7 Biodiversity

7.1 Introduction

7.1.1 This chapter of the ES was prepared by Greengage Environmental Limited and presents an assessment of the likely significant effects of the Proposed Development on the Site and surrounds within the Zone of Influence (ZoI) (defined in Section 7.3). Mitigation measures are identified, where appropriate, to avoid, reduce or offset any significant adverse effects identified and/or enhance likely beneficial effects. The nature and significance of the likely residual effects are reported.

7.1.2 The chapter is supported by the following appendices:

- Appendix 7.1: Preliminary Ecological Appraisal (PEA), including 2022 and 2023 survey report (February 2023);
- Appendix 7.2: Figures;
- Appendix 7.3: SSSI Impact Assessment;
- Appendix 7.4: Draft Mitigation and Ecological Management Plan (MEMP) Volume 1;
- Appendix 7.5: Draft Mitigation and Ecological Management Plan (MEMP) Volume 2 Parts A-D;
- Appendix 7.6: Wintering Bird and Disturbance Survey Report (October 2023);
- Appendix 7.7: Breeding Bird Survey Report (August 2023);
- Appendix 7.8: Invertebrate Survey Report (August 2023);
- Appendix 7.9: Ecology Report (terrestrial habitats, lacustrine habitats, survey for invasive non-native species, badger, otter, water vole) (October 2023) (N.B. the badger survey report within this appendix confidential, a redacted version of this report is provided for public viewing);
- Appendix 7.10: Bat Survey Report (October 2023);
- Appendix 7.11: Biodiversity Net Gain Assessment;
- Appendix 7.12: Biodiversity Air Quality Modelling Assessment; and
- Appendix 7.13: Natural England Discretionary Advice.

7.1.3 The figures in Appendix 7.2 comprise the following:

- Figures 1-5: UKHab habitat maps of the Site;
- National Nature Reserves (NNR) within 10km;
- NNRs within 2km;
- Sites of Special Scientific Interest (SSSI) within 10km;
- SSSIs within 2km; and
- Local Nature Reserves (LNR) within 2km.

7.1.4 The following figure is included within the text of this Chapter: Figure 7.1: Mid-Colne Valley SSSI, SINC and the Site boundary.

Competence

7.1.5 This assessment has been written by a Greengage Associate Ecologist who has an undergraduate degree (BSc Hons) and a PhD in Environmental Sciences, along with a Natural England Level 1 Class Licence for bats. They have over 15 years' experience in ecological surveying and assessment.

7.1.6 The work has been reviewed by a second Associate and a Director.

7.1.7 The reviewing Associate has a first-class BSc (Hons) in Environmental Science and MSc in Environmental Management and Sustainable Development. She is a full member of CIEEM and an Associate member of IEMA. She co-chairs the IEMA Biodiversity and Natural Capital Steering Group and is a member of the IEMA Policy and Practice Committee. She has over 16 years of ecological consultancy experience and is licenced to survey bats and GCN in England and Wales She has held mitigation licences for bats and GCN and holds a CL31 water vole displacement licence.

7.1.8 The Director who approved this chapter has a bachelor's degree in environmental biology (BSc Hons), and holds Natural England Protected Species licences for Great Crested Newt and Dormouse; he is a Chartered Environmentalist (CEnv) and Full member of CIEEM with over 20 years' experience in ecological surveying and assessment.

7.2 Legislation, Planning Policy and Guidance

7.2.1 Detailed information relating to relevant legislation, policy and guidance with regards to Biodiversity, the Site and the Proposed Development is provided within Appendix 7.1; a summary is provided below.

Legislative Context

7.2.2 The following legislation is relevant to the Proposed Development:

- The Environment Act, 2021[1].
- The Conservation of Habitats and Species (Amendment) (EU Exit) Regulations, 2019 ('Habitats & Species Regulations')[2].
- The Wildlife and Countryside Act 1981 (as amended)[3].
- The Countryside and Rights of Way Act, 2000 (CRoW Act)[4].
- The Natural Environment and Rural Communities Act, 2006[5].

Statutory Duties of Local Planning Authorities with respect to SSSI

7.2.3 Under Section 28G of the Wildlife and Countryside Act 1981 (as amended) local planning authorities have a statutory duty not only to avoid damage to SSSIs but to further their conservation and enhancement.

7.2.4 The Natural Environment and Rural Communities (NERC) Act 2006 ('NERC Act') places a duty on every public authority to consider biodiversity. This duty is designed to encourage effective management of biodiversity in the wider environment and includes designated sites such as SSSIs.

Planning Policy Context

7.2.5 The following national, regional and local planning policy is relevant to the Proposed Development:

National

- National Planning Policy Framework (2023)[6].

7.2.6 National Planning Policy Framework (NPPF) (paragraph 180 (B) provides national policy protection for SSSIs and states that *"Development on land within or outside a Site of Special Scientific Interest, and which is likely to have an adverse effect on it (either individually or in combination with other developments), should not normally be permitted."* The NPPF (paragraph 180 (B)) also states *"The only exception is where the benefits of the Proposed Development in the location proposed clearly outweigh both its likely impact on the features of the site that make it of special scientific interest, and any broader impacts on the national network of Sites of Special Scientific Interest"*.

Regional

- The London Plan (March 2021)[7].

7.2.7 Policies within the London Plan of relevance to the Site and the Proposed Development include Policy G1 Green Infrastructure, Policy G5 Urban Greening, Policy G6 Biodiversity and access to nature and Policy G7 Trees and Woodland. Further detail on these policies is provided within Appendix 7.1.

Local

- London Borough of Hillingdon Local Plan Part 1 – Strategic Policies (LPP1) (adopted November 2012); and
- London Borough of Hillingdon Local Plan Part 2 – Development Management Policies (LPP2) (adopted January 2020)[8].

Guidance

7.2.8 The following guidance is relevant to the Proposed Development:

- London Environment Strategy (2018)[9];
- UK Biodiversity Action Plan (BAP)[10] (superseded but still of relevance);
- London Biodiversity Action Plan (2007)[11];
- Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine version 1.2 (2022)[12]; and
- Bats and Artificial Lighting at Night (2023)[13].

7.2.9 Specific guidance on species and Biodiversity Net Gain is detailed within the relevant appendices to this chapter.

7.3 Assessment Methodology

Consultation

Pre-Application Consultation

7.3.1 Consultation with Natural England has been undertaken since December 2022, with a total of three virtual meetings and one site-based walkover meeting. The meetings covered the following items:

Meeting 1: 20th December 2022 (Virtual)

- Principles of the Proposed Development;
- Background / reason for the Proposed Development;
- Alternative sites considered and broad reasons why these were discounted;
- Environmental and ecological setting of the Site;
- Key considerations for the masterplan and how these have amended the masterplan for each iteration – presentation of the two latest iterations; and
- Options for ecological mitigation and enhancement and the evolution of the masterplan as a result of survey findings.

Meeting 2: Site Walkover 24th March 2023 (On site – Natural England, ecologist of Greengage and Project Manager representing London Borough of Hillingdon)

- Review of the current Site habitats and their condition;
- Survey of completed buddleia clearance works;
- Discussion of the proposed mitigation and enhancement measures being designed for the Proposed Development and Site; and
- Request for further information relating to the designated features of the mid-Colne Valley SSSI.

Meeting 3: 17th August 2023 (Virtual)

- Presentation of the updated masterplan incorporating more recent comments and inputs from consultees;
- Information provided to Natural England on 25th and 31st August including Breeding Bird Report and Alternative Sites Assessment; and
- Natural England provided comment on the submitted documents through the Discretionary Advice Service (DAS) offered by Natural England. The DAS response is included in Appendix 7.14.

Meeting 4: 6th October 2023 (Virtual)

- Clarification on latest SSSI Condition Assessment published on Natural England website;
- Methodology used for assessing condition assessment;
- Use of Natural England analysed data on previous years bird assemblage numbers; and
- Discussion on loss of open water acceptability.

7.3.2 Further consultation with Natural England has occurred by email, to clarify how open water is measured, and request information on other similar sites where enhancement works have

been successfully carried out. Natural England also attended a meeting on 25th August 2023 with the Environment Agency and the Proposed Development design team to understand the nature of impacts to the water environment, and to input any concerns as a result of the discussions.

7.3.3 Consultation with HS2 has been undertaken since September 2022, with two Site meetings and one virtual meeting. The meetings were mainly focussed on understanding HS2 requirements for its own mitigation within an area of water onsite adjacent to the peninsula, how this enhancement may be accommodated alongside the Proposed Development, and how such an arrangement may legally proceed. Other topics covered included additional mitigation provision that HS2 originally proposed and then deemed unnecessary, to ascertain where HS2 had published this and whether this could be relied on to inform the design of the masterplan and permit the Proposed Development to proceed.

7.3.4 Table 7.1 summarises key comments raised by consultees of relevance to this assessment during pre-application meetings and/or communication exchanges and how the assessment has responded to them.

Table 7.1: Consultation Response Summary

Consultee and Comment	Response
Natural England	
Requirement for no loss of existing woodland to the Proposed Development. Verbally confirmed that loss of open water was preferable to loss of woodland habitat.	Masterplan evolved to introduce land reclamation to provide adequate space for the required facilities and ensure there would be no loss of woodland as part of the Proposed Development.
Requirement for adequate assessment of alternatives	The Applicant has undertaken an Alternative Sites Assessment which is presented as Appendix 4.1 and summarised in Chapter 4: Alternatives together with other alternatives. The Applicant is satisfied that there are no suitable alternative sites for the Proposed Development.
Requirement for no significant loss of open water	The masterplan evolved to minimise the amount of in-lake created habitat (as enhancement) and reduce area of land reclamation, in order to retain more open water. Total open water loss is 4.9% within the Site boundary, and 3.1% across the SSSI which is not classified as a significant loss for the SSSI by Natural England.
Provision of additional information regarding the detail of the designated features (habitats and species assemblages) of the Mid-Colne Valley SSSI and stipulation that the assessment addresses impacts to each feature.	Impacts and effects upon each designated feature clearly assessed within this chapter, and surveys, mitigation and enhancement tailored to these features where possible.

Consultee and Comment	Response
Natural England recommend that a minimum of three consecutive years of surveys are required to ascertain the breeding bird assemblage of the lake and its immediate surroundings.	Impacts and effects are based upon a review of historical data for the site including WeBS and BTO data and data gathered during extensive survey work in 2022 and 2023. Analysed data used by Natural England in the most recent condition assessment has also been used.
We recognise surveys took place over the spring and summer months, which is when the majority of activity of the centre will take place. However, Natural England would expect survey effort at all key times of the year for species classified within the SSSI.	Survey effort has been completed in all months of late 2022 and 2023. This data gathered has been used, along with historical data, to assess the impact of the Proposed Development on ecological receptors.

HS2

Requirement for HS2 own mitigation within an area of water onsite adjacent to the peninsula	Requirement for a location to provide one or more islands (floating or solid – design not confirmed) that lies within the south-west corner of Broadwater Lake but as far away from the HS2 Scheme as possible. The location to have driven access to the shoreline for ease of deployment and ongoing maintenance. The Proposed Development provides an area of c. 3,400m^2 within which HS2 may provide their mitigation and which meets the above criteria. In addition, the location is improved from HS2's original location in that it observes an offset of 50m from land (a request from Natural England) so that the occupants of new islands would not be vulnerable to predation from foxes.
Legal arrangements are needed between HS2 and the Applicant to effectively amend the location of HS2 mitigation in-lake	It was agreed in principle between the Applicant and HS2 that this was possible, with the exact mechanism and legal agreements to be drawn up in due course.
Size of HS2 island(s) as mitigation (design not yet undertaken)	Detailed design of HS2 mitigation measures has not been completed and therefore size and design are not yet known. The area within which any islands once designed may be placed has been identified (as detailed above). HS2 indicated that the whole area may not be needed, and that mitigation may comprise one or multiple islands.

Herts and Middlesex Wildlife Trust (21 June 2023)

Consultee and Comment	Response
Request for pre-application meeting to understand the Proposed Development proposals	Virtual meeting was held on 21 June 2023 to present the current masterplan design along with a brief overview of how the design evolved, and the various environmental and ecological drivers.

EIA Scoping Opinion

7.3.5 A request for a Scoping Opinion was submitted by the Applicant to LBH on 23rd February 2023. An EIA Scoping Report (the 'Scoping Report') accompanied the request (Appendix 3.2). A Scoping Opinion was issued by the LBH on 19th May 2023 (Appendix 3.3) which included comments from statutory consultees. Table 7.2 summarises key comments raised by consultees of relevance to this assessment by the EIA Scoping Opinion and how the assessment has responded to them.

Table 7.2: EIA Scoping Opinion Response

Consultee and Comment	Response
Natural England (6 April 2023)	
Standing advice provided which details at length how to undertake a professional Ecological Impact Assessment. To incorporate assessment of environment data, SSSI Impact Risk Zones (IRZ), Biodiversity and Geodiversity, designated nature conservation sites, protected species, priority habitats and species, Biodiversity Net Gain, ancient woodland, veteran trees, resilience to climate change of existing and created habitats.	This assessment has been undertaken in accordance with best practice guidance from CIEEM and incorporates consideration and assessment of all topics and sources listed by Natural England. See Assessment Methodology section for further details.
The ES should take account of the risks of air pollution and how these can be managed or reduced. This should include taking account of any strategic solutions or SNAPs, which may be being developed or implemented to mitigate the impacts on air quality. Further information on air pollution impacts and the sensitivity of different habitats/designated sites can be found on the Air Pollution Information System (www.apis.ac.uk).	An Air Quality Assessment has been undertaken of the Proposed Development to inform this assessment and is provided as Appendix 7.12. The results have been considered and incorporated into this assessment in Section 7.6 and 7.7.
The ES should consider the contribution the Proposed Development could make to relevant local environmental initiatives and priorities to enhance the environmental quality of the Proposed Development and deliver	Review of relevant local strategy and policy has been undertaken and informed the Landscape Strategy, Ecological Mitigation Plan and Draft Mitigation Enhancement and Management Plan (MEMP) (provided as Appendix 7.4 and 7.5). A

Consultee and Comment	Response
wider environmental gains. This should include considering proposals set out in relevant local strategies or supplementary planning documents including landscape strategies, green infrastructure strategies, tree and woodland strategies, biodiversity strategies or biodiversity opportunity areas.	Biodiversity Net Gain (BNG) Assessment has also been undertaken of the Proposed Development (Appendix 7.11).
HS2 (16 May 2023) – Comments on EIA Scoping Report and Note	
Source of information in paragraph 2.23 (of the EIA Scoping Report) – this paragraph, which discusses the HS2 Colne Valley viaduct, includes the text: "There is also likely to be significant disturbance to waterfowl and breeding birds during construction, including to the bird refuge area on Broadwater Lake. In addition to this, there may be long term disturbance effects". Can you please confirm the source of this information, or is this your view/opinion? For awareness, Align have been carrying out monitoring surveys of the south-west corner of Broadwater Lake to assess levels of disturbance of wildfowl in this area and whether disturbance can be attributed to construction activities. A copy of Align's Broadwater Lake – Waterfowl Disturbance Survey Report (1MC05-ALJ-EV-REP-CS01_CL01-000174 C02) was shared with the agent (Quod) on 28 March 2023.	This statement was based on professional opinion prior to receiving a) the final results of disturbance surveys undertaken to support this application, and b) the waterfowl disturbance report from HS2. The ecological assessment has been updated for this ES Chapter to incorporate results of HS2 construction disturbance monitoring and the final results from the winter 2022/23 surveys for this application.
Source of terminology in paragraph 2.24 (of the EIA Scoping Report) – this paragraph mentions "HS2 have committed to areas of wetland and woodland creation including land reclamation". Can you please confirm the source of the term 'land reclamation'?	The HS2 ecological enhancement measures have been clarified for this assessment, confirming that 'land reclamation' is not included.
No / little reference to review of HS2 ecological survey and monitoring data for bats or evidence of this being taken into account. Some data is available online and other data has been supplied directly by HS2 for this assessment in May 2023.	Ecological assessment has been updated, to incorporate relevant results from HS2's bat monitoring work within the evaluation of roosting and foraging bats in Section 7.4.
Bat activity levels based on HS2's monitoring of tagged bats is considered to be high,	HS2 monitoring data taken into consideration in the ecological assessment. It should be noted that the activity of a single tagged bat will give a

Consultee and Comment	Response
compared with the survey results for the Site which found moderate activity levels.	good idea of how bats are using the Site but does not give a measure of how many individual bats are present or using the Site. Both measures are an important part of characterising bat activity levels.
One of the biggest areas of land reclamation/island creation will partially clash with/adjoin HS2's proposed gravel islands/rafts. The implications of this from a health and safety perspective will need to be considered and addressed as appropriate in dialogue with HS2 Ltd. The Proposed Development intersects land within HS2 Act limits which the appointed contractor (Align) are progressing a habitat creation design for. The EIA Scoping Report does not include for the impacts of relocating HS2's mitigation site within Broadwater Lake and how the emerging Proposed Development within HS2's land would enable HS2 to be compliant with its own environmental obligations.	Negotiations with HS2 have occurred and it has been agreed in principle that the position of HS2's island/in-lake mitigation can be adjusted to accommodate the Proposed Development. The adjusted location is shown on the Ecological Mitigation Plan for the Proposed Development – this new location is only slightly different from the original proposed location and will functionally deliver the exact same benefits as assessed in the HS2 ES. Safe access will also be secured for HS2 to construct and monitor the island / rafts as required. As such the Proposed Development will not prevent HS2 from delivering its environmental obligations.
HS2 (16 May 2023) – Comments on Preliminary Ecological Appraisal	
HS2's 2022 bat monitoring work in the Colne Valley recorded several bat roosts in the area based on automated radio tracking data. Nathusius' pipistrelle, soprano pipistrelle, Daubenton's (likely maternity) and Natterer's. The 2019 manual radio tracking confirmed roosts here too. This information may increase the value of the roosting importance above the level shown in the Report.	An extensive review of data provided by HS2, and activity surveys completed by Ecology By Design on the peninsula was undertaken by Greengage at the start of 2023 to inform the ongoing assessment. In addition to this review, a full suite of bat surveys (ground level potential bat roost survey, tree climbing surveys and emergence surveys from May 2023 to Sept 2023 have been undertaken and reported (Section 7.4 and Appendix 7.10).
Potential impacts have not been assessed for bats. There is an apparent lack of activity surveys and roost assessment on the islands or remainder of lake away from the peninsula. HS2 has data that evidences the presence of	An extensive review of data provided by HS2, and activity surveys completed by Ecology By Design on the peninsula was undertaken by Greengage at the start of 2023 to inform the ongoing assessment. In addition to this review, a

Consultee and Comment	Response
bat roosts in locations proposed for dredging / removal of islands; these areas are also well used bat flight lines and are important for foraging bats.	full suite of bat surveys (ground level potential bat roost survey, tree climbing surveys and emergence surveys from May 2023 to Sept 2023 have been undertaken and reported (Section 7.4 and Appendix 7.10).
No / little reference to review of HS2 ecological survey and monitoring data for bats or evidence of this being taken into account.	An extensive review of data provided by HS2, and activity surveys completed by Ecology By Design on the peninsula was undertaken by Greengage at the start of 2023 to inform the ongoing assessment. In addition to this review, a full suite of bat surveys (ground level potential bat roost survey, tree climbing surveys and emergence surveys from May 2023 to Sept 2023 have been undertaken and reported (Section 7.4 and Appendix 7.10).
How would the construction affecting the lake be timed to avoid or minimise impacts on both wintering and breeding birds?	Since the EIA Scoping Report was produced, a detailed construction programme has been developed. This process has been led by the mitigation requirements for identified impacts. Timing of works is a key part of the mitigation and is set out in Section 7.5 of this assessment.
Environment Agency (30 March 2023)	
Construction and operational impacts to the SSSI will need to be carefully considered within the Mitigation Enhancement and Management Plan and should be agreed with both Natural England and Herts and Middlesex Wildlife Trust (HMWT).	Consultation with Natural England undertaken since December 2022. Consultation with HMWT was undertaken on 21 June 2023 but no comments were forthcoming following the consultation. Comments from Natural England have been addressed or incorporated into this assessment and the Draft MEMP (Appendix 7.4 and 7.5).
If significant harm resulting from a development cannot be avoided, adequately mitigated, or as a last resort compensated for, planning permission should be refused.	Impacts and effects assessed in Section 7.6 and 7.7 along with associated mitigation. Scheme Design described in Section 7.5 whereby embedded avoidance and mitigation measures were designed into the Proposed Development.
A water vole survey was undertaken in November 2022. This is not the optimal survey season for this species and further surveys will be required to support the EIA.	Further land and boat-based surveys have been undertaken at the Site in May and August 2023. These surveys have included survey effort for water vole per best practice guidance. Results

Consultee and Comment	Response
	are provided within Appendix 7.9 and incorporated into this assessment.
Consideration should be given to the potential impacts of construction and recreation to the spread of Invasive Non-Native Species (INNS).	INNS have been appropriately considered as part of the assessment (survey results set out in Appendix 7.9). Impacts and their effects are fully characterised and assessed in Section 7.6.
Recreational pressures should include increased noise, physical disturbance both on the lake, the riparian area and woodland to breeding birds and other sensitive species e.g., Eurasian Otter and Water Vole. Consideration of how these will impact on the breeding bird assemblages at the site with regard to how any displacement would affect populations across the landscape of the Colne Valley- additional pressures at other sites within the valley (increased competition for food or mating, predation pressures etc.).	Impacts and their effects during operation of the Proposed Development are fully characterised and assessed in Section 7.7.
Harefield Tenants and Residents Associated (20 March 2023)	
Increased traffic and noise in the area must be controlled well. There will be areas of wildlife habitat that is destroyed so wildlife must be protected from pollution and noise.	There will be no net terrestrial habitat loss or destruction of priority / important habitats. This is evidenced in the BNG Assessment (Appendix 7.11). Although the Proposed Development requires the removal of trees, these are currently trees on hardstanding and not classified as woodland. Measures to mitigate for pollution and noise impacts to the different ecological receptors are set out in Sections 7.5, 7.6 and 7.7 of this assessment.
LB Hillingdon (advice provided by Arup on their behalf) (6 April 2023)	
Confirmation should be sought as to whether Phase 2 (NVC) habitat surveys of Habitats of Principal Importance (deciduous woodland and wet woodland) on site have been considered and, if so, why deemed not to be necessary.	Addressed in Section 7.4. Woodland habitats at the peninsula are pioneering and therefore extremely simple in terms of their species composition; due to their small size they are also fairly homogeneous. NVC surveys would not add any value as the habitat type has already been established. Condition assessments have been undertaken for the Biodiversity Net Gain

Consultee and Comment	Response
	calculation (provided in Appendix 7.11) and will be used to inform future management and monitoring (as set out in the Draft MEMP Volume 2) to provide biodiversity enhancements for the Site. No loss of woodland is required for the Proposed Development. Although the Proposed Development requires the removal of trees, these are currently trees on hardstanding and are not classified as woodland.
No explicit mention of Impact Risk Zones around SSSIs and potential project interfaces with IRZs (leading to the potential for indirect effects to SSSIs). These should be included within the spatial scope of the study.	Consideration of SSSI Impact Risk Zones (IRZs) is provided within this assessment in Section 7.6. The nature of the Proposed Development (recreational / sports with non-permanent seasonal residential use only) is not a land use identified within the IRZs of these SSSIs that would require consultation with Natural England.
Some confusion in the scoping report which needs clarification and/or alignment: • description of status of bat roosts on site • presence of dormouse and water vole	The PEA provided consistent reporting; since it was written further survey information has been collected. Desk study information provided on bat roosts from HS2, and 2023 bat surveys of trees and buildings has been incorporated to establish the ecological baseline with regard to bats (Section 7.4). Further surveys undertaken in 2023 with regard to water vole (7.4) and otter (7.4) provide greater confidence / clarity in the assessment. Absence of dormouse is clarified in Section 7.4.
Otter holts ruled out despite large areas of the banks not accessed. Confirm why no boat/kayak-based survey completed. Requirement for further waterside survey referenced in PEA.	Boat based survey completed in May and August 2023. Results are incorporated into Section 7.4.
Wintering Bird results outstanding - assessment in progress (due for completion March 2023).	Surveys were completed in March 2023 and the assessment completed May 2023. Results are incorporated into Section 7.4.
PEA appendices note “The Proposed Development would cause a net loss of deciduous woodland, and could impact breeding and wintering birds, damaging the integrity of the SSSI”, so future Biodiversity Net Gain (BNG) and EIA assessment must address this clearly.	The PEA appendices were prepared in the absence of the detailed masterplan. The current scheme also evolved in response to the ecological surveys and findings, to avoid and minimise impacts. This assessment addresses these effects clearly. See Sections 7.5 Embedded Mitigation and 7.6 Assessment of Effects - Construction Phase.

Consultee and Comment	Response
Assessment of future baseline should consider the potential value of any habitats that might be retained through positive management intervention, in line with current EcIA guidance, and not just the decline in current condition of habitats on site through neglect. Note that Defra metric version 4.0 may be available by the time of the assessment.	The future baseline assessment has been updated to include consideration of positive intervention as well as in the absence of management. Refer to Section 7.4.
Assessment of the impact of dredging on aquatic receptors (fish, European eel) will be expected within the EIA.	Addressed within assessment of construction effects upon fish, see paragraphs 7.6.
Monitoring of species and adaptive management commitments to respond to findings (for example, any decline in wintering bird numbers for which the SSSI is designated) should be made clear.	A monitoring programme is set out within the Draft MEMP (Appendix 7.4 and 7.5), and a summary provided in Section 7.7.
The 30-year management plan should be produced in line with BNG requirements.	A Draft MEMP has been produced in alignment with best practice and published guidance on BNG to cover an operational period of a minimum of 30-years. A BNG Assessment (Appendix 7.11) has been made and relevant condition criteria factored into monitoring and management prescriptions (MEMP Appendix 7.4 and 7.5).
The Ecological Mitigation Plan should be updated following the results of wintering bird and otter surveys.	The Proposed Development design, this assessment and the associated mitigation have all been updated to incorporate the findings and recommendations of the full suite of ecology surveys including those completed as recently as August 2023.
Consultation with Natural England will be expected, given the site's SSSI status. Consultation should include reference to any interfaces with Impact Risk Zones around SSSIs.	Consultation with Natural England has been undertaken. Consideration of SSSI IRZs has already been undertaken but this has been made clearer within this assessment. See Section 7.6.

Summary of Assessment Scope

7.3.6 As outlined within the EIA Scoping Report (Appendix 3.2), and as agreed with LBH and Natural England via the EIA Scoping Opinion (Appendix 3.3), the scope of the ecological assessment within this chapter is limited to the following assessment of effects:

Construction

7.3.7 The assessment of construction phase effects includes consideration of the flora and fauna to be directly and / or indirectly affected by the Proposed Development. The construction phase of the Proposed Development is taken to include preparatory works, including demolition, habitat clearance and modifications to the lake including localised dredging, land reclamation and habitat creation. Construction of the Proposed Development will involve works to the lake and its habitats as well as terrestrial areas on the peninsula.

7.3.8 The majority of effects during the construction stage are likely to be largely confined to the Site and its immediate vicinity including the Mid-Colne Valley SSSI and SINC, although indirect effects from potential displacement of wide-ranging bird species to likely receptor sites in the wider surrounds will also be considered. The assessment considers the following potential effects during the construction phase:

- Habitat loss and degradation;
- Effect of air quality emissions from Construction-generated traffic on designated sites and ancient woodland;
- Direct impacts on faunal populations on and in the vicinity of the Site such as loss of breeding and resting sites as a result of the Proposed Development;
- Indirect impacts to habitats and faunal populations within the ZoI of construction activities from dust, lighting, noise, emissions from construction traffic, etc.;
- Fragmentation of ‘dispersal corridors’ utilised by faunal populations;
- Indirect disturbance of bird populations on adjacent designated / protected sites or habitats caused by displacement of bird species from the Site; and
- Hydrological and water quality effects on sensitive habitats and species.

Completed Development

7.3.9 The assessment considers the following potential operational effects:

- Degradation of retained and created habitats from activities associated with the completed, operational Development;
- Effect of air quality emissions from Development-generated traffic on designated sites and ancient woodland;
- Disturbance to faunal species / populations from unintentional mismanagement and timing of management works;
- Disturbance to habitats and fauna species due to an increase in recreational pressure;
- Indirect disturbance to faunal populations from lighting and noise associated with the completed Development; and
- Effects associated with invasive species and biosecurity threats from the creation of new habitats as part of the proposed mitigation and enhancement strategy.

Non-Significant Effects

7.3.10 All other ecological effects were scoped out of further assessment within this ES, as detailed within the Scoping Report, see Appendix 3.2.

7.3.11 The baseline assessment has shown that significant effects on the following receptors are not likely and as such, they would not be considered further in the assessment (detail on why they are not considered further can be found within Appendix 7.1 – 7.11):

- SPAs, SACs, and Ramsars on account of their spatial separation and removal from the Site, and which are not designated for wintering or breeding birds;
- Hazel dormouse and harvest mouse due to a considered lack of presence; and
- Amphibians due to lack of Great Crested Newt presence and common status of other amphibian species likely to be present of little conservation concern.

7.3.12 Since the Scoping Report was prepared further ecological surveys have been completed. As reported in the 2023 Greengage Ecology report (Appendix 7.9), water vole has been found to be likely absent with no signs identified and a lack of suitable habitat.

Study Area

7.3.13 The extent of the desk study was:

- 10km for European designated sites;
- 10km for National designated sites where the designations are for bats and birds (highly mobile species);
- 2km for all National designated sites;
- 2km surrounding the Site for Regional / Borough / Local designated sites; and
- 2km for records of protected and priority species.

7.3.14 In respect of air quality, namely from traffic (both from construction and the completed Proposed Development), potential sensitive receptors (e.g., SSSIs, Local Wildlife Sites and ancient woodland) within 200 metres of roads are considered within 10km of the Site.

Zone of Influence

7.3.15 The Zone of Influence (ZoI) is defined as the area surrounding a direct impact location where indirect impacts may be assumed to occur. Given the different habitats and ecological receptors at the Site, there are different ZoI considered as part of the assessment. These ZoI are all made using professional judgement based on education and experience:

- For noise and visual impacts to breeding and overwintering waterbirds using the lake, the ZoI is considered to be the open water area surrounding the source of the impact, extending out to the closest adjacent visual or physical barrier (i.e., lake edge or islands) but not beyond. This is based on disturbance surveys of waterbirds; when disturbances arise from sailing events, birds generally seek refuge on the opposite (lee) side of islands away from the disturbance.
- Where birds may be displaced from the lake through visual or noise disturbance, the ZoI will include the likely receiving waterbodies;
- For disturbance to the lakebed or water column arising from in-lake / underwater activities such as dredging of sediments, formation of islands etc, the ZoI is considered to be the surrounding open water area extending to the nearest land mass (lake edge or closest islands) up to 300m distance;

- 100m for dust, noise and vibration impacts to terrestrial habitats; and
- 20m for all other impacts on land to terrestrial habitats and species (including those listed in s41 of the NERC Act 2006).

Establishing Baseline Conditions

7.3.16 This section briefly sets out the surveys completed and summarises the methodologies used to establish the baseline conditions. Results are not presented here but are set out in Section 7.4: Baseline Conditions and in the supporting appendices. Detailed methodologies are provided in the individual survey reports in Appendix 7.1 and 7.6 – 7.11.

Habitat / Vegetation Surveys

Preliminary Ecological Appraisal (PEA)

7.3.17 The PEA was undertaken in accordance with guidance in the UK Habitat Classification System (UKHab) and the Chartered Institute of Ecological and Environmental Management (CIEEM) (2017) Guidelines for Preliminary Ecological Appraisal, in accordance with BS42020:2013: Biodiversity. The assessment consisted of:

- Desktop review - a review of Site-specific biological information gained from statutory and non-statutory consultation; and
- A Site survey comprising a protected species scoping assessment and UKHab survey.

7.3.18 In addition, this PEA was adapted to include a review of the 2021 PEA and a number of third-party phase 2 survey reports (bat activity, dormouse presence / likely absence, great crested newt eDNA, reptile presence / likely absence, water vole, otter, fish, aquatic invertebrates and terrestrial invertebrates). The results of which have been incorporated into the findings of this report and the individual reports appended to the 2023 PEA report.

7.3.19 The survey was undertaken in late 2022 and early 2023. The full PEA is provided in Appendix 7.1. Further specific habitat surveys to inform ecological baseline and ultimately the BNG Assessment are detailed below. These further surveys were undertaken at appropriate times of year for the specific survey.

Vegetation on islands

7.3.20 A boat survey to broadly identify and map habitat on islands within Broadwater Lake was undertaken in May 2023. This survey was undertaken to inform the BNG Assessment and inform future management proposals. Habitats were identified and classified using the UKHab methodology. Due to the presence of nesting birds on the islands, the UKHab survey was undertaken from the boat and at sufficient distance to ensure there was no disturbance to nesting birds.

7.3.21 The survey methodology and results are provided in the 2023 Ecology Survey Report in Appendix 7.9.

Invasive Non-Native Species (INNS) - plants

7.3.22 A boat survey and site walkover were undertaken in August 2023 to record the presence and determine the coverage of any INNS. The survey comprised a walkover survey of land, where access was possible. Where access was not possible, e.g., on islands, the survey

was conducted from a boat using high powered binoculars to search for areas of vegetation not easily visible from the land. Species searched for included Japanese knotweed, giant knotweed, Himalayan balsam and giant hogweed.

7.3.23 The survey methodology and results are provided in the 2023 Ecology Survey Report in Appendix 7.9.

Aquatic macrophytes

7.3.24 A survey was undertaken by boat to assess for macrophyte presence, coverage and to identify species present. To locate areas where macrophytes were present within the lake, transects were taken across the lake with sampling points every 100m. A bathyscope was used to look into the water and a grapnel deployed to collect samples of plant material from the bed for identification. The location and information regarding any visible macrophyte cover was noted at each interval. An assessment of presence, coverage and species was made from the information.

7.3.25 The surveys were undertaken in May (the start of the main growing season) and August (when full macrophyte growth would have been achieved and the most likely month to discover the full coverage / extent and species composition).

7.3.26 The survey methodology and results are provided in the 2023 Ecology Survey Report in Appendix 7.9.

Emergent vegetation

7.3.27 Emergent vegetation was mapped from a boat in May 2023 and August 2023 and characterised using binoculars, or a closer approach was made if breeding birds were unlikely to be present. Emergent vegetation was fairly visible and occurred on shallow sediments close to land such as the lake shore and islands.

7.3.28 The survey methodology and results are provided in the 2023 Ecology Survey Report in Appendix 7.9.

Grassland

7.3.29 A UKHab survey was undertaken of the Moorhall Road field during July 2023 to inform a BNG Assessment and inform future management proposals. The field was walked and the plant species identified throughout and ground conditions assessed. A 'w' transect was undertaken with sampling points at each point of the W. The number of species were counted within a 1m2 area at each point. This was to better allow the grassland type to be established, as the number of species is an important criterion in grassland classification.

7.3.30 The survey methodology and results are provided in the 2023 Ecology Survey Report in Appendix 7.9.

Wet Woodland

7.3.31 In June 2023 a further botanical survey of the on-site wet woodland was undertaken in the optimal month to gain greater information on understorey plant species composition and inform a condition assessment; a further condition assessment was completed in August 2023. NVC surveys were not considered necessary for woodland habitat at the Site due to the underlying ground conditions and young age of the habitat limiting species composition

and diversity. Woodland elsewhere lies at significant distance from planned development and will not be subject to impacts and therefore was not subject to further assessment.

7.3.32 The information gathered was used to inform the woodland condition assessment element of the BNG Assessment. The BNG Assessment is provided in Appendix 7.11.

Faunal Surveys

Wintering Bird Survey and Disturbance Assessment

7.3.33 An extensive wintering bird survey and disturbance study has been undertaken on site between November 2023 to February 2023. The full methodology is detailed within Wintering Bird Survey and Disturbance Assessment report in Appendix 7.6.

7.3.34 The survey and assessment included:

- A desk study (review of bird records supplied by GiGL and TVERC);
- Review of Wetland Bird Survey (WeBS) data and data held on the Natural England website for the SSSI;
- A review of a published report 'The wetland resource of the Colne Valley' by White and Harris 2008[14];
- A literature review of disturbance effects on waterbirds;
- An extensive standard on-site wintering bird survey; and
- A bespoke on-site disturbance assessment (see below for more detail).

7.3.35 The standard methodology for both the wintering and disturbance bird surveys undertaken at Broadwater Lake between October 2022 and March 2023 broadly followed the 'look-see' method used for the Wetland Bird Survey (WeBS) and the species monitored were those recorded for WeBS.

7.3.36 Counts were undertaken on days when no sailing occurred ('non-sailing' days) and on days when sailing occurred ('sailing' days).

7.3.37 For the disturbance surveys counts were made pre, during and post sailing. The behaviour of birds in relation to observed and potential disturbance was recorded.

7.3.38 The full survey methodology and results are provided in the Wintering Bird Survey and Disturbance Assessment in Appendix 7.6.

Breeding Bird Survey

7.3.39 A series of six Breeding Bird Survey (BBS) visits were carried out between March and July 2023, with two visits in May and one in each of the other months.

7.3.40 Due to the size of the lake, in most cases the counts were split over two consecutive days with waterbirds being surveyed on one and non-waterbird species (passerines and near passerines) surveyed on the other.

7.3.41 The waterbird surveys were undertaken on 'non-sailing' days when baseline disturbance was likely to be minimal, to maximise the potential for the surveyor to detect signs of breeding for waterbirds or other bird species that use the lake.

7.3.42 The methodology used for all species followed that of the Common Bird Census (Marchant, 1983) and Bird Survey Guidelines, the latter being the accepted industry standard.

7.3.43 In addition to the standard six BBS visits, a dusk bird survey was undertaken in May to attempt to ascertain the presence of crepuscular and nocturnal species (e.g., Woodcock, owls, Water Rail, Bittern, etc).

7.3.44 As well as the main red-line boundary (the Site), additional areas were surveyed. These included the scrub and vegetation along the western side of the Site between the Lake and the River Colne. This was to include passerine species that were utilising this area.

7.3.45 The survey methodology and results are provided in the Breeding Bird Survey Report in Appendix 7.7.

Invertebrate Report

7.3.46 Invertebrate survey visits were undertaken in April, May, June and August 2023. During each survey visit standard field techniques were employed to sample the invertebrate fauna across the site. These included:

- Sweeping vegetation with a wide mouthed sweep net;
- Beating trees and bushes over a beating tray;
- Grubbing amongst tussocks and key host plant rosettes; and
- A 0.5mm mesh GB nets net was used to sample the ponds and flowing water.

7.3.47 Sampling stations were selected for their accessibility and representativeness of the site habitats. Sampling was also carried out between these stations on an ad hoc basis primarily for flying insects.

7.3.48 Samples were collected and preserved in the field in ethanol, before being identified at a later date in a laboratory using a microscope.

7.3.49 Because it is impracticable to survey all the potential invertebrates within any given site, only specific groups of species were examined during fieldwork. These groups are sufficiently well known as to allow meaningful comparisons to be made with other sites, both locally and nationally. They are also important as indicators of the quality of a site and the habitats present.

7.3.50 The survey methodology and results are provided in the Invertebrates Survey Report in Appendix 7.8.

Badger

7.3.51 The potential for badger to inhabit or forage within the study area was assessed during a visit in April 2023. Evidence of badger activity includes the identification of setts (a system of underground tunnels and nesting chambers), grubbed up grassland (caused by the animals digging for earthworms, slugs, beetles etc.), badger hairs, paths, latrines and paw prints.

7.3.52 In June 2023 monitoring of an identified outlier sett was undertaken using trail cameras to assess levels of use of the sett by badgers. There were two entrances; one with signs of use and one that appeared disused. Two camera traps were placed in view of each entrance

so that anything passing between the camera and the sett entrance would trigger the camera and footage would be recorded. The cameras were deployed for two weeks and footage reviewed.

7.3.53 The survey methodology and results are provided in the 2023 Ecology Survey Report in Appendix 7.9.

Otter

7.3.54 Boat surveys to search for signs of otter and their holts were searched for during the survey with visits undertaken in May and August 2023. This included any slides showing where otters enter the water routinely, and suitable holt (den) sites such as hollows beneath tree roots or within earth banks beneath rocks or rubble. Spraint, footprints or food remains were also searched for. The extent of the survey was limited to Broadwater Lake.

7.3.55 The survey methodology and results are provided in the 2023 Ecology Survey Report in Appendix 7.9.

Water Vole

7.3.56 Water vole potential was assessed during the land-based and water-based surveys undertaken in May and August 2023. The potential is identified by the presence of holes (burrows) and runs along the banks of rivers and lakes as well as ditches. Along with the assessment of suitability of the habitat for water vole, signs including burrows, latrines, footprints or piles of food were also searched for.

7.3.57 Areas of the site covered by the surveys included the shoreline of the lake and the banks of the adjacent River Colne wherever this was accessible. The canal towpath was also walked where this lies in parallel with the site, to assess areas visible from the pathway.

7.3.58 The survey methodology and results are provided in the 2023 Ecology Survey Report in Appendix 7.9.

Bat Survey

7.3.59 A suite of bat surveys has been undertaken on the Site during 2023. Surveys undertaken comprised:

- A desk study including a review of available HS2 data and survey data previously completed by Ecology by Design in 2022 on the peninsula of the Site (this included bat activity surveys of the peninsula);
- Potential Bat Roost Assessment of structures (Nov 22 and July 23) and trees (February 23);
- Inspection of potential roost features within trees previously classified as having moderate or high potential with an endoscope; and
- Dusk emergence surveys between May 23 and September 23.

7.3.60 Survey methodology for the above onsite surveys was in line with BCT Good Practice Guidelines.

7.3.61 The survey methodology and results are provided in the Bat Survey Report in Appendix 7.10.

Great Crested Newt (GCN) eDNA

7.3.62 A survey for GCN was conducted by RSK in April 2022. Any water bodies encountered during the site walkover were subjected to HSI assessment to determine suitability for GCN. Any habitat deemed suitable was then sampled for eDNA analysis. Standard survey methodology by Oldham et al. (2000) and Biggs et al. (2014) were followed.

7.3.63 The method and results for the GCN eDNA survey is provided within Appendix B of the PEA in Appendix 7.1.

Reptile Presence / likely absence

7.3.64 A reptile presence / likely absence survey was conducted by Ecology by Design in 2021 and 2022, following standard methodology (Froglife, 1999; Edgar et al., 2010).

7.3.65 The method and results for the reptile presence / likely absence survey is provided within Appendix B of the PEA in Appendix 7.1.

Dormouse Presence / likely absence

7.3.66 A nest tube survey for dormice (Muscardinus avellanarius) were undertaken in 2021 and 2022 by Ecology by Design following techniques set out in the Dormouse Conservation Handbook (Bright et al, 2006) and Natural England Interim Guidance Document (Natural England, 2011).

7.3.67 The method and results for the dormouse nest tube survey is provided within Appendix B of the PEA in Appendix 7.1.

Fish Survey

7.3.68 Fish surveys were undertaken on Broadwater between the 10th and 12th of October 2022, by a team of suitably qualified and experienced aquatic/fisheries ecologists. The fish community of Broadwater was surveyed using three different methods, designed to target all potential species, as well as all life stages.

7.3.69 Methods used comprised:

- Electric fishing;
- Seine netting; and
- Fyke netting.

7.3.70 On completion of sampling, individual fish were identified to species level, measured to fork length (mm), and returned to the lake. Digital georeferenced photographs were taken of each species.

7.3.71 Several different metrics were produced to provide interpretation of the fish population within Broadwater:

- Abundance: the total number of individuals caught by species;
- Estimated weight: the total weight of fish caught by species calculated using Environment Agency length-weight relationships;

- Species composition: a breakdown by species of the number of fish caught and presented in pie charts;
- Estimated biomass: a breakdown by species of total weight of species caught and presented in pie charts; and
- Population structure: the number of fish by species caught within certain size bands presented in length frequency histograms.

7.3.72 The method and results for the fish survey is provided within Appendix B of the PEA in Appendix 7.1.

Aquatic Invertebrates

7.3.73 Macro-invertebrate surveys were undertaken by a suitably experienced and qualified aquatic ecologist on the 12th of October 2022. Samples were collected from the littoral zones of the lake, with sample sites chosen to target the different habitats present. These were collected on the south, east and west sides of the lake.

7.3.74 Sampling was undertaken using a standardised 3-minute kick sample, using a 1mm mesh net, followed by a 1-minute timed manual search following the Environment Agency (2017) procedure, which conforms to BS EN ISO 10870:2012 Water Quality – Guidelines for the selection of sampling methods and devices for benthic macro-invertebrates in fresh waters (BSI, 2012).

7.3.75 Samples were preserved with Industrial Denatured Alcohol (IDA) on site and transported back to the laboratory for sorting and analysis to Taxonomic Level 5 (TL5) in adherence with the Environment Agency (2014) procedure.

7.3.76 The identification of macro-invertebrates to TL5 species level allowed the use of specific metrics to determine ecological values of the communities and individual species present at each site. These can be combined to give an overall picture of the communities within the lake.

7.3.77 The metrics used are listed below:

- BMWP (Biological Monitoring Working Party);
- NTAXA (Number of Taxa);
- ASPT (Average Score Per Taxa);
- CCI (Community Conservation Index); and
- CS (Conservation Score).

7.3.78 The method and results for the Aquatic Invertebrate survey is provided within Appendix B of the PEA in Appendix 7.1

Assessing Likely Significant Effects

7.3.79 This section presents the methodology used to assess the likely significant effects of the Proposed Development in relation to ecology and biodiversity. The methodology for the construction and operational phases is set out below.

7.3.80 Likely significant effects for the construction and operational phases have been assessed taking into account projected peaks of activity and the seasonality / time of year in which these activities will occur, as the sensitivity of each ecological receptor is highly seasonal.

Construction

7.3.81 The assessment of likely significant effects associated with the construction phase has been based on professional judgement, based on experience and the use of best practice guidance (CIEEM guidance[15] and in accordance with BS42020 2013: Biodiversity[16]).

7.3.82 The assessment has been informed by detailed plans, standard and bespoke ecology surveys and research relating to the ecological receptors identified at the Site and the relevant Zones of Influence. The detailed Ecological Mitigation Plans are provided in Chapter 5 Description of the Proposed Development. The ecology surveys are provided in Appendices 7.1 and 7.6 – 7.10 of this chapter of the ES.

7.3.83 The design of the Proposed Development and the careful scheduling of activities to deliver the Proposed Development have been led by requirements for protection of those habitats and species identified as ecological receptors (as described in Section 7.4).

7.3.84 Mitigation measures have been 'embedded' within the construction phase of the Proposed Development wherever possible, as well as carefully defined design principles of landscaping, green infrastructure, access and lighting. Full details are provided in Section 7.5 of this chapter.

7.3.85 The construction phase includes the construction and/or deployment of embedded mitigation measures for impacts that will arise at the construction and operational stages. These embedded mitigation measures will be installed first so to be in place before the main construction activities commence.

7.3.86 The impacts / effects at the construction stage are temporary. In-lake activities will take approximately 12-16 weeks. These works have been carefully scheduled to occur when likely significant effects would be minimised through absence of key ecological receptors. On-land construction will take approximately 12-14 months including mobilisation and demobilisation; again, initial impacts have been carefully planned to occur when ecological receptors are absent.

Completed Development

7.3.87 The assessment of likely significant effects associated with the operational phase has been based on professional judgement, based on experience and the use of best practice guidance (CIEEM guidance and in accordance with BS42020 2013: Biodiversity).

7.3.88 The assessment has been informed by detailed plans, standard and bespoke ecology surveys and research relating to the ecological receptors identified at the Site and the relevant Zones of Influence. The detailed Ecological Mitigation Plans are provided in Chapter 5 Description of the Proposed Development. The ecology surveys are provided in Appendices 7.1 and 7.6 – 7.10 of this chapter of the ES.

7.3.89 The design of the Proposed Development and the careful scheduling of activities to deliver the Scheme have been led by requirements for protection of those habitats and species identified as ecological receptors (as described in Section 7.4).

7.3.90 Mitigation measures have been 'embedded' within the Proposed Development wherever possible, as well as carefully defined design principles of landscaping, green infrastructure, access and lighting. Full details are provided in Section 7.5 of this chapter.

7.3.91 Operational impacts have been informed by the projected programme of activities planned for the Proposed Development and its users as set out in Chapter 5: Description of the Development. Operation of the Proposed Development will occur in the lake (sailing and boating activities, management of created habitats and enhancement measures), and on land. The month, time of day and volume of individuals participating are all key factors, along with staffing levels and vehicle movements.

7.3.92 Operational activities will not commence until completion of the construction programme.

7.3.93 A period of thirty years has been considered for the assessment of significant operational impacts. Operation of the HWSFAC is planned to commence in September 2025, although operation of Broadwater Sailing Club (BSC) in its new location will commence as soon as the new facilities at the peninsula are completed (August 2025). It is important to note though that the operation of BSC is not a new impact as BSC already operates on the lake, albeit the location of the land-based elements of BSC and the main launching area is in the north of the lake. This will switch to the peninsula in the south of the lake as part of the Proposed Development.

7.3.94 Management (including enhancement works) and monitoring will be implemented over the operational period; the impacts of these activities have been taken into consideration.

Cumulative Effects

7.3.95 Cumulative likely significant effects have been assessed using professional judgement and best practice guidance (CIEEM guidance and in accordance with BS42020 2013: Biodiversity).

7.3.96 Cumulative effects have been considered with regard to the schemes identified in Chapter 3: EIA Methodology. Only impacts from the HS2 (Colne Valley Viaduct) scheme are considered likely to have the potential to give rise to cumulative effects due to its proximity (100m from the Site). Other cumulative schemes lie greater than 1.8km from Site, thereby lacking ecological connectivity with the Site.

7.3.97 This assessment has been informed by a review of available information for the HS2 Scheme. Planning information was reviewed, namely the Environmental Statement and published baseline ecology survey data. HS2 has also undertaken construction phase monitoring which has encompassed some or all of the Site and which has not been published; HS2 have supplied the reports (for birds and bats) to LBH for review to inform this Proposed Development. An assessment of the reports and data has been made and incorporated into the relevant protected species reports (Appendix 7.6 Wintering Birds and Disturbance Survey, and Appendix 7.10 Bat Survey Report). Data for other species were not relevant to the assessment as other species are not as mobile as bats and birds and therefore the ZoI for each species did not encompass the Site (meaning that there was no likelihood of significant cumulative effects).

Determining Effect Significance

7.3.98 This section presents the methodology used to assess the potential effects of the Proposed Development in relation to ecology and biodiversity. The assessment has been made with reference to the CIEEM Guidelines. This is the current industry guidance for ecological assessment. It is not considered to be prescriptive but provides guidance to practitioners for refining their own methodologies.

Identification of Important Ecological Features (IEF)

7.3.99 Under the CIEEM guidance, the first step in the EcIA process is determination of which ecological features or receptors (designated sites, habitats, species, ecosystems and their functions/processes) are important. To determine this, the baseline data were reviewed.

7.3.100 Nature conservation sites (statutory or non-statutory protected) onsite and within 2km were identified as IEF.

7.3.101 Where present onsite or within the ZoI, habitats of principal importance listed under Section 41 (s41) of the NERC Act 2006 (such as woodland or standing open water) and habitats which form part of the designation of a nature conservation site were identified as IEF.

7.3.102 Plant/tree species of principal importance listed under the NERC Act 2006 s41 (such as black poplar) occurring onsite or within the ZoI were identified as IEF.

7.3.103 For protected species (Red- or Amber- listed, rare or legally protected), where presence was indicated by desk study and there were habitats onsite that may potentially support the species, further surveys were then undertaken. The information provided by the desk study and site surveys was used to assess importance of the species as follows in Table 7.3:

Table 7.3: Identification of species which are IEF

Presence	Desk study	Suitable habitat present	Species survey results (phase 2 surveys)	Importance	Important ecological receptor?
Absent	No desk study records	No suitable habitats onsite or in immediate surrounds	No survey undertaken	Based on suitability of Site to support the species – Negligible potential	No
Absent	Desk study records may or may not exist.	Limited suitable habitat occurs onsite (small area / only part of the habitat required) or in immediate surrounds	Surveys did not find any evidence of presence	Based on suitability of Site to support the species - Low potential	No

Presence	Desk study	Suitable habitat present	Species survey results (phase 2 surveys)	Importance	Important ecological receptor?
Likely-absent	Desk study records exist	Good habitat exists onsite or in immediate surrounds	No evidence of presence found	Based on suitability of Site to support the species – Moderate or High potential	No - however consider enhancement to encourage species to colonise the Site
Present	Desk study records may or may not exist	Suitable habitat present	Presence confirmed	Further detailed assessment required to determine importance	Yes

Determining Importance

7.3.104 Professional judgement has been used to rate the importance of a feature, based on available guidance, information, personal knowledge, and advice from other ecological and species-specific experts. In applying professional judgement, the following key considerations have been taken into account:

- Designated sites and their geographic importance: e.g., international (SACs, SPAs, Ramsar Sites); national (SSSIs, National Nature Reserves); local (designated by Local Authorities & Wildlife Trusts);
- Biodiversity value: assessed in relation to published selection / evaluation criteria where available, e.g. The Conservation of Habitats & Species Regulations 2019, SSSI Selection Guidelines, and BAPs;
- Geographical distribution of a species: species which have a significant proportion of their European or global population in the UK may be highly valued;
- Population status (e.g., widespread, common, rare) and trends (e.g., declining, stable). A species that is rare and declining may be assigned a higher level of importance than one that is rare but known to be stable;
- Potential value: e.g., sites where there is a high potential to restore or create Local Biodiversity Action Plan priority habitats;
- Secondary or supporting value: e.g., connectivity features such as linear habitat corridors (e.g., hedgerows and riparian habitats) or stepping stones (e.g., ponds and woodlands) essential for the migration, dispersal and genetic exchange of wild species;
- Legal status: e.g., in relation to, Schedules 1, 5 and 8 of the Wildlife & Countryside Act 1981, Protection of Badgers Act 1992;
- Ecosystem Services and Natural Capital: benefits arising from the natural environment, including social, health-related, cultural or economic; and

- Presence of legally controlled species and management requirements.

7.3.105 The degree of importance for IEF is expressed at a geographic scale as set out below:

- International (European) – highest value;
- National (United Kingdom);
- Regional (Greater London);
- Borough (Hillingdon);
- Local (up to 2km from the Site);
- Zone of Influence (typically of value within the Site and / or up to 100m or so beyond the Site only – the zone of influence may be species-specific); and
- Negligible (none – effectively this denotes sites, habitats or species which are not considered to be IEF).

7.3.106 Ecological features are given importance using a geographic scale because they occur within the landscape. For example, National importance signifies that the Site or the numbers of a particular species occurring onsite supports the ecological value of Great Britain as a whole. Local importance signifies that the contribution of the species or habitats present onsite are important for biodiversity or conservation within the local area (typically a walking distance area such as 1-2km) but beyond this the Site would not be recognised as having any particular value.

7.3.107 The geographic evaluation of importance has been applied as set out in Table 7.4.

Table 7.4: Geographic value of importance

Importance	Examples (where possible of relevance to this assessment)
International (not applicable to this assessment)	Internationally important statutory designated sites (SACs, SPAs, Ramsar Sites) Species present in numbers greater than 1% of the international population
National	National Nature Reserves. Sites of Special Scientific Interest. Units of an individual SSSI, when in favourable condition or meeting criteria for selection as a SSSI. Assemblage of species present onsite that meets criteria for selection as a SSSI. Bird species present in numbers greater than 1% of the national population[17] (this is the same as criteria for selection as a biological SSSI for birds). Protected species present in nationally important numbers, or site found to be important to national conservation of that species in the UK.
Regional	Regionally important nature reserves. Sites designated by the Greater London Authority. Site forms part of a well-connected network of sites extending further than the Borough / Unitary Authority that together support Regionally important numbers of species (e.g., Colne Valley Gravel Pits).

Importance	Examples (where possible of relevance to this assessment)
	Bird species present onsite in numbers greater than 0.5% but less than 1% of the national population (definition specific to this assessment).
Borough	Larger / more important sites designated by Local Authorities & Wildlife Trusts e.g., Local Nature Reserves; Sites of Importance for Nature Conservation (SINC) with Metropolitan status. Bird species present onsite in numbers greater than 0.1% but less than 0.5% of the national population (definition specific to this assessment). Bat assemblages of moderate diversity as defined by the Bat Mitigation Guidelines (2023). Habitats of Principal importance (NERC Act 2006 s41) not falling within or being the primary reason for designation of a higher valued designated site (the site designation takes precedence).
Local	Non-statutory nature conservation sites e.g., SINCs with Local status, smaller sites designated by Wildlife Trusts. Bird species present onsite in numbers greater than 0.01% but less than 0.1% of the national population. Widespread protected species with a low population (e.g., otter). Species protected by legislation for welfare reasons (badgers). Non-protected species in moderate or high numbers.
Zone of Influence	Protected species – presence limited to individual animals passing through (transient / intermittent low numbers) (e.g., common reptiles). Bird species present onsite in numbers greater than 0.001% but less than 0.01% of the national population. Non-protected species in low numbers.

7.3.108 Under CIEEM guidance, it is not considered necessary to carry out detailed assessment of features (habitats or species) that are sufficiently widespread and resilient to project impacts such that there is no risk to the integrity or viability of the resource. For this project, this typically applies to IEF given an importance of 'Zone of Influence' or 'Negligible'. However, some species assessed as having importance within the Zone of Influence are protected by law (such as low populations of common breeding bird species) and therefore are still considered to be an IEF from a legal perspective.

Sensitivity of Receptor

7.3.109 Although it might seem confusing, under CIEEM guidance the sensitivity of an IEF is also expressed using the geographic scale as set out above. Nationally important sites and species are considered the most sensitive to impacts / significant effects. Zone of Influence sensitivity is considered only very slightly sensitive, if at all.

7.3.110 The sensitivity to disturbance of some individual bird species has been considered within this assessment. This is based on a review of available literature as well as a bespoke survey methodology and sensitivity classification undertaken for the Proposed Development which is presented within the Wintering Bird and Disturbance Survey report in Appendix 7.6.

7.3.111 The sensitivity of other species has been considered with regard to potential impacts and likely significance of effects, although other species are not considered as sensitive to disturbance as birds.

Impact Assessment

7.3.112 The impact assessment process involves:

- Identifying the importance / sensitivity of a feature (as described above);
- Identifying and characterising impacts on IEF (taking account of any designed-in mitigation such as avoidance);
- Incorporating measures to avoid and reduce (mitigate) these effects;
- Assessing the significance of any likely residual effects after mitigation;
- Identifying appropriate compensation measures to address significant residual effects; and
- Identifying opportunities for ecological enhancement.

7.3.113 Under the CIEEM Guidance, it is only necessary to assess and report significant residual effects, i.e., those that remain after mitigation measures (including avoidance and compensation measures) have been taken into account. However, reporting significant effects prior to the specification of mitigation can be a useful step in identifying and prioritising mitigation.

7.3.114 The assessment only describes those characteristics of impacts that are relevant to understanding an ecological effect and determining its significance. It considers, as appropriate: direct, indirect, secondary and cumulative impacts (noting that cumulative impacts are reported at the end of this chapter, under 'Cumulative Effects'), and whether the impacts and their effects are of short, medium or long-term duration, permanent, temporary, reversible, or irreversible.

Assessing Significance of Potential Impacts / Effects

7.3.115 Impacts / effects are considered significant if they either support or undermine biodiversity conservation objectives for important ecological features or for biodiversity in general.

7.3.116 In summary, the key terms utilised in the assessment are:

- Effects – positive, neutral or negative;
- Scale of effects - minor, moderate, or major;
- Duration of effects – temporary, short-term, medium-term, long-term, permanent; and
- Reversibility – reversible, irreversible.

7.3.117 More detail on the scale of likely effects is provided in Table 7.5 below.

Table 7.5: Definition of the terms used for assessing the scale of likely effects

Impact Magnitude	Descriptor
Negligible	No discernible impact.
Minor	A temporary or short-term impact on a physical resource / receptor that is localised and detectable above natural variations but not regarded as imparting an order of magnitude change. The environment will revert back to pre-impact status once the impact ceases. An effect on a species that affects a specific group of localised individuals within a population over a short time period (one generation or less) but does not affect other trophic levels or the population itself.
Moderate	A temporary or short-term impact on a physical resource / receptor that may extend beyond the local scale and may bring about an order of magnitude change in the quality or functionality of a resource / receptor. It does not, however, threaten the long-term integrity of the resource / receptor or any receptor / process dependent on it. A moderate magnitude impact multiplied over a larger area would be regarded as a major magnitude impact. An impact on a species that affects a portion of a population and may bring about a change in abundance and / or a reduction in the distribution over one or more generations but does not threaten the long-term integrity of that population or any population dependent on it. The size and cumulative character of the consequence is also important. A moderate magnitude impact multiplied over a wide area would be regarded as a major magnitude impact.
Major	An impact on a physical resource / receptor that results in an order of magnitude change on the local or larger scale that is irreversible and above any applicable limits. The change may alter the long-term character of the resource / receptor or another receptor / process dependent on it. An impact that persists after the activity ceases is a major magnitude impact. An impact on a species that affects an entire population or species in sufficient magnitude to cause a decline in abundance and / or change in distribution beyond which natural recruitment (reproduction, immigration from unaffected areas) would not return that population or species, or any population or species dependent upon it, to its former level within several generations, or when there is no possibility of recovery.

Significance Criteria

7.3.118 The CIEEM Guidance sets out information about the concept of ecological significance and how it relates to the ability to deliver biodiversity conservation objectives for a given feature.

7.3.119 Prior to the specification of additional mitigation, the significance of effects is qualified with reference to an appropriate geographic scale. The scale of an effect may be lower the

geographic context in which the feature is considered important (e.g., if the feature is only partially affected). This is defined in Table 7.6, providing a means of relating the geographic scale of impact to the categories used in the wider EIA process (i.e., effect is categorised into major, moderate, minor, negligible, and neutral).

Table 7.6: Relationship between geographic scale of effect and EIA significance

Geographic scale of effect	Significance value
International, national	Major
Regional / Borough level	Moderate
Local importance	Minor
Zone of Influence	Negligible (not significant)
No effect	Neutral / none

7.3.120 After the specification of additional mitigation, the residual effects are then assessed for their significance in the context of national and local planning policy. Significant effects are defined in the CIEEM guidance as follows: *"A significant effect is simply an effect that is sufficiently important to require assessment and reporting so that the decision maker is adequately informed of the environmental consequences of permitting a project. A significant effect is a positive or negative ecological effect that should be given weight in judging whether to authorise a project". The guidance further points out that "A significant effect does not necessarily equate to an effect so severe that consent for the project should be refused planning permission".*

7.3.121 In practical terms, significant effects are those which will hamper or conflict with legislation or policy aims, plans or strategies relating to biodiversity and nature conservation. For the purposes of EIA, significant effects are those defined as moderate effects and above.

7.3.122 Effects which conflict (or potentially conflict) with wildlife law more widely (e.g., the Protection of Badgers Act 1992[18] are also identified (and appropriate mitigation specified) in this assessment, in line with the CIEEM guidelines.

Biodiversity Net Gain Assessment

7.3.123 As part of the project design process, as per best practice in EcIA, opportunities for ecological enhancements and net gain of biodiversity were identified as early as possible. However, given the status of the Site as a SSSI, the design of the Site was developed first and foremost around avoiding and reducing impacts to the designated features (particularly assemblages of wintering and breeding birds). Potential enhancements for biodiversity were then identified, however only those that would not cause further disturbing impacts / likely significant effects to the designated features were selected for the final design. Therefore, proposals such as engineering of the banks and shoreline of the lake to improve the profile for wildlife generally and for water vole and otter have not been developed.

7.3.124 A BNG Assessment was undertaken to calculate the ecological value of the pre- and post-development site. The Natural England Metric 4.0 methodology ('the metric') was utilised, following good practice guidance from Natural England[19,20,] and joint guidance from CIEEM, IEMA and CIRIA[21]. The BNG Assessment is provided as Appendix 7.11.

7.3.125 The metric solely utilises habitat data (area and condition) and does not incorporate measures of value (existing or enhanced) for protected species.

7.3.126 It should be noted that features with no or negligible ecological value are included within the Defra Biodiversity Metric 4.0 calculation as the metric accounts for every part of the Site regardless of existing value.

Assumptions and Limitations

7.3.127 For the purposes of the impact assessment, it should be noted that the direct impacts arising from the Proposed Development will be geographically localised within the Site. This will limit direct impacts to those species present in that specific location (and ZoI) at the time the impact occurs. Not all species will be affected by each individual impact. The assumptions as to which species will be present when impacts occur have been clearly set out within the impact assessment.

7.3.128 Only where an impact has the potential to create a significant effect on the designated features of the SSSI (thus affecting the favourable conservation status of the SSSI) would a significant effect at the National level be identified by the impact assessment.

7.3.129 Surveys in 2021 and 2022 were limited to the peninsula and parallel access road as at the time impacts for the whole Site were not being considered. Surveys have been extended to the full Site boundary since late 2022.

7.3.130 Difficulties due to the presence of dense buddleia on the peninsula constrained surveys during 2021, 2022 and into early 2023 by preventing access to certain areas and blocking visibility. However, further surveys carried out since buddleia clearance was undertaken in February 2023 have not had the same constraints, allowing the baseline to be fully established.

7.3.131 Two experienced ornithologists were consulted to try to determine if it was possible to assess disturbance impacts to breeding birds at the lake in the same way as for the wintering birds. It was concluded it would not be possible to survey for disturbance of breeding birds as they are very cryptic and will hide rather than be flushed when any disturbance occurs. If birds are flushed from within vegetation or from islands, it is often not possible to tell if they were flushed from a nest site. Too intrusive a search for nests amongst shoreline vegetation where nests may be hidden (to inform a baseline for a disturbance survey) may also cause nests to be abandoned. Therefore, no such survey was possible. A traditional breeding bird survey was undertaken using calls / bird song and typical behaviours to identify breeding pairs. Incidental observations of behaviour in response to visual and noise disturbance were also made during these surveys.

7.3.132 Bat activity surveys of the islands have not been possible due to potential disturbance to breeding birds present and the difficulties in gaining access / egress to safe vantage points for surveyors. However, radio tracking data from HS2 provided in May 2023 has allowed characterisation of the use of the full Site by bats including the islands to be established.

7.3.133 There are several limitations with the HS2 bat radio-tracking data (inherent to the technique and not to the HS2 survey effort) that should be borne in mind:

- Radio-tracking can only find roosts of bats that were tagged, and HS2 only had a licence to tag four species. Other species were not tagged and therefore their roosts are not represented, should they be present;
- The roost locations are considered to be approximate. Typically, radio-tracking has an accuracy of between 10 – 100m depending on the distance of triangulation, although if the night radio-tracking is followed up with daytime searches for day roosts, the exact tree or building can be determined. No survey results of daytime inspections or dusk emergence surveys of the identified roosts were provided by HS2, meaning that identification of the exact roost tree or feature was probably not part of the survey effort (this would be appropriate as the focus of HS2 survey efforts and data capture would not be on roosts located outside of their own red line boundary). Furthermore, although HS2 surveyors had full access to the Site, they would have been constrained from closely locating exact roost trees by the presence of dense buddleia (which was not cleared until February 2023). Therefore, the location of the roosts is assumed to be approximate with a 20m buffer at the peninsula (where there was good access) and lower accuracy (larger buffer) further away from roads; and
- Accurate characterisation of the roosts was also not undertaken by HS2 (again this requires a dusk emergence survey of the roost to be done), so roost classification is assumed to have been made on a precautionary basis based on the sex and breeding status of the tagged bat. As such, a 'maternity roost' identified by HS2 data may only have been occupied by a single post-lactating female or by a juvenile bat with no signs of breeding late in the maternity season, and therefore large numbers of bats or a roost of high conservation value cannot be assumed to be present.

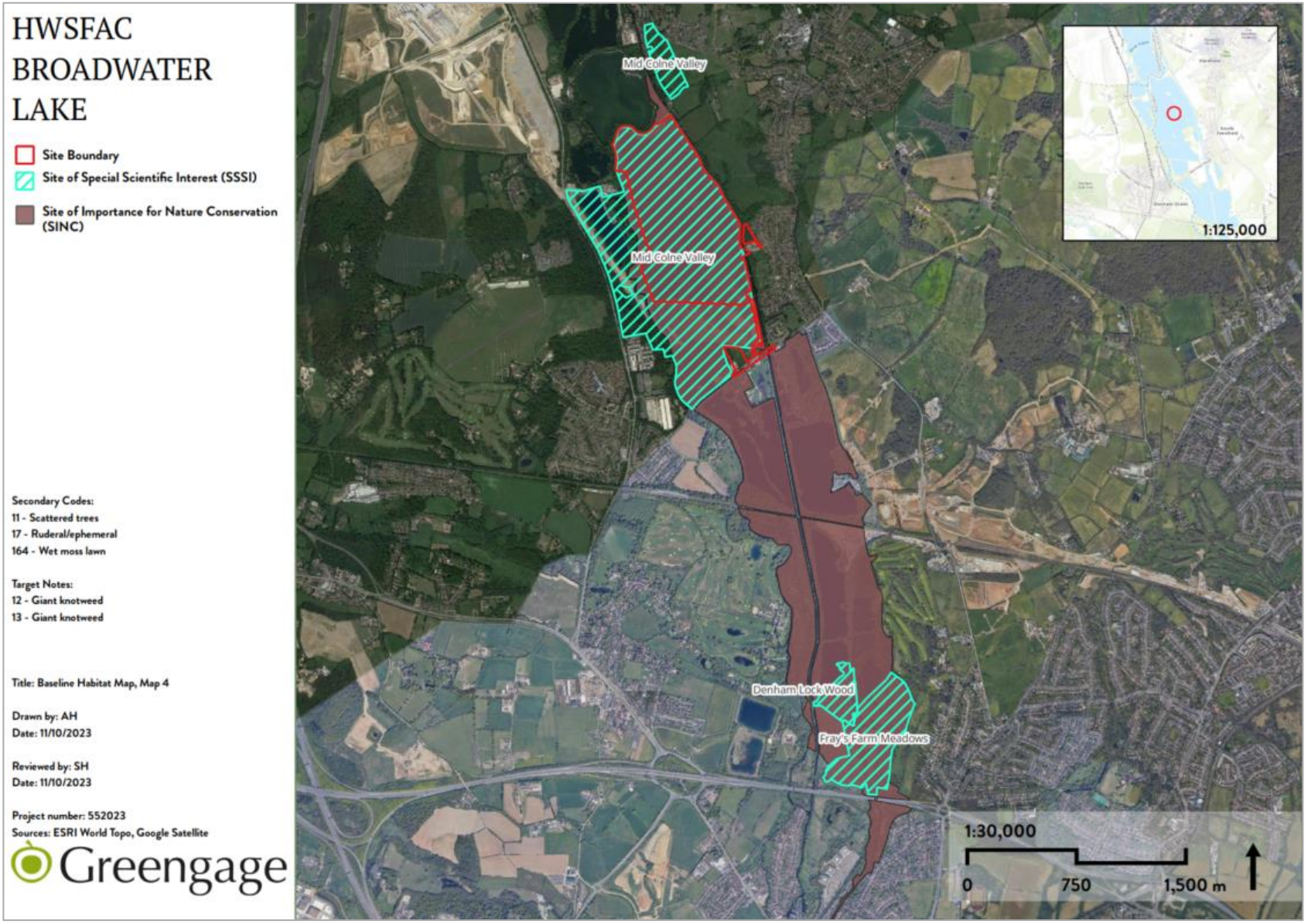
7.4 Baseline Conditions

7.4.1 The ecological baseline is set out below and comprises designated sites, habitats and species that occur on-site and within the ZoI of the Proposed Development.

7.4.2 For further information relating to these receptors, please refer to the PEA in Appendix 7.1.

7.4.3 The location of Mid-Colne Valley SSSI and the Site boundary are shown on Figure 7.1.

Figure 7.1: Mid-Colne Valley SSSI, SINC and the Site boundary



On-site - Designated Sites (Statutory and Non-Statutory)

Mid-Colne Valley Site of Special Scientific Interest

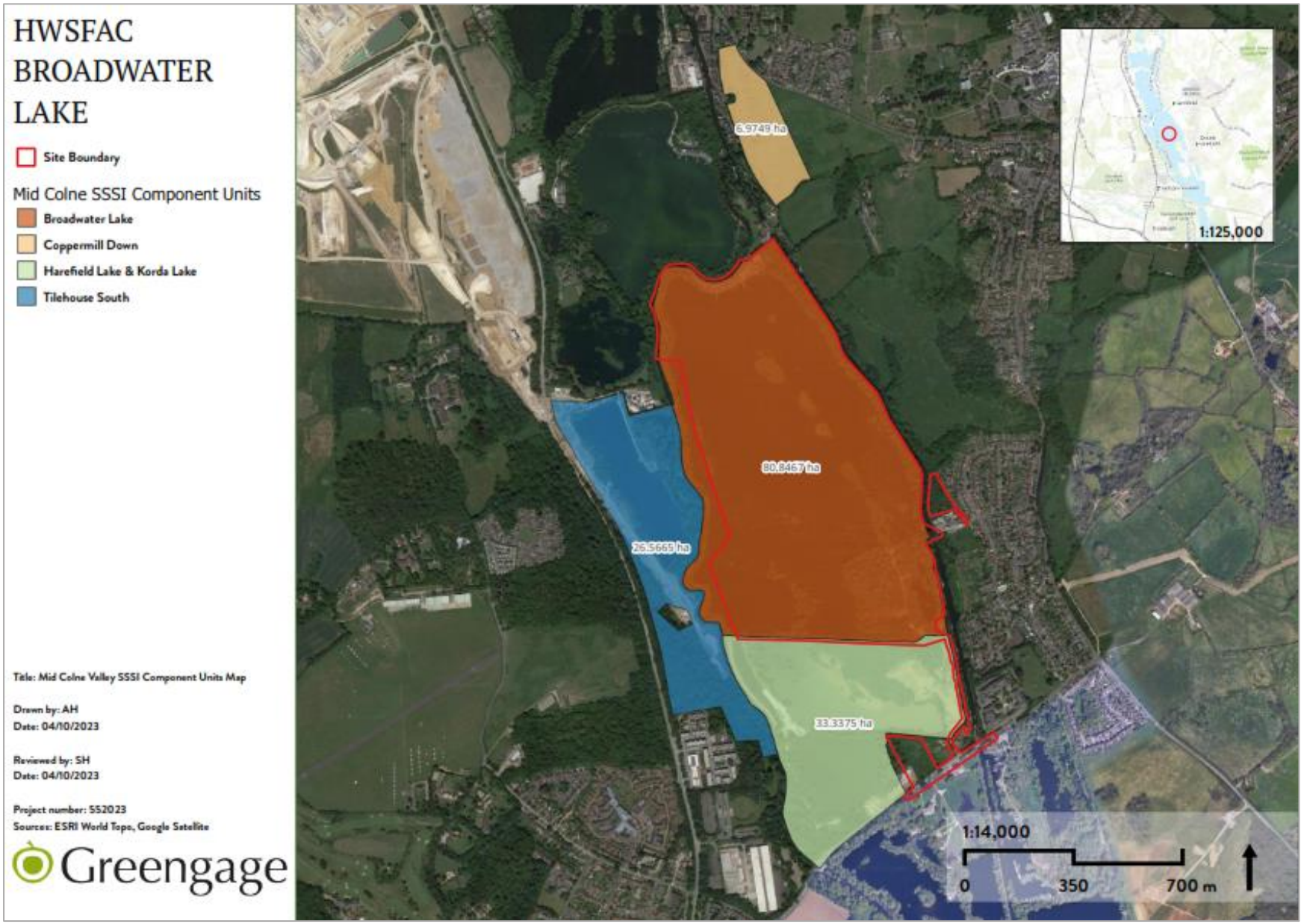
7.4.4 The Site itself is within the boundary of the Mid-Colne Valley SSSI. The Mid-Colne Valley SSSI is comprised of several individual nature conservation sites (units). The total area of the SSSI is 147.73 ha of which 72.03 ha is outside of the Site boundary.

7.4.5 There are four designated units of the SSSI as follows in Table 7.7 and shown in Figure 7.2. Together these units provide the requisite habitats that support SSSI designated features (assemblages and aggregations of birds and calcareous grassland).

Table 7.7: Designated units of the SSSI

Unit	Unit name	Area (ha)	Habitat Features	Location Relative to the Site
1	Coppermill Down	6.9749	Lowland calcareous grassland	Offsite approximately 100m north of the Site
2	Tilehouse South	26.5665	Standing open water and canals	Offsite immediately to the west of the Site
3	Broadwater Lake	80.8467	Standing open water and canals	Onsite
4	Harefield Lake and Korda Lake	33.3375	Standing open water and canals	Offsite immediately south of the Site
	Total area	147.7256		

Figure 7.2: Units of Mid-Colne Valley SSSI



7.4.6 The full citation for the SSSI is provided below:

The Mid-Colne Valley is of significant ornithological interest, particularly for the diversity of breeding woodland and wetland birds, and for the numbers of wintering wildfowl. On the eastern valley slope is one of the last remaining examples of unimproved chalk grassland in Greater London.

The Site represents a cross-section of the River Colne flood-plain and the adjoining valley slopes; these rise abruptly to the east and west and lie on Upper Chalk with pebbly clay capping the higher western slopes. An extensive series of flooded pits occupy much of the flood-plain resulting from the gradual and continuing extraction of underlying river gravels. The main and most northern pit, known locally as Broadwater is one of the largest expanses of open water in the Colne Valley and is unusual with its scattering of small, wooded islands. Around the pits and on the dividing causeways are remnants of the original alluvial grasslands and valley alder woods. These grade into various types of beech and hornbeam woodland and mixed scrub on the western slopes.

The ornithological interest of the Site is considerable with over 70 breeding and 80 wintering species of bird regularly recorded. This high diversity reflects the close proximity of the wide range of habitats present: woodland, scrub, grassland, running and standing water, marginal fen and gravel banks. Breeding woodland birds include kestrel, lesser whitethroat, nuthatch, tawny owl and three species of woodpecker. The gravel pits and River Colne attract one of the most important wetland breeding bird communities in Greater London and the Colne Valley: coot, greylag goose, little ringed plover, kingfisher, mute swan and tufted duck nest regularly, while others such as gadwall and shoveler are resident and occasionally breed. Recently a heronry has become established on the islands in Broadwater and is expanding rapidly. Many species of wintering wildfowl are attracted to the extensive water areas; the numbers of tufted duck frequently reach levels of national importance, and pochard and shoveler occasionally reach levels of similar significance. In winter Broadwater's islands are also the site of a large cormorant roost.

Coppermill Down on the east side of the valley contains an area of chalk grassland and scrub in which downland grasses such as upright brome Bromus erectus and yellow oatgrass Trisetum flavescens are abundant. Among these grasses typical chalk herbs occur including dwarf thistle Cirsium acaule, rough hawkbit Leontodon hispidus, fairy flax Linum atharticum and cowslip Primula veris. The Down is also one of the few remaining sites in North London for pyramidal orchid Anacamptis pyramidalis and bee orchid Ophrys apifera.

The banks of the gravel pits, although of relatively recent origin, already support a variety of willow species and many fen plants such as water plantain Alisma plantagoaquatica, yellow iris Iris pseudacorus and gipsywort Lycopus europaeus. In sheltered areas where the banks are gently shelving more extensive stands of tall swamp vegetation occur, comprising mainly common reed Phragmites australis and bulrush Typha latifolia. The relatively unimproved stretch of the River Colne adds further diversity top the range of wetland habitats. Above the riverside alderwoods, a steep chalk escarpment gives rise to a beech hanger wood with ash and pedunculate oak. The woodland is notable for an abundance of coralroot Cardamine bulbifera, a plant with a nationally restricted distribution, but a characteristic species of long-established woodland on calcareous soils in this locality.

7.4.7 The designated features of the SSSI that fall within the Site boundary are:

- Aggregations of non-breeding birds - variety of wintering species;
- Aggregations of non-breeding birds - Tufted duck Aythya fuligula;
- Assemblages of breeding birds - Mixed: Lowland open waters and their margins, Lowland fen and Lowland damp grassland;
- Assemblages of breeding birds - Mixed: Scrub, Woodland;
- Assemblages of breeding birds - variety of species; and
- Standing open water.

7.4.8 One designated feature lies entirely outside the Site boundary:

- Lowland calcareous grassland (CG3-5). This feature does not occur within the boundary of the Proposed Development and is not considered further.

7.4.9 The most recent condition assessment was carried out in 2023. The SSSI is considered to be 50% favourable (Aggregations of non-breeding birds - Tufted duck, Aythya fuligula, Aggregations of non-breeding birds - variety of wintering species and Assemblages of breeding birds - Mixed: Lowland open waters and their margins, Lowland fen and Lowland damp grassland), 33.33% unfavourable - no change (Assemblages of breeding birds - Mixed: Scrub, Woodland and Assemblages of breeding birds - variety of species) and 16.67% unfavourable declining (Lowland calcareous grassland (CG3-5).

7.4.10 The condition of the individual units: 75% are considered to be unfavourable - no change (Tilehouse South, Broadwater Lake and Harefield Lake and Korda Lake); and 25% are considered to be unfavourable and declining (Coppermill Down).

7.4.11 The baseline for each of these designated features is set out below in the sections on habitats and birds (non-waterbirds (passerines and near-passerines) and waterbirds (breeding and wintering)).

7.4.12 Although these habitats and aggregations / assemblages of birds form part of the designation of the SSSI, the entirety of which has a **National value**, the ecological value of the individual species forming part of the assemblage, and each assemblage individually, has been assessed rather than simply applying a blanket National value. This is considered important to avoid overestimating the effects of impacts from the Proposed Development.

7.4.13 Habitats have been evaluated for their value within the context of the landscape in which they lie, i.e., the frequency and extent of the habitat within the locality and wider area.

7.4.14 The assemblages and individual bird species have been evaluated by their numbers onsite by comparison to the UK total estimated populations (non-breeding and breeding). The local context has also been considered i.e., species numbers at surveyed sites in the Colne Valley (where survey data are available) and known populations within Greater London (such as for greylag goose).

7.4.15 For breeding species, the degree to which breeding onsite may sustain the conservation status of the species concerned, and whether the onsite population is itself self-sustaining has been assessed, to value the Site's importance to individual species.

Mid-Colne Valley Site of Importance for Nature Conservation - Metropolitan

7.4.16 London's equivalent of Local Wildlife Sites, Sites of Importance for Nature Conservation (SINCs) are recognised for the important habitats they support. This is a non-statutory designation, although SINCs are still afforded a high level of protection within the planning system.

7.4.17 In London, SINCs are designated as one of a hierarchy of types:

- Sites of Metropolitan Importance are selected on a London-wide basis;
- Sites of Borough Importance (Grade I and II, with Grade I being of higher importance) are selected from candidates within each borough, so ensuring that borough has some sites identified; and
- Sites of Local Importance are the lowest tier of sites, selected to redress any remaining local deficiencies.

7.4.18 The Site itself, as well as the adjacent lakes and active mineral works to the south of the Site, are covered by a section / parcel of the Mid-Colne Valley SINC. This is a multi-site designation, formed of several parcels and which is of Regional importance. It covers an area of 321.17ha. Frays Farm Meadows and Denham Lock Wood are both SSSIs and are components of the Mid-Colne Valley SINC however it should be noted these are greater than 2km from the Site. These individual components have National importance given their status individually as SSSIs as well.

7.4.19 The SINC is summarised as: "*A section of the Colne Valley with a remarkable range of high-quality wetland habitats, including three Sites of Special Scientific Interest*." Habitats listed as present include: Ancient woodland, Marsh/swamp, Pond/lake, Running water, Wet ditches, Wet grassland, Wet woodland/carr.

7.4.20 The full designation is provided below although the Site is only mentioned indirectly:

This section of the Colne Valley includes a diverse range of high-quality habitats. Several waterways include the Frays River, from which 53 species of aquatic and wetland plants have been recorded. The unimproved wet pastures of Frays Farm Meadows (a Site of Special Scientific Interest and Local Nature Reserve managed by the London Wildlife Trust and Hillingdon Natural History Society) support a very rich flora, including locally uncommon species such as marsh-marigold (Caltha palustris) and ragged-robin (Lychnis flos-cuculi). The invertebrate fauna includes the locally declining glow-worm (Lampyris noctiluca). The meadows support wintering waders such as snipe, as well as a population of harvest mice. The adjacent Denham Lock Wood (also Site of Special Scientific Interest) is one of few wet alder-willow woods in London and supports a rich fen flora including the very localised small teasel (Dipsacus pilosus). Invertebrates here include the nationally rare species Desmoulin's whorl snail (Vertigo moulinsiana) and the balsam carpet moth. The extensive flooded gravel pits are very important for breeding and wintering waterfowl, and for passage migrants. Several of the gravel pits are part of a third Site of Special Scientific Interest. The Site is important for its population of the specially protected water vole and there are also recent reports of otters in the vicinity.

7.4.21 The Site and the extent of the SSSI and SINC designations are shown in Figure 7.1.

Offsite – Statutory Designated Sites-

7.4.22 The closest international statutory designated Site, Burnham Beeches Special Area of Conservation (SAC) and National Nature Reserve (NNR), lies 8.9km away. The Site does not fall within the 5.6km buffer zone around the SAC whereby impacts from development are required to be considered (and as such is not an IEF for this assessment).

7.4.23 Within 10km there are four Nationally important SSSI sites with mention of birds within the descriptions for the sites. The SSSI IRZ of these sites do not overlap the Site, however they have been considered to ensure all potential impacts are assessed for mobile species. These SSSI are:

- Sarratt Bottom SSSI (8.6km north) - alluvial meadow designated for damp species-rich neutral grassland. The description notes that it supports a variety of wetland birds and wide range of invertebrates;
- Hodgemoor Wood SSSI (7.3km north-west) – designated for ancient and semi-natural broadleaf woodland. The description mentions supporting many woodland bird species;
- Whippendell Wood SSSI (7.8km north-east) – designated for ancient woodland. There is mention of a diverse woodland bird community; and
- Black Park SSSI (5.4km south-west) - variety of habitats and designated for lowland woodland and heathland. There is mention of a wide variety of breeding and wintering birds.

7.4.24 The above sites are not considered to be an IEF for this assessment, as their designations do not include important assemblages of wintering or breeding birds.

7.4.25 Within 2km there are four sites with SSSI statutory designation (of which one is also an NNR) with IRZ that overlap the Site – these sites are of National importance. There are also four Local Nature Reserves (LNR), which are of Borough importance. Table 7.8 below gives the locations and descriptions of these sites.

Table 7.8: Statutory Designated Sites within Search Radius

Site Name	Approximate Location	Description
Harefield Pit SSSI	214m NE	Designated for its geological interest only.
Old Park Wood SSSI	874m N	Ancient woodland, "*some of the most floristically rich ancient woods in Greater London*". Has a good variety of birds particularly in winter (bats not mentioned).
Ruislip Woods SSSI and National Nature Reserve (NNR)	1445m E	Designated for its ancient semi-natural woodland, invertebrates, and includes mention of its diverse range of breeding birds characteristic of woodland habitat and being particularly suitable for less common breeding species such as woodcock and hawfinch (bats not mentioned).

Site Name	Approximate Location	Description
Old Rectory Meadows SSSI	1690m SW	Grassland of botanical interest. "*Base-rich and poor marsh, wet alluvial meadows and water meadows with grazed wet and damp meadows, as well as alder carr woodland*" on calcareous gley soils.
Northmoor Hill Wood Local Nature Reserve (LNR)	282m W	Ancient woodland (birds and bats not mentioned in the designation).
Denham Country Park LNR	939m S	River, wetland, meadow and woodland habitats. "*A scenic and relaxing location on the banks of the rivers Colne, Misbourne and Frays, the park is home to a mix of wildlife. You may catch a glimpse of herons and kingfishers while in summer damselflies and dragonflies dart over the wet meadows*."
Denham Quarry Park LNR	945m S	Wet meadows (bats and birds not mentioned)
Frays Valley LNR	From 1.25km south	71.84ha multi-parcel designation incorporating two SSSI: Frays Farm Meadows and Denham Lock Woods (citations below). Wetland and grassland habitats, ancient woodland indicator plants, wildfowl (birds).
Denham Lock Wood SSSI	2090m S	Part of the Mid-Colne Valley SINC designation: wet alder-willow woods supporting a rich fen flora including the very localised small teasel (Dipsacus pilosus). Invertebrates here include the nationally rare species Desmoulin's whorl snail (Vertigo moulinsiana) and the balsam carpet moth. Feature: Lowland wetland including basin fen, valley fen, floodplain fen, waterfringe fen, spring/flush fen and raised bog lagg – Favourable Feature: Wet woodland – Favourable Unit: Broadleaved, Mixed And Yew Woodland – Lowland – Favourable (floodplain and swamp)
Frays Farm Meadow SSSI (forming part of Frays Valley LNR and the Mid-Colne Valley SINC designation)	2.3km distant	Feature: Floodplain fen (lowland) – Unfavourable declining Units: 001 Neutral grassland – Favourable; 002 Neutral grassland – Unfavourable declining.

7.4.26 Although the Site lies within the IRZ for the four SSSIs (Harefield Pit SSSI, Old Park Wood SSSI, Ruislip Woods SSSI and NNR, Old Rectory Meadows SSSI) located within 2km, the proposed uses of the Site as a result of the Proposed Development do not fall into one of

the defined development categories that would necessitate consultation with Natural England, indicating that the Proposed Development is unlikely to pose a risk to these SSSIs. No impacts would be expected to a site designated for geological reasons (Harefield Pit SSSI) given the intervening distance. The habitats at the other SSSIs within 2km comprise woodland and meadows – woodland and grassland bird populations would not be expected to be travelling more than a few hundred metres, as these birds are territorial and will remain within their territories which are typically small. Therefore, the surrounding SSSI's are not identified as IEFs.

7.4.27 Northmoor Hill Wood LNR is ancient woodland beyond the River Colne to the west, that is not in ecological connectivity with the Site. Its woodland bird population would not be expected to be using the Site as these birds remain within their territories which are typically small. This LNR is not identified as an IEF.

7.4.28 Denham Country Park and Denham Quarry Park both lie c. 950m south. The designations for these sites are for their riverine, terrestrial and wetland habitats. Given the similarity of habitat, the proximity to the Site and the likelihood that birds using the Site may also use these parks, they are considered to be IEF, and are valued at the Borough level individually.

7.4.29 Lakes within Denham Country Park and Denham Quarry Park form part of the Colne Valley Gravel Pits (CVGP), a series of connected lakes of which the Site forms a key part.

7.4.30 Frays Valley LNR incorporates two SSSIs beyond 2km distant: Denham Lock Wood and Frays Farm Meadow. They also form part of the CVGP and the Mid-Colne Valley SINC. These sites are identified as IEF as part of the CVGP and the Mid-Colne Valley SINC. They are valued at the National level.

7.4.31 Figures included in Appendix 7.2 show the location of statutory designations relative to the Site comprising:

- NNRs within 10km;
- NNRs within 2km;
- SSSIs within 10km;
- SSSIs within 2km; and
- LNRs within 2km.

Offsite Non-statutory Designations

7.4.32 There are multiple non-statutory designated sites adjacent to and within 2km of the Site. SINCs within 2km of the Site are detailed in Table 7.9. These are shown in Appendix 7.2.

Table 7.9: Details of the closest SINCs to the Site

Site Name	Approximate Location from Site	Description
London Canals SINC (Metropolitan)	Adjacent site to the east; a canal bridge falls	London's canals provide a home for many fish and aquatic plants and are a great way

Site Name	Approximate Location from Site	Description
	within the red line boundary	to enjoy the natural world in some of the city's most built-up areas.
Coppermill Down SINC (Metropolitan)	107m north-east	The only natural chalk grassland in north London, with an excellent range of wild flowers. (This also forms one of the units of the Mid-Colne Valley SSSI).
Harefield Chalk Pit SINC (Borough Grade I)	235m north-east	Oak woodland which has developed in an old chalk pit.
Harefield Churchyard and Wood SINC (Borough Grade I)	500m east	A picturesque 14th century parish church and cemetery.
Harefield Hospital Ponds and the Old Orchard (Borough Grade II)	592m north-east	Two ponds in the grounds of Harefield Hospital, and an old orchard within a tenanted
The Dairy Farm, Harefield (Borough Grade II)	630m north-east	A small but interesting area of fields with no official public access.
Old Park Wood (Metropolitan; also, a SSSI)	690m north	A fine ancient wood, rich in woodland wild flowers.
Breakspear House Wood (Borough Grade II)	961m east	A small ancient woodland with a footpath running through it.
Harefield Green Pond (Borough Grade II)	978m north-east	A small pond on the edge of the historic village green of Harefield.
Knightscote Farm Ponds (Borough Grade II)	1.1km east-northeast	Two ponds separated by an area of woodland, one used for fishing.
Dews Dell SINC (Borough Grade I)	1.2km southeast	An old quarry with great wildlife potential.
Medipark Site (Borough Grade I)	1.2km north-east	An interesting mosaic of habitats within the former grounds of a demolished hospital building. Adjoins the eastern edge of Old Park Wood
Ruislip Woods and Poor's Field (Metropolitan)	1.3km east	One of London's two National Nature Reserves, this site includes a large area of ancient woodlands, as well as heathland and grassland.

Site Name	Approximate Location from Site	Description
Shepherd's Hill Woods and Fields (Borough Grade I)	1.4km east	A large mosaic of fields and small woods with thick inter-connecting hedges, creating a distinctly rural feel.
Newyears Green (Borough Grade I)	1.4km south-east	A woodland believed to have been planted in the late 19th century, surrounded by fields and hedges.
White Heath Farm and Harefield Grove (Borough Grade II)	1.5km north-east	No details provided
Harefield Hall and the Lodge	1.6km south-east	No details provided
Shepherds Hill House (Borough Grade II)	1.8km north-east	No details provided
Springwell and Stocker's Lakes (Metropolitan)	1.9km north	Lakes forming part of the Mid-Colne Valley Gravel Pits. Herts and Middlesex Wildlife Trust Nature Reserve. Important for wintering and breeding birds, with a heronry

7.4.33 Only London's Canals SINC, Coppermill Down SINC and Springwell and Stocker's Lakes SINC are considered to be IEF for the purposes of this Development. The Grand Union Canal, forming part of London's Canals SINC, lies adjacent to Site and part of the Proposed Development concerns a bridge crossing the Grand Union Canal. Coppermill Down SINC forms part of the Mid-Colne Valley SSSI. Springwell and Stocker's Lakes are ecologically connected to the Site through the chain of lakes within the Colne Valley Gravel Pits, of which Broadwater Lake forms a part.

7.4.34 The three SINCs mentioned above and included as IEFs are all SINC (Metropolitan) and as such have Borough importance for nature conservation.

7.4.35 The other SINCs within 2km lie outside the likely ZoI of the Proposed Development and are unlikely to support species or populations that are also using the Site The open water habitats are ponds with small size being unable to support any part of the assemblages using the Site. The terrestrial habitats are discrete habitat areas supporting limited woodland assemblages which are typically territorial and do not travel far (other than cuckoo or birds of prey); the distance from the Site means there is no ecological connectivity.

Undesignated Nature Conservation Sites

Broadwater Lake Nature Reserve

7.4.36 The Broadwater Lake Nature Reserve is present adjacent to the western edge of Broadwater Lake, managed by Herts and Middlesex Wildlife Trust. The nature reserve is formed of the land between the banks of the River Colne and the banks of Broadwater Lake and has a walkway through this area with a small number of viewing platforms onto the

lake. The Nature Reserve is currently under the legal possession of HS2 Ltd for construction of the high-speed railway line; it will be returned to Herts and Middlesex Wildlife Trust once construction works are completed. Its intrinsic value for wildlife is assessed as being of Borough importance.

7.4.37 However due to being located on the west side of the lake more than 100m from intrusive construction works outside the direct and indirect impact areas, the Reserve has not been identified as an IEF for the purposes of this assessment.

Colne Valley Gravel Pits

7.4.38 The Colne Valley Gravel Pits (CVGP) is a chain of 20 lakes stretching through the Colne Valley from Frays Farm (Frays Wildfowl Lake and Frays Carp Lake 2.5km south from the Site) in the south up to Batchworth Lake 6.7km north-west (beyond Stockers Lake 4km north-east) from the Site. Effectively the CVGP (along with some additional unmonitored small lakes / former gravel pits where presumably there is no access for monitoring) is a connected functional ecological unit with the different lakes together supporting a huge diversity and number of wetland birds. The CVGP has been monitored by the British Trust for Ornithology (BTO) since 1955 until the present date for its non-breeding bird populations (as part of the Wetland Bird Survey or WeBS).

7.4.39 White and Harris (2008) reported that Broadwater Lake and Stockers Like are the two largest lakes within the CVGP. Key populations of duck species such as shoveler and pochard appear to utilise both these lakes depending on the availability of food, time of year and other factors perhaps such as disturbance.

7.4.40 A summary of information relating to Broadwater Lake as a part of the CVGP (taken from White and Harris 2008) has been provided in Appendix 7.6 Wintering Bird and Disturbance Survey Report.

7.4.41 Within CVGP are the following designated sites (already detailed above) (due to the 2km extent of the data search this list is likely to be incomplete as the CVGP extends nearly 7km away from the Site):

- Denham Country Park LNR;
- Denham Quarry Park LNR;
- Frays Valley LNR incorporating Denham Lock Wood SSSI and Frays Farm Meadow SSSI; and
- Springwell and Stocker's Lakes SINC.

7.4.42 The CVGP WeBS data (5 year rolling average peak count and 2018/19 peak count) for wetland birds were evaluated using the same methodology as for the wintering birds occurring at the Site. The CVGP has nationally important numbers of shoveler and pochard, however, most species occurring are at Regional importance or less. Therefore, overall, the CVGP is considered to be of Regional importance.

Irreplaceable Habitats: Ancient Woodland and veteran trees

7.4.43 One parcel of ancient woodland lies 95m west from the south-western corner of the Site beyond the River Colne. The woodland (Battlesford Wood or Ranston Covert) is under the possession of HS2 and lies directly adjacent to the new viaduct on the far side away from

the Site. Beyond this, further parcels of ancient woodland lie 225m west and 315m west. Due to the location beyond the River Colne and the HS2 Colne Valley viaduct, and more than 500m from proposed construction works, this woodland does not lie within the ZoI of the Proposed Development.

7.4.44 No veteran trees have been identified within influencing distance of the Site. The closest notable tree identified by the Ancient Tree Inventory[22] is a 4.99m DBH hybrid black poplar 'robusta' located 205m east (beyond the Grand Union canal) at the margin of a recreation ground.

7.4.45 Due to the factors outlined above, neither receptor has been identified as an IEF for this assessment.

Priority Habitats

7.4.46 The following priority habitats (as defined by Section 41 of the NERC Act) were identified at the Site and immediate surrounds:

- Woodland: w1d, w1f woodlands; and
- Standing water bodies: Pond, Lake.

7.4.47 The following UK Biodiversity Action Plan (BAP) priority habitats were present at Site or in the immediate vicinity:

- Deciduous woodland (on Site and in immediate vicinity).
- River Colne - a Chalk River.

7.4.48 The London BAP lists four priority habitats and 11 Habitat Action Plans (HAP). Those of relevance to the Site comprise:

- Parks and Urban Green Spaces HAP;
- Rivers and Streams HAP;
- Standing Water HAP (including canals); and
- Woodland HAP.

7.4.49 The priority and BAP habitats are described in detail below.

Wet woodland (w1d)

7.4.50 Wet woodland occurs at the peninsula within an area which was formerly a silt lagoon. It was characterised by pools of water and extremely significant amounts of deadwood on the ground. Tree species recorded were dominant willows (Salix sp.) including weeping willow (S. pendula), crack willow (S. fragilis), goat willow (S. caprea), grey willow (S. cinerea), along with frequent alder (Alnus glutinosa) and silver birch (Betula pendula) and occasional sycamore (Acer pseudoplatanus). Ground flora recorded comprised dominant nettle (Urtica dioica) with frequent St John's wort (Hypericum perforatum), and occasional to rare herbs including forget-me-not (Myosotis sylvatica), self-heal (Prunella vulgaris), great burdock (Arctium lappa), field mint (Mentha arvensis), cleavers (Galium aparine), spear thistle (Circium vulgare), woodland sedge (Carex pendula), ground ivy (Glechoma hederacea), cotoneaster (Cotoneaster sp.), stone parsley (Sison amomum). Species typical of damp

and wet habitats recorded were occasional gypsywort (Lycopus europaeus) hemp agrimony (Eupatorium cannabinum) and yellow flag iris (Isis pseudacorus).

7.4.51 Wooded islands within the lake have also been classified as wet woodland - these are covered with willows. It has not been possible to examine the ground flora so as not to disturb breeding birds nesting at the islands. Where the base of small islands has been seen closely, these were mainly covered with sections of fallen willow trunk from which new trees have arisen.

7.4.52 While this habitat forms part of a designated feature of a SSSI (woodland) it has been very limited by the artificial ground conditions it has developed upon (See Chapter 9: Ground Conditions and Contamination for further details of ground conditions). Wet woodland is assessed as being of Borough importance.

7.4.53 Adjacent to Site to the south (running parallel with the causeway across the south end of the lake) lies a small area of wet woodland that has developed on another silt lagoon. This had areas of sinking sand visible from the path and was unsafe to access. This area lies outside the ZoI of the Proposed Development.

Ponds

7.4.54 There are pools of standing water within wet woodland onsite, these vary in extent according to the height of the water table and amount of recent rain. However, these are categorised within wet woodland (as a characteristic of that habitat) rather than discrete habitat in their own right, which is in accordance with the UKHab classification scheme mainly due to their small size.

Lowland mixed deciduous woodland (w1f)

7.4.55 On the peninsula, there are two distinct areas of this woodland type, both meeting the description however varying in underlying ground conditions and species diversity.

7.4.56 Woodland occurring on former mineral working areas across the Site surrounds the wet woodland; it occurs on very hard and organic-poor substrate. The habitat was species-poor and comprised mainly willow, birch and alder. Willows occurred on the shorelines. It had a very sparse and species-poor ground flora comprising of dominant nettle (Urtica dioica) with frequent St John's wort, and occasional bramble (Rubus fruticosus agg.), cleavers (Galium aparine) ivy (Hedera helix) and buttercup (Ranunculus sp.), being quite choked with buddleia in many places.

7.4.57 Along small areas of remaining natural ground at the peninsula and along the southern boundary of the Site, this habitat was more species rich as natural soil was present. Species included pedunculate oak (Quercus robur), alder, birch and hazel (Corylus avellana) as well as willows. This woodland had a diverse ground flora of ruderal / ephemeral where buddleia and bramble scrub had been kept from encroaching along a pathway running through this area.

7.4.58 Along the access road, at the sides of the lake and along the canal all the way to BSC, lowland mixed deciduous woodland occurs with a typical native woodland understorey of mixed scrub, herbs and grasses. Species included oaks (Quercus spp.), willows, black poplar (Populus nigra) with alder, birch and hazel, and understorey of bramble, nettles, ivy.

7.4.59 While this habitat forms part of a designated feature of a SSSI (woodland) it has been very limited by the artificial ground conditions it has developed upon. This woodland habitat is assessed as being of **Borough importance**.

Open standing water

7.4.60 Broadwater Lake, the inlet and lagoon, and standing pools of water in the wet woodland are present at the Site. Approximately 60ha of the lake's open water falls within the Site boundary of the Proposed Development.

7.4.61 Broadwater Lake has been assessed using Environment Agency (EA) criteria as a lake of medium alkalinity due to test results of 120 mg/l of calcium carbonate ($CaCO_3$).

7.4.62 The Freshwater Biological Association 'Habitat Naturalness Assessment' may be used to assess the condition of lakes (this is used for the DEFRA Biodiversity Metric). Scores for four attributes (physical, hydrological, chemical, and biological naturalness) are averaged to generate an overall 'habitat naturalness assessment score' which can then be translated into a condition score. Using these criteria, the lake has been assessed as being in moderate condition. The criteria and assessment are set out in the MEMP Volume One provided in Appendix 7.4.

7.4.63 Emergent vegetation was present in small patches along the shoreline all around the lake. Species comprised dominant common reed (Phragmites australis), frequent rosebay willowherb (Chamaenerion angustifolium) and yellow flag-iris (Iris pseudacorus) as well as occasional branched bur-reed (Sparganium erectum), reedmace (Typha latifolia), water mint (Mentha aquatica) and purple loosestrife (Lythrum salicaria). It is understood from BSC (pers. comm.) and from observations of the differing water levels at the Site during 2022 and 2023 that the fluctuating levels of the lake through the year cause vegetation to die in some years (such as in 2022) restricting its establishment and spread.

7.4.64 As one of four lakes (within three SSSI units) that together form a designated feature of the Mid-Colne Valley SSSI, the standing open water onsite is valued at Regional importance. Refer to Chapter 8: Water Resources and Flood Risk for further information.

River Colne

7.4.65 The River Colne lies directly adjacent to the Site; it is a priority habitat and designated as UK BAP and London BAP habitat. It has Regional importance as its character influences the entire Colne Valley. It lies up-hydrological gradient from the Site (the direction of groundwater flow is to the south).

Grand Union Canal

7.4.66 The Grand Union canal lies adjacent to the Site just beyond its eastern boundary. It is designated as London BAP habitat, forms part of the London's Canals SINC and is valued as a corridor for wildlife. As part of a SINC designated throughout Greater London, it is valued at Regional importance.

Open Mosaic Habitat

7.4.67 MAGIC indicatively shows some of the Site as Open Mosaic Habitat (due to its previously developed land usage) however this mapping is not based on detailed surveys.

7.4.68 Field survey data and use of satellite imagery and Google Earth was utilised to assess whether the Site contained any areas meeting the UK BAP criteria of open mosaic habitat on previously developed land. This assessment (detailed within the PEA in Appendix 7.1) found that the site failed to meet three (criteria 1,4 and 5) of five relevant criteria for open mosaic habitat. Open mosaic habitat is therefore not present at the Site.

Habitats

7.4.69 The habitats present at the Site are shown in Figures 1-5 in Appendix 7.2.

7.4.70 The habitats at the peninsula comprise:

- u1c – Artificial unsealed surface (gravel) with secondary codes designating small patches of habitat too small to map: 11 (scattered trees), 17 (ruderal / ephemeral), and 164 (moss lawn on concrete hardstanding);
- w1d – Wet woodland (willow and alder carr) (described above in paragraph 7.8.45 under priority habitats);
- w1f – Lowland mixed deciduous woodland (described above in paragraphs 7.8.53 under priority habitats);
- h3h – Mixed scrub with 1160 introduced shrub;
- u1b5 Buildings; and
- u1b Artificial sealed surface (concrete).

7.4.71 The lake islands comprised ruderal / ephemeral (where managed for nesting birds) and wet woodland, with an area of introduced (non-native) scrub and another of dense scrub. Some individual mature trees were present, including willows, two oaks, a sycamore, a conifer species, and a silver birch.

7.4.72 The access road running along the edge of the lake from the entrance from Moorhall Road to the entry to the peninsula was constructed from concrete (u1b). The access road from the gate at the peninsula up to BSC was formed of gravel hardstanding (u1c). To each side of the access road was w1f – lowland mixed deciduous woodland.

7.4.73 The habitat at the lake edge (south of Site) comprised w1f – Lowland mixed deciduous woodland. Directly adjacent but offsite lay a mixture of w1f woodland and w1d wet woodland with sinking sand.

7.4.74 The habitats at Broadwater Sailing Club comprised:

- g4 -Modified grassland;
- ub1 – Developed Land; sealed surface;
- u1b5 – Buildings;
- u1c – artificial unvegetated unsealed surface; and
- w1f – Lowland mixed deciduous woodland.

7.4.75 Offsite – field to south on Moorhall Road:

- g4 - Modified grassland; and

- u1b – Developed land; sealed surface.

7.4.76 Offsite – woodland to the east:

- w1f – Lowland mixed deciduous woodland; and
- u1b – Developed land; sealed surface.

7.4.77 Off-site to the west, along the edge of the lake the habitats noted were w1g6 – Line of Trees (typically willows along the lake edges) and g4 -Modified grassland (footpaths and land between the tree lines).

7.4.78 Habitats of principle importance at the Site (woodland) have been evaluated as being of Borough importance.

7.4.79 Remaining habitats are considered to have value within the Zone of influence only and are not therefore identified as IEF for the Proposed Development.

Badgers

7.4.80 There are low numbers of badger records within 2km (individual badgers killed on the road) of the Site and no setts reported.

7.4.81 The lake margins, grassland and woodland adjacent to BSC, and northern part of the peninsula are suitable to support foraging badger. There is a limited area of soft natural ground (i.e., soil containing organic matter) along the northern edge of the peninsula.

7.4.82 A single latrine was recorded during surveys in 2022 by Ecology By Design. In April 2023, an outlier sett, comprising one active and one disused entrance was discovered.

7.4.83 Camera trap footage from 6 June to 20th June 2023 confirmed occasional use of the active entrance by a single badger, supporting the classification of the sett as an outlier sett. The second entrance was confirmed as disused. Observations within the 15-day monitoring period evidenced use of the sett overnight on two occasions. The survey results are presented in Appendix 7.9.

7.4.84 The remainder of the peninsula is unsuitable to support badger setts, as substrates are comprised of concrete, hard substrate gravel and rocks, within which badgers cannot excavate setts. The former silt lagoon, supporting the wet woodland, is at a lower level and inundated most if not all of the year; wet ground conditions are unsuitable for badger setts.

7.4.85 The value of the Site for badger is therefore assessed as being of Local importance.

Bats – foraging

7.4.86 A full account of the desk study, surveys undertaken and an impact assessment including licensing recommendations has been provided for bats in Appendix 7.10 Bat Survey Report.

7.4.87 The local bat population comprises at least ten species of bat. The most commonly occurring species during surveys undertaken for the Site in 2021, 2022 and 2023 and for HS2 was soprano pipistrelle (Pipistrellus pygmaeus), along with common pipistrelle (P. pipistrellus), Nathusius's pipistrelle (P. nathusii), brown long-eared (Plecotus auritus),

Daubenton's (Myotis daubentonii) and Natterer's (M. nattereri). Serotine (Eptesicus serotinus), noctule (Nyctalus noctula), Leisler's bat (N. leisleri) and barbastelle (Barbastella barbastellus) occur occasionally. The following additional species are recorded within 2km and may also be present (although not confirmed through survey): whiskered bat (M. mystacinus) and Brandt's bat (M. brandtii).

7.4.88 Brown long-eared, soprano pipistrelle, noctule and barbastelle are species of principal importance (s41 NERC Act 2006). Barbastelle is a rare bat with limited distribution. Bats have a Species Action Plan under the London BAP.

7.4.89 This is a moderately diverse bat assemblage and given the occasional presence of barbastelle, the bat assemblage utilising the Site is valued at the Borough level in accordance with the Bat Mitigation Guidelines (2023)[23].

7.4.90 The woodland fringes around the shores of the Site, woodland edges on the peninsula, islands on the lake, the access road along the eastern edge of the Site and the narrow access track corridors running through the Site, provide good commuting and foraging habitat for bats. The HS2 radio-tracking data recorded locational fixes in all these locations, confirming that the radio-tracked bats used the lake (including open water) and islands for foraging. Bat activity transect surveys and bat fixed point automated surveys were conducted by Ecology By Design during August-October 2021 and April-July 2022 (see PEA provided in Appendix 7.1). The results from both survey methodologies suggested moderate bat activity levels are typical for the Site. The Site is considered to have Borough importance for foraging bats.

Bats – roosting

7.4.91 A full account of the desk study, surveys undertaken and an impact assessment including licensing recommendations has been provided for bats in Appendix 7.10 Bat Survey Report.

7.4.92 HS2 radio-tracking surveys have recorded 14 roosts (assumed to be in trees) on-site; these are shown in Appendix 7.10 along with an indicative 50m buffer. The roosts were for four bat species (soprano pipistrelle, Nathusius's pipstrelle, Daubenton's and Natterer's. and included summer / day roosts, night roosts (locations where a bat rested for 20mins or so during the night) and four maternity roosts (limitations with the radio-tracking data mean that 'maternity roosts' may include features that would only support individual bats or low numbers of bats). One HS2 radio-tracked roost (HS2 roost M, a day roost for a Nathusius' pipistrelle) was indicated on an island where the trees (regenerated scrub only 5m tall) are too young to support PRFs. It is considered likely the bat was night-roosting (i.e., perching on a bare branch) and will have moved to a more substantial PRF at or close to dawn (a commonly observed behaviour of bats). Although the island will be removed as part of the Proposed Development, no impacts to bats are therefore predicted.

7.4.93 The initial ground level assessments in May 2023 identified 29 trees with low, moderate and high potential to support bat roosts. Trees were ruled out from further survey due to distance (>20m) from development (5) and / or their location >10m from development and within an area to be retained and protected (3). Endoscopic examinations were completed on the remaining trees, through which the majority were downgraded to low or negligible potential. In total, four moderate potential trees were identified to require emergence / re-entry surveys. Low potential trees were excluded from requirement for further surveys per best practice guidance.

7.4.94 Emergence surveys were completed in July, August and September; the survey on 29th August 2023 identified two soprano pipistrelle summer day roosts in a black poplar tree adjacent to the canal bridge. Due to the lateness of the season and presence of up to three bats foraging, the roost may also be classified as a mating roost.

7.4.95 It should be noted that no trees with moderate or high potential PRFs were identified at the peninsula within the ZoI of the Proposed Development, where HS2 had recorded bat roosts or within 10-20m. This is fairly normal for radio-tracked roosts where the error associated with remote triangulation can be 100m or more.

7.4.96 There were four small breezeblock flat roof buildings at the edge of broadleaf woodland on the peninsula, supporting features with low bat roost potential. No other buildings were present at the Site. A single dusk emergence survey of these low potential buildings was undertaken between May and July 2023. The surveys did not identify any bat roosts; no further surveys are required.

7.4.97 The BSC single storey building had PRFs in the form of gaps behind wooden cladding and vents and holes in the façade. The building was ascribed low potential to support bat roosts as it is in a very exposed location on the lake shore with the river behind, with no trees or shrubs around to provide some shelter from the wind, or to provide cover into which bats may safely emerge. A single dusk emergence survey in July 2023 did not identify any bat roosts; no further surveys are required.

7.4.98 A canal bridge that carries cables to the Site is of steel construction sat atop brick plinths. Works to upgrade this bridge are required to facilitate the Proposed Development. There were rot holes in the corrugated steel underside of the bridge, gaps between the steel and brick plinths, and significant cracks in the brickwork. The bridge was identified to have moderate potential to support bat roosts. Dusk emergence surveys of the canal bridge were undertaken in June, July 2023 and September 2023; during the second survey the underside of the bridge was observed (by eye and using thermal and IR cameras) to be used by at least two soprano pipistrelles for light-sampling, night-roosting and as a feeding perch. A third survey in September did not record any further bat roosts.

7.4.99 Therefore, the whole site is considered to have up to Borough importance, based on data gathered for this Site and the HS2 work. However, due to the careful planning of the scheme and the small overall footprint, the area of the Site that could be impacted by the Proposed Development is considered to be no more than Zone of Influence importance.

Breeding birds

7.4.100 There are numerous records of birds within 2km. The desk study revealed a total of 125 species recorded within 2km, of which 53 were Amber-Listed and 30 were Red-Listed.

7.4.101 'Breeding birds' incorporates both non-waterbirds (passerines / near passerines) and waterbirds. The specific SSSI designated assemblages of breeding birds incorporate species from both groups. The baseline breeding information for non-waterbirds and waterbirds has been set out separately below. Where species form part of a SSSI designated assemblage, this has been indicated.

Breeding birds (non-waterbird)

7.4.102 There are numerous records of non-waterbirds within 2km. The desk study revealed 73 records of passerines and near-passerines (24 Amber-Listed and 23 Red-Listed). The Site's terrestrial habitats are suitable to support a wide range of breeding birds.

7.4.103 The breeding terrestrial bird populations at Broadwater Lake form part of the following SSSI designated features:

- Assemblages of breeding birds - Mixed: Lowland open waters and their margins, Lowland fen and Lowland damp grassland;
- Assemblages of breeding birds - Mixed: Scrub, Woodland; and
- Assemblages of breeding birds - variety of species.

7.4.104 Breeding bird surveys were undertaken in 2022 at the peninsula (report provided in the PEA in Appendix 7.1), and in 2023 at the whole Site (Appendix 7.7).

7.4.105 A total of 41 non-waterbirds species were recorded on the Site:

- 13 were Confirmed breeding;
- 15 were Probably breeding;
- 4 were Possibly breeding; and
- 9 were Non-breeding.

7.4.106 The data across the whole survey season were reviewed and based on the observations (e.g., birds sitting on nests or carrying nest material, calls of young, chicks or young seen in nests or on the water, presence of juveniles on the lake) and professional judgement, an estimate of the number of breeding pairs or territories was made. Breeding pairs / territories at the Site were then compared with estimates of the total UK breeding population for each species as provided by the BTO, and a valuation of the Site to support the breeding status of each species in the UK was made. The evaluation method is set out in the 2023 breeding bird survey report (Appendix 7.7). Table 7.10 lists the identified breeding (confirmed, probable, possible) species at the Site.

Table 7.10: Summary of geographic importance of the Site for breeding (confirmed, probable, possible) non-waterbird species

Species	Breeding observations	Importance of the Site for breeding per species	Member of SSSI assemblage
Red Kite (WCA Schedule 1 species) Re-established population	Confirmed Breeding. 1 pair bred successfully in area just to SE of Site. Other pairs may breed in local vicinity.	Local >0.01%	Woodland

Species	Breeding observations	Importance of the Site for breeding per species	Member of SSSI assemblage
Tawny Owl (Amber List)	Confirmed breeding. 1-2 pairs around site. Young heard calling during bat survey in August after BBS surveys had ended.	Zone of Influence >0.001%	Woodland
Great Spotted Woodpecker	Confirmed Breeding. 1-3 pairs	Zone of Influence >0.001%	Woodland
Blue Tit	Confirmed Breeding. 20+ territories	None <0.001%	
Great Tit	Confirmed Breeding. 15+ Territories	None <0.001%	
Long-tailed Tit	Confirmed Breeding. 10+ territories	Zone of Influence >0.001%	Woodland Lowland scrub
Blackcap	Confirmed Breeding. 30+ territories	Zone of Influence >0.001%	
Garden Warbler	Confirmed Breeding. ca. 15 territories	Local >0.01%	Woodland Lowland scrub
Goldcrest	Confirmed Breeding. 6-10 territories	Zone of Influence >0.001%	Woodland
Wren (Amber List)	Confirmed Breeding. 40+ territories.	None <0.001%	
Blackbird	Confirmed Breeding. Ca. 10 territories	None <0.001%	
Robin	Confirmed Breeding. 35-40 territories	None <0.001%	
Chaffinch	Confirmed Breeding. 3+ territories	None <0.001%	
Stock Dove (Amber List)	Probable breeding.	None <0.001%	Woodland
Woodpigeon (Amber List)	Probable breeding.	None <0.001%	
Ring-necked Parakeet (Non-native)	Probable breeding Estimated 5+ pairs	Not a species of conservation concern	

Species	Breeding observations	Importance of the Site for breeding per species	Member of SSSI assemblage
Jay	Probable breeding 1-2 pairs	None <0.001%	Woodland
Magpie	Probable breeding 2+ pairs	None <0.001%	
Cetti's Warbler (WCA Schedule 1 species)	Probable Breeding. 10+ territories	Borough >0.1%	Open water Lowland fen
Chiffchaff	Probable Breeding. 10-12 territories	None <0.001%	
Sedge Warbler	Probably breeding. 3-5 territories, mainly on western side of Site.	Zone of Influence >0.001%	Open water Lowland damp grassland Lowland fen
Reed Warbler	Probable breeding 10-15 territories, mainly on western side of Site	Local >0.01%	Open water Lowland fen
Treecreeper	Probable Breeding. 2-4 territories	Zone of Influence >0.001%	Woodland
Song Thrush (Amber List; NERC-S41 listed species)	Probable Breeding. ca. 6 territories	Zone of Influence >0.001%	
Mistle Thrush (Red List)	Probable Breeding. 1+ pairs	Zone of Influence <0.001%	
Dunnock (Amber List NERC-S41 listed species)	Probable Breeding. ca. 15 territories	None <0.001%	
Grey Wagtail (Amber List)	Probable Breeding. 2 territories	Zone of Influence >0.001%	Open water
Reed Bunting (Amber List; NERC-S41 listed species)	Probable Breeding. ca. 3 territories	Zone of Influence >0.001%	Open water Lowland damp grassland Lowland fen

Species	Breeding observations	Importance of the Site for breeding per species	Member of SSSI assemblage
Cuckoo (Red List; NERC-S41 listed species)	Possible breeding	Local >0.01%	Open water Lowland damp grassland Lowland fen Woodland Lowland scrub
Green Woodpecker	Possible breeding	Zone of Influence >0.001%	Woodland
Carrion Crow	Possible Breeding. 1-2 pairs	None <0.001%	
Goldfinch	Possible Breeding	None <0.001%	

7.4.107 Overall, the value / importance of the non-waterbird breeding bird assemblage is considered to be at the Borough importance. This consideration is based upon the highest importance to any of the breeding birds record being Borough (Cetti's Warbler). It should be noted that the majority of the species are valued at Local importance or less.

Breeding waterbirds

7.4.108 The desk study revealed 52 records of waterbirds (geese, ducks, waders, etc) of which 29 were Amber-Listed and 7 Red-Listed.

7.4.109 Broadwater Lake is designated as a SSSI in part for its breeding waterbird population ("Assemblages of breeding birds: variety of species"). Three designated features incorporate breeding waterbirds:

- Assemblages of breeding birds - Mixed: Lowland open waters and their margins, Lowland fen and Lowland damp grassland;
- Assemblages of breeding birds - Mixed: Scrub, Woodland; and
- Assemblages of breeding birds: variety of species.

7.4.110 Breeding bird surveys in 2022 encompassed the lagoon east of the peninsula, the shores of the peninsula, the large island to the west of the peninsula, the east inlet, and closed ponds on the peninsula. In 2023, breeding bird surveys encompassed the entire Site. The data from 2023 have been preferred over the 2022 data as the 2023 surveys captured the whole Site.

7.4.111 Of the 30 waterbirds species (excluding a hybrid goose) that were recorded on the Site:

- 15 were Confirmed Breeding;
- 2 were Probably Breeding;
- 2 were Possibly Breeding; and
- 11 were Non-breeding.

7.4.112 The data across the whole survey season were reviewed and based on the observations (e.g., birds sitting on nests or carrying nest material, calls of young, chicks or young seen in nests or on the water, presence of juveniles on the lake) and professional judgement, an estimate of the number of breeding pairs or territories was made. Breeding pairs / territories at the Site were then compared with estimates of the total UK breeding population for each species as provided by the British Trust for Ornithology. The total number of breeding pairs was calculated as a percentage of the total UK breeding population, and a valuation of the Site to support the breeding status of each species in the UK was made. The assessment method is set out in the 2023 breeding bird survey report (Appendix 7.7).

7.4.113 The results of this assessment are summarised below in Table 7.11 which sets out the breeding waterbird species, the assessment of their importance and whether they are members of any of the designated SSSI assemblages. Possible breeders have been included.

Table 7.11 Summary of geographic importance of the Site for breeding (confirmed, probable, possible) waterbird species.

Waterbird Species	Evaluation	Member of SSSI assemblage
Pochard (Red-list)	Borough	Open water Lowland damp grassland
Shoveler (Amber-listed) (possible breeder / breeds some years)	Borough	(if breeding) Open water Lowland damp grassland
Gadwall (Amber-listed)	Borough	Open water Lowland damp grassland
Common Tern	Borough	Open water
Cormorant	Borough	
Little Egret	Borough	Open water Lowland damp grassland Woodland
Black-headed Gull	Local / Borough	
Great Crested Grebe	Local / Borough	Open water
Kingfisher (probable breeder)	Local	Open water
Grey Heron	Local	Open water Lowland damp grassland Lowland fen Woodland
Coot	Local	

Waterbird Species	Evaluation	Member of SSSI assemblage
Tufted Duck	Local	Open water
Little Grebe (possible breeder)	Local (precautionary)	Open water (if breeding)
Mallard	Zone of Influence / Local	
Greylag goose (Amber List)	Zone of influence	Open water
Moorhen (Amber List)	Zone of influence	Open water Lowland damp grassland
Lesser Black-backed Gull (Amber List)	Zone of influence	(if breeding) Open water Lowland damp grassland
Oystercatcher (Amber List) (probable breeder)	Zone of influence	Open water Lowland damp grassland
Canada goose	None	

7.4.114 Overall given the notable diversity of the waterbird breeding bird assemblage, the value / importance is considered to be at the Borough level.

Evaluation of SSSI Designated Breeding Bird Assemblages

7.4.115 The Site held a total of 45 bird species which were either Confirmed or Probably Breeding during the Breeding Bird Season in 2023. According to Fuller (1980)[24] the Site would be classified as Local Importance (waterbirds - 15 confirmed and 2 probable; non-waterbirds - 13 confirmed and 15 probable). This information is provided for context only.

7.4.116 A measure of designating SSSI's is the Guidelines for the Selection of Biological SSSIs[25], which describes how to calculate whether an assemblage of breeding birds meets the criteria to qualify for selection as a SSSI.

7.4.117 The breeding waterbird assemblage for the Site was assessed using the Guidelines for the Selection of Biological SSSIs criteria for its different designated assemblages. Confirmed and probable breeders were included, but possible breeders were excluded.

7.4.118 The different assemblages score between 14.3% (for lowland scrub) and 71.3% (for lowland open waters and their margins). If cuckoo (a member of every assemblage but only possibly breeding at the Site) is included (possible breeders are routinely excluded), the percentage increases to between 35-78%.

7.4.119 These figures show that the Site has significant biodiversity within its breeding bird assemblage, although not, as a discrete unit of the SSSI, at the National importance level.

7.4.120 The importance assigned to each of the SSSI breeding bird assemblages is as follows:

- Assemblages of breeding birds - Mixed: Lowland open waters and their margins, Lowland fen and Lowland damp grassland – Borough importance;

- Assemblages of breeding birds - Mixed: Scrub, Woodland – Borough importance; and
- Assemblages of breeding birds – variety of species – Borough importance.

Wintering birds (lake)

Wintering bird assemblage

7.4.121 The wintering bird survey report with full dataset and assessment is presented in Appendix 7.6. The key results for this assessment have been summarised below.

7.4.122 Overall, winter surveys from November 2022 to March 2023 confirmed the presence of 33 species. There were 13 duck and 2 grebe species, 3 goose species and 5 gull species. Other species included heron, cormorant, swan, kingfisher, 3 species of rails and crakes, and 3 species of wader.

7.4.123 17 species were considered to form a regular part of the wintering assemblage and were valued at the Local level or above. The species are detailed below:

- The Site is Nationally important for shoveler (Amber-listed) with the peak count of 315 (visit 9) equating to 1.66% of the estimated GB wintering population. The GB 1% threshold was exceeded on seven dates although the median count was 67 across the entire season;
- The Site supports Regionally important numbers of pochard (Red-listed) with a peak count of 182 (visit 3) and numbers over 100 mainly in December;
- The population of tufted duck at the Site is evaluated as being of Borough importance, with a peak count of 455 recorded on visit 8 and median count across the winter of 147 (n=29 i.e., present on all visits / counts). Natural England ascribed a Local level of importance for this population in their latest condition assessment;
- Kingfisher (1 individual) was present during the winter and recorded on three visits; this is a Schedule 1 species and valued as being of Local importance;
- Wigeon, mallard and goldeneye were valued at having Local importance and gadwall was evaluated as being of Local / Borough importance (all species Amber-Listed);
- Little grebe, great-crested grebe, lapwing, grey heron, cormorant, coot was evaluated as being Locally important; and
- The site has Local importance for gulls, and this value is mainly due to the numbers of black-headed gull (Amber-List) and lesser black-backed gull (Amber-List).

7.4.124 The Site provides a locally important gull roost with peak counts of 919 black-headed gull (Amber-List) (visit 17), 44 common gull (Amber-List) (visit 13), 40 herring gull (Red-List) (visit 9) and 20 lesser black-backed gull (Amber-List) (visit 9). Numbers are not particularly high considering the UK population sizes for these species (approximately 2.2million for black-headed gull).

7.4.125 Nine further species were considered to be regularly present, but numbers were low and the value was below Local level (or the species was non-native). These included herring gull (Red-Listed), moorhen (Amber-listed), teal (Amber-listed), great black-backed gull (Amber-listed), common gull (Amber-listed), oystercatcher (Amber-listed), and non-native naturalised species (Canada goose, Egyptian goose, red-crested pochard).

7.4.126 Six species were not recorded regularly and are considered occasional visitors, including smew (Red-Listed), pintail (Amber-List) and snipe (Amber-List).

Non-breeding SSSI designated assemblages

7.4.127 Broadwater Lake is designated as a SSSI in part for the variety of species that form its overwintering waterbird population:

- Aggregations of non-breeding birds - variety of wintering species; and
- Aggregations of non-breeding birds - population of tufted duck.

7.4.128 The definition of these designated feature is: *"Localities which regularly support 1% or more of the total British non-breeding population of any native species in any season and non-breeding waterbird assemblages of over 20,000 individuals will qualify for SSSI selection."*

7.4.129 Given the presence of shoveler in Nationally important numbers, the SSSI designated assemblage 'Aggregations of non-breeding birds - variety of wintering species' present at Broadwater Lake is assessed as being of National importance.

7.4.130 The SSSI designated assemblage 'Aggregations of non-breeding birds - population of tufted duck' is assessed as being of Borough importance.

Baseline Disturbance Levels to Waterbirds

7.4.131 The literature search found that disturbance from sailing has been occurring at the Site even while quarrying operations were ongoing more than 40 years ago - historically the Site had a better range of wetland habitats and may have supported more species even up until the late 2000s. As a function of both its size and the presence of undisturbed areas protected by islands, the Site has historically been reported to provide a refuge to birds using other sites that were disturbed by watersports or other activities, even while Broadwater Lake itself was being used for sailing and angling.

7.4.132 The disturbance surveys found that in the absence of sailing disturbance the whole lake is evenly used by a wide range of species including open water areas away from islands. Once sailing commences birds typically move to refuge areas within the lake in the south-west and east. The distribution of ducks (including the Nationally important shoveler, Regionally important pochard and Borough important tufted duck) was significantly affected by sailing with the vast majority of birds recorded post-sailing within refuge areas in the south-west and east of the Site (see Appendix 7.6). Notably, tufted duck carried on using other parts of the site post-disturbance, although in small numbers with small groups in the north-west, north and north-east. As such the effect of sailing on distribution of birds across the Lake is clear.

7.4.133 However, the evidence was not clear with regard to the effect of sailing disturbance on the numbers / counts of individual species or groups of species at the Site.

7.4.134 For ducks, numbers of several species (tufted duck, goldeneye, pochard, shoveler, mallard and gadwall) increased on two or more post-sailing disturbance counts. The increase may be partly explained by 'flushing' and greater visibility post-disturbance as the birds flock together, but it is very likely that birds are also coming to the Site from other areas and are not deterred by sailing disturbance. Overall sailing disturbance did not appear to be the most significant factor regulating numbers of ducks at the Site on days when sailing

activities were monitored. The presence of the refuge areas within the lake clearly ensures that the birds are able to remain at the Site during periods of sailing disturbance.

7.4.135 Gulls were the group of birds least affected by sailing. Though very few large gulls were present on the Site during sailing events, black-headed gull numbers increased during the sailing events. Typically, gulls would be away from the Site during the day to feed, congregating through the afternoon as the gull roost reassembles nightly – this appears to occur regardless of sailing activities.

7.4.136 Cormorant and grey heron were typically present in low numbers; sailing disturbance provoked a small reduction (up to 11-12 individual cormorant and 1 grey heron) (c. 20% for cormorant and c. 50% for grey heron).

7.4.137 It was not possible to confidently characterise the response of waders due to infrequent presence at the Site although they appeared to be hardly affected at all by sailing disturbance.

7.4.138 Coot and Moorhen generally showed tolerance to sailing activities - a 7% reduction post-sailing was typical for coot.

7.4.139 The numbers of grebes were frequently recorded to increase post-sailing, although this seemed to be more a function of their usual behaviour / movements which were little influenced by disturbance from sailing.

7.4.140 Geese were highly sensitive to sailing disturbance generally, more so than other species. Egyptian goose was least sensitive with 43% leaving the Site as a result of sailing disturbance; this increased to 50% for greylag goose and 80% of Canada goose.

7.4.141 The presence of the south-west refuge area has long been considered important to allow birds to remain at the lake during sailing events; surveys have also shown the wider importance of islands generally as a refuge (on the lee side) during sailing disturbances, the role of the east edge of the lake has been particularly clarified by 2023 surveys.

7.4.142 The literature search and analysis of bird counts within the Site and CVGP shows that Broadwater Lake has an important role within the Colne Valley in supporting regionally and nationally important numbers of wintering wildfowl. Even while sailing disturbance occurs, it has been historically noted that birds disturbed at other smaller sites will still fly to Broadwater Lake to use the refuge areas; the data from these surveys (whereby some species counts increased post-disturbance) support this observation. It is clearly important to retain refuge areas and ensure these are protected and strengthened as part of the Proposed Development. The surveys recording observations of bird reactions to disturbance, along with review of HS2 disturbance monitoring data, provided some interesting information, although this data was not considered as robust as the pre- and post-sailing counts which are reported above.

7.4.143 Other activities were recorded to cause disturbance - the main baseline disturbing activity was aircraft, followed by pedestrians and anglers (in that order). The surveys for HS2 found that no birds left the Site as a result of disturbance events. The survey for this Scheme found that only 11% of recorded disturbance events caused birds to leave the lake entirely and the response between species differed significantly: 20% of mallard, 6.3% of pochard, 2.8% of shoveler and 1.3% of tufted duck. No individual gadwall or goldeneye left the Site

in response to disturbance, although they swam or flew away within the lake. Wigeon were not recorded responding to disturbance during these surveys.

7.4.144 Habituation to regular disturbing activities was noted. A klaxon regularly used by BSC provoked zero response from birds even very close to the source of the noise. It is generally well recognised (and reported in the literature) that birds are less disturbed by regular noise than by visual disturbance and become easily and quickly accustomed. Fishing was observed to provoke little response other than birds moving away from the immediate area. No effect of HS2 disturbance was noted and HS2's own surveys also came to this conclusion.

Reptiles

7.4.145 Within 2km of Site there is one record of slow worm (Anguis fragilis) in 2019 and one record of grass snake (Natrix helvetica) in 2013.

7.4.146 The Site contains habitats that are suitable to support reptiles in the form of modified grassland and scrub, amongst others. The 2021 PEA reported good suitability of the peninsula to support transient individual grass snakes.

7.4.147 A reptile presence / likely absence survey was undertaken in 2022 by Ecology By Design at the peninsula. No reptiles were seen or recorded during the survey. The report concluded that a low population of grass snake could be present on Site, based on personal comment from a local landowner about grass snake being seen on Site previously.

7.4.148 Given the above, the potential for the Site to support reptiles, in particular grass snake, cannot be ruled out, although based on the results of the previous survey (nil return) the potential for the Site to support reptiles is low at best.

Water vole

7.4.149 Water vole has been recorded in the surrounding 2km area; it is known to be present at Denham Lock Wood and was officially recorded there last in 2020. The closest record was approximately 800m away but the record dates from 1990; water vole populations have declined steeply since that date due to the presence of mink which has also been recorded within 2km.

7.4.150 No signs of water vole were recorded during walkover surveys encompassing the canal bridge, River Colne and the BSC site, or incidentally noted during breeding bird surveys throughout 2023. The presence of mink will typically exclude water voles from natural habitats. The river floods regularly which reduces suitability for water vole due to flooding of burrows. The canal is highly disturbed from pedestrian users. Given the absence of recent records, the lack of signs of water vole and the known presence of mink, these habitats have been assessed as having negligible suitability.

7.4.151 The boat surveys inspected the banksides of the Lake and found that these were mainly formed of a mix of earth and gravel, limiting suitability for water vole burrows although not completely unsuitable. The majority of the bankside was covered with dense willow - this habitat was mainly unsuitable for water vole, having very limited vegetation growth suitable for water vole foraging / cover. No signs of water vole were seen or heard.

7.4.152 Emergent and marginal vegetation was notably scarce around the lake margins. It comprised mainly of small pockets of common reed / bulrush / yellow flag iris which had been created (and largely failed) as previous enhancement within the lake.

7.4.153 Very limited suitable habitat exists on the peninsula which is mostly too rocky to support water vole and lacks ground flora except along the more natural north-west shoreline, which was fully accessed.

7.4.154 Water vole is therefore considered to be likely absent and therefore has not been identified as an IEF for the Site.

Otter

7.4.155 Otter has been recorded in the surrounding 2km area. The key habitats for otter are the lake itself, and the woodland, scrub and grassland areas immediately bordering the lake. Adjacent to Site, the River Colne and Grand Union Canal also provide suitable habitat. The Site forms part of an abundant network of suitable habitat within the wider Colne Valley.

7.4.156 During the 2021 PEA (see Appendix B of the 2023 PEA in Appendix 7.1) the remains of several empty valves of swollen river mussel (Unio tumidus) were found in a young birch clearing in the south-west part of the peninsula. Specific otter surveys conducted by Ecology By Design (May and August 2022) recorded evidence of otter activity during the August 2022 visit (see Appendix B of the 2023 PEA in Appendix 7.1). The evidence included:

- A spraint on the banks of the Grand Union Canal that runs adjacent to the Site;
- A potential spraint within the peninsula on the northern bank of the lake. The spraint was dried out due to the extended warm weather and so confirmation it was otter could not be concluded; and
- The remains of crayfish were also found close to the potential spraint. Otters are known to eat crayfish, although it is noted that other species that occur at Site are also known to eat crayfish such as gulls and heron.

7.4.157 Surveys in 2023 found a spraint on the towpath beneath the canal bridge on the Grand Union Canal, and nibbled mussel shells on a beach at the south-west tip of the peninsula and along the northern shore of the peninsula. See PEA Appendix A Peninsula Surveys (provided in Appendix 7.1) for the locations of otter feeding remains.

7.4.158 Fish and macro-invertebrate surveys at the Site (see section below) have observed there is a relative lack of habitat for fish with very low populations; this will reduce the likelihood of otter being able to catch fish (its main food item) at the Site. Eels (another preferred food) were not confirmed to be present at the Site. Otters will eat amphibians, crustaceans and waterbirds (e.g., coot, moorhen) within the lake. On land, food for otters at the Site includes small birds, eggs, insects and small mammals.

7.4.159 Following clearance of buddleia in February 2023, a search for potential holts was undertaken at the peninsula. There are two locations with suitable holes within concrete debris piles which have been uncovered from beneath the buddleia although no signs of use by otter were observed. These are in fairly disturbed locations near the access road, with regular disturbance occurring from visitors and site users. Therefore, these locations are assessed as having negligible potential to be used as holts.

7.4.160 A detailed search for holts around the banks of the lake and shore of the peninsula was undertaken by two ecologists from a boat in May 2023 and again in August 2023 (see Appendix 7.9: Ecology Report). One tree which had collapsed at the base had holes which were potentially suitable for otter holts, but these could only be viewed at distance from the boat. No signs of use by otter were found during either survey.

7.4.161 In summary, no active holts have been identified. The Site is valued as being of Local importance for otter.

Fish

7.4.162 Fish surveys were completed at the lake in October 2022 (see PEA in Appendix 7.1). Generally, the habitat in Broadwater Lake appeared to be lacking for juvenile fish, with limited areas of macrophytes (a few beds of branched bur-reed noted only). Most of the cover for small fish fry was provided by overhanging branches from large willow trees around the perimeter of the lake. The lack of cover present is likely to result in low juvenile survival rates as a result of predation.

7.4.163 A total of five fish species, all native, were recorded during the fish surveys across all methods; these were: pike (Esox Lucius), perch (Perca fluviatilis), tench (Tinca tinca), common carp (Cyprinus carpio) and three-spined stickleback (Gasterostreus aculeatus). The combined abundance of fish was 245 individuals with an estimated biomass of 10,228.56 grams. Perch were the most abundant species present, while pike had the highest biomass. Fish populations appeared to be low and biodiversity is also low with only five species present.

7.4.164 Anecdotal evidence from local anglers reported carp close to 20kg in the lake, and presence of common bream (Abramis brama) and European eel (Anguilla anguilla). However, neither of these species was caught in the surveys, indicating that if they were present then they would have been in low abundances. European eel is a priority species under s41 of the NERC Act 2006, listed as critically endangered on the global IUCN Red List of threatened species, and protected in England under specific legislation (The Eels (England and Wales) Regulations 2009).

7.4.165 Overall, the fish species assemblage is assessed as having Local importance only.

Macro-invertebrates (aquatic)

7.4.166 Macro-invertebrate surveys were completed at the lake in October 2022 (see PEA in Appendix 7.1). Macro-invertebrate communities were sampled in three locations; these were found to be relatively diverse and were indicative of moderate water quality. No protected species were found in the samples. Although there was some submerged macrophytes present (Elodea sp.), overall, the marginal / emergent vegetation was poor and the littoral zone also appeared to be very homogenous. This may potentially limit the diversity of the macro-invertebrate community.

7.4.167 The macro-invertebrate assemblage is assessed as being of Local importance.

Terrestrial invertebrates

7.4.168 Surveys for terrestrial invertebrates have been carried out in 2022 at the peninsula (see PEA in Appendix 7.1), and in 2023 around the edges of the lake and peninsula, and within suitable habitats on the peninsula (see Appendix 7.8).

7.4.169 In 2022 at the peninsula 447 terrestrial invertebrate species were recorded, of which 10 have some level of national conservation status (a few however have become more widespread and their status would be reviewed). Thirty-nine further moth species are classed as 'Local'. In 2022, two species assemblages (of scrub edge and rich flower resource) were found to be in favourable condition.

7.4.170 In 2023, a total of 303 taxa were recorded at the peninsula (including its lake edge, woodland and pools). Ten species have a conservation designation. The same two species assemblages (of scrub edge and rich flower resource) were in favourable condition.

7.4.171 In general, the peninsula was found to be floristically species-poor, indicating poor habitat for terrestrial invertebrates. There was a lack of specimen trees within woodland, few open areas, hard ground and extensive buddleia scrub - these factors were considered to limit the diversity of the invertebrate populations. In 2022, the best areas for invertebrates were two open areas with ruderal / ephemeral plants providing flowers as a source of nectar for invertebrates (shown in PEA Appendix A Peninsula Surveys) (PEA provided in Appendix 7.1). This habitat was limited to small areas on the peninsula at the edges of its central access road. The survey concluded that these areas have moderate value for terrestrial invertebrates; other areas have low value.

7.4.172 Stag beetle was not recorded by the surveys; ground at the peninsula would be too hard for this species to occur. There is a low potential for this species to occur along the canal.

7.4.173 Around the remaining lake edge the 2023 surveys have recorded 245 taxa to date, with 11 species with conservation designations. The species assemblage for 'open water on disturbed mineral sediments' is in favourable condition with 9 species recorded (threshold is six species), although other species assemblages are in unfavourable condition (tree-associated: bark and sapwood decay; wetland: reed-fen and pools; open habitats: scrub edge; open habitats: rich flower resource; and wetland: northern lakes and lochs). No assemblages of high conservation concern were found by the surveys.

7.4.174 Away from the lake and peninsula, areas across the rest of the Site did not typically have the mosaic of habitats that might support notable invertebrates or diverse assemblages. The woodland along the eastern edge of the lake and canal has an apparent lack of standing or fallen deadwood suitable for saproxylic invertebrates, and the available area is relatively small in extent. These areas have only low potential for stag beetle to occur.

7.4.175 The terrestrial invertebrate assemblages identified to be receptors for the Site are set out in Table 7.12.

Table 7.12: Terrestrial invertebrate assemblages.

Assemblage	2022	2023	Valuation
Peninsula			
Open habitats: Scrub edge Open habitats: Flower rich resource	Favourable / 10 sp with conservation status	Favourable / 10 sp with conservation status	Moderate / Local
Lake edge away from peninsula			
Open water on disturbed mineral sediments	Not assessed	Favourable 9 sp recorded	Moderate / Local

Desmoulin's Whorl Snail

7.4.176 This species has been found to be likely absent through surveys in 2022 and in 2023. It is not considered further within this assessment.

Aquatic plants

7.4.177 Boat surveys in May and August 2023 were undertaken to survey for aquatic macrophytes during the main growing season. No macrophyte species were recorded in May 2023 and it was assumed this was too early in the growing season and also indicative of very minimal macrophyte presence, which was also observed in 2022 during fish and macro-invertebrate surveys.

7.4.178 In August 2023, very limited macrophytes were observed to be present with patchy distribution. Species recorded were lesser pondweed (Potamogeton pusillus), hornwort (Ceratophyllum demersum), and the invasive non-native Canadian pondweed (Elodea canadensis) along with algae (it was beyond the scope of the survey to identify the algal species). At depths of 3m or more, the lakebed was bare (four transect points); in one location gravels were present on the lakebed which were also bare of growth. Algae was predominantly present within shallow areas of the lake used by waders / dabblers for feeding. Overall, there were very few species and growth were very limited in extent. Further information on Aquatic macrophytes can be found in Appendix 7.9.

7.4.179 As such, aquatic macrophytes are not considered to be an IEF for the Site.

Terrestrial plants

7.4.180 There are relatively few notable, rare or protected plant species records within 2km. Records from the desk study include bluebell from 1km distant, and individual records from 1984 and 1995 of coralroot bittercress (a rare plant whose distribution is restricted nationally) and fringed waterlily at Broadwater Lake Herts and Middlesex Wildlife Trust Nature Reserve (c. 650m distant - the nature reserve includes Korda Lake, Long Pond, the River Colne and the western side of Broadwater Lake).

7.4.181 No specially protected plant species were recorded during the Site walkover or during relevant Phase 2 surveys such as the invertebrate scoping visit in April 2022.

7.4.182 A mature black poplar has been recorded at the Site along the canal next to the canal bridge (see Appendix 7.2). The arboricultural report identifies it as a hybrid species. On a precautionary basis, it is assessed as having Borough importance. This is the only notable plant species receptor identified for the Site.

Other BAP species - hedgehog

7.4.183 Terrestrial habitats at the Site away from the peninsula (including woodland, ruderal / ephemeral, modified grassland, bankside habitats) are suitable for foraging and sheltering hedgehog. At the peninsula there is a restricted extent of soft ground / natural soil within which hedgehogs may forage.

7.4.184 The Site is assessed to have Local importance to support hedgehog.

Invasive Non-Native Species

Terrestrial

7.4.185 There are a low number of records of invasive non-native species (INNS) listed on Schedule 9 of the Wildlife and Countryside Act within 2km including the terrestrial plants Japanese knotweed, rhododendron, few flowered garlic and Montbrecia.

7.4.186 During the 2021 PEA, Japanese knotweed and giant knotweed were noted onsite (refer to Appendix 7.2).

7.4.187 Buddleia, a species listed in Category 3 of the London Invasives Species Initiatives (LISI) Species of Concern, was present at the peninsula in dense stands. A significant proportion was cleared in February 2023, but significant stands are still present within woodland.

7.4.188 Giant knotweed was confirmed in a large stand on one island on the lake during boat-based habitat surveys in May 2023.

Aquatic

7.4.189 There are records of the aquatic invasive species floating pennywort (Hydrocotyle ranunculoides) on the River Colne adjacent to Site.

7.4.190 Floating pennywort was observed on the River Colne adjacent to the Site boundary during the November walkover survey.

7.4.191 Limited presence of submerged macrophytes (Elodea canadensis) were recorded within the lake.

7.4.192 While undertaking fish surveys, 210 signal crayfish (Pacifastacus leniusculus) were caught at multiple sites across Broadwater Lake.

Summary of Receptors and Sensitivity

7.4.193 Table 7.13 provides a summary of the ecological receptors identified at the Site and in the identified ZoI, their sensitivity, and whether or not they comprise IEF for the impact assessment.

Table 7.13: Summary of Receptor Sensitivity

Receptor	Sensitivity (Value)	IEF
Onsite - Mid-Colne Valley SSSI	National importance	Yes
Designated features of the Mid-Colne Valley SSSI that are present onsite:		
Standing open water	Regional importance	Yes
Assemblages of breeding birds – mixed: open water, lowland fen, lowland marsh	Borough Importance	Yes
Assemblages of breeding birds – variety of species	Borough Importance	Yes
Aggregations of non-breeding birds - variety of wintering species	National importance	Yes
Aggregations of non-breeding birds - tufted duck	Borough Importance	Yes
Onsite Priority Habitats (s41, London BAP): Woodland: w1d, w1f woodlands Standing water bodies: Pond, Lake	Borough importance	Yes
Woodland	Borough Importance	Yes
Assemblages of breeding birds – mixed: lowland woodland, lowland scrub	Borough Importance	Yes
Onsite - Mid-Colne Valley SINC Incorporating: Frays Farm Meadows SSSI Denham Lock Wood SSSI	Borough importance National importance National importance	Yes
Four SSSIs within 2km designated for geological reasons or with woodland habitat (Harefield Pit SSSI, Old Park Wood SSSI, Ruislip Woods SSSI and National Nature Reserve (NNR), Old Rectory Meadows SSSI)	National importance	No
Denham Country Park LNR	Borough importance	Yes
Denham Quarry Park LNR	Borough importance	Yes

Receptor	Sensitivity (Value)	IEF
Colne Valley Gravel Pits (CVGP) (undesignated)	Regional Importance	Yes
London's Canals SINC adjacent to the east	Regional importance	Yes
Coppermill Down SINC (a unit of the Mid-Colne Valley SSSI)	Borough importance	Yes
Springwell and Stocker's Lakes SINC	Regional importance	Yes
Undesignated Wildlife Site: Broadwater Lake Nature Reserve	Borough importance	No
Irreplaceable habitats: Ancient woodland and veteran trees	Borough importance	No
Priority Habitats (s41, London BAP): River Colne (adjacent to Site)	Regional importance	Yes
Other onsite habitats		
Islands: ruderal / ephemeral, individual trees, dense scrub	Zone of influence	No
BSC: Modified grassland	Zone of influence	No
Peninsula: Moss lawns on concrete hardstanding	Zone of influence	No
Peninsula: Individual mature trees on hardstanding	Zone of influence	No
Peninsula: Mixed scrub with introduced shrub	Zone of influence	No
Other habitats at the Site: buildings, concrete, gravel hardstanding, introduced shrub	N/A – not a receptor	No
Badger	Local importance	Yes
Foraging bats	Borough importance	Yes
Roosting bats Two day / summer / mating roosts identified for soprano pipistrelle	Zone of Influence	Yes
Reptiles (grass snake)	Local importance	Yes
Water vole	N/A - absent	No
Otter	Local importance	Yes
Fish	Local importance	Yes
Aquatic macrophytes	N/A - not an important receptor	No
Aquatic invertebrates	Local importance	Yes
Rare / notable terrestrial invertebrates	Local importance	Yes

Receptor	Sensitivity (Value)	IEF
Terrestrial plant species (notable / rare / protected) - Black poplar	Borough importance	Yes
Hedgehog (UK BAP)	Local importance	Yes
Terrestrial Invasive/Non-native species Sch 9 species: Japanese knotweed, giant knotweed. LISI Category 3: buddleia.	Present	Yes
Aquatic Invasive/Non-native species Sch 9 species: Elodea sp., signal crayfish.	Present	Yes

7.4.194 Overall, the surveys have identified nationally important number of shoveler and regionally important numbers of pochard. The lacustrine (associated with lake) breeding bird assemblage is also valued at the borough level.

7.4.195 Despite this, upon examining the detailed results of the completed surveys, the SSSI is noted to be relatively impoverished ecologically from what might be expected. There is a lack of aquatic and emergent vegetation, likely due to a lack of organic matter and limited availability of soft sediments, and the bed of the lake is very homogeneous (flat and featureless). This reflects its origins as a gravel extraction area. As such, ecological food webs within the lake are poorly supported, with low numbers of macro-invertebrates and low fish populations. Bird species that feed on either aquatic vegetation or fish will therefore occur in lower numbers than might otherwise be possible. The lake is very large and therefore its apparently meagre resources still play a role in supporting nationally notable numbers of wintering birds. The lack of extensive areas of emergent vegetation such as reed beds means that birds also have few refuge areas within the lake. The limited availability of island-based nest / roost sites may also limit the numbers of certain species using the Site. Existing disturbance from current site uses have been observed and disturbances occur daily at the Site with differing impacts per species.

7.4.196 The above information suggests that Broadwater Lake could be a much richer ecosystem resource with judicious enhancement and management intervention, supporting larger numbers of waterbirds year-round. This has been taken into consideration in the following sections addressing mitigation and enhancement recommendations.

Future Baseline

7.4.197 The current baseline of the Site will be changed by the Proposed Development and operation of HS2, with the Colne Valley Viaduct located to the west. Construction of the viaduct is ongoing and is expected to be complete in 2025. HS2 however is not expected to be fully operational until 2029 at the earliest.

7.4.198 Disturbance surveys in 2022 for HS2 (provided by HS2) and in winter 2022/23 for this assessment for the Proposed Development, found no significant disturbance to the Site or its receptors from HS2 construction activities. However, from 2027 the railway will undergo pre-operational testing with a limited number of trains, and from 2029 the railway will be fully operational with 14 trains per day running from approximately 6am till 11:30pm at night; the operational lifespan of the railway is assumed to be at least 100 years. The viaduct has

noise and visual barriers designed to minimise environmental impacts. Noise is less disturbing to birds than visual impacts, therefore as long as movement from the viaduct cannot be seen from the lake, it is considered that waterbirds using the Site will habituate to any intermittent noise from both pre-operational testing and full operation, and therefore populations are assumed to remain unaffected.

7.4.199 Habitat creation is proposed within the south-west area of Broadwater Lake adjacent to the peninsula to compensate for habitat loss because of HS2. This is likely to comprise a gravel or floating island, and floating tern rafts, or similar. These would be maintained and managed for a period of 30 years.

In the absence of development

7.4.200 Current operations and associated ongoing management would be assumed to continue. The BSC would remain where it is and continue to operate as normal, with membership assumed to remain relatively constant and current disturbance levels to the lake from sailing to also remain relatively constant. Fishing activities would also continue as they are. The woodland along the access road and habitat around the lake edges would continue to be managed for fishermen and for access to BSC. The islands on the lake may continue to be managed by BSC with scrub clearance to maintain nest / roost sites for breeding and wintering birds. Once HS2 is completed the western edge of the lake may go back under the control of the Wildlife Trust or other wildlife group and management would be assumed to be budget-conscious and focussed on access for nature lovers / bird watchers and maintaining existing habitats in a good condition.

7.4.201 Unauthorised site uses would continue and may increase. Pressures from an increased population are considered to be likely in the future, with potential increased incidences (in proportion to the increased population) of trespassing, poaching, camping, fly tipping and other current non-authorised uses of the Site.

7.4.202 The influence of climate change over the future baseline has been taken into account. A scenario of warming in London of 2-3 degrees (annual mean temperature) above the 1980-2000 baseline over the next 50 years has been considered (with summer temperatures being 3-4 degrees warmer by 2080-2099) (UKCP18 project[26]).

7.4.203 Under this scenario, the baseline conditions within the Site are expected to remain relatively constant over a 10–20-year period with up to 2^{o}C warming in summer above the baseline, and the weather likely to be drier in summer as a result. The most obvious change to the baseline would be that water levels in the lake are likely to be lower in summer with drops of greater than the 1m reduction that is the current fluctuation. Weather events may become more extreme, possibly with flash flooding of the River Colne (which if the river overflowed to Broadwater Lake, would likely introduce invasive plants such as floating pennywort and Himalayan balsam).

7.4.204 Beyond this time period from 20 - 50 years, the impacts of climate change will start to be more perceptible with up to 4^{o}C warming in summer above the baseline. Shallow areas of the lake may become completely dry for periods during summer if water levels drop more than 1.5m. Lake water quality may suffer as lower water levels and warmer water may reduce dissolved oxygen levels and there may be algal blooms during summer months. Fish kills may occur; birds and mammals may also be adversely impacted. Sailing may

become limited to smaller areas of the lake in summer, or long-term sailing may become impossible during the summer months and be limited to winter only.

7.4.205 It is difficult to predict the impact of lower lake water levels on fauna. If water levels remain lower in winter, there would potentially be a reduction in wintering bird numbers, but changes in migration patterns will also occur as a result of a warmer climate and species may choose to spend their winters elsewhere (in other countries). Breeding bird numbers may increase as shallower areas of the lake become islands (offering more breeding habitat) during the drier months with more trees establishing and perhaps with slow establishment and spread of emergent and riparian vegetation. Predation of birds may however increase as water levels drop and islands become easier to access by foxes and other predators.

7.4.206 The habitats occurring on made ground within the peninsula will continue to slowly succeed, with wet woodland drying, and plant species composition would change to reflect the warmer dryer conditions. There would be loss of areas of vulnerable habitat to drought such as trees and pioneer habitats growing on hardstanding. The lagoon will likely dry, silt up and become a woodland. Succession of habitats typically results in a slow increase in biodiversity over time; the more extreme weather conditions arising from climate change however may counteract this tendency.

7.4.207 Taking the above into account, two future management scenarios and their overall effect on biodiversity are considered below – no change to current management, and the effects of additional sympathetic management.

No change to current management

7.4.208 It is assumed that current management includes basic housekeeping measures such as removal of litter and fly-tipped wastes, control of Japanese knotweed, maintenance of barriers to limit unauthorised access as best possible; plus, management of trees along access roads for health and safety purposes (i.e., removal of fallen branches and trees, removal of unsafe overhanging limbs).

7.4.209 The peninsula area of the Site would be subject to the most detrimental effects as this area receives minimal management currently. Uncontrolled regrowth and encroachment of buddleia would result in a reduction in biodiversity through further suppression of woodland ground flora and choking of young trees. If woodland habitats were adversely affected by climate such as drying, there would not be any positive management to introduce varieties of tree or plant species that were more suited to the new conditions. Natural introduction of new species would occur but over a much longer period and in the interim, there may be a loss of biodiversity.

7.4.210 The effects of climate change (as set out above) on the lake would be largely unmitigated with no measures put in place to counter loss of biodiversity, impacts to water quality, loss of water depth etc. Floating pennywort if introduced to the lake would likely be managed / eradicated as best possible; Himalayan balsam would likely take hold and be extremely difficult to eradicate.

7.4.211 Although the direction of biodiversity change cannot be predicted with certainty, the Site would not remain in its current condition; over 50 years it is considered that a loss of biodiversity is the most likely scenario.

With additional sympathetic management

7.4.212 Cost-effective additional sympathetic management would comprise ongoing control of buddleia from encroaching into woodland to prevent loss of biodiversity and retaining some open areas along the peninsula access road to encourage the Proposed Development of wildflower rich areas for invertebrates. Control of areas of invasive planting (once identified) will also take place. There may be more concerted and better funded efforts to eradicate new invasives such as floating pennywort and Himalayan balsam in the lake and on its banks.

7.4.213 If additional funds were made available for management, further tree species may be introduced as woodland habitat at the peninsula dries to replace species lost and increase biodiversity. Black poplar grows well in wet ditches and also has an adaptive mechanism for drought, it may therefore be a good opportunity to plant black poplar trees at the peninsula.

7.4.214 In the future, newly dry areas of the lake would probably still be nutrient poor and lack a suitable substrate for plants to grow in. If funding were available, a suitable growing medium may be imported and reedbeds and riparian planting introduced to vegetate these areas; extreme fluctuations of the lake water levels between summer and winter may still kill such planting, but floating systems would allow habitats to rise and fall with water levels.

7.4.215 In response to lower water levels and fish kills, significant additional funds may be made available for remedial measures, but it is not known who / which body would provide such funding. Dredging of the lagoon and / or lake may be necessary in the future, to ensure open water is retained during summer in key areas both for fauna and possibly for sailing. Bubbler systems and water circulation systems may be required in the lake and lagoon to maintain water quality by preventing depleted dissolved oxygen levels, to support fish populations and prevent toxic algal blooms. If algal blooms were to occur, deaths of fish, birds and mammals would certainly occur.

7.4.216 Over 50 years with the above interventions, it is considered that biodiversity at the lake may remain at a similar level; a loss of biodiversity is also a likely scenario as climate change is likely to have an initial negative impact before habitats and species recover longer-term.

7.4.217 The predicted changes to the Site's baseline from the two scenarios outlined above are summarised in Table 7.14.

Table 7.14: Predicted changes to the Site's baseline from the two scenarios outlined above.

Future Baseline Receptor	Changes predicted over 50 years	
	Same management	Additional management
Priority habitat onsite: woodland	Loss of biodiversity	Biodiversity changed but at similar level
Priority habitat onsite: standing water (pond / lake)	Reduction of area and quality	Reduction of area but to a lesser extent, and water quality maintained

Future Baseline Receptor	Changes predicted over 50 years	
	Same management	Additional management
Badger	Lower water levels may provide greater opportunities for badger	Lower water levels may provide greater opportunities for badger
Bats - foraging	No changes predicted	No changes predicted
Bats - roosting	No changes predicted	No changes predicted
Woodland breeding birds	Possible minor negative impact	Neutral impact
Breeding birds (lake)	Increased areas for breeding in summer but more predation; potential impacts from reduction in water quality. Likely negative impact.	Efforts would be aimed at maintaining biodiversity – neutral impact.
Wintering birds (lake)	Dependent on migration patterns and winter water levels – likely loss of biodiversity / negative impact.	Dependent on migration patterns and winter water levels – intervention may manage to maintain biodiversity – neutral impact.
Reptiles	Likely increase in value of the Site for this species	Likely increase in value of the Site for this species
Otter	Reduction of water area and water quality – possible minor negative impact	Reduction of water area but no water quality impacts – neutral impact
Fish	Reduction of water area and water quality – minor to major negative impact	Reduction of water area but no water quality impacts – neutral or minor negative impact
Aquatic invertebrates	Likely negative impact.	Neutral impact
Rare / notable terrestrial invertebrates	Neutral impact	Neutral impact
Black poplar	No change predicted	Possible minor positive impact
Hedgehog (UK BAP)	Neutral impact	Neutral impact
Terrestrial Invasive/Non-native species	Likely minor negative impact	Likely minor negative impact
Aquatic Invasive/Non-native species	Likely negative impact.	Likely negative impact.

7.5 Embedded Mitigation (Scheme Design and Management)

7.5.1 The Proposed Development as described in Chapter 5: Description of Development was designed in an iterative way to embed avoidance and mitigation for impacts to ecological

receptors into the design. Further detail on this design iteration is provided in the Draft MEMP (see Appendix 7.4 and 7.5).

7.5.2 The Draft MEMP would be further developed in consultation with Natural England, LBH and Herts and Middlesex Wildlife Trust prior to finalisation.

7.5.3 The proposed development includes extensive habitat enhancement and creation in order to deliver a biodiversity net gain. The habitat enhancement and creation include:

- The enhancement of approximately 57ha of standing open water;
- The enhancement of other neutral grassland;
- The creation of new areas of willow scrub and native mixed scrub;
- The creation of two new wildlife ponds;
- New wetland/emergent planting within concrete;
- The creation of extensive areas of new floating reedbeds;
- New wet woodland habitat on the newly created islands; and
- The planting of new fruit trees within areas on the peninsula.

7.5.4 For further detail on the habitats to be created and the calculated net gain for biodiversity, see Appendix 7.11.

Avoidance Measures

7.5.5 Avoidance measures comprise primary (inherent design) mitigation and these allow impacts to be avoided entirely.

7.5.6 The main principle driving the design of the Site was the requirement for no net loss of existing woodland habitat, a requirement requested by Natural England in early consultation. Therefore, land reclamation was designed into the scheme early on, to provide a sufficiently large area of hardstanding upon which to develop the main building, avoiding impacts to woodland entirely. As detailed within Table 7.1, during early consultation Natural England verbally confirmed that the loss of open water was preferable to loss of woodland habitat.

7.5.7 The location of the land reclamation was placed at the northern end of the peninsula to avoid the south-west corner of the lake, which previous surveys had identified as an important refuge area for waterbirds. The south-eastern side of the peninsula (including the lagoon and open water) was also avoided, to retain this area for feeding herons; this area also acts as a sheltered refuge area for waterbirds. Therefore, the northern end of the peninsula was considered to be the area with lowest ecological value surrounding the peninsula.

7.5.8 Alongside this, a range of investigations and surveys over the course of two years, facilitated by the clearance of buddleia scrub in February 2023, clarified the extent of hardstanding across the Site and allowed more precise mapping of where valuable habitats were present. An arboricultural survey provided information as to the location of mature trees that had developed on hardstanding areas. The design was then finalised, maximising development (buildings, parking, access road, activity and camping areas) on existing hardstanding, and

designed around mature healthy trees to incorporate them into the design. In this way, loss of valuable habitats has been avoided.

7.5.9 The south-west corner of the lake is used by large numbers of water birds year-round and provides an important refuge during disturbance from sailing to the main lake. To avoid increased disturbance to this area during construction, no dredging works will be undertaken within the south-west part of the lake.

Tertiary mitigation

7.5.10 The following embedded design measures represent tertiary mitigation of relevance to the ecological assessment.

Construction

7.5.11 Timing of works is critical and has been considered alongside the Proposed Development of the masterplan and the construction methodologies required. As the presence of ecological receptors depends on the time of year, works undertaken at different times can have extremely different impacts and effects. Wintering birds are present from mid-October to mid-March; breeding birds are present March to August. This only leaves the month of September where works may be undertaken within the lake without impacting either receptor.

7.5.12 It should be noted though that breeding appeared to have finished at Broadwater Lake in late August 2023 when a survey was undertaken to check for signs of active breeding – none were found.

7.5.13 The phasing of works within the lake as set out in Table 7.15 has been carefully planned to avoid, reduce and mitigate for impacts / effects to the designated features of the SSSI during construction.

Table 7.15: Proposed phasing of construction works

Phase	Sub-Phase	Description of Works
1	A	Deployment of floating reedbeds to create initial protected areas (Aug 24)
	B	Deployment of floating reedbeds in accessible locations (Aug 24)
2	A	Place concrete caissons in preparation for island formation (Aug – Sep 24)
3	A	Removal of islands and reprofiling of Island 2 to create muddy pond and artificial sand martin colony (Sep 24)
	B	Fill caissons (using material from removed islands) (Sep 24)
	C	Fill – island formation (using material from removed islands) (Sep 24)
4	A	Enabling dredge to clear way for main dredge (Sep 24)
	B	Main dredge of lake (Sep 24 – Nov 24)
	C	Peninsula extension / land reclamation (Sep 24 – Nov 24)

Phase	Sub-Phase	Description of Works
5	A	Placement of floating reedbeds associated with new islands (TBC; likely Feb 25 or Sep 25-Nov 25)

7.5.14 Initially, creation of shielded refuge areas within the lake will begin in August 2024. These initial works are non-intrusive (no dredging or large machinery) and of short duration and therefore minimally disturbing. Ready-prepared floating reedbeds will be brought to the Site on lorries, placed onto the lake at the BSC facility, and then floated into place with small tugboats / powerboats. The reedbeds will create a physical and visual barrier between the central part of the lake (where the main works will occur) and areas of the lake where no works will occur. In some places, reedbeds will infill gaps between existing islands and trees in the lake, to strengthen the existing visual shielding. In other areas, extensive lengths of floating reedbeds will create new shielded areas. These areas will act as refuges for waterbirds both during subsequent construction works and during the operation of the HWSFAC.

7.5.15 Two islands are being lost from the central part of the lake. To avoid a net loss of island habitat from the lake, and create enhancements for breeding birds in particular, new solid islands have been designed into the Proposed Development (see Table 7.15). The materials from the removed islands will provide appropriate soils for establishment of trees and vegetation. The new solid islands have been placed in locations where the development of trees and vegetation is particularly desirable for visual screening and creation of future breeding habitat. It is important that there will be a cycle of new / younger trees to support a heronry and cormorant roosts (the existing heronry trees will die or collapse in the future as willows do). The location for the new solid islands is mainly around the perimeter of the south-west lake corner, and around island 14 (important for breeding ducks and heronry / cormorant roost). This will strengthen visual screening and ensure the south-west area of the lake will remain undisturbed from the launch of boats at the peninsula, and from sailing and dredging activities in the central part of the lake.

7.5.16 To avoid temporary impacts from loss of roosting habitat while the new islands are constructed, tern rafts will be deployed within refuge areas in advance as replacement roost space. The location is shown on the Ecological Mitigation Plans provided in Chapter 5.

7.5.17 To avoid disturbance impacts to birds using the south-eastern part of the lake, floating reedbeds will enclose the northern extent of this area and fill in gaps between the existing chain of islands, to provide a sense of security and reduce or prevent birds using this area from being visually disturbed from construction and sailing activities within the lake.

7.5.18 The north end of the lake has been designed to provide an additional place for waterbirds to retreat to when sailing activities begin at the peninsula. Based on findings from the 2023 surveys, birds typically swim or fly away from a disturbance in all directions; the disturbance surveys showed that during sailing events, birds were concentrated into existing areas shielded by islands to the east and south-west. A refuge area located diagonally opposite the new sailing club at the far end of the lake will provide a further calm area to retreat to in the opposite direction from the source of disturbance - this will cater to more sensitive species that feel the need to travel greater than 300m away from a disturbance source. This area is also as far from the new HS2 viaduct as possible; this area provides a quiet undisturbed area well away from HS2 that birds can retreat to once the railway becomes

operational. This refuge area will be visually enclosed with floating reedbeds in a long chain, behind which tern rafts will be provided.

7.5.19 The north end has been connected up to the south-western corner by a corridor formed of floating reedbeds; the north end has very deep water and therefore does not provide significant benthic food resource (algae, plants etc) for waders and dabblers. A shielded corridor along the western edge of the lake, utilising the existing willow trees as part of the corridor, will allow birds to swim from north to south in the lake without being disturbed by sailing or construction activities. This shielded corridor also enhances the protective nature of the western bank, potentially providing benefits to breeding birds in this area.

7.5.20 To avoid noise, vibration and visual disturbance to the lagoon (and habitats beyond to the east) during construction, a temporary barrier providing a visual screen will be erected around the lagoon once sufficient buddleia and scrub have been removed (during September 2023 – February 2024).

7.5.21 To avoid noise and visual disturbance to breeding woodland birds, prior to the commencement of the bird breeding season (March 2024), a visual and acoustic screen will be installed around the woodland, slightly inset behind the tree line. This has been designed into the Proposed Development, to prevent any significant disturbance of bird species using the woodland for breeding, initially during construction and later (from April 2025) during operation. Details of the design, installation methodology and timing of implementation of the operational phase visual and acoustic barrier around the woodland should be set out within a Landscaping Plan for the Site which will be secured by condition.

7.5.22 To avoid impacts from noise and vibration from construction works occurring at the peninsula to surrounding habitats and receptors, works compounds will be located away from the lake shoreline, lagoon and woodland. Acoustic barriers will be placed around noise and vibration generating plant. These measures would be set out and confirmed within a Construction Environment Management Plan (CEMP), an Outline CEMP has been provided as Appendix 6.1.

7.5.23 Details of the design, construction, installation and removal methodology and timing of implementation of visual and acoustic barriers for the construction phase will be set out within a CEMP and secured through planning conditions. An Outline CEMP has been provided as Appendix 6.1.

7.5.24 Table 7.16 summarises the habitat loss and compensation that will occur through the delivery of the Proposed Development.

Table 7.16: Habitat loss vs compensation as a result of the Proposed Development

Feature/Habitat	Loss (m^2)	Creation (m^2)	Net Area (m^2)
Open Water	16,114	2,158	-13,956*
Solid Islands	2,412	4,307	+1,895
Floating Reedbeds	0	1,325	+1,325
Tern Rafts	0	4 tern rafts	+4 tern rafts

Feature/Habitat	Loss (m^2)	Creation (m^2)	Net Area (m^2)
Aquatic Planted Coir Mattresses	0	10,791	+10,791
Concrete Caisson aquatic and emergent planting	0	8,540	+8,540

* The remaining open water will be enhanced to improve its quality for biodiversity. Further details on the proposals are provided within the Draft MEMP (Appendix 7.4 and 7.5).

Completed Development

7.5.25 A key measure of the embedded mitigation is the operational timing and spatial constraints with HOAC only being operational 1 April – 31 September.

7.5.26 Increased disturbance to birds using central and northern areas of the lake will occur as a result of the relocation of BSC from the north of the lake to the south. The new sailing launch location lies much closer to the south-west corner of the lake. Upon boats launching from BSC in the north, birds on the main lake have been shown to move directly away from the boat launch location to the south-west refuge area; their reaction to disturbance likely being moderated by the proximity of a safe haven to which they may retreat. The new sailing launch location is much closer to the south-west corner of the lake. The new launch location is expected to cause birds in the centre of the lake to move to the north; the absence of sheltered refuge areas in the opposite direction may cause birds to react more strongly to disturbance and leave the lake.

7.5.27 A northern refuge area within the lake has therefore been created which will serve to provide embedded mitigation for this increased disturbance. The creation of additional islands and reedbed habitat along the western lake edge with the open water corridor behind will also serve to reduce the effect of increased disturbance on affected individuals.

7.5.28 Visitors and children undertaking outdoor activities at the Proposed Development, once completed, may stray away from designated areas (hides and activity areas) to find the shoreline. Without mitigation, this could cause disturbance to breeding birds using the peninsula shoreline, south-east lake area, inlet, lagoon and south-western corner of the lake. To control accessibility, thick thorny vegetation will be planted around the edges of the peninsula and along the isthmus. This will be strengthened with fences and screens where sightlines to the water remain after planting. This will prevent physical access to the shoreline (away from the hides and activity areas). It will also block sightlines from the water of any human activity in these areas (not including hides and activity areas). As such, visual disturbance from operational activities at the peninsula to breeding birds on the lake and its shoreline will be avoided. Details of the thick vegetated barrier will be provided within the detailed landscaping design for the Site which will be secured by condition. Appendix 5.1: Planning Application Drawings includes drawings which show the proposed boundary treatments.

7.5.29 The lighting scheme for the operational development has been designed to avoid impacts to foraging bats by reducing lux levels falling from external lighting onto vegetation to a maximum of 0.4 lux which is lower than best practice guidance. In the majority of locations onsite light levels falling onto adjacent vegetation are reduced to zero by bespoke mitigation comprising 4m wide panels behind the lighting columns. The panels provide a further

vertical enhancement opportunity for providing climbing plants, bird boxes and invertebrate enhancements. A Lighting Impact Assessment and External Lighting Design accompanies the planning application and it is expected that details would be secured by planning condition.

7.5.30 Internal lighting spill from buildings with windows facing onto natural habitats will also be controlled by design and through an Operational Management Plan to ensure impacts do not occur. Measures include layout of internal lighting and choice of luminaires, to prevent lights pointing directly out of windows. Measures will also include suitable window treatments that will be closed at night, and electronic controls on lighting to ensure lights are not switched on at night if windows are unshielded.

7.5.31 To summarise, designed-in mitigation as shown on the masterplan, Ecological Mitigation Plans (see Chapter 5) and set out within the draft MEMP for the Proposed Development (Appendix 7.4 and 7.5) secures a raft of mitigation and enhancement measures, including:

- Enhancements and long-term management of retained woodland at the Proposed Development;
- A larger area of solid islands, floating reedbeds as well as tern rafts will be provided through the scheme to increase the total area of roosting habitat at the lake. During winter these islands and trees may be used by roosting wintering birds; and
- General biodiversity enhancements within the lake such as areas of aquatic and emergent planting, and artificial reefs to support greater numbers of small fish and overall larger fish populations may increase the overall food resource for wintering birds.

7.5.32 Overall, these measures may increase the number of feeding and roosting wintering birds the lake may support. Table 7.17 provides a summary of the mitigation and enhancement measures design into the Proposed Development.

Table 7.17: Enhancement measures designed into the Proposed Development

No.	Habitat Feature	Directly Benefits	Indirectly Benefits
1	Solid island with trees	Breeding birds Wintering Birds Riparian mammals such as otter and water vole (if in wider area)	
2	Floating Reed Beds	Breeding birds Wading birds Riparian mammals	Fish – rooted systems may act as fish shelter
3	Emergent and Riparian Vegetation Planting	Otter Water vole (if in wider area) Wading birds	Invertebrates Bats
4	Tern Rafts	Breeding birds	Fish – rooted systems may act as fish shelter
5	Artificial reefs	Fish	Piscivorous birds, otter

No.	Habitat Feature	Directly Benefits	Indirectly Benefits
			May offer a surface on which to provide aquatic and / or emergent vegetation
6	Grassland Enhancement	Badger Otter Invertebrates Larger mammals like fox and deer	Birds and bats to feed on higher invertebrate numbers.
7	Hedgerow Creation and Scrub	Badger Otter Breeding Birds Larger mammals Bats Small mammals like hedgehogs Reptiles	N/A – habitat will directly benefit all terrestrial species for shelter, nesting, foraging.
8	Fruiting Trees	(Longer term) Invertebrates Birds	Bats attracted to higher invertebrate numbers.
9	Fruiting and Flowering Shrubs	Badger Otter Breeding Birds Larger mammals Bats Small mammals like hedgehogs Reptiles	N/A – habitat will directly benefit all terrestrial species for shelter, nesting, foraging.
10	Vertical Climbers	Invertebrates – Pollination	Bats attracted to higher invertebrate count, especially when using night scented species. Sometimes can also roost behind ivy. Birds can utilise ivy for sheltering and nesting if thick enough.
11	Bat Boxes	Bats	Humans and mammals through reduction in numbers of flying insects such as mosquitos
12	Bird Boxes	Breeding birds	N/A
13	Small Ponds	Amphibious species such as newt and toad Grass snake Invertebrates	Bats and birds may benefit from higher invertebrate populations.

No.	Habitat Feature	Directly Benefits	Indirectly Benefits
			May also be of use for mammals for drinking in hot weather.
14	Basking Rocks	Reptiles Invertebrates	Birds may use large rocks to crack open harder nuts and shells (such as song thrush)
15	Log Piles	Invertebrates Reptiles Small mammals	
16	Hibernacula	Amphibians Reptiles	Invertebrates, Small mammals
17	Creation of mosaic habitat	Invertebrates	Amphibians, Reptiles, Small mammals, Birds, Bats
18	Invertebrate hotels and bee hotels	Invertebrates	Birds, Bats
19	Hedgehog Highways	Small mammals	Will help maintain connectivity throughout site in sealed areas.
20	Biodiverse Green Roofs	Invertebrates Birds	May provide higher invertebrate populations for bat foraging
21	Biodiverse Sustainable Urban Drainage Systems	Invertebrates	Slow / reduce surface water runoff from Site into waterbodies

7.5.33 The enhancement measures provide embedded mitigation to reduce the energetic toll of increased disturbance from activities associated with the Proposed Development on waterbirds using the lake at any time of year.

7.6 Assessment of Effects – Construction Stage

7.6.1 Taking into account the avoidance measures and designed-in mitigation measures set out above, the assessed impacts and effects of the construction phase are set out in the sections below.

7.6.2 Measures will be undertaken during the construction phase to minimise disruption and manage the environmental and ecological impacts of the Proposed Development. These will be set out within a CEMP which will be secured through a planning condition; an Outline CEMP has been provided as Appendix 6.1. A Construction Method Statement will also be provided to LBH which will set out the working methods once a contractor has been appointed.

On-site National Statutory Sites – Mid-Colne Valley SSSI

Air Quality Effects

7.6.3 An air quality assessment was undertaken for the Proposed Development for construction (and operational traffic) both alone and in-combination with the HS2 Scheme, utilising guidance provided by London Borough of Hillingdon. An air quality assessment of designated sites was undertaken by AQC and is provided in Appendix 7.12.

7.6.4 The air quality assessment (Appendix 7.12) sets out the changes to air quality at relevant designated nature conservation sites associated with the Proposed Development. The emissions which have been considered are emissions from road traffic generated during the construction of the Proposed Development and by the completed and occupied Development. The increase to traffic associated with the Development will be greater than the Decision-Making Threshold defined by JNCC, meaning that a quantitative assessment was required. The assessment was based on pre-COVID 19 pandemic activity and emissions forecasts, to ensure a worst-case assessment that does not take into account temporary reductions in pollutant concentrations as a result of reduced activity levels during the Covid-19 pandemic.

7.6.5 The Proposed Development is predicted to increase concentrations of No_x and ammonia, and nitrogen and acid deposition fluxes within the Mid-Colne Valley SSSI. These increases, when considering the changes brought about by the Proposed Development in-isolation, are considered to be insignificant through the application of commonly accepted screening criteria. However, there is a small area of the Site where these increases, in-combination with other projects and plans, cannot readily be discounted as insignificant through application of the same criteria. Information available from Natural England and APIS does not identify these areas as containing the features for which the SSSI has been designated. Examination of aerial photographs suggests that these areas, over which significant in-combination effects cannot immediately be discounted, are a thin woodland strip next to a road and a thin strip of a HS2 construction compound.

7.6.6 A further ecological assessment was then made assessing the potential impact of the assessed air quality changes as a result of construction of the Proposed Development to the Mid-Colne Valley SSSI. This further assessment has also been provided in full in Appendix 7.12 and key points are provided below.

7.6.7 The Proposed Development will lead to changes in traffic flows on roads that pass within 200m of two SSSI, namely the Mid-Colne Valley SSSI and Harefield Pit SSSI. The Harefield Pit SSSI citation covers geological features of interest only so will not be affected and has not been considered further. The traffic flows passing the Mid-Colne Valley SSSI could result in the exceedance (or an increase in current exceedance) of the critical levels (Cles) and critical loads (Clos) for nitrogen oxide and ammonia concentration and deposition fluxes within habitats supporting the designated features of the SSSI through the production of emissions from vehicle exhaust. This could result in direct effects on individual plants due to toxicity, or changes in the make-up of floral communities through changes in nutrient availability and/or acidification.

7.6.8 The increases in traffic will occur on three roads that are within 200m of the Mid-Colne Valley SSSI, namely the A412, Moorfield Road and Moorhall Road. These roads abound unit 2 (A412) and unit 4 (Moorfield Road and Moorhall Road) of the SSSI. Both units are monitored with respect to their bird populations and are in the broad habitat category of

standing open water and canal. However, the habitats closest to the roadside include modified grassland, wet woodland, scrub and lines of trees. These habitats will support a wide variety of the breeding birds described in the SSSI citation and therefore degradation could impact upon the ornithological feature of this designated site. The unimproved lowland calcareous grassland present in unit 1 (Coppermill Down) is not within 200m of any road where additional traffic numbers are predicted and can be discounted.

7.6.9 To determine whether degradation of the roadside habitats within the affected zones could occur, the detailed species lists and habitat classifications were considered by Logika Consultants. The habitats present and the species that they are made up of are typical of the area and do not support a range of features that would be considered to be particularly susceptible to marginal increases in nitrogen deposition. Modified grassland and wet woodland dominated by willow are habitats commonly growing across soils supporting high nutrient levels (naturally or artificially), as does scrub (also supporting willow species of various kinds) especially that with a ground flora including indicators of high nutrient status such as common nettle. None of these habitats would be considered to be particularly sensitive to small levels of additional nutrient input, indeed they have developed since the creation of Broadwater Lake (in the 1980's) in an environment where deposition rates were highly likely to have been greater than today's baseline.

7.6.10 The Proposed Development is not predicted to give rise to adverse effects (i.e., deterioration) on the Mid-Colne Valley SSSI due to air quality changes associated with increases of traffic during the peak construction phase. This is because the changes are small and the habitats within 200m of the roads are relatively insensitive to additional nitrogen inputs.

7.6.11 No effects are therefore predicted.

7.6.12 Detailed impacts to the on-site Mid-Colne Valley SSSI have been assessed against the relevant individual designated features below.

Mid-Colne Valley SSSI Designated Features

7.6.13 The following sections provide an assessment of the effects of construction of the Proposed Development on the designated features of the Mid-Colne Valley SSSI. Appendix 7.3: SSSI Assessment provides a more detailed assessment of the effects of the Proposed Development alone and in-combination on the designated features of the Mid-Colne Valley SSSI.

SSSI Designated Feature – Standing open water

7.6.14 There will be a permanent reduction in area of open water due to reclaimed land (16,114m^2) and a net increase in the area of islands (c.1,895m^2). This loss represents 4.9% of the open water habitat on-site and 3.1% of the total open water habitat across the whole SSSI. A significant change would be considered to be 5% or greater. Common standards monitoring sets a basic target for ornithological SSSIs that there should be no reduction in extent of more than 5% of any component habitat of the habitat mosaic supporting the breeding bird assemblage.

7.6.15 Lake functionality will not be affected by the change given the placement of the reclaimed land continuous with the peninsula. Based on survey data, this location is not critical to other designated features of the SSSI such as breeding or wintering birds. This is likely due to

the north peninsula shoreline being very exposed to the lake and experiencing regular visual disturbance as a result of a range of site users accessing the shore already.

7.6.16 The lake forms part of a much larger area of open water provided within the wider Colne Valley; at the landscape scale, the small loss of open water at Broadwater Lake is not considered to be significant. The functionality of the Site to support the other SSSI designated features is also considered to be unaffected by this loss of open water, given the placement of reclaimed land, and the floating features will overlie the water column. Therefore, the loss may be compensated for through the enhancement of the remaining standing water area.

7.6.17 Embedded enhancement measures to improve the condition of the remaining standing open water from moderate to fairly good have been designed into the Proposed Development as part of achieving the vision for Broadwater Lake for the long-term (as set out within Appendix 7.4 Draft MEMP Volume 1). The measures are designed to enhance the water quality within the lake and build in greater climate change resilience for the Site. At the construction stage (at the same time as the loss of the open water) the physical structure of the lake will be improved to become more naturalised by increasing the variability of the lake bathymetry (physical naturalness is one of the measures of lake condition). More deeper areas will be created in the centre of the lake through dredging, and more shallows associated with islands will be created using concrete caissons to form stepped underwater planting beds. Another measure of lake condition is water quality: the lake water quality is currently reduced due to an excess of nutrients in the water. Also, during the construction stage, greater areas of underwater and emergent planting will be provided along with floating reedbeds. These large areas of plants will begin to act immediately to improve water quality by removing nutrients from the water column, although the benefits will increase and accumulate over time as the plants grow in successive growing seasons.

7.6.18 Overall, at the construction stage (prior to any significant improvement in water quality) a neutral (not significant) effect within the Zone of Influence is predicted to the SSSI designated standing open water and canals feature (the lake).

Assemblages of breeding birds – mixed: open water, lowland fen, lowland marsh & Assemblages of breeding birds – variety of species

7.6.19 Construction activities within the centre and north of the lake (mobilisation, removal of two small islands and construction of new solid islands, reprofiling of island 2, dredging works for land reclamation, demobilisation) will occur in August to November 2024.

7.6.20 Only the advance mitigation works planned in August will be undertaken during a month when breeding birds may potentially be present. However, it should be noted that breeding had finished at Broadwater Lake in late August 2023 when a survey was undertaken to check for signs of active breeding – none were found.

7.6.21 The first phase of the works (Phase 1A and 1B) will comprise the deployment of floating reedbeds and tern rafts using a small powerboat / tug. These works will be of short duration, intermittent and of minimal disturbance. The works will occur in between islands 3, 4, 6, 14, 15 and 16 and close to the lake banks, affecting (indirectly disturbing) adjacent small areas of breeding habitat. The works are planned for the tail-end of the breeding season to ensure the embedded mitigation is in place ready prior to the subsequent phases in September

(which are likely to cause greater disturbance) when neither breeding nor wintering birds will be present. The Phase 1A and 1B works would cause temporary visual disturbance effects, which would be localised, intermittent and of short duration (approximately 10 days or less), but there would be no direct disturbance. There would be minimal intermittent noise from powerboat engine and talking only. As such, a temporary short term intermittent negative effect within the Zone of Influence (not significant) is predicted.

7.6.22 The second stage of works (Phase 2A) will be placement of concrete caissons in between islands 6 and 8, and also between islands 12, 14, 15 and 16. Works will be completed using a boat to transport the caissons and an excavator to place the caissons on the lakebed. The excavator will drive on the lakebed. The works would cause temporary visual disturbance effects which would be intermittent and of short duration (approximately four weeks). There would be no direct disturbance to breeding habitat. Intermittent noise would arise from boat engine and excavator, as well as talking. A temporary short term intermittent negative effect within the Zone of Influence (not significant) is predicted.

7.6.23 The remaining in-lake construction impacts to breeding waterbirds relate to loss of nest sites and loss of open water for land reclamation. These impacts would occur outside of the bird breeding season because of careful timing / programming of works, occurring September to November 24. The removal of two islands (islands 2a and 3) during Phase 3A will result in the loss of at least 10 confirmed breeding sites for black headed gull (Local / Borough) Canada goose (ZoI) and coot (Local). Land reclamation at the north end of peninsula with incorporation of island 9 (willow trees projecting out of the water) into the new land will result in the loss of nest sites on island 9 and along adjoining isthmus edge (island 8) for black-headed gull (1-2 nests) (Local / Borough) and coot (2 nests on islands 9 and 8) (Local). Embedded mitigation for loss of ground roost / nest sites comprises creation of new solid islands, floating reedbeds and tern rafts to provide new nest sites. Replacement of lost tree nest sites will occur over the medium-term as new planted willow trees grow. Overall, there will be a significant increase in roost / nest sites available at the Site, and an increase in vegetation, benefitting the assemblages as a whole, and allowing an increase in the total numbers supported. This benefit will occur at the construction stage (when the new habitats are created). A significant permanent moderate positive effect at up to the Borough level is predicted which will take effect during the next breeding season (also within the construction phase of the Proposed Development).

7.6.24 Loss of open water also as a result of land reclamation will result in the loss of a small part of up to 16 territories of 10 species valued at up to the Borough level. Embedded mitigation comprises new and strengthened refuge areas that will increase the value of open water and existing nest sites for breeding birds using the refuge areas. Enhanced food resources within refuge areas through increased macrophytes and emergent planting will increase the number of birds supported by a smaller area. As a result, no effects are predicted to the SSSI designated breeding assemblages at the Site during the construction stage as a consequence of the loss of open water habitat.

7.6.25 Reprofiling of island 2 to improve it for waterbirds will only have positive impacts for breeding waterbirds. Confirmed breeding at the island comprised Canada goose (2 nests), mallard (young seen, 1-2 territories), moorhen (young seen). The works will create a larger area of beach-type shingle habitat level with the water (to match projecting finger where birds tend to cluster; the rest of the island lacks clear sightlines due to vegetation and is relatively unused) and create muddy pools for waders / passage birds. An artificial sand martin bank

will also be created. A long-term significant positive effect at up to the Borough level is predicted from the reprofiling of island 2.

7.6.26 Construction activities occurring on land adjacent to the lake (north and north-west of reclaimed land at peninsula) in breeding season may cause displacement of small numbers of breeding waterbirds liable to use the zone of influence to areas further away and within refuge areas. Species tolerant of disturbance and habituated to the noise may still use the zone of influence. Ample availability of open water and alternative nest sites, along with visual screening already provided to retained breeding sites and refuge areas in the wider area, means that no impacts to breeding frequency or success for any species are predicted. Mitigation would comprise location of site compounds away from the shoreline; acoustic barriers placed around noise and vibration generating plant. For any intermittent disturbing activities, constant masking noise may be generated. No effects are predicted to the SSSI designated breeding waterbird assemblages at the Site during the construction stage as a consequence of adjacent construction activities.

7.6.27 A summary of the effects identified to the SSSI designated breeding bird assemblages (variety of species and mixed: open water, lowland fen and marsh) at each phase of in-lake works is provided below:

- Phase 1: temporary short-term intermittent negative effect at the Zone of Influence level – non-significant;
- Phase 2: temporary short-term intermittent negative effect at the Zone of Influence level – non-significant;
- Phase 3: permanent positive significant effect at the Borough level;
- Phase 4: permanent positive significant effect at the Borough level;
- Phase 5: no effects (receptor absent therefore not discussed); and
- Construction on peninsula: no effects.

Aggregations of non-breeding birds – variety of wintering species & Aggregations of non-breeding birds – tufted duck

7.6.28 The in-lake works will have two types of potential impacts:

- Temporary or permanent loss of habitat (as a result of removal of islands 2A and 3, reprofiling works to island 2, and land reclamation incorporating island 9 and with loss of open water); and
- Disturbance (visual and noise disturbance) as a result of the construction works being undertaken.

Loss of habitat

7.6.29 Phase 3A of the construction works will remove two existing islands (2A and 3) and reprofile island 2 during September 2024. The works will occur outside the wintering bird season. At this stage, the loss of islands 2A and 3 will result in the loss of terrestrial roost sites used by up to 24 individuals from up to 20 wintering species under a likely worst-case scenario based on 2023 monitoring data. None of the species recorded directly using the islands were valued above the Local level.

7.6.30 Embedded mitigation would replace the lost roost sites in advance through provision of tern rafts and floating reedbeds; during Phase 3C solid islands will be created at the same time as the roost sites are lost and will be ready for the first wintering birds to arrive in October. The enhanced roost resource created by the embedded mitigation would ensure that there would be a permanent significant positive effect between Local and National level (given that wintering species such as shoveler and pochard will benefit from the enhancements, valued at the National and Regional levels respectively).

7.6.31 During Phase 3A in September 2024, the reprofiling of island 2 to improve it for waterbirds would only have positive impacts for wintering birds. 12 species were recorded directly using island 2 in small numbers, mostly on the edges. The centre of the lake was used during January, February and March 2023 by Egyptian and Canada goose, and in March by black-headed gull, cormorant and mallard. A permanent significant positive effect at the Local level is predicted from reprofiling of island 2 as the higher valued species are unlikely to utilise the improved island.

7.6.32 In October and November, land reclamation (Phase 4) at the north end of peninsula with incorporation of island 9 (willow trees projecting out of the water) will result in the loss of up to 10 winter terrestrial roosting sites (tree branches and base of trees) used by small numbers of coot and Canada goose under a likely worst-case scenario. These birds would be displaced to other areas onsite, increasing pressure on the remaining roost resource onsite. The Embedded enhancement is the same as for loss of islands 2A and 3 and will result in a permanent significant positive effect between Local and National level (given that wintering species such as shoveler and pochard will benefit from the enhancements, valued at the National and Regional levels respectively).

7.6.33 In winter 2022/3 island 9 and the surrounding water was home to 3-6 coot. Tufted duck and black-headed gull were recorded frequently (on 5/6 of 19 visits). Other species recorded in descending order of frequency: shoveler (5), great crested grebe (4), mallard (3), Canada goose and grey heron (2) and mute swan, pochard, Egyptian goose, moorhen, cormorant (1). During Phase 4 of the construction works in-lake, loss of this open water as a result of land reclamation will result in the loss of a non-significant area (<5%) of open water core habitat for small numbers of coot, tufted duck and black-headed gull and with nine further species also using the area. The status of these species and their continued presence at the Site will be unaffected as there is still a sufficiently large area of open water remaining. Designed-in mitigation comprises new and strengthened refuge areas that will increase the value of open water and existing roost sites within the protected areas. Enhanced food resources within refuge areas through increased macrophytes and emergent planting will increase the number of birds supported by a smaller area. As a result, no effects are predicted to the SSSI designated features (aggregations of non-breeding birds – variety of wintering species and tufted duck).

Disturbance from construction works

7.6.34 During Phase 4, dredging works for land reclamation within the centre and north of the lake will occur between September and November. This will cause physical and visual disturbance to birds using the central and north parts of the lake outside of the created refuge areas for the duration of the works. The bed material would be dredged from the centre and north of the lake and around islands 1 and 2, and then transported by boat to the land reclamation area north of the peninsula, passing within the ZoI of island 14. The timing of works is at the start of the wintering bird season when fewer species and individuals are typically present. Dredging will not use fast motorboats and speeds of travel

within the lake will be kept low to reduce disturbance of sediment; a speed limit may be imposed to reduce disturbance impacts to birds. Embedded mitigation measures have been designed into the Proposed Development to reduce disturbance impacts to wintering birds during construction activities within the lake (islands and floating reedbeds creating strengthened refuge areas and reducing visibility of the moving dredging boats). These will be installed prior to dredging works commencing and should significantly reduce the degree of response to the disturbance. The majority of species present in October and November are present in low numbers and are assessed as being of Local importance or lower. Disturbance to these species will be during a time of year when maximum numbers are not present at the Site. The birds would have free rein before works commence and once works ceased for the day (some species are active feeders at night).

7.6.35 Individuals of less sensitive species (gulls, heron, cormorant, waders, moorhen, coot etc) are expected to swim or fly to the pre-existing or new refuge areas within the lake as works commence (some will remain despite the works). This would have a very minor (insignificant) energetic toll on the birds. Once within refuge areas, no further disturbance impacts would occur each day. A short-term temporary negative effect at the Zone of Influence level (not significant) is predicted.

7.6.36 The species most sensitive to disturbance present at the lake are geese which only occur in very low numbers at the Site. Disturbance behaviour surveys have shown that 50-80% will typically leave the lake entirely at the first signs of disturbance. Canada geese mainly use terrestrial habitats during the day anyway and typically would leave the lake before disturbance occurs. The very low numbers and low importance of these species mean that disturbance effects on the individuals and on receiving waterbodies or land would be insignificant. No effect has been predicted to geese.

7.6.37 For the moderately sensitive species, comprising a few of the ducks at the Site including shoveler (national importance) and pochard (Regional importance) as well as tufted duck, the reaction would be greater. A likely worst-case scenario would be that initially up to 10% of the 2022 late November population (shoveler 7No., pochard 18No., 29 tufted duck plus single individuals of other species) would be displaced to adjacent waterbodies during the day. There would be a small energetic toll on the individual birds from the flight and stress. The numbers displaced may reduce or cease as birds habituate to the disturbance. Embedded mitigation comprising increased shelter from disturbance within refuge areas will make the lake more attractive and increase the probability that the disturbed birds return to the lake during the day or once works cease at the end of the working day. These factors are also likely to reduce the likelihood that birds will leave the lake entirely when disturbance occurs. Given the likely small numbers affected and likelihood of habituation**,** for sensitive and high value duck species at the Site, a short-term temporary significant negative effect at the Local level is predicted.

7.6.38 During December 2024 to March 2025, construction activities occurring on land adjacent to the lake (north and north-west of reclaimed land at peninsula) in the winter season may cause displacement of small numbers of waterbirds liable to use the construction ZoI to areas further away and within refuge areas. Species tolerant of disturbance and habituated to the noise may still use the ZoI. Embedded mitigation will be implemented through the CEMP, including siting compounds away from the shoreline; acoustic barriers placed around noise and vibration generating plant. For any intermittent disturbing activities, constant masking noise may be generated. No effects are predicted.

Woodland

7.6.39 Woodland (lowland mixed deciduous, wet woodland) is present at the peninsula adjacent to planned construction works. During mobilisation, site clearance and construction, damage to woodland habitat may arise from dust, runoff and pollutant spills. Impacts may comprise smothering of vegetation with dust until next rainfall; dust and runoff impacts to soils potentially may alter surface substrate chemistry and alter plant species assemblage over the medium-term. Pollutant spills may cause localised death of vegetation. The effects of these impacts would be highly localised due to the attenuating effects of vegetation preventing pollutants spreading. A range of embedded mitigation measures are included within the Outline CEMP (Appendix 6.1) including site compounds to be set back from woodland areas; chemicals stored in bunds, spill kit made available. No effect predicted.

7.6.40 Accidental loss of or damage to individual trees or branches may occur during site clearance and construction. This would likely only affect individual trees at the edges of woodland, due to the dense tree cover and lumpy concrete hardstanding on the ground around the trees, and long overhanging branches which are low to the ground in some places, preventing vehicle movement from going far beneath the trees. Embedded mitigation measures would be described within a CEMP and secured through planning condition; an Outline CEMP is provided as Appendix 6.1. Protective barriers will be erected around the woodland, carefully sited by an EcoW. The barrier will visually demarcate woodland to be protected, separating it from invasive buddleia scrub and trees on hardstanding. It will also act to prevent accidental damage from plant movement and during clearance works. Other measures such as toolbox talks will ensure site workers are aware of the importance of woodland habitat at the Site. No effect predicted.

Assemblage of breeding birds – mixed: lowland woodland, lowland scrub

7.6.41 Minimal clearance of trees and mixed scrub on hardstanding at the peninsula is required to facilitate the proposed Development. The best quality / value trees have been retained at the peninsula through careful design to fit development elements such as carparks around the retained trees. On those trees required to be cleared, bird boxes are present on a few trees, and trees and scrub are suitable for nesting birds during the breeding season. In the absence of mitigation, clearance could impact nests in terms of destruction, which would be a legal offence under the WCA 1981. Clearance would therefore be undertaken prior to March 2024 outside the active bird breeding season, subject to planning permission. If planning permission were to be received later than this, works would be required during the breeding bird season. Suitable mitigation would comprise clearance undertaken under an ecological watching brief supervised by an Ecological Clerk of Works who would check for the presence of active nest s immediately prior to any clearance works. Any clearance work would only be allowed in areas with no active bird nests. Timing of works and method would be stipulated within a CEMP, an Outline CEMP is provided in Appendix 6.1. No effect predicted.

7.6.42 Construction activities occurring on land at the peninsula in the breeding season (planned for March – August 2025) adjacent to the retained woodland may cause visual, noise and vibration disturbance within the ZoI up to 50m into woodland areas. Notable species breeding in the peninsula woodland or within the ZoI include red kite, stock dove, wood pigeon, tawny owl, wren, song thrush, dunnock, reed bunting. Embedded mitigation delivered through a CEMP has therefore been designed into the Proposed Development in the form of a visual and acoustic screen which would be installed around the peninsula woodland close to where disturbing activities will occur, slightly inset behind the tree line.

Works compounds and noise generating equipment would also be located away from woodland. No effects would be expected following embedded mitigation.

7.6.43 Cetti's warbler has been recorded probably breeding along western edge of lake and in the western woodland, but not found to be regularly using woodland on peninsula although there were a few records near the canal in 2023. It is considered that Cetti's warbler is unlikely to be impacted and no effects are predicted.

Other Statutory Sites

7.6.44 Potential effects to other statutory sites are limited to displacement of birds from the Site to other lakes. The vast majority of adjacent lake are covered by statutory designations. Therefore, the potential effects have been considered to all the sites together. The sites comprise the Mid-Colne Valley SINC incorporating Frays Farm Meadows SSSI and Denham Lock Wood SSSI; Denham Country Park LNR; Denham Quarry Park LNR; Colne Valley Gravel Pits (CVGP) (undesignated) including Springwell and Stocker's Lakes SINC.

7.6.45 Dredging works for land reclamation within the centre and north of the lake (Phase 4) will occur between September and November. October and November lie within the wintering bird season. This will cause physical and visual disturbance to central and north parts of the lake outside of the created refuge areas for the duration of the works. The timing of works is at the start of the wintering bird season when fewer species and individuals are typically present. Dredging will not use fast motorboats and speeds of travel within the lake will be kept low to reduce disturbance of sediment; a speed limit may be imposed to reduce disturbance impacts to birds. Embedded mitigation measures have been designed into the Proposed Development to reduce disturbance impacts to wintering birds during construction activities within the lake (islands and floating reedbeds creating strengthened refuge areas and reducing visibility of the moving dredging boats). These will be installed prior to dredging works commencing and should significantly reduce the degree of response to the disturbance.

7.6.46 As previously set out above in the assessment for effects to the SSSI designated wintering assemblage, taking embedded mitigation into account, a likely worst-case scenario would be that 10% of the 2022 late November population of species moderately sensitive to disturbance (including shoveler 7No., pochard 18No., tufted duck 29No.) and up to 10 total individuals of other ducks including gadwall, wigeon and goldeneye) and 1-2No. individuals of other more highly sensitive species including geese would be displaced to adjacent waterbodies during the day.

7.6.47 The small numbers of displaced bird species may create a short-term temporary increased pressure on the feeding resources on adjacent receiving waterbodies (many lakes are used by the same population; Stocker's Lake to the north and Savay Lake to the south provide similar habitat and food resources) during the works in October and November. The designed-in mitigation providing new roost sites and increased shelter within refuge areas will make the lake more attractive and increase the probability that the disturbed birds return to the lake during the day or once works cease at the end of the working day. These factors are also likely to reduce the likelihood that birds will leave the lake entirely. A short-term temporary significant negative effect at the Local level is predicted to receiving waterbodies contained within designated Sites (and outside them).

London's Canals SINC / Grand Union Canal

7.6.48 Upgrades to utilities serving the Site will be required; these run east-west across the canal bridge that falls within the red line boundary of the Proposed Development. To the east of the canal and bridge the utilities run from a sub-station through an earth covered ramp to the top of the canal bridge at the side of a former boat yard (now a transport yard). Works to this area will not affect the canal directly or indirectly as they will be at height and away from the canal as the bridge spans a wider area than just the canal, extending 2+m to each side beyond the canal. No significant mature or veteran trees will be affected by the works as trees are young and lack PRFs. No effects are predicted to the canal with regard to the upgrading of utilities running over the canal bridge.

7.6.49 The canal bridge will be refurbished; works for this will be undertaken under a bat mitigation licence as roosts have been discovered within the bridge. The canal will be refurbished in situ or craned away from the canal to the adjacent eastern former boat yard. No associated works will directly impact the canal or land at ground level within a minimum of 2m to each side. The canal will not be closed to canalboats or pedestrians during the works. Measures will be prescribed within a CEMP and a precautionary working method produced, to ensure no materials or bridge components are dropped into the canal and the canal and towpath remain open, with protection measures for the canal itself, and passing boats or pedestrians. Any noise generating works will be of short duration and intermittent (15mins per hour for 1-2 days maximum predicted). Dust and vibration would be minimised. No effects are predicted to the canal from bridge refurbishment works.

7.6.50 Potential indirect and secondary impacts during the construction stage may comprise dust, noise, vibration and runoff from activities at the peninsula and access road. Upgraded services running across the canal bridge will be buried in a trench from the edge of the bridge (c. 2-3m from the canal on the west side) across a ditch and beneath the access road down to the lake. Works will be of short duration and highly localised with the footprint of the trench minimised. The canal is separated from the access road by a vegetated embankment which will also serve to screen the canal from indirect impacts as a result of burying the services. Works at the peninsula will be >20m distance from the canal and there are mature trees and shrubs in between to buffer impacts. Impacts will be managed through a CEMP; an Outline CEMP is provided in Appendix 6.1**.** No effects are predicted following embedded mitigation.

Coppermill Down SINC

7.6.51 No adverse impacts are predicted during construction as Coppermill Down SINC is considered sufficiently far away. The adjacent Grand Union Canal separates the Site from the Coppermill Down SINC. There are no pathways through which impacts / significant effects may occur. No effects predicted.

Broadwater Lake Nature Reserve

7.6.52 Adjacent to the Broadwater Lake Nature Reserve, works will occur within the lake to create new islands and habitats – no direct impacts to the lake shore or terrestrial habitats are anticipated as access will be via the lake, with no generation of dust. Works will be of short duration (typically 1 week or less) and greater than 20m from the banks. No effect predicted.

Priority Habitats

7.6.53 Impacts to priority habitats present on-site (i.e., woodland, standing open water) are assessed under the relevant SSSI designated features and wildlife sites set out above. All other priority habitats have been scoped out as IEF as being outside the ZoI of construction works.

River Colne

7.6.54 The BSC will be demolished once the new development is completed. The main building lies within 5m of the River Colne however between the BSC building and the river there is a footpath lined with a fence. This footpath must remain in place to protect a right of way for fishermen and this access would be maintained and not be disturbed by the works.

7.6.55 The main building is a single storey building made of repurposed prefabricated concrete panels and other materials including wooden cladding. Disturbing works that may cause rise to noise, dust and vibration will comprise demolition of the building – this will likely be undertaken over 1-2 days. Wooden cladding and pergolas will be dismantled by hand and likely repurposed. It is likely that existing concrete hardstanding will be left in situ rather than being dug up and removed.

7.6.56 Measures would be in place during demolition to minimise disturbance, although some noise, dust and vibration, may arise for 1-2 days. Protection of the fence and footpath will be prescribed within a CEMP and will ensure the banks of the river are not encroached upon; the CEMP will also prescribe dust suppression measures if identified to be required. No effects are predicted following embedded mitigation.

Badgers

7.6.57 An outlier sett lies within an area of retained habitat within the Site but is less than 20m from works. In the absence of mitigation, disturbance or inadvertent destruction of the outlier sett may occur through adjacent construction activities. A Natural England licence would be obtained for the temporary closure of the outlier sett during the construction period, minimising impacts although there would still be a temporary short-term minor negative effect at the Local level (not significant). The sett would be closed under licence, and reopened once construction is complete.

7.6.58 Occasional foraging badger may utilise the Site during construction. Gaps to allow free passage to badger (also deer and foxes which also occur at the Site) should be allowed within construction barriers at the Site. Trenches and excavations should be constructed with inbuilt ramps, to allow any animals that fall in to escape.

Bats – foraging

7.6.59 Night-time lighting of works areas and compounds, and security lighting may prevent light-sensitive bat species from using lit areas for foraging. Small areas would be impacted only, with no severance of connectivity due to the large area and alternative flightlines around any lit areas.

7.6.60 Embedded mitigation measures are included in the Outline CEMP which include no lighting of construction works at night, and no night-time construction works to occur. No security lighting will be installed as the Site may be secured through its existing gates and through presence of security personnel. Lighting of site compounds, although temporary, will be

designed in accordance with best practice guidance and would be bespoke, low level, shielded and directional with LED and warm colour temperatures. Site compounds will be enclosed by visual screening. As a result of these measures, no effects are predicted.

Bats – roosting

7.6.61 No bat roosts have been identified within trees at the peninsula within the ZoI of construction works. There are a small number of trees with potential roost features within 10-20m of construction works but that lie within areas that will be retained with no works planned or required and which will be protected with barriers during construction. There would therefore be no direct effects on trees with bat roosts.

7.6.62 The bridge on the Grand Union Canal and adjacent black poplar have been identified as supporting low conservation value roosts for small numbers of soprano pipistrelle. A European Protected Species License (EPSL) will be obtained, once planning is granted, for works to proceed. Appropriate standard mitigation measures are set out in the Bat Survey Report in Appendix 7.10, summarised below, and would be detailed within the EPSL application. Works would be undertaken during winter when bats would be absent from the identified summer / day / night roosts (no hibernation potential has been identified).

7.6.63 The branches of the black poplar will be cut back to increase the buffer zone between the bridge and the tree, and permit access for a crane without causing damage to the main tree. Following an endoscope inspection by an Ecological Clerk of Works (EcoW) to determine that no bats are present, the bridge will be craned off its supports and lifted east onto the adjacent service yard. The roosts within the black poplar would be retained and protected during the bridge repair works. The roosts within the bridge would be lost; these would be replaced with bat boxes placed on healthy mature trees within 20m which have no existing potential roost features. The repaired / replacement bridge would then be craned back into position under a watching brief by the EcoW to ensure the black poplar was protected and taken into consideration. As a result of these embedded mitigation measures, no effects are predicted.

Reptiles

7.6.64 There is a very low risk of injury or killing of individual transient grass snake through clearance of habitat at the BSC site and the peninsula. A watching brief by an EcoW will be undertaken during Site clearance works in suitable reptile habitat, with methodical clearance of habitat towards areas of retained vegetation. No effects are predicted following mitigation.

Otter

7.6.65 No impacts to otter are predicted because of the construction phase of the Proposed Development on land. Although otter may use the peninsula occasionally for feeding, the presence of construction compounds and plant will be disturbing and deter them from using these areas. Measures to protect badger and small mammals during construction such as ramps within excavations will also protect otter in the unlikely event one ventures onto the construction site. Other areas will remain quiet and undisturbed (such as the concrete beach at the south-west corner of the peninsula) and will still be available throughout the construction phase (and operational phase) for feeding otters.

7.6.66 Visual, noise and vibration disturbance from construction activities within the lake (dredging, land reclamation, island construction) may cause a short-term reduced use of the Site for

feeding activities by otter. This disturbance will only occur within the day; otter are mainly active at night, giving them undisturbed periods of time within which to hunt and feed. There are significant alternative resources accessible within the locality for otter (River Colne, Grand Union canal, further lakes within the Colne Valley). Overall, there would be a short-term temporary negative effect (not significant) within the Zone of Influence. No further mitigation is required as a result.

Fish

7.6.67 Noise and vibration disturbance from dredging works and island construction may cause the temporary displacement of fish from affected areas to sheltered undisturbed areas of the lake. These works are programmed to be undertaken outside of the sensitive spawning season for fish. This would comprise a short-term negative effect (not significant) within the Zone of Influence.

7.6.68 No mitigation is considered to be required.

7.6.69 No significant effects are predicted to fish from construction activities occurring on land.

Terrestrial Invertebrates

7.6.70 Mobilisation, site clearance, vegetation clearance and construction activities may cause disturbance or destruction of areas of habitat at the peninsula supporting moderately diverse invertebrate populations: open habitats scrub edge and flower rich resource.

7.6.71 Prior to the commencement of works, the main area identified to be important for invertebrates will be protected with Heras fencing; the Proposed Development has been designed to retain this small existing area of open flower-rich resource and protect it from disturbance. No effects predicted.

Aquatic Invertebrates

7.6.72 Runoff or pollutant spills from construction activities may cause localised smothering of aquatic invertebrate habitat. The impact may comprise a possible reduction in number of species within the zone of influence of works until impacts cease. Impacts would be managed through measures within a CEMP. No effects predicted following embedded mitigation.

Hedgehog

7.6.73 Impacts to hedgehogs during construction may include disruption to connectivity of habitat, and injury or killing of individual hedgehogs if they fall into open excavations or pipes. Embedded mitigation measures would be included within the CEMP and would include ramps placed within open excavations during construction and open pipework to be capped off overnight. No effects predicted.

Notable Plants – Black Poplar

7.6.74 Works to refurbish the canal bridge may require equipment such as scaffolding or a crane; in the absence of mitigation the works may tear tree limbs or damage the trunk of the adjacent mature black poplar tree. This would cause a minor negative effect within the Zone of Influence (not significant). However, if the damage caused tree mortality this would comprise a permanent significant negative effect at the Borough level.

7.6.75 The tree supports two roosts for soprano pipistrelle and therefore any works would be undertaken under an EPSL as described under 'Bats'. Careful trimming of branches to clear the works area in advance of works would take place. Additional measures if a crane is used will include a watching brief by a banksman and an experienced crane operator will be used to undertake the works. A detailed methodology and risk assessment for crane works should be produced, informed by a site visit. Measures would be detailed within a CEMP to be secured through planning condition. No effects are predicted following embedded mitigation.

7.6.76 Any further works to this tree (if required) would be made with reference to the AIA and bat report, with no effects predicted.

Terrestrial and Aquatic INNS

7.6.77 Spread of existing INNS or introduction of new INNS may occur through movement of boats, plant, machinery from external contaminated sites to Broadwater Lake without decontamination measures being implemented, or through use of contaminated PPE such as wellington boots.

7.6.78 An updated INNS survey would be completed prior to commencement of construction. If INNS were to be identified to be present, an eradication programme would be undertaken by a specialist contractor. These measures are included in the Outline CEMP which will be developed further in consultation with stakeholders taking their concerns into account.

7.6.79 Control of potential impacts would be managed through biosecurity measures detailed within a CEMP secured through planning condition. No effects are predicted following mitigation.

Additional Mitigation, Monitoring and Residual Effects

7.6.80 No additional mitigation has been identified to be required. Residual effects will either be neutral or positive.

7.6.81 Monitoring has been formulated to cover both the construction and operational phases of the Proposed Development. The monitoring is set out at the end of Section 7.7. The overarching monitoring strategy (and how it is regulated) will be developed further in consultation with stakeholders taking their concerns into account.

7.7 Assessment of Effects – Completed Development

7.7.1 The embedded avoidance and mitigation measures set out in Section 7.5 ensure that all foreseeable operational impacts have been addressed and mitigated for. Activities at height (i.e., high ropes, zip wire) are sited close to tall trees which provide natural screening, thus ensuring no intermittent visual impacts to the lake or lagoon. Visual and acoustic screens will be provided to prevent disturbance to sensitive habitats (woodland, lagoon, refuge areas within the lake for birds) from daytime land-based activities such as movement of pedestrians and vehicles, noises from vehicles, engines and children playing. Thick vegetation will prevent access to unscreened areas. Lighting impacts have been avoided through best practice design and tertiary mitigation measures.

7.7.2 Taking into account the avoidance measures and embedded mitigation measures set out above, the assessed impacts and effects of the operational phase are discussed further below.

7.7.3 Measures will be undertaken during the operational phase to minimise disruption and manage the environmental and ecological impacts of the Proposed Development. These will be set out within the MEMP which will be secured through a planning condition; a Draft MEMP has been provided as Appendices 7.4 and 7.5.

Onsite – Mid-Colne Valley SSSI – Air Quality

7.7.4 The Air Quality report (Appendix 7.12) has set out the changes to air quality at relevant designated nature conservation sites associated with the operational Proposed Development. The emissions which have been considered are emissions from road traffic generated during both the construction phase and the completed and occupied Proposed Development. The increase to traffic associated with the Development will be greater than the Decision-Making Threshold defined by JNCC, meaning that a quantitative assessment is required. The assessment has been based on pre-pandemic activity and emissions forecasts, to ensure a worst-case assessment that does not take into account temporary reductions in pollutant concentrations as a result of reduced activity levels during the Covid-19 pandemic.

7.7.5 The operational Proposed Development will increase concentrations of Nox and ammonia, and nitrogen and acid deposition fluxes within the Mid-Colne Valley SSSI. These increases, when considering the changes brought about by the Development in-isolation, can be discounted as insignificant through the application of commonly accepted screening criteria. However, there are small areas of the SSSI away from the Site along the A412 Moorfield Road and Moorhall Road where these increases, in-combination with other projects and plans, cannot readily be discounted as insignificant through application of the same criteria. Information available from Natural England and APIS does not identify these areas as containing the features for which the SSSI has been designated. Examination of aerial photographs suggests that these areas, over which significant in-combination effects cannot immediately be discounted, are a thin woodland strip next to a road and a thin strip of a HS2 construction compound.

7.7.6 A further assessment of the data was undertaken by Logika Consultants to determine if significant effects would be likely to the SSSI.

7.7.7 The traffic flows passing the Mid-Colne Valley SSSI could result in the exceedance (or an increase in current exceedance) of the critical levels (CLes) and critical loads (CLos) for nitrogen oxide and ammonia concentration and deposition fluxes within habitats supporting the designated features of the SSSI through the production of emissions from vehicle exhaust. This could result in direct effects on individual plants due to toxicity, or changes in the make-up of floral communities through changes in nutrient availability and/or acidification.

7.7.8 The increases in traffic will occur on three roads that are within 200m of the Mid-Colne Valley SSSI, namely the A412, Moorfield Road and Moorhall Road. These roads lie adjacent to unit 2 (A412) and unit 4 (Moorfield Road and Moorhall Road) of the SSSI. Both units are monitored with respect to their bird populations and are in the broad habitat category of standing open water and canal. However, the habitats closest to the roadside

include modified grassland, wet woodland, scrub and lines of trees. These habitats will support a wide variety of the breeding birds described in the SSSI citation and therefore degradation could impact upon the ornithological feature of this designated site.

7.7.9 The unimproved lowland calcareous grassland present in unit 1 is not within 200m of any road where additional traffic numbers are predicted and can be discounted.

7.7.10 To determine whether degradation of the roadside habitats within the affected zones could occur, the detailed species lists and habitat classifications were considered. The habitats present and the species that they are made up of are typical of the area and do not support a range of features that would be considered to be particularly susceptible to marginal increases in nitrogen deposition. Modified grassland and wet woodland dominated by willow are habitats commonly growing across soils supporting high nutrient levels (naturally or artificially), as does scrub (also supporting willow species of various kinds) especially that with a ground flora including indicators of high nutrient status such as common nettle. None of these habitats would be considered to be particularly sensitive to small levels of additional nutrient input, indeed they have developed since the creation of Broadwater Lake (in the 1980's) in an environment where deposition rates were highly likely to have been greater than today's baseline.

7.7.11 The assessment concludes that the Mid-Colne Valley SSSI will not see deterioration due to air quality changes associated with increases of traffic during the fully operational state of the Proposed Development along roads within 200m of the SSSI boundary. This is because changes are small and the habitats within 200m of the roads are relatively insensitive to additional nitrogen inputs.

7.7.12 No effects are therefore predicted.

Onsite - Mid-Colne Valley SSSI – Other operational impacts

7.7.13 Detailed operational impacts to the onsite Mid-Colne Valley SSSI have been assessed against the relevant individual designated features below.

SSSI Designated Features – standing open water

7.7.14 No further loss of open water will occur during operation. The removal of nutrients from the water column will continue and benefits will start to accrue as a result of the floating reedbeds and other planting provided during construction. Planting areas will be maintained and may be increased in the future in response to ongoing monitoring findings. Many benefits will be seen during summer months. The clarity of the water may be improved. Increased plant coverage will provide shade and oxygenation to the water column, and larger deeper areas within the lake will ensure there are still cool water areas during hot summers. These effects will help to prevent fish kills and reduce the likelihood of harmful algal blooms. Floating planting will ensure that planting is not killed by large fluctuations in water level during hot summers, as has occurred from previous enhancement schemes at the Site.

7.7.15 Further enhancements during the operational stage to improve water quality and lake condition include pumps that will move water from shallow / more enclosed areas to deeper areas as part of water source heat pump systems to provide heating to the Proposed Development. This will assist with oxygenation of shallower waters and create currents that

will be beneficial especially when water temperatures are elevated during the summer months.

7.7.16 The proposed monitoring programme will allow trends in water quality and temperature to be identified. Shallow areas can become particularly hot during summers then deoxygenation can become an issue (as heat reduces the oxygen carrying capacity of the water); solar powered aerators have been proposed to be deployed within shallow lake areas as future mitigation against the warming effects of climate change.

7.7.17 Overall, the improvements to lake condition and the benefits of ongoing monitoring and adaptive management will provide significant resilience to climate change. At the operational stage a significant long-term positive effect at the Regional level is predicted.

Onsite SSSI Designated Features – Assemblages of breeding birds – variety of species; Assemblages of breeding birds – mixed: open water, lowland fen, lowland marsh

Operation of HOAC

7.7.18 Physical and visual disturbance of open water in the centre and north of the lake will occur from watersports activities during the breeding season. The operation of HOAC will occur during April – September each year. The resident breeding bird populations are habituated to current sailing activities from the BSC however HOAC activities will represent a significant increase in sailing activity within central open water area of the lake from 2-3 times a week to daily. As a worst case, up to 50 boats will be present on the lake at any one time during the day between 9am and 4pm; there may also be other water sports occurring such as rowing and rafting. The location of the launch point for sailing will also be changed, from the north of the Site to the peninsula further south. At the time of launch, this change is likely to cause birds using the centre of the lake to be pushed away to the west, north and east from the launch location into margins and sheltered areas of the lake, rather than to the south-west as happens currently.

7.7.19 Embedded mitigation includes the provision of solid islands and floating reedbeds to create visually shielded open water areas along the east, north and west sides of the lake. Birds displaced from the central open water will be able to swim or fly to these reserve areas in the direction of displacement. The embedded mitigation measures also provide a sheltered open water corridor created by floating reedbed within which birds may swim from the north of the lake to the south-west corner to attain the main feeding grounds, without being adversely impacted by ongoing sailing activities. The measures create a larger total area of undisturbed open water for breeding water birds which are more spread around the lake. The new islands and floating reedbeds (used to create the refuge areas) also provide good quality breeding habitat, allowing more birds to use the lake for breeding. There would be permanent positive effects for the majority of breeding waterbirds at the Site. For most species, effects would be within the Zone of Influence (i.e., not significant) however for some species valued at the Local level, effects would be at the Local level and significant. If the numbers of breeding pochard were to increase from 2 pairs up to four pairs consistently this would increase the value of the Site for breeding pochard to the Regional level. If shoveler were to breed more consistently at the Site this would be at the Local to Borough level depending on the number of pairs (>10 pairs would be Borough importance). Overall, there would be a permanent positive effect at the Local and up to the Regional level.

Relocation of BSC from north of Site to the peninsula

7.7.20 BSC is active throughout the bird breeding season and therefore disturbance will continue to arise from March to August annually. This disturbance forms the baseline disturbance of the Site. The relocation of the Club and associated launch location changes the effect of the disturbance. The disturbance could cause birds using the centre of the lake at the time of launch to be pushed away to the west, north and east, away from the launch location. The likely destination of these birds would be into the margins and sheltered areas of the lake, rather than to the south-west.

7.7.21 Embedded mitigation measures include solid islands and floating reedbeds to create visually shielded open water areas along the east, north and west sides of the lake. Birds displaced from the central open water area will be able to swim or fly to these reserve areas in the direction of displacement. The availability of refuge areas away from launch locations will reduce the degree of response to disturbance and reduce the energetic toll on breeders.

7.7.22 The embedded mitigation also provides a sheltered open water corridor created by floating reedbed within which birds may swim from the north of the lake to the south-west corner to attain the main feeding grounds, without being adversely impacted by ongoing sailing activities.

7.7.23 The measures create a larger total area of undisturbed open water for breeding water birds which are more spread around the lake. The new islands and floating reedbeds (used to create the refuge areas) also provide excellent breeding habitat, allowing more birds to use the lake for breeding. Floating reedbeds and aquatic and emergent planting will increase food resources at the Site.

7.7.24 As a result of the embedded mitigation, there would be permanent positive effects for the majority of breeding waterbirds at the Site. For most species, effects would be within the Zone of Influence (i.e., not significant) however for some species valued at the Local level, effects would be at the Local level and significant. If the numbers of breeding pochard were to increase from 2 pairs up to four pairs consistently this would increase the value of the Site for breeding pochard to the Regional level. If shoveler were to breed more consistently at the Site this would be at the Local to Borough level depending on the number of pairs (>10 pairs would be Borough importance). Overall, there would be a permanent positive effect at the Local and up to the Regional level.

SSSI Designated Features: Aggregations of non-breeding birds – variety of wintering species; Aggregations of non-breeding birds – population of tufted duck

7.7.25 Physical and visual disturbance of open water in the centre and north of the lake will continue to occur throughout the winter from sailing / boating activities arising as a result of the ongoing activities of BSC. This disturbance occurs at present so forms part of the disturbance baseline for the Site, which was characterised through surveys during 2022-23 as reported in Appendix 7.4. The relocation of BSC changes the effect of the baseline disturbance however as the launch location will be changed from the north of the lake to the south.

7.7.26 Embedded mitigation measures include the provision of sheltered refuge areas at the north and west sides of the lake, providing somewhere for the disturbed birds to head to initially; they can then choose to swim down the screened west side to the lake to the south-west corner if desired. These will reduce the effects of visual disturbance from BSC sailing

activities, reducing the baseline disturbance. The embedded mitigation also increases the amount of terrestrial in-lake habitat for wintering birds and provides an increased food resource. These measures will reduce the energetic toll of this baseline disturbance on wintering birds. Numbers of birds displaced may be reduced by the embedded mitigation measures, as birds will be provided with more abundant and readily accessible feeding grounds. As a result of the embedded mitigation, it is predicted there would be a permanent positive effect ranging from not significant (Zone of Influence) to the National level depending on the individual species.

7.7.27 The overall effect would be considered to be a permanent significant positive effect at the National level as the wintering assemblage of birds is valued at the National level due to the nationally important numbers of overwintering shoveler.

SSSI designated features: Woodland

7.7.28 No loss of woodland will occur at the operational stage. Woodland will be protected from disturbance as embedded mitigation comprises a fence around the retained central wet woodland to prevent children and pedestrians accessing into the woodland. Woodland will be protected and managed through measures within the draft MEMP (see Appendix 7.4 and 7.5) to improve its condition and enhance its biodiversity value.

7.7.29 No effects are predicted to woodland habitat as a result of the embedded mitigation.

Assemblages of breeding birds – mixed: lowland woodland, lowland scrub

7.7.30 Operational activities near to terrestrial habitats used by these breeding bird assemblages, comprise activities, camping, traffic and pedestrian movement at the peninsula. These activities will be very localised. Noise and visual disturbance to woodland and scrub may occur within the zone of influence, likely 20-50m in the absence of mitigation.

7.7.31 Embedded mitigation comprises a fence around the retained central wet woodland to prevent children and pedestrians accessing into core breeding bird habitat and reduce impacts from noise and visual disturbance. Due to the presence of dense vegetation within the woodland which will attenuate noise and visual disturbance, along with the fence, the effects of adjacent activities are likely to be very minimal. The birds of this assemblage are spread across the Site with many using the habitats both onsite and offsite including lake edges, river corridor, canal, access road, woodland adjacent to the south. Any disturbance will only affect a small part of the habitat being utilised.

7.7.32 No effects are predicted to this assemblage as a result of the embedded mitigation.

7.7.33 Enhancement measures are set out within the Draft MEMP and include a range of fruiting and flowering shrubs and trees to be planted within hardstanding area, scrub around margins of the water, scrubby mounds at the former BSC and other landscaping enhancements. Bird boxes will also be provided.

7.7.34 The enhancements are predicted to be a significant long-term positive effect at the Local level.

Other Statutory Sites

7.7.35 Potential effects to other statutory sites are limited to displacement of birds from the Site to other lakes. The vast majority of adjacent lake are covered by statutory designations. Therefore, the potential effects have been considered to all the sites together. The sites comprise the Mid-Colne Valley SINC incorporating Frays Farm Meadows SSSI and Denham Lock Wood SSSI; Denham Country Park LNR; Denham Quarry Park LNR; Colne Valley Gravel Pits (CVGP) (undesignated) including Springwell and Stocker's Lakes SINC.

7.7.36 HOAC will not be operational during the winter months. During the summer, breeding birds are liable to remain within their territories at Broadwater Lake and not be displaced as a result of the embedded mitigation measures enhancing the habitats and providing enhanced refuge areas. No effects arising as a result of HOAC's activities are therefore predicted to the other statutory sites.

7.7.37 Physical and visual disturbance of open water in the centre and north of the lake will continue to occur throughout the winter from sailing / boating activities arising as a result of the ongoing activities of BSC. This disturbance is pre-existing so forms part of the disturbance baseline for the Site, which was characterised through surveys during 2022-23 as reported in Appendix 7.6. The relocation of the Club changes the effect of the baseline disturbance however as the launch location will be changed from the north of the lake to the south. Embedded mitigation provided by the Proposed Development provides for sheltered refuge areas at the north and west sides of the lake, providing somewhere for the disturbed birds to head to initially; they can then choose to swim down the screened west side to the lake to the south-west corner if desired. The embedded mitigation also increases the amount of terrestrial in-lake habitat for wintering birds and provides an increased food resource. These measures will reduce the energetic toll of this baseline disturbance on wintering birds. Numbers of birds leaving the lake in response to disturbance may be reduced by the embedded mitigation measures, as birds will be provided with more abundant and readily accessible feeding grounds. The baseline impact of disturbance from BSC activities causing displacement of birds from the Site is therefore predicted to remain the same as per the current baseline. No effects are therefore predicted to offsite receptors as a result of the operation of the Proposed Development.

London's Canals SINC / Grand Union Canal

7.7.38 No activities arising as a result of the operational phase will generate impacts to the adjacent canal. No birds will be displaced, no habitats will be cleared. Works to the bridge will have been completed. The boundary with the access road and canal will have been strengthened at the construction phase, with planting and fencing as required to close gaps. Fishermen will continue to have access as per the current baseline.

7.7.39 Additional access along the access road will be strictly controlled thanks to improved security measures including key code systems and CCTV, reducing potential impacts from unauthorised access to the access road and adjacent canal. Access along the eastern Site boundary will be limited to site managers, ecologists, landscaping contractors and maintenance staff implementing the management and monitoring measures prescribed within the draft MEMP. Works will include management and planting to enhance habitats and their condition.

7.7.40 As such, no effect upon the London Canals SINC is predicted.

Coppermill Down SINC

7.7.41 Due to the distance of this SINC from the Site 100m away to the north-east beyond the canal, there is no practical physical connectivity other than for flying species such as birds and bats.

7.7.42 At the operational stage no effects are predicted to arise as a result of the operation of the Proposed Development.

Priority Habitats

7.7.43 Impacts to priority habitats present on-site (woodland, lake) are assessed under the relevant SSSI designated features and wildlife sites set out above.

River Colne

7.7.44 No activities arising as a result of the operational phase will generate negative impacts to the adjacent river. No birds will be displaced, no habitats will be cleared. Access to the river, achieved via the southern causeway and along the eastern access road will be strictly controlled thanks to improved security measures including key code systems and CCTV to gain access to the peninsula, reducing potential impacts from unauthorised access along the southern site boundary to the river. Fishermen will continue to have access as per the current baseline. Additional access will be limited to site managers, ecologists, landscaping contractors and maintenance staff implementing the management and monitoring measures prescribed within the draft MEMP. Works will include management and planting to enhance habitats and their condition, and prescribed ecological monitoring.

7.7.45 As such, no effects upon the River Colne are predicted.

Badger

7.7.46 Once the Site is operational, the outlier sett (to be closed during construction under a Natural England licence) will be reopened. Planting of thorny shrubs, use of screens or fence panels, large rocks and other carefully planned landscaping features will hide the sett from view, preserve it from accidental damage and maintain its usefulness as an outlier sett for an individual badger.

7.7.47 Habitat enhancements set out within the landscaping plan and MEMP to be implemented at the operational stage may increase the food provision for badger by introducing new planting areas with imported soils across the peninsula. Further enhancements at the BSC will also benefit this species, with enhancement of grassland and provision of scrubby mounds, both of which may be exploited by badgers for foraging and potentially for new sett excavation. Hedgehog highways will be provided and discrete larger gaps may be created through any permanent fences for badger, fox and deer.

7.7.48 A significant permanent positive effect at the Local level is predicted for badger as a result of the proposed enhancements.

Foraging bats

7.7.49 Embedded mitigation comprising a lighting scheme designed in accordance with best practice guidance, with no lighting directed onto woodland or open water habitats and dark

corridors (0lux) along woodland edges. This ensures no negative effects are predicted to foraging bats as a result of the operation of the Proposed Development.

7.7.50 Enhancements will comprise creation of additional habitat to benefit invertebrates – this will enhance the area for bats by increasing their food resource. Clearings and rides within woodland designed to enhance the habitat condition will also create good foraging areas for bats.

7.7.51 The end result will be a significant long term positive effect at up to the Borough level.

Roosting bats

7.7.52 Bat boxes and bat features will be provided as part of the licenced canal bridge refurbishment works. At the operational stage these boxes will enhance the canal bridge and locality for bats, providing a significant positive long term, effect at the Local level.

7.7.53 Bat roosts and indicative locations of such roosts identified through survey work carried out for HS2 lie away from the operationally active areas of the Site. Operational controls including gates and fences will ensure no disturbance occurs to confirmed and suspected roosts.

7.7.54 Ongoing Site management will be prescribed within a MEMP (draft provided in Appendix 7.4 and 7.5) secured through planning permission. The location and potential for bat roosts will be provided as part of the final MEMP documents, ensuring that site workers, landscaping contractors and maintenance operative are aware of areas with potential for roosting bats. The requirement for a Permit to Work onsite will ensure all checks have been made prior to works commencing.

7.7.55 Enhancements for roosting bats comprise bat boxes provided on mature trees along the access road and around the peninsula. Bat boxes will include some suitable for maternity and hibernation roosts which would be of high conservation value depending on the species using them. Many potential roosting features at the Site were identified to be low potential and high potential features were notable uncommon, likely due to the young age of woodland and trees at the Site. These bat boxes may supplement the range of PRFs provided by the Site and improve resources for roosting bats. A significant positive effect at up to the Borough level is predicted for the roosting bat assemblage using the Site.

Reptiles

7.7.56 The main operational areas of the Proposed Development at the peninsula are the only areas where reptiles might be harmed (through vehicle movements and outdoor activities mainly) at the operational phase. As reptiles (individual transient grass snake) are assumed to only be occasionally present and within areas of better habitat onsite such as on the lake shores, within scrub and grassy habitats, it is considered that reptiles will be likely to be absent from active areas at the peninsula.

7.7.57 To enhance the site for reptiles, the former BSC site will be enhanced with wildflower-rich grassland, scrubby mounds, hibernacula, log piles and a small pond. Compost heaps will also be created. These habitats will encourage breeding and egg laying on site. Overall, a long term minor positive effect at up to the Local level is predicted.

Otter

7.7.58 The increased use of the hardstanding areas of the peninsula for the activities of HOAC during April to September, and the lower-level activities of the BSC year-round at the peninsula, will not prevent otter from using the Site and even the edges of the peninsula during the night and quiet times of the day.

7.7.59 Increased use of the lake for watersports in the day between April and September will not have a negative impact on otter as it is a highly mobile species and can swim at speed and dive to get away; it also prefers to avoid disturbed areas. Otters are active in the day and at night; they have large ranges with significant suitable habitat close to the Site along the Grand Union canal, River Colne and the other connected lakes of the Colne Valley; they will use alternative habitat in the day and may also use Broadwater Lake at night.

7.7.60 Enhancements at the lake for birds such as floating reedbeds may be exploited by otter as couches or feeding platforms. Creation of wildflower meadow with scrubby mounds at the BSC site will create sheltered terrestrial areas for couches and feeding. Enhancements that benefit the resident fish population will potentially increase the food resource for otter, although there is already significant food resource for otter in the form of the invasive signal crayfish.

7.7.61 As a result of the enhancements, a positive long-term effect within the Zone of Influence (not significant) is predicted for otter.

Fish

7.7.62 Operation of HOAC will increase watersports use of open water at Broadwater Lake during April to September. The types of watersports are not motorised. Instructors will use small, motorised boats; these will be limited to 1-2 boats on the lake at any time, and as they are supervising students sailing, the boats will only rarely need to move at speed to rescue any students in difficulty. This is consistent with the use of motorised boats by the BSC although at slightly higher intensity. There will only be a small increase in use of motorboats disturbing wakes from engines due to the small size and limited number of the boats. This is the only potentially disturbing activity identified for fish at the operational stage of the Proposed Development. Fish are highly mobile and if disturbed will simply move to less disturbed areas of the lake – these areas will be present around the majority of the lake edge and cover 40% of the lake.

7.7.63 Floating reedbeds deployed across the lake will provide underwater rootzones within which fish may hide; aquatic planting also provides concealing vegetation. Enhancements to improve breeding and survival of small fish will be provided within the lagoon in the south-east corner of the Site. These enhancements may result in a significant long-term positive effect at the Local level**,** particularly as increased small fish populations will support piscivorous bird populations at the lake**.**

Aquatic invertebrates

7.7.64 The lakebed and vast majority of lake shore will not be disturbed by operational activities; only the shoreline of the new reclaimed land at the peninsula will be subject to repeated disturbance arising from launching and landing of boats and other watercraft. The boats will stay on the open water and the bed of the lake, and its shores will not typically form part of

the usual operational activities of HOAC. Aquatic invertebrates utilising bed sediments and aquatic and emergent vegetation in other areas of the lake will be unaffected.

7.7.65 General biodiversity enhancements within the lake such as areas of aquatic and emergent planting will provide benefits by improving water quality and increasing the area of suitable habitat for these species. Overall, a significant long term positive effect at up to the Local level is predicted for aquatic macroinvertebrates as a result of increased planting and resultant water quality improvements.

Rare / notable terrestrial invertebrates

7.7.66 At the operational phase, no loss of habitat will occur. Disturbance may arise from outdoor activities, and movements of pedestrians through semi-natural and natural habitat areas. A small area important for the open flower-rich resource assemblage of terrestrial invertebrates will be protected from human disturbance within an area made inaccessible by barriers at the edge of the active area of the Site. Other terrestrial invertebrate assemblages present within woodland and open water habitats are more widely dispersed around the Site and less susceptible to disturbance. Embedded mitigation measures such as fences, and thorny shrub planting have been designed in to ensure these retained habitats will not be encroached into during operation of the Proposed Development.

7.7.67 Enhancements for terrestrial invertebrates have been designed for the peninsula and BSC site as these species provide a valuable food resource for a range of other species. There will be creation of mosaic habitat with rocks / bare ground, friable substrates, flower-rich grassland, deadwood including log mounds and piles, hibernacula, scrub and water sources, and wildlife ponds. Flower-rich swales will be exploited by invertebrates. At the peninsula, the log piles and soft soils away from gravel and concrete hardstanding areas may encourage stag beetle to utilise the area. Overall, a significant long-term positive effect at the Local level is predicted for terrestrial invertebrates.

Black poplar

7.7.68 The identified black poplar lies away from the areas of the Site that will be active during the operational phase of the Proposed Development. At this stage, works to the adjacent bridge will have been completed. The boundary with the access road and canal will have been strengthened at the construction phase, with planting and fencing as required to close gaps. Fishermen will continue to have access as per the current baseline. Additional access along the access road will be strictly controlled thanks to improved security measures including key code systems and CCTV, reducing potential impacts from unauthorised access to the access road and adjacent canal. Access along the eastern Site boundary will be limited to site managers, ecologists, landscaping contractors and maintenance staff implementing the management and monitoring measures prescribed within the draft MEMP. Works will include management and planting to enhance habitats and their condition.

7.7.69 Black poplar will be included in planting mixes for new trees around the Site for landscaping and ongoing management to provide biodiversity benefits. A significant very long-term positive effect at the Local to Borough level is predicted as a result of these enhancements.

Hedgehog

7.7.70 Hedgehog highways will be implemented by creating gaps into any fences and hedgerows to maintain connectivity for the species. There would be very limited benefit to hedgehogs

at the peninsula at the operational stage from landscaping, although enhancements proposed at the BSC may provide some small benefit. Overall, no effects are predicted.

Terrestrial and Aquatic INNS

7.7.71 Standard operating protocols include biosecurity measures for the operation of the BSC and for HOAC and these measures will be implemented for the Proposed Development to prevent introduction or spread of INNS. The control measures will not be secured through the MEMP but through operational protocols that form part of the operation of each individual entity.

7.7.72 At the operational stage, the Site will benefit from improved operational controls and security. This will significantly reduce or prevent unauthorised Site uses and reduce the risk of INNS being introduced in the future. The ongoing management and monitoring will ensure that future threats and stressors arising to the Site will be identified quickly and addressed promptly and positively. The effect of the improved operational controls, management and monitoring for terrestrial and aquatic INNS is assessed as a significant long-term positive effect at the Borough level.

Additional Mitigation, Monitoring and Residual Effects

7.7.73 No additional mitigation has been identified to be required. No significant residual negative effects are predicted.

7.7.74 Mitigation and enhancements have been designed into the Proposed Development that benefit every identified ecological receptor at the operational stage, to ensure either a neutral or positive effect which will be long-term or permanent, and as resilient to climate change as possible. See Draft MEMP Volume 1 for further details (provided within Appendix 7.4).

7.7.75 The Applicant has made a commitment to a programme of monitoring as part of the draft MEMP. This forms a key part of an adaptive mitigation approach / management strategy. Details will be confirmed in due course and will be developed in consultation with relevant stakeholders.

7.7.76 Monitoring at the operational stage has been prescribed to monitor for evidence of success or failure to achieve the goals of the designed-in enhancement features, to detect any negative or positive effects arising from the mitigation and enhancement measures prescribed as part of the Proposed Development, and to inform management prescriptions for each of the designated features of the SSSI. This is set out within the MEMP for the Proposed Development. Table 7.18 has been reproduced from the Draft MEMP Volume 1 (Appendix 7.4).

Table 7.18: Proposed Monitoring Programme for SSSI Features

Feature	Monitoring Goal	Method	Timing
Standing open water	Establish detailed water quality baseline. Detection of trends long-term	Common Standards Monitoring Guidance for Freshwater Lakes, JNCC (2015)	Monthly DO, temperature, turbidity, depth, total P Annual

Feature	Monitoring Goal	Method	Timing
	To informed detailed interventions		Macrophyte & filamentous algae survey, sampling for zooplankton & phytoplankton
Lake condition assessment	Confirm baseline and monitor progress towards improvement goals. Detection of trends long-term	Freshwater Biological Association 'Habitat Naturalness Assessment'	Annual reassessment; using data provided by detailed monitoring above
Woodland	Confirm baseline and monitor progress towards improvement goals	DEFRA Metric condition assessment	Annual in June or July
Aggregations of non-breeding birds - variety of wintering species - population of tufted duck	Record assemblage and numbers - no change or improvement relative to the 2023 baseline	Wintering bird survey non-sailing days	Monthly October to March During construction and operation - annually until 2027 and then bi-annually
	Disturbance effects on species, detection of reduction relative to 2023 baseline	Wintering bird survey on sailing days	Monthly October to March During construction and operation - annually until 2027 and then bi-annually
Aggregations of breeding birds (waterbirds) - variety of species	Record assemblage and numbers - no change or improvement relative to the 2023 baseline	Breeding bird survey	Monthly March - July During construction and operation - annually until 2027 and then bi-annually
Assemblage of breeding birds - mixed: lowland damp grassland, scrub, woodland	Record assemblage and numbers - no change or improvement relative to the 2023 baseline	Breeding bird survey	Monthly March - July During construction and operation - annually until 2027 and then bi-annually
SSSI designated features - assemblages / aggregations of birds	Provide a measure of intrinsic biodiversity relative to the recorded baseline - to detect any improvement resulting from the enhancement measures provided by the proposed development	SSSI condition assessment - calculation of site threshold values for each designated assemblage	Annually until 2027 and then biannually using survey data as detailed above

7.8 Cumulative Effects

7.8.1 The only cumulative impacts identified are with the HS2 scheme. These are discussed below.

Construction

Assessment

7.8.2 The HS2 ES did not identify a potential disturbance impact of noise and visual impacts from the construction of the Colne Valley Viaduct. HS2 are undertaking disturbance monitoring during periods of construction activity on the viaduct to determine if disturbance is being caused by their works to the birds using the south-west corner of the lake. To date, their surveys have not identified any such disturbance impacts. Construction of the Colne Valley Viaduct will likely continue for the next 12-24 months, overlapping with the construction phase of the Proposed Development

7.8.3 The potential cumulative impact identified is that during October and November 2024, the Proposed Development may cause more wintering birds to be using the south-west corner as a result of visual disturbance arising from dredging and land reclamation in the centre-north part of the lake and near the peninsula. If during this period (October – November 2024) HS2 construction works disturb the south-west refuge area, individuals of sensitive species of birds may leave the lake during the disturbing works, causing an energetic toll on the disturbed individuals, and causing increasing feeding and roosting pressures on adjacent sites including other designated units of the Mid-Colne Valley SSSI. To mitigate for cumulative disturbance impacts of the Proposed Development with the construction and future operation of HS2 (located 100m from the lake at the south-west corner), a visually screened refuge area has been designed for the northern end of the lake, well away from both HS2 and from the Proposed Development. This refuge area will be visually enclosed with floating reedbeds in a long chain, behind which tern rafts will be provided. As a result of the embedded mitigation, no cumulative effects have been predicted.

Mitigation, Monitoring and Residual Effects

7.8.4 No further mitigation or monitoring is recommended and the residual effect would remain as no cumulative effect.

Completed Development

Assessment

7.8.5 In the Environmental Statement for the HS2 Scheme, a potential disturbance impact of visual and noise impacts from the operation of the Colne Valley Viaduct was identified, from the passage of trains along the viaduct. This impact is identified to affect the Site in the south-west corner of the lake. The HS2 assessment stated that the lake offered a much larger area of habitat away from the impacted area that may be used by any disturbed birds, and that birds would habituate to the train noise, reducing the impacts to where they are not significant. However, surveys for the Proposed Development and a review of published literature have shown this affected area is used by waterbirds as a refuge from human on-lake activities as well as for feeding, roosting and breeding.

7.8.6 To mitigate for the predicted operational disturbance impact, HS2 designed in visual and acoustic barriers to the viaduct and have designed a landscaping scheme to shield the viaduct so that train movements are not visible from the level of the water within the lake (where the birds will be). HS2 also proposed an area of one or more additional islands (floating being the most likely construction) within the south-west corner of the lake, however close to the peninsula as far from HS2 as possible (See Chapter 2: Site and Setting). Given the publicised construction delays there is no official programme of construction and operation available to reference. It is considered that the operation of the HS2 railway is likely to commence in 2026-27 with 12-18 months of pre-operational testing, and with full operation likely from 2028-29.

7.8.7 Once operational, the Proposed Development may cause more breeding birds to be using the south-west corner as a result of increased daily sailing activities on the central part of the lake during April – September. If HS2 then disturbs this area, the value of the area as a refuge from increased sailing activities may be reduced. Bird species are known to habituate to regular disturbance. Disturbance and its potential effects (energetic toll on disturbed individuals, reduced breeding or absence of breeding for one or more species, reduced population size at the Site) are therefore only likely to affect more sensitive species adversely. Pochard and shoveler are species identified to be relatively sensitive to disturbance and these species both use the south-west area; as such in the absence of embedded mitigation, significant effects may be at the Regional or National level.

7.8.8 To mitigate for cumulative impacts of the two schemes at the operational phase, an additional refuge area has been designed for the lake. This is sited at the north end of the Site, away from HS2, and in the furthest away location from the Proposed Development. This area will be created by a line of floating reedbeds with gaps in between to facilitate permeability to the central part of the lake. This northern refuge provides a large visually enclosed area to which disturbed birds can retreat to away from launching boats, and it is far enough away from HS2 that any potential disturbance from the operation of HS2 will have no effect. This area, in combination with the other strengthened refuge areas around the lake, will ensure that species sensitive to disturbance will always have alternative quiet locations within the lake to fly to if and when disturbance occurs.

7.8.9 As a result of the embedded mitigation, no cumulative effects are predicted.

Mitigation, Monitoring and Residual Effects

7.8.10 Monitoring will be required to assess for disturbance impacts once HS2 commences pre-operational testing, likely in 2026-27. Disturbance surveys should take place during the breeding and winter seasons to determine effects to the different receptors. HS2 will undertake this monitoring; they undertake a consultation process with stakeholders (Colne Valley Regional Park group) to ensure that consultee considerations are taken into consideration.

7.8.11 Additional mitigation is considered to be unnecessary although the requirement for this would be informed by the monitoring. If remediation is required, this would lie with HS2 but the requirement for this is considered highly unlikely.

7.9 Summary

7.9.1 Table 7.19 presents a summary of the assessment.

Table 7.19: Summary of Effects

Effect	Receptor (IEF) (Sensitivity)	Temporal Scale	Scale of Impact (geographic scale)	Significance of Effect	Additional Mitigation and Monitoring	Significance of Residual Effect
Construction						
Construction traffic – air quality impacts	Mid-Colne Valley SSSI (National)	None	No effect	None	None	None
Loss of <5% of open water from land reclamation	Designated feature of Mid-Colne Valley SSSI: Open standing water – (Regional)	Permanent	Zone of influence	Neutral, not significant	None	Neutral, not significant
Phase 1 works in-lake – placement of floating reedbeds and tern rafts - disturbance	SSSI designated assemblages of breeding birds: Mixed: open water, lowland fen, lowland marsh (Borough) Variety of species (Borough)	Temporary, short term, intermittent	Zone of Influence	Negative, not significant	None	Negligible
Phase 2 works in-lake – placement of concrete caissons - disturbance	SSSI designated assemblages of breeding birds: Mixed: open water, lowland fen, lowland marsh (Borough) Variety of species (Borough)	Temporary, short term, intermittent	Zone of Influence	Negative, not significant	None	Negligible
Phase 3 and Phase 4 works in-lake – loss of nest sites through removal of islands and land reclamation and replacement with new islands	SSSI designated assemblages of breeding birds: Mixed: open water, lowland fen, lowland marsh (Borough) Variety of species (Borough)	Permanent	Borough	Positive significant	None	Moderate Positive
Phase 4 works in-lake – loss of open water	SSSI designated assemblages of breeding birds: Mixed: open	Permanent	No effect	None	None	None

Effect	Receptor (IEF) (Sensitivity)	Temporal Scale	Scale of Impact (geographic scale)	Significance of Effect	Additional Mitigation and Monitoring	Significance of Residual Effect
	water, lowland fen, lowland marsh (Borough) Variety of species (Borough)					
Phase 3A works in-lake – reprofiling island 2 as enhancement	SSSI designated assemblages of breeding birds: Mixed: open water, lowland fen, lowland marsh (Borough) Variety of species (Borough)	Permanent	Borough	Positive significant	None	Moderate Positive
Construction works on land at the peninsula adjacent to open water	SSSI designated assemblages of breeding birds: Mixed: open water, lowland fen, lowland marsh (Borough) Variety of species (Borough)	Temporary, March – August 2025	No effect	None	None	None
Phase 3A in-lake works - Loss of habitat and advance replacement	SSSI designated aggregations of non-breeding birds: variety of wintering species (National) Tufted duck Athya fuligula (Borough)	Permanent	Local to National	Positive significant	None	Minor to Major Positive
Phase 3A works in-lake – reprofiling island 2 as enhancement	SSSI designated aggregations of non-breeding birds: variety of wintering species (National) Tufted duck Athya fuligula (Borough)	Permanent	Local	Positive significant	None	Minor Positive
Phase 4 works in-lake – loss of nest sites through land	SSSI designated aggregations of non-breeding birds: variety of wintering species (National)	Permanent	Local to National	Positive significant	None	Minor to Major Positive

Effect	Receptor (IEF) (Sensitivity)	Temporal Scale	Scale of Impact (geographic scale)	Significance of Effect	Additional Mitigation and Monitoring	Significance of Residual Effect
reclamation and advance replacement	Tufted duck Athya fuligula (Borough)					
Phase 4 works in-lake – loss of open water	SSSI designated aggregations of non-breeding birds: variety of wintering species (National) Tufted duck Athya fuligula (Borough)	Permanent	No effect	None	None	None
Phase 4 works in-lake – disturbance to less sensitive species and geese	SSSI designated aggregations of non-breeding birds: variety of wintering species – species within assemblage valued at Local / Zone of Influence / None	Short-term, temporary	Zone of Influence	Negative, not significant	None	Negligible
Phase 4 works in-lake – disturbance to moderately sensitive species valued at the Borough level or higher	SSSI designated aggregations of non-breeding birds: variety of wintering species (National) Tufted duck Athya fuligula (Borough)	Short-term, temporary	Local	Negative significant	None	Minor Negative
Construction on land adjacent to the lake - disturbance to moderately sensitive species valued at the Borough level or higher	SSSI designated aggregations of non-breeding birds: variety of wintering species (National) Tufted duck Athya fuligula (Borough)	4 months, temporary	No effect	Not significant	None	None
Construction at the peninsula – indirect and direct impacts	Woodland (Borough)	14 months	No effect	Not significant	None	None

Effect	Receptor (IEF) (Sensitivity)	Temporal Scale	Scale of Impact (geographic scale)	Significance of Effect	Additional Mitigation and Monitoring	Significance of Residual Effect
Clearance of scrub and individual trees from hardstanding	SSSI designated assemblage of breeding birds – mixed: lowland woodland, lowland scrub (Borough)	Permanent	No effect	Not significant	None	None
Construction at the peninsula – indirect impacts / disturbance	SSSI designated assemblage of breeding birds – mixed: lowland woodland, lowland scrub (Borough)	Short-term (March – August 2025)	No effect	Not significant	None	None
Phase 4 in-lake works - disturbance arising from displaced wintering birds	Other Statutory Sites (Borough to National value)	Short-term, temporary	Local	Negative significant	None	Minor Negative
Refurbishment works to canal bridge – direct and indirect impacts	London's Canals SINC / Grand Union Canal (Regional)	Short-term, temporary, intermittent	No effect	Not significant	None	None
Construction works – direct and indirect impacts	Coppermill Down SINC (Borough)	None	No effect	None	None	None
Construction works – direct and indirect impacts	Broadwater Lake Nature Reserve (Borough)	None	No effect	None	None	None
Construction works – direct and indirect impacts	River Colne (Regional)	None	No effect	None	None	None
Construction works at the peninsula	Badger (Local)	Short-term, temporary	Local, minor	Not significant	None	Negligible
Construction works at the peninsula - lighting	Bats (foraging) (Borough)	None	No effect	None	None	None

Effect	Receptor (IEF) (Sensitivity)	Temporal Scale	Scale of Impact (geographic scale)	Significance of Effect	Additional Mitigation and Monitoring	Significance of Residual Effect
Canal bridge refurbishment affecting summer / day / mating roost for up to 3 soprano pipistrelles (low conservation value)	Bats (roosting) (Borough)	Permanent	No effect	None	None	None
Clearance prior to construction works at the BSC and peninsula	Reptiles (Local)	None	No effect	None	None	None
Disturbance arising from construction works in-lake	Otter (Local)	Short-term, temporary	Zone of Influence,	Not significant	None	Negligible
Noise and vibration disturbance from dredging works and island construction	Fish (Local)	Short-term, temporary	Zone of Influence,	Not significant	None	Negligible
Construction works at the peninsula – direct impacts	Terrestrial invertebrates (Local)	None	No effect	None	None	None
Construction works – direct and indirect effects	Aquatic invertebrates (Local)	None	No effect	None	None	None
Construction works at the peninsula – indirect impacts (falling into open excavations at night	Hedgehog (Local)	None	No effect	None	None	None
Canal bridge refurbishment works - accidental damage	Black poplar (Borough)	None	No effect	None	None	None
Construction works - spread of existing INNS or introduction of new INNS	Terrestrial and aquatic INNS	None	No effect	None	None	None
Operational						

Effect	Receptor (IEF) (Sensitivity)	Temporal Scale	Scale of Impact (geographic scale)	Significance of Effect	Additional Mitigation and Monitoring	Significance of Residual Effect
Operation traffic – air quality impacts	Mid-Colne Valley SSSI (National)	None	No effect	None	None	None
Enhancement of lake condition	Designated feature of Mid-Colne Valley SSSI: Open standing water – (Regional)	Long-term	Regional	Positive significant	None	Moderate Positive
Operation of HOAC; relocation of BSC during the breeding bird season	SSSI designated assemblages of breeding birds: Mixed: open water, lowland fen, lowland marsh (Borough) Variety of species (Borough)	Permanent	Local to Regional	Positive significant	None	Minor to Moderate Positive
Relocation and operation of BSC during the wintering bird season – reduction of disturbance baseline	SSSI designated aggregations of non-breeding birds: variety of wintering species (National) Tufted duck Athya fuligula (Borough)	Permanent	Up to National	Positive significant	None	Major Positive
Operation of HOAC at the peninsula	Woodland (Borough)	None	No effect	None	None	None
Operation of HOAC at the peninsula	SSSI designated assemblage of breeding birds – mixed: lowland woodland, lowland scrub (Borough)	Long-term	Local	Positive significant	None	Minor Positive
Relocation and operation of BSC during the wintering bird season Operation of HOAC during the breeding season	Other Statutory Sites (Borough to National value)	None	No effect	None	None	None

Effect	Receptor (IEF) (Sensitivity)	Temporal Scale	Scale of Impact (geographic scale)	Significance of Effect	Additional Mitigation and Monitoring	Significance of Residual Effect
Operation of the Proposed Development	London's Canals SINC / Grand Union Canal (Regional)	None	No effect	None	None	None
Operation of the Proposed Development	Coppermill Down SINC (Borough)	None	No effect	None	None	None
Operation of the Proposed Development	River Colne (Regional)	None	No effect	None	None	None
Operation of the Proposed Development – effect of habitat enhancements	Badger (Local)	Permanent	Local	Positive significant	None	Minor Positive
Operation of the Proposed Development – effect of habitat management and enhancement	Bats (foraging) (Borough)	Long-term	Borough	Positive significant	None	Moderate Positive
Operation of the Proposed Development – provision of bat boxes	Bats (roosting) (Borough)	Long-term	Borough	Positive significant	None	Moderate Positive
Operation of the Proposed Development – effect of habitat management and enhancement	Reptiles (Local)	Long-term	Local	Positive significant	None	Minor Positive
Operation of the Proposed Development – effect of habitat management and enhancement	Otter (Local)	Long-term	Zone of Influence	Positive, not significant	None	Negligible
Operation of the Proposed Development – effect of habitat management and enhancement	Fish (Local)	Long-term	Local	Positive significant	None	Minor Positive
Operation of the Proposed Development – effect of habitat management and enhancement	Aquatic invertebrates (Local)	Long-term	Local	Positive significant	None	Minor Positive

Effect	Receptor (IEF) (Sensitivity)	Temporal Scale	Scale of Impact (geographic scale)	Significance of Effect	Additional Mitigation and Monitoring	Significance of Residual Effect
Operation of the Proposed Development – effect of habitat management and enhancement	Terrestrial invertebrates (Local)	Long-term	Local	Positive significant	None	Minor Positive
Operation of the Proposed Development – effect of habitat management and enhancement	Hedgehog (Local)	None	No effect	None	None	None
Operation of the Proposed Development – effect of habitat management and enhancement	Black poplar (Borough)	Very long-term	Local to Borough	Positive significant	None	Minor to Moderate Positive
Operation of the Proposed Development – long-term management	Terrestrial and aquatic INNS	Long-term	Borough	Positive significant	None	Moderate Positive
Cumulative						
Construction phase of the Proposed Development – in-lake works between October and November 2024 – coinciding with construction of HS2 Colne Valley Viaduct	Mid-Colne Valley SSSI designated assemblages: Aggregations of non-breeding birds: variety of wintering species (National) & Tufted duck Athya fuligula (Borough)	None	No effect	None	None	None
Operation of HOAC during the breeding bird season – coinciding with operation of HS2 from 2026 or 2027 onwards	Mid-Colne Valley SSSI designated assemblages: Assemblages of breeding birds: Mixed: open water, lowland fen, lowland marsh (Borough) & Variety of species (Borough)	None	No effect	None	None	None

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