surface water runoff – both soluble and insoluble pollutants, atmospheric pollution)	Although there is a direct hydrological connection between the Scheme and the Severn Estuary SAC, at such a distance, it is considered that the potential for direct impacts via release of pollutants from the Scheme would be eliminated by dilution. DMRB guidance LA 113 states that "for assessment of impacts associated with soluble pollutants, outfalls within 1 km (measured along the watercourse) shall be aggregated for the purposes of cumulative assessment[90]". It therefore follows that soluble pollutants are considered to be sufficiently diluted beyond 1 km. Although not relied upon for the screening conclusions, pollution prevention methods will be in place including standard water protection measures to avoid chemical or sediment pollution of any watercourses. Works will proceed following standard good practice working methods for environmental protection which will adhere to	

[90] Highways England (2020). Design Manual for Roads and Bridges LA 113 Road drainage and the water environment.

Severn Estuary SAC Screening Matrix	
	the Guidance for Pollution Prevention (GPPs)[91] and the Construction Industry Research and Information Association[92] (CIRIA) C715 Environmental good practice. These will be secured via a CEMP. The drainage strategy to be implemented by the Scheme incorporates SuDS to mitigate the pollution risk associated with road runoff as well as accidental spills. However, given the relatively small size of the proposed works in comparison with the distance, size and mixing of the receptor designations, risks of significant spillage of chemical contaminant or silt pollution could be discounted even without any additional pollution controls. The SAC is located beyond the distance from any construction activity at which dust from demolition or construction would be a potential impact, and more than 200 m from the ARN. Therefore, no air quality impacts are anticipated.
Excavation requirements (e.g. impacts of local hydrogeology)	At a distance of 21 km, excavation works associated with the Scheme will not impact the local hydrogeology of the SAC.
Transportation requirements	Construction traffic will not be routed in the vicinity of the SAC.
Duration of construction, operation, etc	The Scheme would be constructed between 2023 and 2024.
Other	N/A
Description of avoidance and/or mitigation measures Describe any assumed (plainly established and uncontroversial) mitigation measures, including information on:	
Nature of proposals	To mitigate the potential for a pollution incidence to occur during construction, with consequent impacts to migratory river lamprey within the River Chelt (functionally linked habitat) standard appropriate controls and mitigation, in accordance with CIRIA C648 and Guidance for Pollution Prevention (GPPs), will be implemented in the construction design as standard and will be included in a Construction Environmental Management Plan (CEMP) followed by the Principal Contractor. Measures include: • All debris arising from the construction and works will be effectively encapsulated and removed from site; • No pollutants should enter drainage or run-off to a watercourse; • The contractor will ensure that they have a robust Pollution Response Plan in place before works start; • Any pollution incident will be contained and cleaned up immediately and reported; and • No storage of oils or chemicals will be allowed within 10 m of a watercourse.

[91] https://www.netregs.org.uk/environmental-topics/guidance-for-pollution-prevention-gpp-documents/guidance-for-pollution-prevention-gpps-full-list/
[92] CIRIA (2006), CIRIA C648 Control of water pollution from linear construction projects Technical guidance. London.

Severn Estuary SAC Screening Matrix	
	To mitigate the potential for disturbance to migratory fish species using functionally linked habitat within the River Chelt, the following measures will be put in place and overseen by a suitably qualified and experienced Ecological Clerk of Works (ECoW): • All haul roads, lay down areas and compounds will be located at least 15 m from watercourses, except where access is required to specific locations for works to bridges/culverts for example. • Soft start procedures will be implemented, to gradually increase the sound/vibration intensity over a period of time. The aim is to deter river lamprey before the full volume/vibration intensity is reached so that noise exposure is reduced; • Wherever possible, works will be timed outside the key ecologically sensitive periods for river lamprey. This is considered to be the upstream migration and spawning period for river lamprey (winter and spring). • No night-time vibration work will occur during migratory periods. If night working is essential, minimal and directional lighting should be used; • Ecologically sensitive design of structures such as culverts will be incorporated into the Scheme, to main connectivity, continuity of flow, and natural substrate establishment.
Location	Scheme
Evidence for effectiveness	The mitigation measures proposed are standard, tried and tested measures.
Mechanism for delivery (legal conditions, restrictions or other legally enforceable obligations)	Mitigation measures will be secured via a CEMP
Characteristics of European Site(s) A brief description of the European Site to be produced, including information on:	
Name of European Site and its EU code	Severn Estuary SAC (UK0013030)
Location and distance of the European Site from the proposed works	The SAC is located 21 km south west of the Scheme, or 40km downstream via the shortest hydrological connection.
European Site size	73,714.11 ha
Key features of the European Site including the primary reasons for selection and any other qualifying interests	Annex I habitats that are a primary reason for selection of this site: • 1130 Estuaries; • 1140 Mudflats and sandflats not covered by seawater at low tide; and • 1330 Atlantic salt meadows (Glauco-Puccinellietalia maritimae). Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site:

Severn Estuary SAC Screening Matrix	
	• 1110 Sandbanks which are slightly covered by sea water all the time; and • 1170 Reefs. • Annex II species that are a primary reason for selection of this site: • 1095 Sea lamprey (Petromyzon marinus); • 1099 River lamprey (Lampetra fluvitalis); and • 1103 Twaite shad (Alosa fallax).
Vulnerability of the European Site – any information available from the standard data forms on potential effect pathways	Principal threats and pressures comprise: • Other urbanisation, industrial and similar activities; • Changes in abiotic conditions; • Human induced changes in hydraulic conditions; • Outdoor sports and leisure activities; and • Modification of cultivation practices.
European Site conservation objectives – where these are readily available	Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring: • The extent and distribution of qualifying habitats and habitats of qualifying species; • The structure and function (including typical species) of qualifying natural habitats; • The structure and function of the habitats of qualifying species; • The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely; • The populations of qualifying species; and • The distribution of qualifying species within the site.
Assessment criteria Describe the individual elements of the project (either alone or in combination with other plans or projects) likely to give rise to impacts on the European Site.	
The Scheme is located approximately 21 km from the SAC or 40 km via the shortest hydrological connection. Potential impact pathways have been identified via the hydrological connection and via construction impacts on habitats that might be functionally linked to fish populations associated with the SAC site. The assessment below discusses these potential impact pathways in more detail.	
Initial assessment The key characteristics of the site and the details of the European Site should be considered in identifying potential impacts. Describe any likely changes to the site arising as a result of:	
Reduction of habitat area	The Scheme would not result in a reduction in habitat area from within the SAC. Survey results indicate that river lamprey are present in the vicinity of the Scheme within the River Chelt. As such, there is the potential for impacts to river lamprey, and functionally linked habitat within or surrounding the Scheme as a result of a pollution event during construction. Such impacts could arise through changes to water

Severn Estuary SAC Screening Matrix	
	quality as a result of mobilization of suspended sediments leading to silt laden runoff entering watercourses; and potential for accidental contamination associated with the spillage or leakage of fuels, lubricants and other chemicals required for construction. In particular, such impacts could occur during the construction of the new bridge over the River Chelt, the temporary River Chelt crossing, and the extension of the Leigh Brook culvert.
Disturbance to key species	The Scheme is too far from the SAC for there to be any direct disturbance. Survey results and desk study records indicate that river lamprey are present in the vicinity of the Scheme within the River Chelt. As such, there is potential for short-term impacts to this species within or surrounding the Scheme as a result of noise or vibration disturbance during construction of the new Link Road, in particular the construction of the new bridge over the River Chelt. The new bridge abutments will be set back from the banks of the River Chelt by 4 m. Foundation design work is still ongoing, but it is assumed that piling will be required in the construction of the bridge. In addition, a temporary River Chelt crossing will be required during construction.
Habitat or species fragmentation	Although the Scheme would not result in a physical barrier to fish migration, the disturbance impacts described above could potentially result in habitat fragmentation/barrier effects.
Reduction in species density	The Scheme would not result in a reduction in species density within the SAC.
Changes in key indicators of conservation value (water quality, etc)	The evidence presented in this report indicates that: hydrological impacts to functionally linked habitat within the River Chelt as a result of a pollution event during construction, and consequent detrimental effects to migratory river lamprey associated with the Severn Estuary SAC cannot be ruled out.
Climate change	Climate change is not listed as a threat or pressure in relation to this site.
Describe any likely impacts on the European Site as a whole in terms of:	
Interference with the key relationships that define the structure of the site	The evidence indicates that hydrological impacts to functionally linked habitat within the River Chelt as a result of a pollution event during construction, and consequent detrimental effects to migratory river lamprey associated with the Severn Estuary SAC cannot be ruled out.
Interference with key relationships that define the function of the site	Disturbance impacts to migratory river lamprey associated with the Severn Estuary SAC using functionally linked habitat within the River Chelt during construction cannot be ruled out.
Indicate the significance as a result of the identification of impacts set out above in terms of:	
Reduction of habitat area	Potential LSE
Disturbance to key species	Potential LSE
Habitat or species fragmentation	Potential LSE

Severn Estuary SAC Screening Matrix	
Loss	N/A
Fragmentation	N/A
Disruption	N/A
Disturbance	N/A
Change to key elements of the site (e.g. water quality, hydrological regime etc)	Potential LSE
Describe from the above those elements of the project, or combination of elements, where the above impacts are likely to be significant or where the scale or magnitude of impacts is not known.	
N/A	
Outcome of screening stage	Potential for a LSE
Are the appropriate statutory environmental bodies in agreement with this conclusion (delete as appropriate and attach relevant correspondence).	TBC

Appendix F. Severn Estuary SPA Screening Matrix

Severn Estuary SPA Screening Matrix		
Project	M5 Junction 10 Improvements Scheme	
European Site under Consideration	Severn Estuary SPA	
Date:	Author (Name/Organisation):	Verified (Name/Organisation)
August 2021	James Cook/Lizzie Hall Atkins	Jules Price Atkins
Description of Project Describe any likely direct, indirect or secondary impacts of the project (either alone or in combination with other plans or projects) on the European Site by virtue of:		
Size and scale (road type and probable traffic volume)	The M5 Junction 10 Improvements Scheme involves construction of a new, all-direction motorway junction; construction of a new two-lane road with segregated cycleway and footway, from the B4634 to the A4019 (the West Cheltenham Link Road, or Link Road); widening of the A4019 east pf the M5 Junction 10 to the Gallagher Retail Park.	
Land-take	The Scheme would not require land-take from the SPA.	
Distance from the European Site or key features of the site (from edge of the project assessment corridor)	The Scheme is 21 km north east of the SPA, or approx. 40 km via the shortest hydrological connection.	
Resource requirements (from the European Site or from areas in proximity to the site, where of relevance to consideration of impacts)	The Scheme does not require resources from the SPA.	
Emissions (e.g. polluted surface water runoff – both soluble and insoluble pollutants, atmospheric pollution)	Although there is a hydrological link between the Scheme and SPA, at a distance of over 40 km downstream, it is considered that the potential for direct impacts via release of pollutants from the Scheme would be eliminated by dilution. Although there is a direct hydrological connection between the Scheme and the Severn Estuary SAC, at such a distance, it is considered that the potential for direct impacts via release of pollutants from the Scheme would be eliminated by dilution. DMRB guidance LA 113 states that "for assessment of impacts associated with soluble pollutants, outfalls within 1 km (measured along the watercourse) shall be aggregated for the purposes of cumulative assessment[93]". It therefore follows that soluble pollutants are considered to be sufficiently diluted beyond 1 km.	

[93] Highways England (2020). Design Manual for Roads and Bridges LA 113 Road drainage and the water environment.

Severn Estuary SPA Screening Matrix	
	Although not relied upon for the screening conclusions, pollution prevention methods will be in place including standard water protection measures to avoid chemical or sediment pollution of any watercourses. Works should proceed following standard good practice working methods for environmental protection which will adhere to the Guidance for Pollution Prevention (GPPs)[94] and the Construction Industry Research and Information Association[95] (CIRIA) C715 Environmental good practice. These will be secured via a CEMP. The drainage strategy to be implemented by the Scheme incorporates SuDS to mitigate the pollution risk associated with road runoff as well as accidental spills. However, given the relatively small size of the proposed works in comparison with the distance, size and mixing of the receptor designations, risks of significant spillage of chemical contaminant or silt pollution could be discounted even without any additional pollution controls. The SPA is located beyond the distance from any construction activity at which dust from demolition or construction would be a potential impact, and more than 200 m from the ARN. Therefore, no air quality impacts are anticipated.
Excavation requirements (e.g. impacts of local hydrogeology)	At a distance of 21 km, excavation works associated with the Scheme will not impact the local hydrogeology of the SPA.
Transportation requirements	Construction traffic will not be routed in the vicinity of the SPA.
Duration of construction, operation, etc	The Scheme would be constructed between 2023 and 2024.
Other	N/A
Description of avoidance and/or mitigation measures Describe any assumed (plainly established and uncontroversial) mitigation measures, including information on:	
Nature of proposals	No mitigation is proposed for the SPA. Although not relied upon for the screening conclusions, pollution prevention methods will be in place including standard water protection measures to avoid chemical or sediment pollution of any watercourses. Works should proceed following standard good practice working methods for environmental protection which should adhere to the Guidance for Pollution Prevention (GPPs)[96] and the Construction Industry Research and Information Association[97] (CIRIA) C715 Environmental good practice. These will be secured via a CEMP.
Location	N/A
Evidence for effectiveness	N/A

[94] https://www.netregs.org.uk/environmental-topics/guidance-for-pollution-prevention-gpp-documents/guidance-for-pollution-prevention-gpps-full-list/
[95] CIRIA (2006), CIRIA C648 Control of water pollution from linear construction projects Technical guidance. London.
[96] https://www.netregs.org.uk/environmental-topics/guidance-for-pollution-prevention-gpp-documents/guidance-for-pollution-prevention-gpps-full-list/
[97] CIRIA (2006), CIRIA C648 Control of water pollution from linear construction projects Technical guidance. London.

Severn Estuary SPA Screening Matrix	
Mechanism for delivery (legal conditions, restrictions or other legally enforceable obligations)	N/A
Characteristics of European Site(s) A brief description of the European Site to be produced, including information on:	
Name of European Site and its EU code	Severn Estuary SPA (UK9015022)
Location and distance of the European Site from the proposed works	The SPA is located 21 km south west of the Scheme, or 40km downstream via the shortest hydrological connection.
European Site size	24,700.91 ha
Key features of the European Site including the primary reasons for selection and any other qualifying interests	This site qualifies under Article 4.1 of the Directive (79/409/EEC) by supporting populations of European importance of the following species listed on Annex I of the Directive: • Wintering Bewick's swan – 280 individuals representing at least 4.0% of the wintering population in Great Britain (5 year peak mean 1991/2 - 1995/6). The site also qualifies under Article 4.2 of the Directive (79/409/EEC) by supporting populations of European importance of the following migratory species: • Passage population of ringed plover (Charadrius hiaticula) – 655 individuals representing at least 1.3% of the Europe/Northern Africa wintering population (5 year peak mean 1991/2 - 1995/6). • Wintering population of curlew (Numenius arquata) – 3903 individuals representing at least 1.1% of the wintering Europe population -breeding population (5 year peak mean 1991/2 - 1995/6). • Wintering population of dunlin (Calidris alpina alpina) – 44,624 representing at least 3.2% of the wintering Northern Siberia/Europe/Western Africa population (5 year peak mean 1991/2 - 1995/6). • Wintering population of pintail (Anas acuta) – 599 individuals representing at least 1.0% of the wintering Northwestern Europe population (5 year peak mean 1991/2 - 1995/6), • Wintering population of redshank (Tringa totanus) – 2330 individuals representing at least 1.6% of the wintering Eastern Atlantic - wintering population (5 year peak mean 1991/2 - 1995/6). • Wintering population of shelduck (Tadorna tadorna) – 3330 individuals representing at least 1.1% of the wintering Northwestern Europe population (5 year peak mean 1991/2 - 1995/6).

Severn Estuary SPA Screening Matrix	
	• Regular assemblages of over 20,000 wildfowl[98], which qualify the site as a wetland of international importance. Over winter, the area regularly supports 93,986 individual waterfowl (5 year peak mean 1991/2 - 1995/6) including: gadwall, shelduck, pintail, dunlin, curlew, redshank, Bewick's swan, wigeon, lapwing, teal, mallard, shoveler, pochard, tufted duck, grey plover, white-fronted goose.
Vulnerability of the European Site – any information available from the standard data forms on potential effect pathways	Principal threats and pressures comprise: • Outdoor sports and leisure activities; • Other urbanisation, industrial and similar activities; • Modification of cultivation practices; • Changes in abiotic conditions; and • Human induced changes in hydraulic conditions.
European Site conservation objectives – where these are readily available	Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the aims of the Wild Birds Directive, by maintaining or restoring: • The extent and distribution of the habitats of the qualifying features; • The structure and function of the habitats of the qualifying features; • The supporting processes on which the habitats of the qualifying features rely; • The population of each of the qualifying features; and • The distribution of the qualifying features within the site.
Assessment criteria Describe the individual elements of the project (either alone or in combination with other plans or projects) likely to give rise to impacts on the European Site.	
The Scheme is located approximately 21 km from the SPA or 40 km via the shortest hydrological connection. Potential impact pathways have been identified via the hydrological connection and via construction impacts on habitats that might be functionally linked to bird populations associated with the SPA. The assessment below discusses these potential impact pathways in more detail.	
Initial assessment The key characteristics of the site and the details of the European Site should be considered in identifying potential impacts. Describe any likely changes to the site arising as a result of:	
Reduction of habitat area	The Scheme would not result in a reduction in habitat area from within the SPA. Monthly wintering and migratory bird surveys were undertaken within 250 m of the Scheme from September 2019 to March 2020 inclusive. A recent study[99] was also reviewed, which identifies functionally linked land associated with the Severn Estuary SPA.

[98] Over winter, the area regularly supports 93,986 individual waterfowl (5 year peak mean 1991/2 - 1995/6), including: gadwall (*Anas strepera*), shelduck, pintail, dunlin, curlew, redshank, Bewick's swan, wigeon (*Anas penelope*), lapwing (*Vanellus vanellus*), teal (*Anas crecca*), mallard (*Anas platyrhynchos*), shoveler (*Anas clypeata*), pochard (*Aythya ferina*), tufted duck (*Aythya fuligula*), grey plover (*Pluvialis squatarola*), white-fronted goose (*Anser albifrons albifrons*) and whimbrel (*Numenius phaeopus*).

[99] Link Ecology Ltd (September 2020) Identification of land with proven or possible functional linkages with the Severn Estuary SSSI/SPA Phase 5 (Gloucestershire and Worcestershire) A report to Natural England.

Severn Estuary SPA Screening Matrix	
	The wintering and migratory bird surveys recorded two qualifying species of the Severn Estuary SPA: lapwing (two individuals) and mallard (peak count of nine individuals). Given the low numbers recorded they are unlikely to be a significant component of the SPA populations. Furthermore, at this distance from the SPA (located over 20 km south west of the Scheme at the nearest point), it is considered highly unlikely that the individuals recorded within the study area are part of the SPA qualifying feature populations. The maps that accompany a recent study100 that was reviewed do not identify that these species regularly move between the SPA and the study area. However, the study also indicates that lapwing have been recorded within the Survey Area (in the vicinity of Boddington Manor Farm, adjacent to the Scheme) in numbers which reached or exceeded the equivalent of the 1% SPA population criterion for importance on at least one occasion. No lapwing were recorded at this location during the wintering and passage bird surveys, and as the study indicates that there are no regular movements between the SPA and this location it is therefore considered that this area is not regularly used by or of significant importance for lapwing. The habitats within the Survey Area are not considered to provide a role in maintaining the SPA populations or be functionally linked to the SPA.
Disturbance to key species	The Scheme is too far from the SPA for there to be any direct disturbance. The Scheme would not result in disturbance of qualifying feature populations within functionally linked habitats either, as there is not considered to be a significant functional linkage between the Scheme and the qualifying feature populations (see above).
Habitat or species fragmentation	The Scheme would not result in fragmentation of the SPA or any significant functionally linked habitats.
Reduction in species density	The Scheme would not result in a reduction in species density within the SPA.
Changes in key indicators of conservation value (water quality, etc)	The Scheme would not result in any changes in any key indicators of conservation value. Although there is a direct hydrological connection between the Scheme and the Severn Estuary SPA, at such a distance, it is considered that the potential for direct impacts via release of pollutants from the Scheme would be eliminated by dilution. DMRB guidance LA 113 states that "for assessment of impacts associated with soluble pollutants, outfalls within 1 km (measured along the watercourse) shall be aggregated for the purposes of cumulative assessment[101]". It therefore follows that soluble pollutants are considered to be sufficiently diluted beyond 1 km. Although not relied upon for the screening conclusions, pollution prevention methods will be in place including standard water protection measures to avoid chemical or sediment pollution of any watercourses. Works should proceed following standard good

[100] Link Ecology Ltd (September 2020) Identification of land with proven or possible functional linkages with the Severn Estuary SSSI/SPA Phase 5 (Gloucestershire and Worcestershire) A report to Natural England.
[101] Highways England (2020). Design Manual for Roads and Bridges LA 113 Road drainage and the water environment.

Severn Estuary SPA Screening Matrix	
	practice working methods for environmental protection which should adhere to the Guidance for Pollution Prevention (GPPs)[102] and the Construction Industry Research and Information Association[103] (CIRIA) C715 Environmental good practice. These will be secured via a CEMP. The drainage strategy to be implemented by the Scheme incorporates SuDS to mitigate the pollution risk associated with road runoff as well as accidental spills. However, given the relatively small size of the proposed works in comparison with the distance, size and mixing of the receptor designations, risks of significant spillage of chemical contaminant or silt pollution could be discounted even without any additional pollution controls.
Climate change	Climate change is not listed as a threat or pressure in relation to this site.
Describe any likely impacts on the European Site as a whole in terms of:	
Interference with the key relationships that define the structure of the site	No likely significant effects on the structure (i.e. the distribution and abundance of habitats) of the SPA are anticipated as a result of the Scheme alone or in combination with other plans or projects.
Interference with key relationships that define the function of the site	No likely significant effects on the function (i.e. the capacity of the SPA to support the qualifying features) of the SPA are anticipated as a result of the Scheme alone or in combination with other plans or projects.
Indicate the significance as a result of the identification of impacts set out above in terms of:	
Reduction of habitat area	Not significant
Disturbance to key species	Not significant
Habitat or species fragmentation	Not significant
Loss	N/A
Fragmentation	N/A
Disruption	N/A
Disturbance	N/A
Change to key elements of the site (e.g. water quality, hydrological regime etc)	Not significant
Describe from the above those elements of the project, or combination of elements, where the above impacts are likely to be significant or where the scale or magnitude of impacts is not known.	
N/A	

[102] https://www.netregs.org.uk/environmental-topics/guidance-for-pollution-prevention-gpp-documents/guidance-for-pollution-prevention-gpps-full-list/
[103] CIRIA (2006), CIRIA C648 Control of water pollution from linear construction projects Technical guidance. London.

Severn Estuary SPA Screening Matrix	
Outcome of screening stage	Not likely to be significant effects
Are the appropriate statutory environmental bodies in agreement with this conclusion (delete as appropriate and attach relevant correspondence).	TBC

Appendix G. Severn Estuary Ramsar Screening Matrix

Severn Estuary Ramsar Screening Matrix		
Project	M5 Junction 10 Improvements Scheme	
European Site under Consideration	Severn Estuary Ramsar	
Date:	Author (Name/Organisation):	Verified (Name/Organisation)
November 2019	James Cook/Lizzie Hall Atkins	Jules Price Atkins
Description of Project Describe any likely direct, indirect or secondary impacts of the project (either alone or in combination with other plans or projects) on the European Site by virtue of:		
Size and scale (road type and probable traffic volume)	The M5 Junction 10 Improvements Scheme involves construction of a new, all-direction motorway junction; construction of a new two-lane road with segregated cycleway and footway, from the B4634 to the A4019 (the West Cheltenham Link Road, or Link Road); widening of the A4019 east pf the M5 Junction 10 to the Gallagher Retail Park.	
Land-take	The Scheme would not require land-take from the Ramsar site.	
Distance from the European Site or key features of the site (from edge of the project assessment corridor)	The Scheme is 21 km north east of the Ramsar site, or approx. 40 km via the shortest hydrological connection.	
Resource requirements (from the European Site or from areas in proximity to the site, where of relevance to consideration of impacts)	The Scheme does not require resources from the Ramsar site.	
Emissions (e.g. polluted surface water runoff – both soluble and insoluble pollutants, atmospheric pollution)	Although there is a direct hydrological connection between the Scheme and the Severn Estuary Ramsar, at such a distance, it is considered that the potential for direct impacts via release of pollutants from the Scheme would be eliminated by dilution. DMRB guidance LA 113 states that "for assessment of impacts associated with soluble pollutants, outfalls within 1 km (measured along the watercourse) shall be aggregated for the purposes of cumulative assessment[104]". It therefore follows that soluble pollutants are considered to be sufficiently diluted beyond 1 km. Although not relied upon for the screening conclusions, pollution prevention methods will be in place including standard water protection measures to avoid chemical or sediment pollution of any watercourses. Works should proceed following standard good practice working methods for environmental protection which should	

[104] Highways England (2020). Design Manual for Roads and Bridges LA 113 Road drainage and the water environment.

Severn Estuary Ramsar Screening Matrix	
	adhere to the Guidance for Pollution Prevention (GPPs)[105] and the Construction Industry Research and Information Association[106] (CIRIA) C715 Environmental good practice. These will be secured via a CEMP. The drainage strategy to be implemented by the Scheme incorporates SuDS to mitigate the pollution risk associated with road runoff as well as accidental spills. However, given the relatively small size of the proposed works in comparison with the distance, size and mixing of the receptor designations, risks of significant spillage of chemical contaminant or silt pollution could be discounted even without any additional pollution controls. The Ramsar site is located beyond the distance from any construction activity at which dust from demolition or construction would be a potential impact, and more than 200 m from the ARN. Therefore, no air quality impacts are anticipated.
Excavation requirements (e.g. impacts of local hydrogeology)	At a distance of 21 km, excavation works associated with the Scheme will not impact the local hydrogeology of the Ramsar site.
Transportation requirements	Construction traffic will not be routed in the vicinity of the Ramsar site.
Duration of construction, operation, etc	The Scheme would be constructed 2023 and 2024.
Other	N/A
Description of avoidance and/or mitigation measures Describe any assumed (plainly established and uncontroversial) mitigation measures, including information on:	
Nature of proposals	To mitigate the potential for a pollution incidence to occur during construction, with consequent impacts to migratory European eel and river lamprey within the River Chelt (functionally linked habitat) standard appropriate controls and mitigation, in accordance with CIRIA C648 and Guidance for Pollution Prevention (GPPs), will be implemented in the construction design as standard and will be included in a Construction Environmental Management Plan (CEMP) followed by the Principal Contractor. Measures include: • All debris arising from the construction and works will be effectively encapsulated and removed from site; • No pollutants should enter drainage or run-off to a watercourse; • The contractor will ensure that they have a robust Pollution Response Plan in place before works start; • Any pollution incident will be contained and cleaned up immediately and reported; and • No storage of oils or chemicals will be allowed within 10 m of a watercourse.

[105] https://www.netregs.org.uk/environmental-topics/guidance-for-pollution-prevention-gpp-documents/guidance-for-pollution-prevention-gpps-full-list/
[106] CIRIA (2006), CIRIA C648 Control of water pollution from linear construction projects Technical guidance. London.

Severn Estuary Ramsar Screening Matrix	
	To mitigate the potential for disturbance to migratory fish species using functionally linked habitat within the River Chelt, the following measures will be put in place and overseen by a suitably qualified and experienced ECoW: • All haul roads, lay down areas and compounds will be located at least 15 m from watercourses, except where access is required to specific locations for works to bridges/culverts for example. • Soft start procedures will be implemented, to gradually increase the sound/vibration intensity over a period of time. The aim is to deter European eels and river lamprey before the full volume/vibration intensity is reached so that noise exposure is reduced; • Wherever possible, works will be timed outside the key ecologically sensitive periods for European eel and river lamprey. This is considered to be the migratory period for European eel (upstream migration February to July, downstream migration October to November[107]) and the upstream migration and spawning period for river lamprey (winter and spring). • No night-time vibration work will occur during migratory periods. If night working is essential, minimal and directional lighting should be used; • Ecologically sensitive design of structures such as culverts will be incorporated into the Scheme, to main connectivity, continuity of flow, and natural substrate establishment.
Location	Scheme
Evidence for effectiveness	The mitigation measures proposed are standard, tried and tested measures.
Mechanism for delivery (legal conditions, restrictions or other legally enforceable obligations)	Mitigation measures will be secured via a CEMP
Characteristics of European Site(s) A brief description of the European Site to be produced, including information on:	
Name of European Site and its EU code	Severn Estuary Ramsar (UK11081)
Location and distance of the European Site from the proposed works	The Ramsar site is located 21 km south west of the Scheme, or 40 km downstream via the shortest hydrological connection.
European Site size	24,662.98 ha
Key features of the European Site including the primary reasons for selection and any other qualifying interests	Ramsar criterion 1: Due to immense tidal range (second-largest in world), this affects both the physical environment and biological communities. Habitats Directive Annex I features present on the SAC include:

[107] https://www.fishsec.org/2020/05/15/eel-migration-report-provides-insights-but-also-highlights-data-gaps/

Severn Estuary Ramsar Screening Matrix

- H1110 Sandbanks which are slightly covered by sea water all the time;
- H1130 Estuaries;
- H1140 Mudflats and sandflats not covered by seawater at low tide; and
- H1330 Atlantic salt meadows (Glauco-Puccinellietalia maritimae).

Ramsar criterion 3:

Due to unusual estuarine communities, reduced diversity and high productivity.

Ramsar criterion 4:

This site is important for the run of migratory fish between sea and river via estuary. Species include salmon (*Salmo salar*), sea trout (*S. trutta*), sea lamprey (*Petromyzon marinus*), river lamprey (*Lampetra fluviatilis*), allis shad (*Alosa alosa*), twaite shad (*A. fallax*), and European eel (*Anguilla anguilla*). It is also of particular importance for migratory birds during spring and autumn.

Ramsar criterion 8:

The fish assemblage of the whole estuarine and river system is one of the most diverse in Britain, with over 110 species recorded. Salmon, sea trout, sea lamprey, river lamprey, allis shad, twaite shad and European eel use the Severn Estuary as a key migration route to their spawning grounds in the many tributaries that flow into the estuary. The site is important as a feeding and nursery ground for many fish species, particularly allis shad and twaite shad, which feed on mysid shrimps in the salt wedge.

Ramsar criterion 5:

Assemblages of international importance:

Species with peak counts in winter:

70,919 waterfowl (5 year peak mean 1998/99-2002/03)

Ramsar criterion 6 – species/populations occurring at levels of international importance:

Qualifying species/populations (as identified at designation):

Species with peak counts in winter:

- Tundra swan (*Cygnus columbianus bewickii*), NW Europe - 229 individuals, representing an average of 2.8% of the GB population (5 year peak mean 1998/9-2002/3);
- Greater white-fronted goose (*Anser albifrons albifrons*), NW Europe – 2,076 individuals, representing an average of 35.8% of the GB population (5 year peak mean for 1996/7-2000/01);
- Common shelduck (*Tadorna tadorna*), NW Europe – 3,223 individuals, representing an average of 1% of the population (5 year peak mean 1998/9-2002/3);

Severn Estuary Ramsar Screening Matrix	
	• Gadwall (*Anas strepera strepera*), NW Europe - 241 individuals, representing an average of 1.4% of the GB population (5 year peak mean 1998/9-2002/3); • Dunlin (*Calidris alpina alpine*), W Siberia/W Europe – 25,082 individuals, representing an average of 1.8% of the population (5 year peak mean 1998/9-2002/3); and • Common redshank (*Tringa totanus tetanus*) - 2,616 individuals, representing an average of 1% of the population (5 year peak mean 1998/9-2002/3). Species/populations identified subsequent to designation for possible future consideration under criterion 6: Species regularly supported during the breeding season: • Lesser black-backed gull (*Larus fuscus graellsii*), W Europe/Mediterranean/W Africa – 4,167 apparently occupied nests, representing an average of 2.8% of the breeding population (Seabird 2000 Census). • Species with peak counts in spring/autumn: • Ringed plover (*Charadrius hiaticula*), Europe/Northwest Africa - 740 individuals, representing an average of 1% of the population (5 year peak mean 1998/9-2002/3). • Species with peak counts in winter: • Eurasian teal (*Anas crecca*), NW Europe – 4,456 individuals, representing an average of 1.1% of the population (5 year peak mean 1998/9-2002/3); and • Northern pintail (*Anas acuta*), NW Europe - 756 individuals, representing an average of 1.2% of the population (5 year peak mean 1998/9-2002/3).
Vulnerability of the European Site – any information available from the standard data forms on potential effect pathways	Factors (past, present or potential) adversely affecting the site's ecological character: • Dredging; • Erosion; and • Recreational/tourism disturbance.
European Site conservation objectives – where these are readily available	No specific conservation objectives found. The overarching objective of the Ramsar Convention is to stem the loss and progressive encroachment on wetlands now and in the future.
Assessment criteria Describe the individual elements of the project (either alone or in combination with other plans or projects) likely to give rise to impacts on the European Site.	
The Scheme is located approx. 21 km from the Ramsar site or 40 km via the shortest hydrological connection. Potential impact pathways have been identified via the hydrological connection and via construction impacts on habitats that might be functionally linked to bird and fish populations associated with the Ramsar site. The assessment below discusses these potential impact pathways in more detail.	
Initial assessment The key characteristics of the site and the details of the European Site should be considered in identifying potential impacts. Describe any likely changes to the site arising as a result of:	

Severn Estuary Ramsar Screening Matrix	
Reduction of habitat area	The Scheme would not result in a reduction in habitat area from within the Ramsar site. Monthly wintering and migratory bird surveys were undertaken within 250 m of the Scheme from September 2019 to March 2020 inclusive. Lesser black-backed gull recorded in reasonably high numbers on one occasion (a peak count of 148 in September 2019). It is considered that these individuals are likely to be from breeding populations within urban areas such as Cheltenham and/or Gloucester, which are closer to the Scheme than the Ramsar site breeding colonies at Steep Holm and Flat Holm[108] (approximately 90 km south west). Cheltenham Borough Council states that "Lesser Black-Backed Gulls nest in the residential areas of Cheltenham and on industrial units in the Kingsditch area"[109]. The JNCC Seabird Monitoring Programme online database states that the Gloucestershire Urban Gulls Cheltenham site (85627) supported 273 lesser black-backed gull apparently occupied territories in 2011 (year of last count) and the Gloucester City: Gloucester site (86737) supported 2230 lesser black-backed gull apparently occupied nests in 2009 (year of last count)[110]. It follows that the lesser black-backed gulls recorded are unlikely to be part of the Ramsar qualifying feature population. The habitats within the Survey Area are not considered to provide a role in maintaining the Ramsar bird populations. Survey results and desk study records indicate that European eel and river lamprey are present in the vicinity of the Scheme within the River Chelt. As such, there is the potential for impacts to European eel and river lamprey, and functionally linked habitat within or surrounding the Scheme as a result of a pollution event during construction. Such impacts could arise through changes to water quality as a result of mobilization of suspended sediments leading to silt laden runoff entering watercourses; and potential for accidental contamination associated with the spillage or leakage of fuels, lubricants and other chemicals required for construction. In particular, such impacts could occur during the construction of the new bridge over the River Chelt, the temporary River Chelt crossing, and the extension of the Leigh Brook culvert.
Disturbance to key species	The Scheme is too far from the Ramsar site for there to be any direct disturbance. Survey results and desk study records indicate that European eel and river lamprey are present in the vicinity of the Scheme within the River Chelt. As such, there is potential for short-term impacts to these species within or surrounding the Scheme as a result of noise or vibration disturbance during construction of the new Link Road, in particular the construction of the new bridge over the River Chelt. The new bridge abutments will be set back from the banks of the River Chelt by 4 m. Foundation design work is still ongoing, but it is assumed that piling will be required in the construction of the bridge.

[108] Burton, N.H.K., Musgrove, A.J., Rehfisch, M.M., and Clark N.A. (2010) Birds of the Severn Estuary and Bristol Channel: Their current status and key environmental issues. Marine Pollution Bulletin 61 (2010) 115–123
[109] Cheltenham Borough Council (2018) Urban Gulls Scrutiny Task Group Report. Available at https://democracy.cheltenham.gov.uk/documents/s27390/2018_12_04_CAB_Urban_Gulls_scrutiny_report.pdf
[110] Available at https://app.bto.org/seabirds/public/index.jsp

Severn Estuary Ramsar Screening Matrix	
	In addition, a temporary River Chelt crossing will be required during construction. The Scheme would not result in disturbance of qualifying bird species within functionally linked habitats, as there is not considered to be a significant functional linkage between the Scheme and the qualifying feature populations (see above).
Habitat or species fragmentation	Although the Scheme would not result in a physical barrier to fish migration, the disturbance impacts described above could potentially result in habitat fragmentation/barrier effects.
Reduction in species density	The Scheme would not result in a reduction in species density within the Ramsar site.
Changes in key indicators of conservation value (water quality, etc)	The evidence presented in this report indicates that: hydrological impacts to functionally linked habitat within the River Chelt as a result of a pollution event during construction, and consequent detrimental effects to migratory European eel and river lamprey associated with the Severn Estuary Ramsar cannot be ruled out.
Climate change	Climate change is not listed as a threat or pressure in relation to this site.
Describe any likely impacts on the European Site as a whole in terms of:	
Interference with the key relationships that define the structure of the site	The evidence indicates that hydrological impacts to functionally linked habitat within the River Chelt as a result of a pollution event during construction, and consequent detrimental effects to migratory European eel and river lamprey associated with the Severn Estuary Ramsar cannot be ruled out.
Interference with key relationships that define the function of the site	Disturbance impacts to migratory European eel and river lamprey associated with the Severn Estuary Ramsar using functionally linked habitat within the River Chelt during construction cannot be ruled out.
Indicate the significance as a result of the identification of impacts set out above in terms of:	
Reduction of habitat area	Potential LSE
Disturbance to key species	Potential LSE
Habitat or species fragmentation	Potential LSE
Loss	N/A
Fragmentation	N/A
Disruption	N/A
Disturbance	N/A
Change to key elements of the site (e.g. water quality, hydrological regime etc)	Potential LSE
Describe from the above those elements of the project, or combination of elements, where the above impacts are likely to be significant or where the scale or magnitude of impacts is not known.	

Severn Estuary Ramsar Screening Matrix	
N/A	
Outcome of screening stage	Potential for a LSE
Are the appropriate statutory environmental bodies in agreement with this conclusion (delete as appropriate and attach relevant correspondence).	TBC

Appendix H. Wye Valley and Forest of Dean Bat Sites SAC Finding of No Significant Effects Report Matrix (Screening)

Wye Valley and Forest of Dean Bat Sites SAC Finding of No Significant Effects Report Matrix (Screening)		
Project Name	M5 Junction 10 Improvements Scheme	
Natura 2000 Site under Consideration	Wye Valley and Forest of Dean Bat Sites SAC	
Date:	Author (Name/Organisation):	Verified (Name/Organisation):
August 2021	James Cook/Lizzie Hall Atkins	Jules Price Atkins
Name and location of European Site	Wye Valley and Forest of Dean Bat Sites SAC The nearest part of the SAC (Blaisdon Hall SSSI) is located approx. 21 km south west of the Scheme.	
Description of the project	The M5 Junction 10 Improvements Scheme involves construction of a new, all-direction motorway junction; construction of a new two-lane road with segregated cycleway and footway, from the B4634 to the A4019 (the West Cheltenham Link Road, or Link Road); widening of the A4019 east pf the M5 Junction 10 to the Gallagher Retail Park.	
Is the project directly connected with or necessary to the management of the site (provide details)?	No	
Are there other projects or plans that together with the project being assessed could affect the site (provide details)?	No	
Assessment of Significance of Effects		
Describe how the project (alone or in combination) is likely to affect the European Site	The only potential impact pathway that has been identified is the potential for construction works to impact upon habitats that might be functionally linked to the SAC.	
Explain why these effects are not considered significant	The Scheme would not result in a reduction in habitat area from within the SAC. The Scheme would not affect functionally linked habitats either, as the distance is considered to be too great for there to be a	

Wye Valley and Forest of Dean Bat Sites SAC Finding of No Significant Effects Report Matrix (Screening)			
	significant functional linkage between the Scheme and the qualifying feature bat populations. This is because the distance is at least seven times larger than the core sustenance zones[111] identified by the Bat Conservation Trust (BCT)[112] for lesser horseshoe bats (2 km) and greater horseshoe bats (3 km). In terms of bat behaviour in this site specifically, flight lines and feeding grounds within the wider ecological network are critical in supporting the SAC. Lesser horseshoe bats tend to forage within two to three kilometres of their roost, with density of bats associated with the SAC declining sharply after this113. In the winter, the foraging range is thought to be around half this. A conservation objective of the SAC is to maintain a wide area of supporting habitat for bats, with the Site Improvement Plan suggesting the creation of a feeding area of a radius of approximately 4 km around maternity roosts114. A radiotracking study of greater horseshoe bats in Dean Hall, a constituent SSSI of the SAC, found that bats forage up to 9 km from the roost using a number of night roosts during the feeding period[115]. At a distance of 21 km at the nearest point, these foraging areas for bats associated with the SAC are significantly less than this. Therefore, the Scheme will not impact any habitat for bats associated with the SAC. In addition, the site is beyond the affected road network, and as a result will not be impacted by air quality pollution impacts.		
List of agencies consulted: provide contact name and telephone or e-mail address	N/A		
Response to consultation	N/A		
Data Collected to Carry out the Assessment			
Who carried out the assessment?	Sources of data	Level of assessment completed	Where can the full results of the assessment be accessed and viewed
James Cook (Ecologist)/Lizzie Hall (Ecologist) Atkins	Collins, J. (ed.) (2016) Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd edn). The Bat Conservation Trust, London.	Screening in accordance with LA 115	M5 Junction 10 Improvements Scheme Habitats Regulations Assessment (Atkins, August 2021)

[111] The area surrounding a communal bat roost within which habitat availability and quality will have a significant influence on the resilience and conservation status of the colony using the roost.
[112] Collins, J. (ed.) (2016) Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd edn). The Bat Conservation Trust, London.
[113] Countryside Council for Wales (2008). Core Management Plan Including Conservation Objectives for Wye Valley and Forest of Dean Bat SAC
[114] Improvement Programme for England's Natura 2000 Sites (2015). Site Improvement Plan: Wye Valley and the Forest of Dean Bat Sites
[115] Improvement Programme for England's Natura 2000 Sites (2015). Site Improvement Plan: Wye Valley and the Forest of Dean Bat Sites

Appendix I. Walmore Common SPA Finding of No Significant Effects Report Matrix (Screening)

Walmore Common SPA Finding of No Significant Effects Report Matrix (Screening)		
Project Name	M5 Junction 10 Improvements Scheme	
Natura 2000 Site under Consideration	Walmore Common SPA	
Date:	Author (Name/Organisation):	Verified (Name/Organisation):
August 2021	James Cook/Lizzie Hall Atkins	Jules Price Atkins
Name and location of European Site	Walmore Common SPA – 17.5 km south west of the Scheme	
Description of the project	The M5 Junction 10 Improvements Scheme involves construction of a new, all-direction motorway junction; construction of a new two-lane road with segregated cycleway and footway, from the B4634 to the A4019 (the West Cheltenham Link Road, or Link Road); widening of the A4019 east pf the M5 Junction 10 to the Gallagher Retail Park.	
Is the project directly connected with or necessary to the management of the site (provide details)?	No	
Are there other projects or plans that together with the project being assessed could affect the site (provide details)?	No	
Assessment of Significance of Effects		
Describe how the project (alone or in combination) is likely to affect the European Site	The only potential impact pathway that has been identified is the potential for construction works to impact upon habitats that might be functionally linked to the SPA.	
Explain why these effects are not considered significant	The Scheme would not result in a reduction in habitat area from within the SPA. Monthly wintering and migratory bird surveys were undertaken within 250 m of the Scheme from September 2019 to March 2020 inclusive. No Bewick's swans (Walmore Common SPA qualifying feature) were observed within the survey area during this time.	

Walmore Common SPA Finding of No Significant Effects Report Matrix (Screening)			
	Gloucestershire Centre for Environmental Records (GCER) was contacted to obtain recent records[116] of protected and notable species within 1 km of the Scheme. No records of Bewick's swan were provided. In addition, a review of existing literature was conducted, which indicated that the agricultural grassland habitats surrounding the Scheme are not key areas for populations of Bewick's swan[117]. The results of the wintering and migratory bird surveys and desk study indicate that Bewick's swan does not regularly use and is not dependent on the habitat in the vicinity of the Scheme.		
List of agencies consulted: provide contact name and telephone or e-mail address	N/A		
Response to consultation	N/A		
Data Collected to Carry out the Assessment			
Who carried out the assessment?	Sources of data	Level of assessment completed	Where can the full results of the assessment be accessed and viewed
James Cook (Ecologist)/Lizzie Hall (Ecologist) Atkins	Robinson *et al*. (2004)[118] Aerial imagery of the Severn Vale[119] Bird survey data (Atkins, September 2019 to March 2020)	Screening in accordance with LA 115	M5 Junction 10 Improvements Scheme Habitats Regulations Assessment (Atkins, August 2021)

[116] Records of observations within the last 10 years.
[117] Robinson, JA, K Colhoun, JG McElwaine & EC Rees (2004). Bewick's Swan *Cygnus columbianus bewickii* (Northwest Europe population) in Britain and Ireland 1960/61 – 1999/2000. Waterbird Review Series, The Wildfowl & Wetlands Trust/Joint Nature Conservation Committee, Slimbridge.
[118] Robinson, JA, K Colhoun, JG McElwaine & EC Rees (2004). Bewick's Swan *Cygnus columbianus bewickii* (Northwest Europe population) in Britain and Ireland 1960/61 – 1999/2000. Waterbird Review Series, The Wildfowl & Wetlands Trust/Joint Nature Conservation Committee, Slimbridge.
[119] Online: https://magic.defra.gov.uk/ [Accessed 04/11/19].

Appendix J. Walmore Common Ramsar Finding of No Significant Effects Report Matrix (Screening)

Walmore Common Ramsar Finding of No Significant Effects Report Matrix (Screening)		
Project Name	M5 Junction 10 Improvements Scheme	
Natura 2000 Site under Consideration	Walmore Common Ramsar	
Date:	Author (Name/Organisation):	Verified (Name/Organisation):
August 2021	James Cook/Lizzie Hall Atkins	Jules Price Atkins
Name and location of European Site	Walmore Common Ramsar – 17.5 km south west of the Scheme	
Description of the project	The M5 Junction 10 Improvements Scheme involves construction of a new, all-direction motorway junction; construction of a new two-lane road with segregated cycleway and footway, from the B4634 to the A4019 (the West Cheltenham Link Road, or Link Road); widening of the A4019 east pf the M5 Junction 10 to the Gallagher Retail Park.	
Is the project directly connected with or necessary to the management of the site (provide details)?	No	
Are there other projects or plans that together with the project being assessed could affect the site (provide details)?	No	
Assessment of Significance of Effects		
Describe how the project (alone or in combination) is likely to affect the European Site	The only potential impact pathway that has been identified is the potential for construction works to impact upon habitats that might be functionally linked to the Ramsar.	
Explain why these effects are not considered significant	The Scheme would not result in a reduction in habitat area from within the Ramsar. Monthly wintering and migratory bird surveys were undertaken within 250 m of the Scheme from September 2019 to March 2020 inclusive. No Bewick's swans (Walmore Common Ramsar qualifying feature) were observed within the survey area during this time.	

Walmore Common Ramsar Finding of No Significant Effects Report Matrix (Screening)			
	Gloucestershire Centre for Environmental Records (GCER) was contacted to obtain recent records[120] of protected and notable species within 1 km of the Scheme. No records of Bewick's swan were provided. In addition, a review of existing literature was conducted, which indicated that the agricultural grassland habitats surrounding the Scheme are not key areas for populations of Bewick's swan[121]. The results of the wintering and migratory bird surveys and desk study indicate that Bewick's swan does not regularly use and is not dependent on the habitat in the vicinity of the Scheme.		
List of agencies consulted: provide contact name and telephone or e-mail address	N/A		
Response to consultation	N/A		
Data Collected to Carry out the Assessment			
Who carried out the assessment?	Sources of data	Level of assessment completed	Where can the full results of the assessment be accessed and viewed
James Cook (Ecologist)/Lizzie Hall (Ecologist) Atkins	Robinson *et al*. (2004)[122] Aerial imagery of the Severn Vale[123] Bird survey data (Atkins, September 2019 to March 2020)	Screening in accordance with LA 115	M5 Junction 10 Improvements Scheme Habitats Regulations Assessment (Atkins, August 2021)

[120] Records of observations within the last 10 years.
[121] Robinson, JA, K Colhoun, JG McElwaine & EC Rees (2004). Bewick's Swan *Cygnus columbianus bewickii* (Northwest Europe population) in Britain and Ireland 1960/61 – 1999/2000. Waterbird Review Series, The Wildfowl & Wetlands Trust/Joint Nature Conservation Committee, Slimbridge.
[122] Robinson, JA, K Colhoun, JG McElwaine & EC Rees (2004). Bewick's Swan *Cygnus columbianus bewickii* (Northwest Europe population) in Britain and Ireland 1960/61 – 1999/2000. Waterbird Review Series, The Wildfowl & Wetlands Trust/Joint Nature Conservation Committee, Slimbridge.
[123] Online: https://magic.defra.gov.uk/ [Accessed 04/11/19].

Appendix K.Severn Estuary SPA Finding of No Significant Effects Report Matrix (Screening)

Severn Estuary SPA Finding of No Significant Effects Report Matrix (Screening)		
Project Name	M5 Junction 10 Improvements Scheme	
Natura 2000 Site under Consideration	Severn Estuary SPA	
Date:	Author (Name/Organisation):	Verified (Name/Organisation):
August 2021	James Cook/Lizzie Hall Atkins	Jules Price Atkins
Name and location of European Site	Severn Estuary SPA – 21 km south west of the Scheme (40 km via the shortest hydrological connection)	
Description of the project	The M5 Junction 10 Improvements Scheme involves construction of a new, all-direction motorway junction; construction of a new two-lane road with segregated cycleway and footway, from the B4634 to the A4019 (the West Cheltenham Link Road, or Link Road); widening of the A4019 east pf the M5 Junction 10 to the Gallagher Retail Park.	
Is the project directly connected with or necessary to the management of the site (provide details)?	No	
Are there other projects or plans that together with the project being assessed could affect the site (provide details)?	No	
Assessment of Significance of Effects		
Describe how the project (alone or in combination) is likely to affect the European Site	Potential impact pathways have been identified via the hydrological connection, which could provide a route for pollutants to travel downstream to the SPA from the Scheme, and via construction impacts on habitats that might be functionally linked to bird populations associated with the SPA.	
Explain why these effects are not considered significant	If any pollutants were to be discharged from the Scheme into the adjacent hydrological network, these would be diluted to a negligible level by the time they reached the SPA, over 40 km downstream. Although there is a direct hydrological connection between the Scheme and the Severn Estuary SAC, at such a distance, it is considered that the potential for direct impacts via release of pollutants from the Scheme would be eliminated by dilution.	

Severn Estuary SPA Finding of No Significant Effects Report Matrix (Screening)	
	DMRB guidance LA 113 states that "for assessment of impacts associated with soluble pollutants, outfalls within 1 km (measured along the watercourse) shall be aggregated for the purposes of cumulative assessment[124]". It therefore follows that soluble pollutants are considered to be sufficiently diluted beyond 1 km. Although not relied upon for the screening conclusions, pollution prevention methods will be in place including standard water protection measures to avoid chemical or sediment pollution of any watercourses. Works should proceed following standard good practice working methods for environmental protection which should adhere to the Guidance for Pollution Prevention (GPPs)[125] and the Construction Industry Research and Information Association[126] (CIRIA) C715 Environmental good practice. These will be secured via a CEMP. The drainage strategy to be implemented by the Scheme incorporates SuDS to mitigate the pollution risk associated with road runoff as well as accidental spills. However, given the relatively small size of the proposed works in comparison with the distance, size and mixing of the receptor designations, risks of significant spillage of chemical contaminant or silt pollution could be discounted even without any additional pollution controls. Monthly wintering and migratory bird surveys were undertaken within 250 m of the Scheme from September 2019 to March 2020 inclusive. A recent study[127] was also reviewed, which identifies functionally linked land associated with the Severn Estuary SPA. The wintering and migratory bird surveys recorded two qualifying species of the Severn Estuary SPA: lapwing (two individuals) and mallard (peak count of nine individuals). Given the low numbers recorded they are unlikely to be a significant component of the SPA populations. Furthermore, at this distance from the SPA (located over 20 km south west of the Scheme at the nearest point), it is considered highly unlikely that the individuals recorded within the study area are part of the SPA qualifying feature populations. The maps that accompany a recent study[128] that was reviewed do not identify that these species regularly move between the SPA and the study area. However, the study also indicates that lapwing have been recorded within the Survey Area (in the vicinity of Boddington Manor Farm, adjacent to the Scheme) in numbers which reached or exceeded the equivalent of the 1% SPA population criterion for importance on at least one occasion. No lapwing were recorded at this location during the wintering and passage bird surveys, and as the study indicates that there are no regular movements between the SPA and this location it is therefore considered that this area is not regularly used by or of significant importance for lapwing.

[124] Highways England (2020). Design Manual for Roads and Bridges LA 113 Road drainage and the water environment.
[125] https://www.netregs.org.uk/environmental-topics/guidance-for-pollution-prevention-gpp-documents/guidance-for-pollution-prevention-gpps-full-list/
[126] CIRIA (2006), CIRIA C648 Control of water pollution from linear construction projects Technical guidance. London.
[127] Link Ecology Ltd (September 2020) Identification of land with proven or possible functional linkages with the Severn Estuary SSSI/SPA Phase 5 (Gloucestershire and Worcestershire) A report to Natural England.
[128] Link Ecology Ltd (September 2020) Identification of land with proven or possible functional linkages with the Severn Estuary SSSI/SPA Phase 5 (Gloucestershire and Worcestershire) A report to Natural England.

Severn Estuary SPA Finding of No Significant Effects Report Matrix (Screening)			
	The habitats within the Survey Area are not considered to provide a role in maintaining the SPA populations or be functionally linked to the SPA.		
List of agencies consulted: provide contact name and telephone or e-mail address	N/A		
Response to consultation	N/A		
Data Collected to Carry out the Assessment			
Who carried out the assessment?	Sources of data	Level of assessment completed	Where can the full results of the assessment be accessed and viewed
James Cook (Ecologist)/Lizzie Hall (Ecologist) Atkins	Aerial imagery of the Severn Vale[129] Bird survey data (Atkins 2019 – 2020) Link Ecology Ltd (September 2020) Identification of land with proven or possible functional linkages with the Severn Estuary SSSI/SPA Phase 5 (Gloucestershire and Worcestershire) A report to Natural England.	Screening in accordance with LA 115	M5 Junction 10 Improvements Scheme Habitats Regulations Assessment (Atkins, August 2021)

Appendix L. Consultation with Natural England

To:	**Rebecca Underdown (Natural England)**		
From:	Lizzie Hall (Atkins)	Email:	Lizzie.hall@atkinsglobal.com
Date:	14/07/2021		
Ref:	Natural England ref: 336137 Our ref: UDS 9083	cc:	Scott Macaulay-Lowe (GCC) Colin Cartwright (Atkins)
Subject:	M5 Junction 10 Improvements Scheme. Atkins response to Natural England's comments received 16/04/2021		

Natural England comment		Atkins response
Survey work – Natural England has reviewed the surveys to date and can offer the following comments	The bat surveys are acceptable; it is noted that they are current and up to date. The surveys are a mix of static and transect surveys, covering the whole season. This is agreed with. For clarification, the consultation document, paragraph 2.4.12 regarding thermal cameras is acceptable.	Noted.
	Figure 9, Buildings within the bat roost study area and figure 10, Bat activity survey locations, show further areas of study. Static detector locations and crossing points, in relation to options 2, 2a and 2b have been highlighted. This is accepted. Bat roost potential in relation to options 2, 2a and 2b have been highlighted. This is also accepted. It should be noted that if bats are found on site, an EPS licence will also be needed from Natural England prior to any works taking place.	Noted and agreed.
	Regarding the GCN surveys, they have been restricted to eDNA, with a commitment to undertake population size class assessments in the future, or alternatively engage with	Noted. Discussions are ongoing with Naturespace regarding district level licensing. The applicant will be collecting further data (HSI and

Natural England comment		Atkins response
	Gloucestershire's district level licensing system. This is agreed with. Regarding further GCN surveys, it does not appear that any information is provided here.	eDNA where possible) on ditches and any waterbodies where access has not previously been granted, if this can now be arranged, in 2021. This information will be passed to Naturespace so that they can assess the suitability of the scheme for district level licensing.
	When the application is submitted in 2022 some of the surveys will be three years old. The applicant proposes to address this through a further phase 1 habitat survey. This is agreed with.	Noted. An extended Phase 1 validation survey is proposed in 2021. This will focus on targeted areas, namely within the scheme boundary, where the greatest impact is anticipated. In addition, validation surveys for bats are proposed. These will comprise validation surveys of seven transects (Transect numbers 2, 4, 5, 7, 8, 9, 19). Three surveys of each transect are proposed during 2021. Further information is included in the Bat Survey Protocol, which is shared with Natural England along with this response.
	It is not considered that likely significant effects (LSE) can be ruled out based on migratory functionally linked species of the Severn Estuary SPA/SAC/Ramsar. The report concludes that based on the River Chelt, LSE can be ruled out. The premise for this conclusion is based on the lack of Environment Agency survey data for these waterbodies. However, a check shows that for example eel data is available. It should be noted that eels are currently classed as critically endangered. It is recommended therefore, that data is formally requested from the Environment Agency, and used to inform the HRA.	Noted. Previous desk study looked at Environment Agency data <5 years old within 2km of the site. No recent (<5 years old) Environment Agency data are available from within 2 km of the site. However, a wider study area and longer data period has now been reviewed. This indicates that qualifying species (eel and trout) are present on site. This confirms, as per Natural England's comment, that eels have been recorded in the vicinity of the site. In addition, the applicant has now undertaken fish surveys for the project. Surveys conducted on behalf of Atkins on the River Chelt in 2020 identified the presence of European eel at two locations (SO 90140 24760 - SO 90053 24787 and SO 90645 24606 – SO 90518 24634) on 28 and 29 July 2020. Bullhead, stone loach and minnow were also present. In terms of potential impacts to fish species, the Scheme would not introduce a barrier and is not expected to reduce connectivity for fish movement in operation. Construction practices will adhere to best practice guidelines and methods such as soft start procedures. The assessment will consider potential for temporary

Natural England comment		Atkins response
		harm, disturbance and barriers to fish movement during construction as well as operational impacts. It may be necessary to time works outside of the key ecologically sensitive periods for fish. Ecologically sensitive design of structures such as culverts will be incorporated to the Scheme, to maintain connectivity, continuity of flow and natural substrate establishment. On the basis that there are potential impact pathways, which if not mitigated could impact on qualifying species of a European site, the applicant accepts that is it probable that an appropriate assessment will be required.
	Regarding surveys of the other species, it appears to be in line with the relevant guidelines, and no issues appear to have arisen.	Noted.
Habitat Regulations Assessment Stage 1 Screening document	Natural England is currently not satisfied, on the basis of the objective information which has so far been provided, that it can be excluded that the proposed plan or project will have a significant effect on both the Severn Estuary SPA and Walmore Common SPA either individually or in combination with other plans or projects. Furthermore, Natural England is not yet satisfied that the proposed operations are not likely to damage any of the interest features of the Severn Estuary SSSI. Natural England therefore requests that additional information is provided in order to address these current uncertainties.	See responses to further, more specific comments, below.
Wye Valley and Forest of Dean Bat Site SAC	The HRA Screening document screens out any impacts on the Wye Valley and Forest of Dean Bat Site SAC on distance. The submitted maps highlight the screening distance that has been used. It is stated that the nearest component site is over 21km away and outside of any core sustenance zone for horseshoe bats. Therefore, the distance between the SAC and the proposal site is too great for any significant functional linkage. It is accepted that impacts from the scheme such as disturbance from lighting	Noted. A review of known foraging/commuting routes for qualifying bat species of the SAC will be undertaken, as well as a more in-depth consideration of any ecological pathways between the Scheme and the SAC.

Natural England comment		Atkins response
	and habitat loss and fragmentation would not occur due to distance. The conclusion could be strengthened by considering any commuting/foraging routes in relation to the above information and making clear whether there are any ecological pathways.	
Severn Estuary	The report omits the following SAC/Ramsar Site designated species: • Atlantic salmon • Sea trout • Allis shad • European eel We would recommend that the report is revised to consider the ecology of these species. Consultation with the Environment Agency, if not already, may provide up to date local knowledge of which species are to be found in the River Chelt and other nearby watercourses.	Noted. Consultation is ongoing with the Environment Agency. As detailed above review of Environment Agency ecology data has been undertaken. Six Environment Agency sites were identified on the River Chelt that have been surveyed within the last 10 years (detailed above). All six sites identified varying life stages of European eel, from glass eels, elvers and adult eels. Fish surveys have also been undertaken to inform the baseline for the Scheme at two locations on the River Chelt (SO 90140 24760 - SO 90053 24787 and SO 90645 24606 – SO 90518 24634). Both surveys recorded European eel. On the basis that there are potential impact pathways, which if not mitigated could impact on qualifying species of a European site, the applicant accepts that is it probable that an appropriate assessment will be required.
	3.3.11 Severn Estuary SPA/SAC/Ramsar Site We note that effects on the SAC habitats have been screened out on the basis of distance and corresponding dilution (e.g. pollution). We propose that the narrative should be strengthened by referring to relevant industry standards for construction site practices (fuel/oil storage, surface water run-off from works compounds etc), together with works along the length of the new route(s) and scope for these to be secured via e.g. CEMP or equivalent. The objective should be to prevent pollution rather than to rely on distance and dilution to protect downstream habitats (including the SAC/Ramsar Site)	Noted. The applicant confirms that construction practices will adhere to industry best practice methodologies. Further information on this will be incorporated into the updated HRA Screening report.

Natural England comment		Atkins response
	3.3.12 There is no reference to eels	Noted. The SAC/Ramsar species that appear to have been omitted will be incorporated into the updated HRA Screening report.
	3.3.14 – 15 Please refer to our comments above about SAC/Ramsar Site species omitted from the current version of the report. You should review your conclusions when you have considered these species. With particular regard to European eel, this species' ecology is such that careful consideration should be given to their potential presence in local watercourses/water bodies near the proposed scheme.	Noted. The SAC/Ramsar species that appear to have been omitted will be incorporated into the updated HRA Screening report.
	3.3.17 – Functional linkage for Severn Estuary SPA wild birds We note that these species have been screened out on the grounds of distance between the project site and the SPA. In order to strengthen the HRA report narrative, we recommend that you reference the following unpublished report, recently commissioned by Natural England: "Identification of land with proven or possible functional linkages with the Severn Estuary SSSI/SPA – Phase 5 (Gloucestershire and Worcestershire)" (Link Ecology). From our understanding of the report we would conclude that significant effects on functionally linked land may be screened out though the report shows that such land lies much closer to the project area than the SPA itself.	Thank you for sending the Link Ecology report to us. When we come to update the HRA we will strengthen this argument and draw on the aforementioned report as evidence.
	Appendix F: Ramsar migratory species mentioned however no detail on eels, salmon etc specifically. Looks like copy from SAC section.	Noted. Information on these species will be incorporated into the updated HRA Screening report.
	Lack of detail on pollution prevention mechanisms or whether the channel will be heavily modified in any way as part of the works in HRA. Pollution prevention mention	Noted. Further detail will be incorporated into the updated HRA Screening report.

Natural England comment		Atkins response
	appears to be phrased in a way that may suggest its being used to screen out LSE.	
	Would like to see SPA species survey detail in HRA and specifically impacted lapwing numbers in relation to estimated number in the Severn Estuary and conservation status. Possible need for bird disturbance strategy depending on work timings and impacted land?	Noted. Further detail will be incorporated into the updated HRA Screening report.
Walmore Common SPA	3.3.9 The document also screens out impacts on Walmore Common SPA for a number of reasons. It is stated that the site is 12.5 km away and there are other suitable habitats closer to the SPA. This is not necessarily agreed with, as it is stated that further surveys will be undertaken. Confirmation is therefore required as to when the wintering and migratory bird species survey be available. The report narrative should then be updated to include reference to this survey work and any issues arising.	Noted. Further detail, including additional survey data, will be incorporated into the updated HRA Screening report.
SSSI Impact Risk Zones	3.3.18 We would caution against using the SSSI Impact Risk Zones as evidence to support screening out significant effects. Our advice above regarding the functional linkage research is provided in order to ensure your reasoning is based on the most up to date available scientific information and takes account of the recent Holohan judgement (Ref C461/17) case law. This reinforces the need for an appropriate assessment, to include an examination of the implications of the proposed project for habitat types and species to be found outside the boundaries of the site provided those implications are likely to affect the conservation objectives of the site.	Noted. Alternative evidence to screen out significant effects will be drawn upon, as appropriate. The probable need for an Appropriate Assessment has already been noted above.
In-combination	3.4 Screening in combination	Noted. This will be considered when we update the HRA Screening report.

Natural England comment		Atkins response
	We note that no other relevant plans or projects are referenced. We would encourage you to consider relevant projects (e.g. those permitted but not yet implemented NB there may be other criteria) where ecological pathways may exist (using the source-pathway-receptor approach). For example, the strategic allocations associated with Cheltenham (Gloucester, Cheltenham and Tewkesbury Joint Core Strategy adopted proposals maps document refers) should be considered. Cheltenham planning application reference 16/02000/OUT (4000 homes and 24ha of employment use land) may require consideration accordingly.	
Air quality	It is considered from the submitted documents that there has been an oversight in terms of air quality. The affected road network needs to be identified and confirmed whether any protected sites are within 200m. As part of the process, through the HRA consideration of designated sites is sought and the impacts from air quality examined. This will include for example, consideration of nitrogen deposition on any woodland SSSI's. We would draw the Council's attention to the two pieces of case law; the Wealden Judgement and Dutch Nitrogen Case.	Noted. Traffic data has now been received and the assessment is underway. The Air Quality assessment will follow DMRB LA105. As per LA105, *internationally, nationally and locally designated sites of ecological conservation importance on protected species and on habitats and other species identified as being of principal importance for the conservation of biodiversity (known as designated habitats) within 200m of the ARN shall be included in the air quality assessment. NOTE Designated habitats include 'Ramsar' sites, special protection areas, special areas of conservation, sites of special scientific interest, local nature reserves, local wildlife sites, nature improvement areas, ancient woodland and veteran trees.*
Air pollution	We would expect the project to address the impacts of air quality on the natural environment. In particular, it should address any traffic impacts associated with new development, particularly where this impacts on European sites and SSSIs. The HRA should also consider any detrimental impacts on the natural environment and suggest	See response above.

Natural England comment		Atkins response
	appropriate avoidance or mitigation measures where applicable. Natural England advises that one of the main issues which should be considered within the HRA are proposals which are likely to generate additional nitrogen emissions as a result of increased traffic generation, which can be damaging to the natural environment. The effects on local roads in the vicinity of any proposed development on nearby designated nature conservation sites (including increased traffic, construction of new roads, and upgrading of existing roads) and the impacts on vulnerable site from air quality effects on the wider road networks in the area (a greater distance away from the development) can be assessed using traffic projections and the 200m distance criterion followed by local Air Quality modelling where required. We consider that the designated sites at risk from local impacts are those within 200m of a road with increased traffic which feature habitats that are vulnerable to nitrogen deposition/acidification. APIS provides a searchable database and information on pollutants and their impacts on habitats and species.	
Nationally Designated Landscapes	As the development site is adjacent to the Cotswold AONB, consideration should be given to the direct and indirect effects upon this designated landscape and in particular the effect upon its purpose for designation, as well as the content of the relevant management plan for the Cotswold AONB.	Potential impacts to the Cotswold AONB will be considered as part of the landscape and ecology assessments.

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