Appendix A

TOPIC BASED SCHEMES ASSESSMENT: AoS FOR AIRPORTS NPS

A-5 BIODIVERSITY

June 2018

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5 BIODIVERSITY

5.1 INTRODUCTION

5.1.1 This topic based assessment considers each airport expansion scheme under the Biodiversity topic. These are London Heathrow Extended Northern Runway (LHR-ENR), London Heathrow Northwest Runway (LHR-NWR) and London Gatwick Second Runway (LGW-2R) (together the Shortlisted Schemes).

5.1.2 By law, before designating an Airports National Policy Statement (NPS) an Appraisal of Sustainability (AoS) must be carried out. This AoS is a strategic level assessment. It is based on the contents of the Airports NPS. The AoS considers alternatives to the Government's preferred scheme as set out in the Airports NPS, including the outline masterplans supplied to the Airports Commission for the three shortlisted schemes. This AoS considers the impacts of expansion without the benefits of the mitigation package put forward by scheme promoters, unless stated otherwise. The Government has outlined that it expects a significant mitigation package to be put in place by the promoter of its preferred scheme to ensure that wherever possible significant effects are avoided, reduced or offset.

5.1.3 Further project-level design will be required which will inform an environmental impact assessment carried out by the promoter. This would include an assessment, which is likely to include effects identified in the AoS as well as more detailed mitigation developed as detailed design progresses. This will also be developed through consultation with both affected communities and other stakeholders.

5.1.4 The assessment builds on the previous evaluation undertaken as part of the Airports Commission's (AC) Sustainability Appraisal, but also responds to the AoS Appraisal Framework. The Framework addresses issues identified through a review of plans, policies and programmes, and the national baseline.

5.1.5 Each expansion scheme is considered against the AoS Appraisal Framework Objectives, and Questions. The Objectives and Questions which are addressed within this assessment are as follows:

- **AoS Objective 7:** To protect and enhance designated sites for nature conservation.
  - **AoS Question 12:** Will it affect internationally, nationally and locally designated biodiversity sites?
- **AoS Objective 8:** To conserve and enhance undesignated habitats, species, valuable ecological networks and ecosystem functionality.
  - **AoS Question 13:** Will it conserve and enhance undesignated habitats, internationally and nationally protected species and valuable ecological networks, such as priority habitats and priority species?
  - **AoS Question 14:** Will it increase the exposure of wildlife to transport noise, air pollution, and water pollution?

5.2 POLICY AND LEGISLATION

5.2.1 The following policy and legislation relevant to this assessment are summarised below and their context and applicability is explained as appropriate in the relevant sections of the assessment.

The Conservation of Habitats and Species Regulations 2010

5.2.2 The Habitats Regulations transpose the provisions of Directive 92/43/EEC ("*the Habitats Directive*") and Directive 2009/147/EC ("*the Wild Birds Directive*").

5.2.3 The Regulations provide for the designation and protection of 'European sites', the protection of 'European protected species', and the adaptation of planning and other controls for the protection of European Sites. Under the Habitats Regulations, competent authorities i.e. any Minister, government department, public body, or person holding public office, have a general duty, in the exercise of any of their functions, to have regard to the EC Habitats Directive.

5.2.4 Airport expansion has the potential to adversely affect European protected sites and species both directly and indirectly.

5.2.5 Screening and appropriate assessment (AA) under the Habitats Regulations have also been undertaken and the AoS cross references this work and takes the conclusions and recommendations into account.

The Wildlife and Countryside Act 1981, as amended (WCA)

5.2.6 The WCA affords the protection of wildlife (birds, animals and plants), countryside, national parks, public rights of way and the designation of protected areas such as Sites of Special Scientific Interest (SSSI) or limestone pavement orders.

5.2.7 The WCA also prohibits the release of non-native species into the wild (Section 14). This is to prevent the release of exotic species that could threaten our native wildlife. The legislation does not prohibit capturing and keeping these animals but it makes re-releasing them an offence.

The Countryside and Rights of Way Act 2000 (CRoW)

5.2.8 The CRoW Act strengthens legal protection for threatened species and brings up to date the WCA.

The Natural Environment and Rural Communities Act 2006 (NERC)

5.2.9 The NERC Act is primarily intended to implement key aspects of the Government's Rural Strategy published in July 2004[1]; it also addresses a wider range of issues relating broadly to the natural environment.

5.2.10 The NERC Act established an independent body – Natural England – responsible for conserving, enhancing and managing England's natural environment for the benefit of current and future generations.

5.2.11 The NERC Act makes provision in respect of biodiversity, pesticides harmful to wildlife and the protection of birds, and in respect of invasive non-native species. It alters enforcement powers in connection with wildlife protection, and extends time limits for prosecuting certain wildlife offences.

5.2.12 The NERC Act places a duty on the Secretary of State to publish, review and revise lists of living organisms and types of habitat in England that are of principal importance for the purpose of conserving English biodiversity, and to consult Natural England before doing so. These lists are known as Biodiversity Action Plan priority habitats, and species.

[1] Department for Environment, Food and Rural Affairs, 2004. *The Rural Strategy 2004*. [online] Accessed 06/01/2017.

National Planning Policy Framework 2012[2] (NPPF)

5.2.13 In the context of biodiversity the NPPF identifies that the planning system should contribute to and enhance the natural and local environment by:

- Recognising the wider benefits of ecosystem services; and
- Minimising impacts on biodiversity and providing net gains in biodiversity where possible, contributing to the government's commitment to halt the overall decline in biodiversity, including by establishing coherent ecological networks that are more resilient to current and future pressures.

The UK Post-2010 Biodiversity Framework (2011-2020)[3]

5.2.14 The Framework succeeds the earlier UK Biodiversity Action Plan (UK BAP)[4] and 'Conserving Biodiversity – The UK Approach'[5] .

5.2.15 The Framework covers the period from 2011 to 2020, and was developed in response to two main drivers: the Convention on Biological Diversity's (CBD's) Strategic Plan for Biodiversity 2011-2020 and its five strategic goals and 20 'Aichi Biodiversity Targets', published in October 2010; and the EU Biodiversity Strategy (EUBS), released in May 2011.

5.2.16 The strategic goals of the Biodiversity Framework remain similar to previous iterations:

- Address the underlying causes of biodiversity loss by mainstreaming biodiversity across government and society;
- Reduce the direct pressures on biodiversity and promote sustainable use;
- To improve the status of biodiversity by safeguarding ecosystems, species and genetic diversity;
- Enhance the benefits to all from biodiversity and ecosystems; and
- Enhance implementation through participatory planning, knowledge management and capacity building.

Biodiversity 2020: A strategy for England's wildlife and ecosystem services[6]

5.2.17 This biodiversity strategy for England builds on the Natural Environment White Paper and outlines how international and EU commitments are being implemented. It sets out the strategic direction for biodiversity policy for the next decade on land (including rivers and lakes) and at sea.

5.2.18 The strategy includes the following priorities:

- Creating 200,000 hectares of new wildlife habitats by 2020;
- Securing 50% of SSSIs in favourable condition, while maintaining at least 95% in favourable or recovering condition;
- Trialling new approaches to setting fishing quotas to reduce discards;

[2] Department for Communities and Local Government, 2012. *The National Planning Policy Framework*. [online] Accessed 05/07/2016.
[3] JNCC and Defra,2012. *UK Post-2010 Biodiversity Framework*. [online] Accessed 05/07/2016.
[4] Defra, 1994. *Biodiversity – The UK Action Plan*. [online] Accessed 05/07/2016.
[5] Defra, 2007. *Conserving Biodiversity – The UK Approach*. [online] Accessed 05/07/2016.
[6] Defra, 2011. *Biodiversity 2020: A strategy for England's wildlife and ecosystem services.* [online] Accessed 05/07/2016.

- Encouraging more people to get involved in conservation by supporting wildlife gardening and outdoor learning programmes; and
- Introducing a new designation for local green spaces to enable communities to protect places that are important to them.

5.3 BACKGROUND TO THE ASSESSMENT

5.3.1 The assessment is based on the following reports:

- Airports Commission, 2015. *Final Report*[7];
- Jacobs, 2014. *Biodiversity Baseline Report*[8];
- Jacobs, 2014. *Biodiversity Assessment Report*[9]; and
- Jacobs, 2014. *Biodiversity: Ecosystem Services Report*[10].

5.3.2 A Habitats Regulations Assessment[11] has also been undertaken in parallel which is relevant and included in this assessment.

5.4 INTERACTION WITH OTHER TOPICS

5.4.1 The assessment of Biodiversity is closely related to other topic-based assessments in this report. In particular, the following interactions are noted within Table 5.1.

Table 5.1: Interaction of the Biodiversity Topic with Other Topics

Topic	Interaction
Noise	Biodiversity can be adversely affected by noise; disturbance of flora can affect breeding and foraging.
Air Quality	Changes in air quality can impact biodiversity receptors via deposition, in particular nitrogen deposition
Landscape	Loss of landscape features also affects biodiversity. Landscape mitigation can affect biodiversity depending on design and species used. Use of green infrastructure can benefit both landscape and biodiversity.
Water	Water quality (ecological and chemical), quantity and geomorphology can result in effects on aquatic habitats and the overall biodiversity of water bodies. Biodiversity is directly impacted by changes related to a river channel, flow rates and routes as well as storage areas and water level trends (including groundwater level patterns).
Quality of Life	Access to nature has an indirect link to well-being, any changes to habitat type and distribution may affect QoL of residents and other receptors.
Community	Changes to biodiversity can have an indirect effect on areas that are culturally valued or offer opportunities to interact with biodiversity by communities.

[7] Airports Commission, 2015. *Final Report*. [online] Accessed 06/01/2016.
[8] Jacobs, 2014. *7. Biodiversity: Baseline*. [online] Accessed 06/01/2016.
[9] Jacobs, 2014. *7. Biodiversity: Assessment*. [online] Accessed 06/01/2016.
[10] Jacobs, 2014. *7. Biodiversity: Ecosystem Services*. [online] Accessed 06/01/2016.
[11] WSP | Parsons Brinckerhoff, 2016. *Aviation Capacity Habitats Regulations Assessment; Statement to Inform Appropriate Assessment.*

5.5 ASSESSMENT CRITERIA

5.5.1 The general criteria used for assessing significant effects within the AoS are set out in the methodology in Section 3 of the AoS to which this appendix is attached. It should be noted that schemes are assessed individually against the requirements of the SEA Regulations and presented together for comparison. This means that although the nature of effects can vary between schemes, the significance may be the same.

5.5.2 The AoS schemes were appraised against the AoS Objectives and Questions using the notation set out in Table 5.2.

Table 5.2: Identification of Significant Effects in the AoS

++	*Significant positive effect*
+	*Positive effect*
-	*Negative effect*
--	*Significant negative effect*
+/-, ++/--	*Mixed positive and negative effect*
?	*Uncertain effect*
0	*No relationship / neutral effect*

5.5.3 In addition to the general criteria, consideration has been given to ecological impact guidance which is provided by the Chartered Institute of Ecology and Environmental Management (CIEEM)[12]. Whilst developed for the purpose of Environmental Impact Assessment chapters the guidance provides useful context in determining potentially significant effects.

5.5.4 CIEEM defines a significant effect as an effect that either supports or undermines biodiversity conservation objectives for important ecological features or for biodiversity in general. Conservation objectives may be specific (e.g. for a designated site) or broad (e.g. national/local nature conservation policy) or more wide-ranging (enhancement of biodiversity). Effects can be considered significant at a wide range of scales from international to local.

5.5.5 CIEEM identifies that significant effects encompass impacts on structure and function of defined sites, habitats ecosystems and the conservation status of habitats and species (including extent, abundance and distribution):

- → Habitats – conservation status is determined by the sum of the influences acting on the habitat that may affect its extent, structure and functions as well as its distribution and its typical species within a given geographical area;
- → Species – conservation status is determined by the sum of influences acting on the species concerned that may affect its abundance and distribution within a given geographical area.

[12] CIEEM, 2016. *Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater and Coastal, 2nd edition*. Chartered Institute of Ecology and Environmental Management, Winchester.

5.5.6 Positive and negative effects are determined according to whether the change is in accordance with nature conservation objectives and policy:

- Positive impact – a change that improves the quality of the environment e.g. by increasing species diversity and generating net gains, extending habitat or improving water quality. Positive impacts may also include halting or slowing an existing decline in the quality of the environment;
- Negative impact – a change which reduces the quality of the environment e.g. destruction of habitat, removal of species foraging habitat, habitat fragmentation, pollution.

5.6 SUMMARY OF BASELINE AND ISSUES

NATIONAL BASELINE

5.6.1 England has a high diversity of habitats and many distinctive species, reflecting its geographical position. Many are of European or world-wide importance. For example[13]:

- England has globally important populations of breeding seabirds, wintering waders and wildfowl, and 18% of the world's heathland;
- England possesses important populations of bats and oceanic lichens, and more than half the European species of bryophytes including one moss not recorded anywhere else in the world;
- England is rich in veteran trees in ancient woodland and parklands;
- England has more chalk rivers than any other country in Europe and over half the European resource of chalk coasts; and
- Nearly 20% of Europe's Atlantic and North Sea estuaries are in England.

5.6.2 There are a number of internationally and nationally designated sites for nature conservation in England. In 2015/16 there were:

- 83 Special Protection Areas (SPAs) of which over 97% are in favourable or recovering condition[14];
- 254 Special Areas of Conservation (SACs) of which over 96% are in favourable or recovering condition[15];
- 72 Ramsar sites (wetlands of international importance)[16];
- 4,129 SSSIs of which over 95% are in favourable or recovering condition[17]; and
- 225 National Nature Reserves of which over 96% are in favourable or recovering condition[18].

5.6.3 There are also a number of Local Nature Reserves (LNRs) and non-statutory locally designated sites for nature conservation.

[13] Natural England, 2008. *State of the Natural Environment 2008* (NE85), Chapter 3 Biodiversity. [online] Accessed 28/07/2016.
[14] Natural England, 2016. *SPA Condition Summary*. [online] Accessed 28/07/216.
[15] Natural England, 2016. *SAC Condition Summary*. [online] Accessed 28/07/2016.
[16] JNCC, 2015. *Designated and Proposed Ramsar sites in the UK as at 7 September 2015*. [online] Accessed 28/07/2016.
[17] Natural England, 2016. *SSSI Condition Summary*. [online] Accessed 01/02/2016.
[18] Natural England, 2016. *NNR Condition Summary*. [online] Accessed 01/02/2016.

UK BAP priority habitats cover a wide range of semi-natural habitat types, and were those that were identified as being the most threatened and requiring conservation action under the UK BAP[19]. Much of the work is now focused on the county level and considered within the lists of priority species and habitats in England, as required under Section 41 of the NERC Act 2006.

5.6.4 A summary of the existing biodiversity baseline features identified and recorded in the baseline reports[8] is provided below for each of the scheme locations.

LOCAL BASELINE

LONDON GATWICK SECOND RUNWAY (LGW-2R)

Statutory Sites

5.6.5 There are three sites of importance for biodiversity at International (European) level within 15 km of the footprint of the LGW-2R scheme, these are:

- Ashdown Forest SAC 12 km to the southeast;
- Ashdown Forest SPA, 12 km to the southeast; and
- Mole Gap to Reigate Escarpment SAC, 10 km to the north.

5.6.6 There are a further two SACs within 30 km of the scheme, which are designated for important bat populations: The Mens SAC (25 km southwest) and Ebernoe Common SAC (29 km west).

5.6.7 There are 35 SSSIs within 15 km of LGW-2R. There are four SSSIs within 5 km, with Glover's Wood SSSI being the only one within 2 km of the scheme boundary. This is currently identified as being in 100% favourable condition based on trend data on general site condition, as defined by Natural England.

5.6.8 There are six LNRs within 5 km of the LGW-2R scheme boundary, with three within 2 km (Edolph's Copse LNR and Grattons Park LNR).

Non-Statutory Sites

5.6.9 The Biological Records Centres have provided information on 46 non-statutory sites within 5 km of the scheme boundary. All are Sites of Nature Conservation Importance (SNCIs). Three of these sites fall within the scheme footprint: Horleyland Wood SNCI, Rowley Wood SNCI and, Willoughby Fields SNCI.

Habitats and Species

5.6.10 There is a significant amount of ancient semi-natural woodland within the footprint, and within 5 km of the LGW-2R scheme. In addition the following priority habitats are all known to be present;

- Lowland mixed deciduous woodland;
- Hedgerow (including ancient hedgerow); and
- Rivers, brooks and ponds.

5.6.11 The Low Weald National Character Area (NCA), in which the scheme is proposed, is amongst the most important areas for bats in terms of species diversity including internationally important populations of Bechstein (*Myotis bechsteinii*) associated with designated sites.

[19] JNCC, 2015. *UK BAP priority habitats*. [online] Accessed 06/01/2016.

5.6.12 It is considered likely that the area would support a range of species protected under UK and EU wildlife legislation including but not limited to bat species, dormice (*Muscardinus avellanarius*), and great crested newts (*Triturus cristatus*). In addition it is likely the area will support species of principal importance as identified under Section 41 of the NERC Act 2006.

LHR-ENR

Statutory Sites

5.6.13 There are eight sites of importance for biodiversity at International (European) level within 15 km of the footprint of the proposed LHR-ENR scheme, these are:

- South West London Waterbodies (SWLW) SPA and Ramsar (two sites), on the boundary to the south;
- Windsor Forest and Great Park SAC, 4.9 km to the west;
- Richmond Park SAC, 8.2 km to the east;
- Burnham Beeches SAC, 10.1 km to the northeast;
- Thursley, Ash, Pirbright and Chobham SAC, 10.6 km southwest;
- Thames Basin Heaths SPA, 10.6 km southwest; and
- Wimbledon Common SAC, 11.9 km east.

5.6.14 The SWLW SPA and Ramsar site is located on the scheme boundary. This site supports internationally important numbers of the ducks gadwall and shoveler (the qualifying interest species of the SPA). There are no European designated sites within 15-30 km of the airport boundary designated for important bat populations.

5.6.15 There are 40 SSSIs and four NNRs within 15 km of the proposed scheme. There are eight SSSIs within 5 km, the following four of which are within 2 km of the proposed boundary: Wraysbury Reservoir SSSI; Wraysbury and Hythe End Gravel Pits SSSI; Wraysbury No 1 Gravel Pit SSSI; and Staines Moor SSSI. Staines Moor SSSI is within the footprint of the scheme. All SSSIs within the 5 km buffer are in either favourable or unfavourable recovering status barring a small section (under 2%) of Staines Moor SSSI in unfavourable declining condition.

5.6.16 There are eight LNRs within 5 km of the scheme boundary, with the following four within 2 km: Cranebank LNR; Bedfont Lakes LNR; Hounslow Heath LNR; and, Arthur Jacobs Nature Reserve LNR.

Non-Statutory Sites

5.6.17 The Local Biological Records Centres provided information on 85 non-statutory sites within 5 km of the proposed scheme. All are designated for their county importance for wildlife although these are allocated different designation names depending on the county that they are within. The breakdown is: five Local Wildlife Sites (LWS); 60 Sites of Importance for Nature Conservation (SINC); 18 SNCI; and two Conservation Target Areas (CTAs).

Habitats and Species

5.6.18 Within the scheme boundary and surrounding area the following priority habitats have been identified:

- Coastal and floodplain grazing marsh;
- Deciduous woodland;

- Good quality semi-improved grassland;
- Lowland calcareous grassland;
- Lowland dry acid grassland;
- Lowland fen;
- Lowland heathland;
- Lowland meadows;
- Purple moor grass and rush pasture;
- Reedbeds; and
- Traditional orchards.

5.6.19 Based on the available information the presence of key protected species including bats, otter (*Lutra lutra*), water vole (*Arvicola amphibius*), reptiles (including grass snake (*Natrix natrix*) and slow worm (*Anguis fragilis*)), and various species of birds within 2 km of the scheme boundary have been identified. It is considered feasible that the area would support a range of other species protected under UK and EU wildlife legislation including but not limited to dormice, and great crested newts. In addition it is likely the area will support habitats and species of principal importance as identified under Section 41 of the NERC Act 2006.

LHR-NWR

Statutory Sites

5.6.20 There are eight sites of importance for biodiversity at International (European) level within 15 km of the footprint of the proposed LHR-NWR scheme. These are:

- SWLW SPA and Ramsar (two sites), on the boundary to the southeast;
- Windsor Forest and Great Park SAC, 6.2 km to the west;
- Richmond Park SAC, 7.5 km to the east;
- Burnham Beeches SAC, 10.2 km to the northeast;
- Thursley, Ash, Pirbright and Chobham SAC, 10.8 km southwest;
- Thames Basin Heaths SPA, 10.8 km southwest; and
- Wimbledon Common SAC, 11.1 km east.

5.6.21 The SWLW SPA and Ramsar site is located on the boundary of the proposed scheme and this site supports internationally important numbers of the ducks gadwall and shoveler (the qualifying interest species of the SPA). There are no European designated sites within 15-30 km of the airport boundary designated for important bat populations.

5.6.22 There are 35 SSSIs and four NNRs within 15 km of the proposed scheme. There are seven SSSIs within 5 km, with Wraysbury Reservoir SSSI and Staines Moor SSSI. All SSSIs within the 5 km buffer are in either favourable or unfavourable recovering status barring a small section (under 2%) of Staines Moor SSSI in unfavourable declining condition.

Non-Statutory Sites

5.6.23 There are seven LNRs within 5 km of the scheme boundary, with five within 2 km (Cranebank LNR; Bedfont Lakes LNR; Hounslow Heath LNR; Arthur Jacobs Nature Reserve LNR; and, Pevensley Road LNR).

5.6.24 The Local Biological Records Centres provided information on 80 non-statutory sites within 5 km of the proposed scheme. All are designated for the county importance for wildlife although are allocated different designation names depending on the county that they are within. The breakdown is: 62 SINC; and, 18 SNCI.

Habitats and Species

5.6.25 Within the scheme boundary and surrounding area the following priority habitats have been identified;

- Coastal and floodplain grazing marsh;
- Deciduous woodland;
- Good quality semi-improved grassland;
- Lowland calcareous grassland;
- Lowland dry acid grassland;
- Lowland fen;
- Lowland heathland;
- Lowland meadows;
- Purple moor grass and rush pasture;
- Reedbeds; and
- Traditional orchards.

5.6.26 Key species include various bats, otter, water vole, reptiles (including grass snake and slow worm), and various species of birds. Pennyroyal (*Mentha pulegium*) is present at the Lower Colne SINC. This is a nationally rare plant species, listed as a UK Priority Species by Joint Nature Conservation Committee (JNCC), and species of Principal Importance under Section 41 of the NERC Act (2006). It is considered feasible that the area would support a range of other species protected under UK and EU wildlife legislation including but not limited to dormice and great crested newts. In addition it is likely the area will support habitats and species of principal importance as identified under Section 41 of the NERC Act 2006.

FUTURE BASELINE AND ISSUES

5.6.27 It is assumed that for statutory internationally and nationally designated sites there would be no decline in their condition over time due to the protection they are afforded[20]. It is assumed that measures to respond to Natural England's Biodiversity 2020 target of securing 50% of SSSIs in a favourable condition, and 95% in a favourable or recovering condition[6] would continue to be successful. It is likely that the legal benefits that European designations provide to conservation will come to be of growing importance as the demands for undeveloped land become increasingly pressured in line with population rise and associated development needs. A potential limiting factor would be the UK position within the EU and the associated legislation. However for the purpose of this assessment it is assumed all designated sites will remain protected.

[20] Jacobs, 2014. *7. Biodiversity: Assessment*. [online] Accessed 06/01/2016.

5.6.28 There is likely to be an increasing integration of the Natura 2000 Network with sites that are located outside the boundaries of designated sites. The importance of wildlife conservation outside designated sites is recognised in the Habitats Directive (European Council Directive 92/43/EEC)[21], e.g. in the measures required to protect species listed on Annexes IV and V (Articles 12-16). Article 10 acknowledges that the series of Natura 2000 sites should function as an ecologically coherent network. It stresses the importance of managing landscape features such as river banks, hedgerows and ponds, to facilitate species migration and dispersal, and generally to provide an ecological infrastructure which supports the protected sites network. In addition, The Natural Environment White Paper, Commitment 32[22] recognises the important role that transport networks can play in contributing to coherent and resilient ecological networks.

5.6.29 Overall, climate change could lead to:

- Changes in phenology (including changes in the timings of seasonal events causing loss of synchronicity and increased competitive advantage for some species at the expense of others);
- Shifts in suitable climate conditions for individual species leading to change in species distribution, abundance and range;
- Changes in the community structure and ecosystem function of habitats which species occupy;
- Changes to the composition and structure of plant and animal communities (including arrival of non-natives, loss of native species and increase in pest species);
- Changes to habitats and ecosystems, such as altered water regimes, increased rates of decomposition in bogs and higher growth rates in forests; and
- Loss of physical space due to sea level rise and increased storminess[23].

5.6.30 Climate change effects are compounded by the influences of population growth and the built environment that increasing populations generate. Pressures for undeveloped land are likely to be greater than ever before and this poses a threat to those areas of non-designated land that fulfil so many valuable functions to ecosystems. Increasingly water resources will need to be safe-guarded and managed to maximum efficiency.

5.7 MITIGATION INCLUDED IN ASSESSMENT

5.7.1 This section provides an overview of the information provided by the scheme promoters and the assessment work completed by the AC; it does not assess the appropriateness of the scheme designs. The Assessment of Shortlisted Schemes (Section 5.9) assesses this detail further for the purpose of the AoS Appraisal and where any differences are identified these are presented in Section 5.9.

LGW-2R

5.7.2 A framework of specific mitigation commitments tied to local and regional biodiversity initiatives has been described by the scheme promoter. Mitigation and compensation proposals and strategies are provided against predicted impacts, and identified relevant ecological receptors.

[21] Council of the European Union, 1992. *Council Directive 92/43/EEC on the Conservation of natural habitats and of wild fauna and flora*. [online] Accessed 06/01/2016.
[22] Defra, 2014. *Natural Environment White Paper*. [online] Accessed 13/10/2015.
[23] Inter-Agency Climate Change Forum, 2010. *Biodiversity and Climate Change: A Summary of Impacts in the UK*. [online] Accessed 06/01/2016.

5.7.3 Table 5.3 is reproduced from Jacobs[24] and provides an outline summary of areas/receptors impacted, with corresponding compensatory habitat extents, as assessed by Jacobs and the scheme promoter. Areas of proposed compensation are quantified on a 2:1 ratio unless otherwise stated.

5.7.4 It was recommended[25] that precautionary allowances were applied for the possibility that protected species might exist in agricultural land not captured within designated sites or priority habitats (10% of the 382 ha agricultural land extent within the scheme footprint, as measured by Jacobs), and for the potential for indirect effects discussed above (10% of the total compensatory habitat calculation). The allowance of 10% is acknowledged to be an arbitrary figure, but was considered to be a reasonable value for the purpose of this assessment.

5.7.5 The 'Surface Access' impact column in Table 5.3 shows extents of priority habitats potentially directly impacted by the proposed road access infrastructure network for the option, as calculated by Jacobs. Estimates for compensation measures for these particular potential losses are also included in the compensation areas.

Table 5.3: LGW-2R impact and compensation summary

Feature	Impact			Compensation	
	Area (ha) or Lengths (km)			Area (ha) or Lengths (km)	
	GAL	Jacobs	Surface Access	GAL	Jacobs
Designated Sites					
Willoughby Fields LNR/SNCI	20ha	25.8ha		Not quantified	(Covered through Priority habitat compensation – see below)[)]
Rowley Wood SNCI	Not specified	3.7ha		Not quantified	
Total Designated Sites	20ha	29.5ha			
Priority Habitats					
Deciduous woodland	62.1ha	62.1ha	13.4ha	2:1 ratio proposed	151 ha
Ancient woodland (taken from within deciduous woodland)	14.2ha	14.2ha		3:1 ratio proposed	71ha (5:1 ratio)
Traditional orchard	Not specified	0.28ha		Not specified	0.5ha
Hedgerow	49.7km (inc. 25.3km of ancient hedgerow)	Not calculated		Not quantified	124.7km
Rivers and Brooks	3.5km	7.2km		Not quantified	14.3km
Protected Species					
Protected species outwith designated sites and PHs	Not specified	38.2 ha[(4)]		Not specified	38.2ha
Indirect Impacts	Not specified	11.5		Not specified	23.0ha
Total Habitat and Protected Species	**62.1ha**	**92.09ha**	**13.4ha**	**124.2ha**	**283.7ha**
Total KM	**3.5km**	**7.2km**			**139km**

[24] Jacobs, 2014. *7. Biodiversity: Assessment,* p. 15, Table 2.3. [online] Accessed 06/01/2016.
[25] Jacobs, 2014. *7. Biodiversity: Assessment*, p. 12 [online] Accessed 06/01/2016.

5.7.6 It was identified[26] that the area to the west is an existing SSSI with favourable status, and the area east of the airport is within a biodiversity improvement area, which falls within the proposed airport development area. It is not clear how the compensation proposals could be delivered adequately within these areas or if other locations outside these are proposed.

5.7.7 It was identified[27] that the scheme promoter commits to replacing ancient woodland at a 3:1 ratio with newly planted woodland, and 'other' woodland at 2:1. An area of 8ha of ancient woodland is likely to be lost, and an additional 6.2 ha impacted equating to total of 14.2 ha impacted. The scheme promoter indicates that the impacts on a large part of this additional ancient woodland area would be mitigated through management approaches to keep within required height restrictions.

5.7.8 It was identified[28] that significant local biodiversity enhancement opportunities exist in relation to the River Mole and its tributaries, in that whilst there will be some loss of natural sections of channel, other sections currently canalised and culverted can be re-naturalised.

5.7.9 It was identified[29] that as the proposed scheme is on a similar alignment to the existing runway and will sit in the same habitat type, the overall birdstrike risk per flight on the new runway is likely to be similar to that on the existing site, providing that any environmental compensation for lost habitats is appropriately designed and sited.

LHR-ENR

5.7.10 A framework of specific mitigation commitments tied to local and regional biodiversity initiatives has been described by the scheme promoter. Mitigation and compensation proposals and strategies are provided against predicted impacts, and identified relevant ecological receptors.

5.7.11 Table 5.4 is reproduced from Jacobs[30] and provides an outline summary of areas / receptors impacted, with corresponding compensatory habitat compensation extents, as assessed by Jacobs and the scheme promoter.

Table 5.4: LHR-ENR impact and compensation summary

Feature	Impact			Compensation	
	Area (ha) or Lengths (km)			Area (ha) or Lengths (km)	
	Hub	Jacobs	Surface Access	Hub	Jacobs
Designated Sites					
East Poyle Meadows SNCI (SSSI component)	2.9 ha	2.9 ha		4 ha swamp	(Covered through Priority habitat compensation – see below)
Arthur Jacob LNR (SSSI component)	4.1 ha	4.1 ha		8.2 ha wet woodland	
Greenham's Fishing Pond SINC	Not specified	0.45ha		26 ha pond	
Management Unit 1 (Poyle Meadow) of Staines Moor SSSI	8.7 ha	8.0 ha		18 ha species-rich neutral grassland	
Lower Colne SMINC	Not specified	10-15 ha		40 ha	
River Colne (From County boundary to Staines Moor)	Not specified	1.25 ha		Not specified	

[26] Jacobs, 2014. 7. *Biodiversity: Assessment*, p. 13. [online] Accessed 06/01/2016.
[27] Jacobs, 2014. 7. *Biodiversity: Assessment*, p. 14. [online] Accessed 06/01/2016.
[28] Jacobs, 2014. 7. *Biodiversity: Assessment*, p. 16. [online] Accessed 06/01/2016.
[29] Jacobs, 2014. 7. *Biodiversity: Assessment*, p. 16. [online] Accessed 06/01/2016.
[30] Jacobs, 2014. 7. *Biodiversity: Assessment*, p. 41, Table 2.9. [online] Accessed 06/01/2016.

Feature	Impact			Compensation	
	Area (ha) or Lengths (km)			Area (ha) or Lengths (km)	
	Hub	Jacobs	Surface Access	Hub	Jacobs
Stanwell Moor SNCI					
Total Designated Sites*	**15.7ha**	**31.7ha**		**Not specified**	
Priority Habitats					
Deciduous woodland	16.2 ha	26.2 ha	30.1 ha	32.4 ha	122.4 ha
Traditional orchard	0.5 ha	0.5 ha		1 ha	1 ha
Lowland meadows	8.6 ha	6.5 ha	32.4 ha	17.2 ha	77.8 ha
Hedgerow	49.7 km (inc. 25.3 km of ancient hedgerow)	Not calculated		Not quantified	124.7 km
Reedbeds	Not specified	0.3 ha	8.0 ha	Not specified	16.6 ha
Rivers and Brooks	6.8 km	10.4 km		6.8 km	20.8 km
Protected Species					
Protected species outwith designated sites and PHs	Not specified	16.8 ha		Not specified	16.8 ha
Indirect Impacts		7.1 ha			14.2 ha
Total Habitat and Protected Species	**25.3 ha**	**57.4 ha**	**70.5 ha**	**146.8 ha**	**248.8 ha**
Total KM	**6.8 km**	**10.4 km**		**6.8 km**	**20.8 km**

5.7.12 It was identified[31] that a default precautionary multiplier of two has been proposed by the scheme promoter to compensate for losses of habitats, and a detailed, quantified list is provided of proposed habitat creation actions. In summary this list prescribes provision of 18 ha of species-rich neutral grassland, 40 ha of fen, 4 ha of swamp / wet grassland, 8.2 ha of wetland including wet woodland, 26 ha of ponds / lakes, 32.4 ha of deciduous woodland, 1ha of traditional orchard, 17.2 ha of lowland meadow and 6.0 km of ditch. These measures give totals of 146ha of habitat and 6 km of linear watercourse. A further recommendation of 6 ha of scrub and up to 70 ha of pasture/rough grassland to compensate for the loss of these less important (not of principal importance) habitats is made by the scheme promoter.

5.7.13 Consideration of the potential requirement for areas greater than those proposed has also been made[32], to compensate for the possibility of adversely impacting the biodiversity resource of the proposed compensation sites themselves. Parcels of land totalling an area of 217 ha have been identified by the scheme promoter as possible compensation sites. This area would largely accommodate the 146 ha requirement above plus the 76 ha for scrub and rough grassland.

5.7.14 It was identified[33] that there are birdstrike management issues for LHR-ENR associated with the nearby complex of open water bodies. The western threshold of the extended runway will be significantly closer to the complex of reservoirs and gravel pits to the west of the airport including sites designated as part of the SWLW SPA and Ramsar site. The closer proximity of the runway and increased air traffic is likely to result in an increased strike risk, and a corresponding requirement for an increase in bird management and control activities is anticipated. Methods of deterring / scaring and controlling bird species potentially hazardous to

[31] Jacobs, 2014. *7. Biodiversity: Assessment*, pp. 39-40. [online] Accessed 06/01/2016.
[32] Jacobs, 2014. *7. Biodiversity: Assessment*, pp. 39-40. [online] Accessed 06/01/2016.
[33] Jacobs, 2014. *7. Biodiversity: Assessment*, pp. 42-43. [online] Accessed 06/01/2016.

aviation operations could potentially have an adverse effect on non-target species and biodiversity.

LHR-NWR

5.7.15 A framework of specific mitigation commitments tied to local and regional biodiversity initiatives has been described by the scheme promoter. Mitigation and compensation proposals and strategies are provided against predicted impacts, and identified relevant ecological receptors.

5.7.16 Table 5.5 is reproduced from Jacobs[34] and provides an outline summary of areas / receptors impacted, with corresponding compensatory habitat compensation extents, as assessed by Jacobs and the scheme promoter.

Table 5.5: LHR-NWR impact and compensation summary

Feature	Impact			Compensation	
	Area (ha) or Lengths (km)			Area (ha) or Lengths (km)	
	HAL	Jacobs	Surface Access	HAL	Jacobs**
Designated Sites					
Lower Colne SMINC	51 ha	51 ha		Not quantified	(Covered through Priority habitat compensation – see below)
Old Slade Lakes LWS	8 ha	8 ha		Not quantified	
Stanwell II SNCI	6 ha	6 ha		Not quantified	
Total Designated Sites*	65 ha	65 ha			
Priority Habitats					
Deciduous woodland	34 ha	37.3 ha	20 ha	Not quantified	114.6 ha
Traditional orchard	1.5 ha	1.5 ha	1.35 ha	Not quantified	5.7 ha
Lowland meadows			9.2 ha		18.4 ha
Reedbeds			0.3 ha		0.6 ha
Rivers and Brooks	13 km	12.3 km		Not quantified	24.6 km
Protected Species					
Protected species outwith designated sites and PHs		23.5 ha		Not specified	23.4 ha
Indirect Impacts		8.68 ha		Not quantified	17.36 ha
Total Habitat and Protected Species	**35.5 ha**	**70.98 ha**	**30.85 ha**	**331 ha (from 400 ha)**	**180.06 ha**
Total KM	**13 km**	**12.3 km**			**24.6 km**

5.7.17 It has been identified[35] that there are potential impacts to Staines Moor SSSI, specifically the alluvial meadows through which the River Colne flows. It is acknowledged that significant changes to a number of water courses, including the River Colne, would need to be made to accommodate the proposal and that these could have potentially significant impacts to the status of the SSSI, through alterations to the hydrological conditions currently supporting the SSSI. The conclusions drawn by the scheme promoter on the potential impacts are that they

[34] Jacobs, 2014. *7. Biodiversity: Assessment*, p. 41, Table 2.9. [online] Accessed 06/01/2016.
[35] Jacobs, 2014. *7. Biodiversity: Assessment*, p. 23. [online] Accessed 06/01/2016.

will be avoided through the design of channel diversions and by minimising culverting requirements, and they state that flow regimes will be maintained to avoid impacts to ecology. As long as this is achieved through the detailed design of this element of the proposal, and that the water quality, volume and flow rate are maintained (or not adversely altered), then Jacobs agrees that impacts to the SSSI should be avoided.

5.7.18 It has been identified[36] that the scheme would result in the direct loss of priority habitats as being approximately 35.5 ha of mixed deciduous woodland / traditional orchard and 13km of river. An estimate of approximately 400 ha of potentially available compensation space has been made by the scheme promoter. The direct habitat loss give a total of approximately 120 ha (the area of riparian habitat loss was calculated based on the assumption that an estimated 20 m wide corridor of riparian habitat would be lost along the 13 km length of river affected). The habitat proposal gain of 400 ha versus the potential direct loss of 120 ha gives a ratio of just over 3:1, which is likely to be sufficient, given the standard ratio of 2:1, but it is important to note that not all the areas would be of inherent significant ecological value meaning the extent of habitat actually available for ecological compensation measures is reduced.

5.7.19 It was identified[37] that the scheme contains a commitment to compensation for lost habitat as well as improvement of existing habitat for wildlife, creation of new habitat and development of outdoor leisure opportunities around the airport. The proposals include creation of wetlands, flood meadows, woodland, open water and marginal habitats. All of these areas have the potential to attract hazardous birds to the area or to change the behaviour patterns of birds that are already present and thus create an additional birdstrike risk. The need to manage the birdstrike risk is acknowledged in the scheme promoter's submission. The scheme promoter's assessment concluded that it is often very difficult to redesign environmental mitigation options to exclude hazardous species without reducing their effectiveness as a mitigation measure to a greater or lesser extent.

5.7.20 The total amount of mitigation and compensation required is detailed in the LHR-ENR scheme, along with a number of sites where such compensation could be carried out. The compensation includes 26 ha of lakes and ponds, the location of which could have a significant impact on the birdstrike risk at the airport.

5.8 APPROACH TO ASSESSMENT OF BIODIVERSITY

5.8.1 Impacts at the strategic level have been assessed for both construction and operational phases. For instance during construction, effects covered under biodiversity arise from direct land-take and disturbance from construction activities. During operation, effects would include presence of new infrastructure and indirect effects from aspects such as noise and air quality. This is addressed through the consideration of the duration of the impact (short medium and long term) within the assessment.

5.8.2 The methodology for the high level, desk based assessment is based on guidance set out in the Airports Commission: Appraisal Framework Chapter 7, Biodiversity[38], in Section 3.3 of the AoS Report and Section 5.5.

[36] Jacobs, 2014. *7. Biodiversity: Assessment*, p. 23 [online] Accessed 06/01/2016.
[37] Jacobs, 2014. *7. Biodiversity: Assessment*, p. 28. [online] Accessed 06/01/2016.
[38] Airports Commission, 2014. *Appraisal Framework*, pp. 88-93. [online] Accessed 24/12/2015.

5.9 ASSESSMENT OF SHORTLISTED SCHEMES

Objective 7: To protect and enhance designated sites for nature conservation

LGW-2R

Habitats Regulations Assessment Findings

5.9.1 The Habitats Regulations Screening Assessment (Stage 1 of the Habitats Regulation Assessment (HRA) process) has identified that the LGW-2R scheme has either the potential to result in likely significant effects, or there is uncertainty as to whether likely significant effects would arise. These potential effects are in relation to air quality impacts. Where such uncertainty exists it is necessary to apply precaution and assume that likely significant effects could arise. The potential for adverse effects could not be ruled out at:

- Mole Gap to Reigate Escarpment SAC;
- Ashdown Forest SAC; and
- Ashdown Forest SPA.

5.9.2 For these three sites the potential for likely significant effects have been identified with regard to air quality impacts associated with surface access within the initial 15 km buffer around the scheme (established during the HRA screening stage).

5.9.3 Cumulative effects may also arise due to additional sources of pollution from major infrastructure projects being carried out in support of plans, policies or programmes. Additional sources of pollution are also expected to arise from increased traffic associated with future residential development being carried out in support of local development plans.

5.9.4 Accordingly further consideration has been undertaken by way of AA (Stage 2 of the HRA process) to determine whether adverse effects to the integrity of sites could be ruled out.

5.9.5 The outcomes of the AA must then be considered in the formation of any policy.

5.9.6 The three European sites (Mole Gap to Reigate Escarpment SAC, Ashdown Forest SAC and Ashdown Forest SPA) are located in proximity to major roads leading to Gatwick.

5.9.7 Mole Gap to Reigate Escarpment SAC is located adjacent to the A217 and < 100m of the M25 and A24. The A22 currently fragments Ashdown Forest.

5.9.8 Following the completion of initial air quality static modelling more detailed and complex dynamic network modelling of the surface transport impacts of the shortlisted schemes was completed to enable an understanding of the likely surface access impacts of schemes.

5.9.9 The maximum predicted annual mean concentrations of nitrogen oxides and nitrogen deposition fluxes was calculated for Mole Gap to Reigate Escarpment SSSI and it was identified that the LGW-2R scheme would result in an additional 0.4 kgN/ha/yr, representing a 1.7%. An additional 3.4 µg/m^3 NOx would also be emitted.

5.9.10 It is concluded that the additional contribution of these pollutants could act cumulatively with pre-existing sources of nitrogen deposition and potentially, in-combination with additional sources and result in adverse effects on the integrity of the Mole Gap to Reigate Escarpment SAC, which is located in proximity to the SSSI boundary where modelling data was obtained.

5.9.11 Ashdown Forest SAC / SPA is also located < 200 m of roads potentially leading to Gatwick.

5.9.12 In the absence of data to provide evidence to the contrary, recourse is given to the Precautionary Principle. It is considered reasonably likely that there will be an increase in traffic levels on the roads within 200 m of Ashdown Forest SAC / SPA with a corresponding increase in the baseline nitrogen deposition. As such, the air quality changes as a result of the option could act cumulatively and/or in-combination and result in adverse effects on the integrity of the SAC. The impacts identified could result in adverse effects on the integrity of the European Sites. These findings differ to those of the scheme promoters and the AC. As such the need for mitigation or compensation under the Habitats Regulations has not been considered by the scheme promoters. Therefore to meet the requirements of the Habitats Regulations consideration of additional mitigation is necessary and this is discussed further in 5.10.

5.9.13 The surface access strategy for the LGW-2R identifies a limited number of road improvement / enhancement schemes, which are predominately located > 2 km from the SAC and as such, it has been considered unlikely that direct impacts will arise at the SAC as a result of associated infrastructure works.

5.9.14 Road improvement works are proposed to the A23 in the vicinity of Junction 9 of the M23. As such, direct impacts will not occur at the SAC. With regard to indirect impacts, the loss or severance of habitats of functional importance may result in impacts upon the SAC qualifying features, both of which rely on the ability to disperse for foraging and genetic interchange.

5.9.15 However, in the case of Bechstein's bat, the habitat losses associated with the proposed A23 works occur at a distance from the designated sites beyond the known foraging range (typically 3 km, although more recent findings for the HS2 development have identified foraging distances of up to 7 km). Under current understanding, habitat loss and fragmentation of woodlands and hedgerows within this zone have the potential to impact foraging of this species.

5.9.16 Deciduous woodland provides most of the habitat for Bechstein's bat it uses woodland for roosting, foraging and almost certainly hibernation. The UK is at the northernmost edge of its distribution range and the Bechstein's bat has gone from being one of the commonest UK species to one of the rarest, due largely to the loss of ancient woodland. Studies indicate that Bechstein's bat may travel long distances (in excess of 48km)[39] to reach swarming sites which is important behaviour for reproduction.

5.9.17 Retention of ancient woodland is considered essential for the long term conservation of Bechstein's bat. Accordingly any removal of such habitat that is likely to form supporting function to the SAC in terms of foraging and commuting could reasonably be expected to result in an adverse effect to the integrity of the population and as such the integrity of the site. It is considered unlikely, given the distance from the SAC to the area of proposed A23 works, that an adverse effect would arise.

5.9.18 On the basis of the information that is available or can be reasonably obtained, and in accordance with the precautionary principle, it has not been possible to rule out adverse air quality related effects on the integrity of the above Natura2000 sites, either alone or in combination with other plans and projects, with respect to each site's conservation objectives.

5.9.19 Where mitigation does not conclude an absence of adverse effects on integrity, both alone and in-combination, further assessment would be required under Stages 3 and 4 of the HRA process.

5.9.20 Stage 3: Assessment of alternative solutions; where adverse effects cannot be ruled out, the process which examines alternative ways of achieving the objectives of the plans or projects that can avoid adverse effects on the integrity of the Natura 2000 site.

[39] Dietz, Markus and Pir, Jacques B., 2009. Distribution and habitat selection of Myotis bechsteinii in Luxembourg: implications for forest management and conservation. *Folia Zool*. 58, 3, 327–340.

5.9.21 Stage 4: Assessment where no alternative solutions exist and where adverse effects cannot be ruled out; an assessment of whether the development is necessary for imperative reasons of overriding public interest (IROPI) and, if so, of the compensatory measures needed to maintain the overall coherence of the Natura 2000 network.

5.9.22 Consideration of the Stage 3 and 4 requirements has been presented in the HRA.

Impacts on Nationally Designated Sites.

5.9.23 It was identified[40] that the area to the west of the LGW-2R scheme is an existing SSSI with favourable status. In addition the scheme development area to the east is located within a biodiversity improvement area. Based on the available information it is not clear how the compensation proposals could be delivered adequately within these areas or if other locations outside these are proposed.

5.9.24 The LGW-2R scheme has the potential for indirect impacts on a number of SSSIs (listed below) from air and water quality changes.

- Glover's Wood is the nearest SSSI at approximately 1.7 km west of the current airport footprint;
- Leith Hill;
- Vann Lake and Ockley Woods;
- Reigate Heath;
- Mole Gap to Reigate Escarpment;
- Hedgecourt;
- Weir Wood Reservoir;
- Wakehurst and Chiddingly Woods;
- Cow Wood and Harrys Wood; and
- St Leonards Wood.

5.9.25 The potential impacts could occur both alone and in-combination. Air and water quality changes could result in adverse effects to the habitats and species interest features of these sites. Impacts may also arise cumulative with other major infrastructure or development set out in plans, policies or programmes listed in Table 6.5 of the AoS.

5.9.26 In addition to the legal protection afforded to SSSIs under the WCA the NPPF[41] states that;

'*proposed development on land within or outside a Site of Special Scientific Interest likely to have an adverse effect on a Site of Special Scientific Interest (either individually or in combination with other developments) should not normally be permitted.*

Where an adverse effect on the site's notified special interest features is likely, an exception should only be made where the benefits of the development, at this site, clearly outweigh both the impacts that it is likely to have on the features of the site that make it of special scientific interest and any broader impacts on the national network of Sites of Special Scientific Interest'.

[40] Jacobs, 2014. *7. Biodiversity: Assessment*, p. 13. [online] Accessed 06/01/2016.
[41] Department for Communities and Local Government, 2012. *The National Planning Policy Framework*, pp. 27-28. [online] Accessed 05/07/2016.

Impacts on Local Designated Sites

5.9.27 The LGW-2R scheme involves direct land take impacts on two local designated sites, one statutory (Willoughby Fields SNCI / LNR), and one non-statutory (Rowley Wood SNCI). The majority of the area of these two sites would be lost. Horleyland Wood SNCI is immediately east of the existing airport boundary, and no impacts are identified at this site.

5.9.28 It was identified[42] that surface access proposals for the scheme could have potential impacts due to land take and disturbance at a small number of non-statutory sites adjacent to the M23 motorway, in the general area of Junction 9A. Sites initially identified are Bridges Wood proposed Site of Nature Conservation Interest (pSNCI), Bridges Fields pSNCI and The Roughs SNCI, all of which carry a degree of importance for biodiversity at the local level. Using the buffer zone of 100 m as a potential area of impact around the proposed surface access routes has identified some potential overlap with the boundaries of these sites. It is considered likely that during subsequent design stages the exact alignment of the surface access routes and the construction methods to be used would be planned to avoid designated sites wherever practicable.

5.9.29 It is considered that significant negative impacts to international, national and local designated sites would occur as a result of the LGW-2R scheme.

LHR-ENR

Habitats Regulations Assessment Findings

5.9.30 The HRA screening (Stage 1) has identified that the LHR-ENR scheme has either, the potential to result in likely significant effects, or there is uncertainty as to whether likely significant effects would arise. Where such uncertainty exists it is necessary to apply precaution and assume that likely significant effects could arise. Likely significant effects have been identified at;

- SWLW SPA;
- SWLW Ramsar;
- Windsor Forest and Great Park SAC;
- Richmond Park SAC;
- Burnham Beeches SAC;
- Thursley, Ash, Pirbright and Chobham SAC;
- Thames Basin Heaths SPA; and
- Wimbledon Common SAC.

5.9.31 With the exception of SWLW, the potential likely significant effects have been identified with regard to air quality impacts associated with increased traffic flow, and direct and indirect impacts upon supporting habitat as a result of the surface access strategy. Cumulative effects are also expected to arise due to additional sources of pollution from major infrastructure projects being carried out in support of plans, policies or programmes. Additional sources of pollution are also expected to arise from increased traffic associated with future residential development being carried out in support of local development plans.

[42] Jacobs, 2014. 7. *Biodiversity: Assessment*, p. 11. [online] Accessed 06/01/2016.

5.9.32 Eight European sites are located in immediate proximity (< 200 m) to major roads in a 15 km buffer (adopted during HRA screening) around Heathrow airport. All sites are assessed as vulnerable to nitrogen deposition and are currently in exceedance (or in the case of SWLW, are close to exceedance). Further investigations are required with regard to the effects of nitrogen deposition on the qualifying features of the sites in order to quantify any changes resulting from the scheme.

5.9.33 The maximum predicted annual mean concentrations of nitrogen oxides and nitrogen deposition fluxes was calculated for SWLW SPA and Ramsar and it was identified that the LHR-ENR scheme would result in additional deposition. The greatest change being at Staines Moor: 2.2 kg/N/ha/yr (representing an increase of 19.6%) as a result of the LHR-ENR scheme. It is concluded that this additional contribution could take the site further away from the achievement of its Conservation Objectives. In addition, it is considered that it could act in combination with other sources of nitrogen deposition and result in adverse effects on the integrity of the SPA and Ramsar.

5.9.34 There would, in addition, be a new exceedance of the ambient NOx Critical Level at the SWLW SPA / Ramsar (a total concentration of up to 51.3 µg/m^3 the Critical Level for annual mean NOx concentration is 30 µg/m^3). As a result, further investigation is required regarding the sensitivity of the habitats to concentrations of ambient NOx. In the absence of evidence to the contrary and with recourse to the precautionary principle, it is considered reasonably likely that the air quality impacts of scheme will contribute additional NOx-related adverse effects on the integrity of the European site.

5.9.35 Wimbledon Common SAC, Thames Basin Heaths SPA, Thursley SAC, Windsor Park SAC, Richmond Park SAC and Burnham Beeches SAC are located within proximity to roads potentially leading to Heathrow (within the initial 15 km buffer adopted in the HRA). No data is currently available regarding the estimated nitrogen deposition rates at these European sites arising from the scheme.

5.9.36 For SWLW the following additional likely significant effects were identified:

- Surface access proposals for the scheme may involve land take and disturbance in the southern area, primarily along the existing M25 motorway corridor. There is potential for surface access routes to overlap with the site boundaries that include SSSI components of the SPA;
- SWLW is located adjacent to the scheme site. Whilst some existing baseline habituation or tolerance of the interest features to disturbance effects is possible, it cannot be assumed that additional levels of disturbance would not result in a cumulative impacts to the interest features;
- The scheme has the potential to result in impacts to hydrological systems such as the River Colne and wetland environments adjacent to the SPA / Ramsar that support the interest features; and
- Increased levels of bird scaring/control as part of birdstrike risk management measures could cause effects to other non-target waterbird species including the SPA/Ramsar interest features.

5.9.37 Accordingly further consideration has been undertaken by way of AA (Stage 2 of the HRA process) to determine if the schemes could result in significant adverse effects to the integrity and interest features of the sites.

5.9.38 The outcomes of the AA must then be considered in the formation of any policy, as per the requirements of the NPPF[43].

5.9.39 The LHR-ENR scheme would result in a direct impact due to land take from the Staines Moor SSSI, comprising the loss of Unit 1 (Poyle Meadow, 8.74 ha) of the SSSI. The predicted impact is 5.7 ha of the total 8 ha of the management unit. It is likely that the whole of the unit would be adversely impacted given that modifications to the transport corridors would take place on either side of the site as well. Therefore, it is likely the whole of this site would be lost.

5.9.40 Based on scenarios presented in the scheme there is potential for indirect impacts on Unit 12 of Staines Moor SSSI from works affecting the River Colne, this could lead to the loss of 40 ha of the SSSI (and therefore the SWLW SPA).

5.9.41 Any reduction to the size of the SSSI components would effectively reduce the areas of designated habitat available to the interest features of the SPA. The SWLW SPA operates as a network and the pattern of use of the network is varied and influenced by a broad range of factors. Reduction in the areas of component sites could result in a component to be of reduced benefit to the interest features in terms of being of inadequate size or functional change. On a precautionary basis, such changes could reasonably be predicted to result in displacement of the interest features to other waterbodies either within the SPA, which could place pressures on unaffected habitats, or displace birds outside of the designated site to areas in the local or wider area that are not afforded the same level of protection.

5.9.42 This impact is predicted to be cumulative with other impacts identified in this assessment including air quality, hydrology, disturbance and recreation.

5.9.43 Accordingly any removal of such habitat could reasonably be expected to result in an adverse effect to the integrity of the waterbird populations and as such the integrity of the SPA.

5.9.44 With regard to disturbance the AA concluded that there is insufficient evidence available at this time to indicate that the existing airport operations at Heathrow result in adverse disturbance effects to the SWLW SPA. Furthermore there has been a degree of assumption from the information submitted for the schemes that the interest features are tolerant or habituated to these effects. However any tolerance or habituation is unsubstantiated and cannot be assumed to apply to additional cumulative disturbance from increased airport operations and the associated disturbance arising from the schemes.

5.9.45 This is further compounded by the existing levels of recreational disturbance which are considered to be a significant issue for the SPA and this baseline must be considered against any further disturbance effects cumulatively. Furthermore there are disturbance pressures relating to gravel extraction, and operation of the waterbodies as reservoirs.

5.9.46 Cumulatively these effects are difficult to differentiate, however it is considered likely that the existing levels of disturbance pressure on the SWLW SPA may have a limiting factor to the integrity of the site. There is uncertainty surrounding flight paths and flight heights for the options at this time and equally a general lack of broader scientific understanding of the effects of aviation disturbance to waterbirds. The precautionary principle therefore requires that any further disturbance effects would be likely to result in cumulative disturbance to the interest features of the site and as such an adverse effect to the sites integrity.

5.9.47 The LHR-ENR scheme would require the diversion of several rivers and streams and the incorporation of a number of significant culverts. It is assessed that adverse effects on water quality and quantity from such major diversions may arise. Changes to water quality within the

[43] Department for Communities and Local Government, 2012. *The National Planning Policy Framework*. [online] Accessed 05/07/2016.

SPA and Ramsar site or supporting habitat could also occur through the release of contaminants during construction or operation (for example, cleaning agents and de-icers).

5.9.48 Further investigation as to the effects of the likely changes in quality and quantity of water on the interest features of the site will be necessary at the project-level HRA once further details are available. However, for the purposes of the AA undertaken for the Airports NPS, recourse is given to the precautionary principle and adverse effects are considered likely on the integrity of the European sites. The LHR-ENR scheme involves extending the existing northern runway to the west, and operating in dual mode with landings and departures on the same runway at the same time. This will mean that the western threshold of the extended runway will be significantly closer to the European sites.

5.9.49 The main risk to aircraft that arises from these waterbodies comes from the very large winter gull roosts that occur there. On clear, still winter days, gulls may commute into their roosting sites at altitudes in excess of those quoted for aircraft by the scheme promoter, and may also soar above roost sites at similar heights. Gulls also routinely move between the larger reservoirs when arriving at roost or during the night and there are regular movements of many hundreds of gulls between Queen Mother Reservoir and Wraysbury Reservoir.

5.9.50 It is highly likely that the LHR-ENR scheme will result in a significantly elevated birdstrike risk from gulls, and this risk would need to be mitigated by dispersal of the roost from the water bodies concerned and / or from feeding sites that result in flightlines of birds that cross the active airspace at a height which results in an increased risk.

5.9.51 Increased levels of bird scaring/control as part of birdstrike risk management measures could cause effects to other non-target waterbird species including the SPA interest features. Given the uncertainty surrounding flight paths and flight heights for the options at this time the precautionary principle requires that any further disturbance effects would be likely to result in disturbance to the interest features of the site and as such an adverse effect to the sites integrity.

5.9.52 On the basis of information that is available or can be reasonably obtained, and in accordance with the precautionary principle, it has not been possible to rule out adverse effects on the integrity of the above Natura 2000 sites, either alone or in combination with other plans and projects, with respect to each site's conservation objectives.

5.9.53 The impacts identified could result in adverse effects on the integrity of the European Sites. These findings differ to those of the scheme promoters and the AC. As such the need for mitigation or compensation under the Habitats Regulations has not been considered by the scheme promoters. Therefore to meet the requirements of the Habitats Regulations consideration of additional mitigation is necessary and this is discussed further in 5.10.

5.9.54 Where mitigation does not conclude an absence of adverse effects on integrity, both alone and in-combination, further assessment of the policy would be required under Stages 3 and 4 of the HRA process. Consideration of the Stage 3 and 4 requirements has been presented in the HRA.

Impacts on Nationally Designated Sites

5.9.55 As per above the LHR-ENR scheme would result in a direct impact due to land take from the Staines Moor SSSI from the LHR-ENR proposals, comprising the loss of Unit 1 (Poyle Meadow, 8.74 ha) of the SSSI. Based on scenarios presented in the scheme there is also potential for indirect impacts on Unit 12 of Staines Moor SSSI from works affecting the River Colne, this could lead to the loss of 40 ha of the SSSI.

5.9.56 The LHR-ENR scheme has the potential for indirect impacts on a number of SSSIs (listed below) from air and water quality changes.

- Staines Moor SSSI;
- Wraysbury Reservoir SSSI;
- Wraysbury No.1 Gravel Pit SSSI;
- Wraysbury and Hythe End Gravel Pits SSSI; and
- Kempton Park Reservoirs SSSI.

5.9.57 The potential impacts could occur both alone and in-combination with other major infrastructure or development set out in plans, policies or programmes listed in Table 6.5 of the AoS. Air and water quality changes could result in adverse effects to the habitats and species interest features of these sites. In addition to the legal protection afforded to SSSI under the WCA, the NPPF[41] deters development.

Impacts on Local Designated Sites

5.9.58 The scheme includes the potential for direct land take due to surface access requirements of 4.1 ha from Arthur Jacob LNR, 2.9 ha from East Poyle Meadows SNCI, 0.45 ha from Greenham's Fishing Pond SINC, 10-15 ha from Lower Colne SMINC, and 1.25 ha from the River Colne.

5.9.59 It is considered that significant negative impacts to international, national and local designated sites would occur as a result of the LHR-ENR scheme.

LHR-NWR

5.9.60 The HRA screening (Stage 1) has identified that the LHR-NWR scheme has either the potential to result in likely significant effects, or there is uncertainty as to whether likely significant effects would arise. Where such uncertainty exists it is necessary to apply precaution and assume that likely significant effects could arise. Likely significant effects have been identified at;

- SWLW SPA;
- SWLW Ramsar;
- Windsor Forest and Great Park SAC;
- Richmond Park SAC;
- Burnham Beeches SAC;
- Thursley, Ash, Pirbright and Chobham SAC;
- Thames Basin Heaths and
- Wimbledon Common SAC.

5.9.61 With the exception of SWLW, the potential likely significant effects have been identified with regard to air quality impacts associated with increased traffic flow, and direct and indirect impacts upon supporting habitat as a result of the surface access strategy both alone and in-combination. Eight European sites are located in immediate proximity (< 200 m) to major roads leading to Heathrow (within the initial 15 km buffer adopted for assessment during the HRA screening stage). All sites are assessed as vulnerable to nitrogen deposition and are currently in exceedance (or in the case of SWLW, are close to exceedance). Further investigations are required with regard to the effects of nitrogen deposition on the qualifying features of the sites in order to quantify any changes resulting from the scheme.

5.9.62 The maximum predicted annual mean concentrations of nitrogen oxides and nitrogen deposition fluxes was calculated for SWLW SPA and Ramsar and it was identified that the LHR-NWR scheme would result in additional deposition. The greatest incremental change

being at Staines Moor SSSI: 1.2 kgN/ha/yr (representing an increase of 11.8%). Although this does not result in a new exceedance it is concluded that this additional contribution could act in combination with other sources of nitrogen deposition (arising from other plans and projects) and result in adverse effects on the integrity of the SPA and Ramsar.

5.9.63 There would, in addition, be a new exceedance of the ambient NOx Critical Level at the SWLW SPA / Ramsar (an annual mean ambient NOx concentration of up to 32.4 µg/m^3 for LHR–NWR, the Critical Level for annual mean NOx concentration is 30 µg/m). As a result, further investigation is required regarding the sensitivity of the habitats to concentrations of ambient NOx. In the absence of evidence to the contrary and with recourse to the precautionary principle, it is considered reasonably likely that the air quality impacts of the scheme will contribute additional NOx-related adverse effects on the integrity of the European site.

5.9.64 Wimbledon Common SAC, Thames Basin Heaths SPA, Thursley SAC, Windsor Park SAC, Richmond Park SAC and Burnham Beeches SAC are located within proximity to roads potentially leading to Heathrow. No data is currently available regarding the estimated nitrogen deposition rates at these European sites arising from the scheme.

5.9.65 For SWLW the following additional likely significant effects were identified:

- Surface access proposals for the scheme may involve land take and disturbance primarily along the existing M25 motorway corridor. There is potential for surface access routes to overlap with the site boundaries that include SSSI components of the SPA and other potential functionally linked habitat. Further the scheme includes the loss of Old Slade Lakes LWS, which provides functional support to the SPA;
- SWLW is located adjacent to the scheme site. Whilst some existing baseline habituation of the interest features to disturbance effects is likely, it cannot be assumed that additional levels of disturbance would not result in a cumulative impacts to the interest features;
- The scheme has the potential to result in impacts to hydrological systems such as the River Colne and wetland environments adjacent to the SPA / Ramsar that support the interest features; and
- Increased levels of bird scaring/control as part of birdstrike risk management measures could cause effects to other non-target waterbird species including the SPA / Ramsar interest features.

5.9.66 Accordingly further consideration has been undertaken by way of AA (Stage 2 of the HRA process) to determine if the schemes could result in significant adverse effects to the integrity and interest features of the sites.

5.9.67 The outcomes of the AA must then be considered in the formation of any policy, as per the NPPF[44].

5.9.68 Surface access proposals for the scheme may involve land take and disturbance in the southern area of the scheme, primarily along the existing M25 motorway corridor. There is potential for surface access routes to overlap with the boundaries of sites that include SSSI components of the SPA and other potential functionally linked habitat. Applying a buffer zone of 100 m as a potential area of impact around the proposed surface access routes has identified some potential overlap with the boundaries of sites that include Staines Moor SSSI and Wraysbury Reservoir SSSI (and therefore the SWLW SPA).

[44] Department for Communities and Local Government, 2012. *The National Planning Policy Framework*. [online] Accessed 05/07/2016.

5.9.69 Any reduction to the size of the SSSI components would effectively reduce the areas of designated habitat available to the interest features of the SPA. The SWLW SPA operates as a network and the pattern of use of the network is varied and influenced by a broad range of factors. Reduction in the areas of component sites could result in a component to be of reduced benefit to the interest features in terms of being of inadequate size or functional change. On a precautionary basis such changes could reasonably be predicted to result in displacement of the interest features to other waterbodies either within the SPA, which could place pressures on unaffected habitats, or displace birds outside of the designated site to areas in the local or wider area that are not afforded the same level of protection.

5.9.70 This impact is predicted to be cumulative with other impacts identified in this assessment including air quality, hydrology, disturbance and recreation.

5.9.71 Accordingly any removal of such habitat could reasonably be expected to result in an adverse effect to the integrity of the waterbird populations and as such the integrity of the SPA.

5.9.72 With regard to disturbance the AA concluded that there is insufficient evidence available at this time to indicate that the existing airport operations at Heathrow result in adverse disturbance effects to the SWLW SPA. Furthermore there has been a degree of assumption form the information submitted for the schemes that the interest features are tolerant or habituated to these effects. However any tolerance or habituation is unsubstantiated and further cannot be assumed to apply to additional cumulative disturbance from increased airport operations and the associated disturbance arising from the schemes.

5.9.73 This is further compounded by the existing levels of recreational disturbance which are considered to be a significant issue for the SPA and this baseline must be considered against any further disturbance effects cumulatively. Furthermore there are disturbance pressures relating to gravel extraction, and operation of the waterbodies as reservoirs.

5.9.74 Cumulatively these effects are difficult to differentiate however it is considered likely that the existing levels of disturbance pressure on the SWLW SPA may have a limiting factor to the integrity of the site. There is uncertainty surrounding flight paths and flight heights for the options at this time and equally a general lack of broader scientific understanding of the effects of aviation disturbance to waterbirds. The precautionary principle therefore requires that any further disturbance effects would be likely to result in cumulative disturbance to the interest features of the site and as such an adverse effect to the sites integrity.

5.9.75 The LHR-NWR scheme would require the diversion of several rivers and streams and the incorporation of a number of significant culverts. It is assessed that adverse effects on water quality and quantity from such major diversions may arise. Changes to water quality within the SPA and Ramsar or supporting habitat could also occur through the release of contaminants during construction or operation (for example, cleaning agents and de-icers).

5.9.76 Further investigation as to the effects of the likely changes in quality and quantity of water on the interest features of the site will be necessary at the project-level HRA once further details are available. However, for the purposes of this AA, recourse is given to the precautionary principle and adverse effects are considered likely on the integrity of the European sites.

5.9.77 The footprint of the LHR-NWR will remove a number of agricultural fields that attract significant numbers of pigeons and particularly Canada Geese following the harvesting period and that also attract gulls following ploughing and seed sowing activities. This reduction in potential birdstrike risk is likely to be offset by the fact that the western boundary will be significantly closer to Queen Mother Reservoir, which supports a very large gull roost numbering up to 20,000 birds during the winter months as well as a significant number of other waterfowl. At present aircraft departing to, or arriving from, the west are sufficiently high when passing over the reservoir that they rarely encounter roosting gulls.

5.9.78 Moving the runway closer to this reservoir may mean that aircraft arriving or departing on the western end will be low enough to conflict with gulls spiralling over the reservoir or those arriving at the roost from feeding sites, such as landfills, situated to the north or north east. This would create a significant additional birdstrike risk which would need to be managed.

5.9.79 Further work is therefore needed to determine the arrival directions and flight altitude of birds using Queen Mother Reservoir in particular, and the reservoirs to the west of Heathrow in general, so that the likely additional risk can be properly assessed.

5.9.80 Increased levels of bird scaring/control as part of birdstrike risk management measures could cause effects to other non-target waterbird species including the SPA interest features. Given the uncertainty surrounding flight paths and flight heights for the options at this time the precautionary principle requires that any further disturbance effects would be likely to result in disturbance to the interest features of the site and as such result in an adverse effect to the sites integrity.

5.9.81 On the basis of information that is available or can be reasonably obtained, and in accordance with the precautionary principle, it has not been possible to rule out adverse effects on the integrity of the above Natura 2000 sites, either alone or in combination with other plans and projects, with respect to each site's conservation objectives.

5.9.82 These findings differ to those of the scheme promoters and the AC. As such the need for mitigation or compensation under the Habitats Regulations has not been considered by the scheme promoters. Therefore to meet the requirements of the Habitats Regulations consideration of additional mitigation is necessary and this is discussed further in 5.10.

5.9.83 Where mitigation does not conclude an absence of adverse effects on integrity, both alone and in-combination, further assessment of the policy would be required under Stages 3 and 4 of the HRA process. Consideration of the Stage 3 and 4 requirements has been presented in the HRA.

Impacts on Nationally Designated Sites

5.9.84 The LHR-NWR scheme has the potential for indirect impacts on a number of SSSIs (listed below) from air and water quality changes.

- Staines Moor SSSI;
- Wraysbury Reservoir SSSI;
- Wraysbury No.1 Gravel Pit SSSI;
- Wraysbury and Hythe End Gravel Pits SSSI; and
- Kempton Park Reservoirs SSSI.

5.9.85 The potential impacts could occur both alone and in-combination with other major infrastructure or development set out in plans, policies or programmes listed in Table 6.5 of the AoS. Air and water quality changes could result in adverse effects to the habitats and species interest features of these sites. In addition to the legal protection afforded to SSSIs under the Wildlife and Countryside Act the NPPF[41] deters development.

Impacts on Local Designated Sites

5.9.86 The LHR-NWR scheme involves direct land take impacts on three local non-statutory designated sites (Old Slade Lake LWS, Lower Colne SMINC and Stanwell II SNCI).

5.9.87 It is considered that significant negative impacts to international, national and local designated sites would occur as a result of the LHR-NWR scheme.

Objective 8: To conserve and enhance undesignated habitats[45], species, valuable ecological networks and ecosystem functionality

LGW-2R

5.9.88 As per Table 5.3, including land take for surface access, the losses of the following priority habitats would occur as a result of the LGW-2R scheme:

- Lowland mixed deciduous woodland, including ancient woodland;
- Hedgerow including ancient hedgerow;
- Rivers and brooks including canalised or conduited channel; and
- Ponds.

5.9.89 The NPPF[46] states that:

'planning permission should be refused for development resulting in the loss or deterioration of irreplaceable habitats, including ancient woodland and the loss of aged or veteran trees found outside ancient woodland, unless the need for, and benefits of, the development in that location clearly outweigh the loss'.

5.9.90 Further Natural England's standing advice on ancient woodland and veteran trees[47] identifies that the nature of ancient woodland and veteran trees means that loss or damage cannot simply be rectified by mitigation and compensation measures. Therefore, where measures seek to address issues of loss or deterioration of ancient woodland or veteran trees Natural England considers that these should be issues for consideration only after it has been judged that the wider benefits of a proposed development clearly outweigh the loss or damage of ancient woodland which is as per the NPPF above.

5.9.91 The existing habitat comprises of woodland of various sizes, including ancient woodland. There is a series of interconnecting hedgerows, including ancient hedgerows, both of which are a priority habitat. The existence of the network of hedgerows joining various woodland blocks provides a functioning habitat throughout this landscape. The loss of such a large extent of this functioning habitat would therefore occur and require consideration on a landscape scale. Woodlands and hedgerows provide habitat for a diverse range of species and ecological networks via the hedgerows between the woodland blocks.

5.9.92 Loss, severance and fragmentation of woodland and / or hedgerows, in particular ancient woodland and hedgerows, require consideration both directly and indirectly. The direct loss of habitat requires consideration on the remaining habitat's connectivity, quality (via pollution and fragmentation) and robustness. This affects the habitat's resilience into the future including the potential effects of climate change and species abilities to absorb future pressures on the landscape.

5.9.93 The scheme could result in air quality impacts on ancient woodland blocks adjacent to affected roads. Natural England's standing advice on ancient woodland and veteran trees highlights the need for developers to consider air quality impacts on ancient woodland.

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[45] Undesignated habitats are not covered by a nature conservation designation listed in Objective 7.

[46] Department for Communities and Local Government, 2012. *The National Planning Policy Framework*, p. 28. [online] Accessed 05/07/2016.

[47] Natural England and Forestry Commission, 2015. A*ncient woodland and veteran trees: protecting them from development* [online] Accessed 28/07/2016.

5.9.94 In addition to the direct and indirect effects associated with airport expansion the scheme may have cumulative effects with other development proposed in plans, policies or programmes set out in Table 6.5 of the AoS Report. These effects may arise as a consequence of decreasing air quality due to increasing traffic associated with new development or major infrastructure, or due to the cumulative effect on sites and due to loss of habitat.

5.9.95 As identified in the baseline, it is considered likely that the area would support a range of species protected under UK (and EU) wildlife legislation including but not limited to bat species, dormice, and great crested newts. In addition it is likely the area will support species of principal importance as identified under Section 41 of the NERC Act 2006.

5.9.96 The Low Weald NCA in which the scheme is proposed is amongst the most important areas for bats in terms of species diversity including internationally important populations of Bechstein's associated with designated sites. The Bechstein's bat is one of the rarest of our mammals and a UK BAP priority species. Bechstein's bats receive full statutory protection as a European Protected Species under the Habitats Regulations. The habitat losses occur at a distance from the designated sites (10 km) that exceeds the current known foraging of Bechstein's (typically 3 km) although more recent findings for the HS2 development have identified foraging distances of up to 7 km. Fragmentation of ancient woodlands and hedgerows also has the potential to impact this species.

5.9.97 The proposal to add a 10% compensation allowance based on overall land take to allow for compensation for protected species is recognised to be arbitrary and for the purposes of this assessment appropriate. However, due to the information available at this time, it must be recognised with the associated limitations and, given the complexity of some of the habitats and species that might be affected, significant risk remains with regard to viable mitigation and compensation.

5.9.98 It is considered that significant negative impacts to habitats, species, valuable ecological networks and ecosystem function would occur as a result of the LGW-2R scheme.

LHR-ENR

5.9.99 As per Table 5.4, including land take for surface access the losses of the following priority habitats would be affected as a result of the LHR-ENR scheme;

- Deciduous woodland;
- Traditional orchard;
- Rivers and brooks;
- Reedbeds; and
- Lowland meadows.

5.9.100 The scheme promoter schemes currently falls short of a 2:1 ratio for these losses which would be considered the minimum standard.

5.9.101 There are birdstrike management issues for LHR-ENR associated with the nearby complex of open water bodies. The western threshold of the extended runway will be significantly closer to the complex of reservoirs and gravel pits to the west of the airport including sites designated as part of the SWLW SPA and Ramsar site. The closer proximity of the runway and increased air traffic is likely to result in an increased strike risk, and a corresponding requirement for an increase in bird management and control activities is anticipated.

5.9.102 Methods of deterring / scaring and controlling bird species potentially hazardous to aviation operations could potentially have an adverse effect on non-target species and biodiversity including those not listed on the designation interest features.

5.9.103 Compensatory habitats created as offset for the scheme proposals will need to be designed in such a way as to deter/not attract birds hazardous to aviation operations or be sited sufficiently far away for increased strike risks to be insignificant and this may limit the biodiversity benefits for some of the proposed compensation areas close to the proposed scheme.

5.9.104 As per the baseline section based on the available information the presence of key protected species including, bats, otter, water vole, reptiles (including grass snake and slow worm), and various species of birds within 2 km of the scheme boundary have been identified. It is considered feasible that the area would support a range of other species protected under UK (and EU) wildlife legislation including but not limited to dormice, and great crested newts.

5.9.105 The recommendation to add a 10% compensation allowance based on overall land take to allow for compensation for protected species is recognised to be arbitrary and for the purposes of this assessment appropriate however due to the information available at this time it must be recognised with the associated limitations and given the complexity of some of the habitats and species that might be affected significant risk remains with regard to viable mitigation and compensation.

5.9.106 It is considered that significant negative impacts to habitats, species, valuable ecological networks and ecosystem function would occur as a result of the LHR-ENR scheme.

5.9.107 In addition to the direct and indirect effects associated with airport expansion the scheme may have cumulative effects with other development proposed in plans, policies or programmes set out in Table 6.5 of the AoS Report. These effects may arise as a consequence of decreasing air quality due to increasing traffic associated with new development or major infrastructure, or due to the cumulative effect on sites and due to loss of habitat.

LHR-NWR

5.9.108 As per Table 5.5, including land take for surface access the losses of the following priority habitats would be affected as a result of the LHR-NWR scheme;

- Deciduous woodland;
- Traditional orchard;
- Rivers and brooks;
- Reedbeds; and
- Lowland meadows.

5.9.109 There are birdstrike management issues for LHR-NWR associated with the nearby complex of open water bodies. The western threshold of the extended runway will be significantly closer to the complex of reservoirs and gravel pits to the west of the airport including sites designated as part of the SWLW SPA and Ramsar site. The closer proximity of the runway and increased air traffic is likely to result in an increased strike risk, and a corresponding requirement for an increase in bird management and control activities is anticipated.

5.9.110 Methods of deterring / scaring and controlling bird species potentially hazardous to aviation operations could potentially have an adverse effect on non-target species and biodiversity including those not listed on the designation interest features.

5.9.111 Compensatory habitats created as offset for the scheme proposals will need to be designed in such a way as to deter/not attract birds hazardous to aviation operations or be sited sufficiently far away for increased strike risks to be insignificant and this may limit the biodiversity benefits for some of the proposed compensation areas close to the proposed scheme.

5.9.112 As per the baseline section based on the available information the presence of key protected species including pennyroyal, bats, otter, water vole, reptiles (including grass snake and slow worm), and various species of birds within 2 km of the scheme boundary have been identified. It is considered feasible that the area would support a range of other species protected under UK (and EU) wildlife legislation including but not limited to dormice, and great crested newts.

5.9.113 The recommendation to add a 10% compensation allowance based on overall land take to allow for compensation for protected species is recognised to be arbitrary and for the purposes of this assessment appropriate however due to the information available at this time it must be recognised with the associated limitations and given the complexity of some of the habitats and species that might be affected significant risk remains with regard to viable mitigation and compensation.

5.9.114 It is considered that significant negative impacts to habitats, species, valuable ecological networks and ecosystem function would occur as a result of the LHR-NWR scheme.

5.9.115 In addition to the direct and indirect effects associated with airport expansion the scheme may have cumulative effects with other development proposed in plans, policies or programmes set out in Table 6.5 of the AoS Report. These effects may arise as a consequence of decreasing air quality due to increasing traffic associated with new development or major infrastructure, or due to the cumulative effect on sites and due to loss of habitat.

5.10 ASSESSMENT OF ALTERNATIVES

Objective 7: To protect and enhance designated sites for nature conservation

Question 12: Will it affect internationally, nationally and locally designated biodiversity sites?

SEA TOPIC	LGW-2R	LHR-ENR	LHR-NWR
Description of Impact (including receptor)	**International Sites:** Mole Gap to Reigate Escarpment SAC Ashdown Forest SAC and SPA Significant adverse effects have been identified with regard to air quality impacts associated with increased traffic flow as a result of the surface access strategy. **National Sites** → Glover's Wood SSSI → Leith Hill SSSI → Vann Lake and Ockley Woods SSSI → Reigate Heath SSSI → Mole Gap to Reigate Escarpment SSSI → Hedgecourt SSSI → Weir Wood Reservoir SSSI → Wakehurst and Chiddingly Woods SSSI → Cow Wood and Harrys Wood SSSI → St Leonards Wood SSSI Potential impacts principally associated with air and water quality changes that could result in adverse effects to the habitats and species interest features of these sites. **Local Sites** → Willoughby Fields SNCI / LNR → Rowley Wood SNCI. → Horleyland Wood SNCI	**International Sites:** SWLW SPA / Ramsar Significant adverse effects have been identified with regard to: land take; construction disturbance; operation disturbance including flights; hydrological impacts; air quality changes; disturbance through increased levels of bird scaring / control as part of birdstrike risk management measures. → Windsor Forest and Great Park SAC → Burnham Beeches SAC → Thursley, Ash, Pirbright and Chobham SAC → Thames Basin Heaths SPA → Richmond Park SAC → Wimbledon Common SAC Significant adverse effects have been identified with regard to air quality impacts associated with increased traffic flow, and direct and indirect impacts upon supporting habitat as a result of the surface access strategy. **National Sites** → Staines Moor SSSI → Wraysbury Reservoir SSSI → Wraysbury No.1 Gravel Pit SSSI → Wraysbury and Hythe End Gravel Pits	**International Sites:** SWLW SPA / Ramsar Significant adverse effects have been identified with regard to: land take; construction disturbance; operation disturbance including flights; hydrological impacts; air quality changes; disturbance through increased levels of bird scaring / control as part of birdstrike risk management measures. → Windsor Forest and Great Park SAC → Burnham Beeches SAC → Thursley, Ash, Pirbright and Chobham SAC → Thames Basin Heaths SPA → Richmond Park SAC → Wimbledon Common SAC Significant adverse effects have been identified with regard to air quality impacts associated with increased traffic flow, and direct and indirect impacts upon supporting habitat as a result of the surface access strategy. **National Sites** → Staines Moor SSSI, → Wraysbury Reservoir SSSI → Wraysbury No.1 Gravel Pit SSSI → Wraysbury and Hythe End Gravel Pits

	→ Bridges Wood pSNCI → Bridges Fields pSNCI → The Roughs SNCI Potential impacts including, loss, disturbance, air and water quality changes.	SSSI → Kempton Park Reservoirs SSSI Potential impacts principally associated with air and water quality changes that could result in adverse effects to the habitats and species interest features of these sites. **Local Sites** → Arthur Jacob LNR → East Poyle Meadows SNCI → Greenham's Fishing Pond SINC → Lower Colne SMINC → River Colne Potential impacts from direct land take due to surface access requirements.	SSSI Kempton Park Reservoirs SSSI Potential impacts principally associated with air and water quality changes that could result in adverse effects to the habitats and species interest features of these sites. **Local Sites** → Old Slade Lake LWS → Lower Colne SMINC → Stanwell II SNCI Potential impacts from direct land take due to surface access requirements.
Direct/ Indirect/ Cumulative	**Direct, Indirect and Cumulative** Effects on the sites would be direct (construction and operation of new infrastructure) and indirect (surface access, overhead flights). Cumulative effects to sites may arise from airport expansion in combination with other major infrastructure development.	**Direct, Indirect and Cumulative** Effects on the sites would be direct (construction and operation of new infrastructure) and indirect (surface access, overhead flights). Cumulative effects to sites may arise from airport expansion in combination with other major infrastructure development.	**Direct, Indirect and Cumulative** Effects on the sites would be direct (construction and operation of new infrastructure) and indirect (surface access, overhead flights). Cumulative effects to sites may arise from airport expansion in combination with other major infrastructure development.
Probability (High, Medium, Low, Very Low)	**High** There is a High probability that adverse effects will occur. However, the significance of these effects will depend on whether it will be possible to provide effective mitigation and compensation.	**High** There is a High probability that adverse effects will occur. However, the significance of these effects will depend on whether it will be possible to provide effective mitigation and compensation.	**High** There is a High probability that adverse effects will occur. However, the significance of these effects will depend on whether it will be possible to provide effective mitigation and compensation.
Phase, Duration (Long-term, Medium-term, Short-term), Frequency	**Construction and Operation** **Long-term, Continuous** Loss of sites would occur at construction. Other effects on sites will occur both during construction and operation. The effects will be ongoing throughout the	**Construction and Operation** **Long-term, Continuous** Loss of sites would occur at construction. Other effects on sites will occur both during construction and operation. The effects will be ongoing throughout the	**Construction and Operation** **Long-term, Continuous** Loss of sites would occur at construction. Other effects on sites will occur both during construction and operation. The effects will be ongoing throughout the

	operational life of the airport.	operational life of the airport.	operational life of the airport.
Permanent/ Temporary **Irreversible/ Reversible**	**Permanent and Irreversible** A number of the effects on sites are permanent and irreversible. However, it may be possible to reduce the significance of these effects through mitigation, enhancements and compensation.	**Permanent and Irreversible** A number of the effects on sites are permanent and irreversible. However, it may be possible to reduce the significance of these effects through mitigation, enhancements and compensation.	**Permanent and Irreversible** A number of the effects on sites are permanent and irreversible. However, it may be possible to reduce the significance of these effects through mitigation, enhancements and compensation.
Magnitude and Spatial Extent, incl. Transboundary	**High, International**	**High, International**	**High, International**
Assumptions and Limitation	A desk based assessment has been undertaken and there have been no site visits. Precautionary approaches have been adopted for cumulative and in-combination impacts where a lack of detail exists. Uncertainty exists of the cumulative effects of air quality impacts. Uncertainty exists of the viability and efficacy of mitigation and compensation.	A desk based assessment has been undertaken and there have been no site visits. Precautionary approaches have been adopted for cumulative and in-combination impacts where a lack of detail exists. Uncertainty exists of the cumulative effects of air quality impacts. Uncertainty exists of the viability and efficacy of mitigation and compensation.	A desk based assessment has been undertaken and there have been no site visits. Precautionary approaches have been adopted for cumulative and in-combination impacts where a lack of detail exists. Uncertainty exists of the cumulative effects of air quality impacts. Uncertainty exists of the viability and efficacy of mitigation and compensation.
Significance	**Significant Negative effect (--)**	**Significant Negative effect (--)**	**Significant Negative effect (--)**
	Effects on international, national and locally designated sites; effects are direct, indirect and cumulative; high probability but effective mitigation is possible; occurring during construction and operation; long-term, permanent and irreversible; High magnitude and affecting international sites.	Effects on international, national and locally designated sites; effects are direct, indirect and cumulative; high probability but effective mitigation is possible; occurring during construction and operation; long-term, permanent and irreversible; High magnitude and affecting international sites.	Effects on international, national and locally designated sites; effects are direct, indirect and cumulative; high probability but effective mitigation is possible; occurring during construction and operation; long-term, permanent and irreversible; High magnitude and affecting international sites.

Question 13: Will it conserve and enhance undesignated habitats, internationally and nationally protected species and valuable ecological networks, such as priority habitats and priority species?

SEA TOPIC	LGW-2R	LHR-ENR	LHR-NWR
Description of Impact (including receptor)	**Habitats** → Lowland mixed deciduous woodland, including ancient woodland; → Hedgerow including ancient hedgerow; → Rivers and brooks including canalised or conduited channel; and → Ponds **Species** A range of species protected under UK (and EU) wildlife legislation including but not limited to bat species (including Bechstein's) dormice, and great crested newts). In addition it is likely the area will support species of principal importance as identified under Section 41 of the NERC Act 2006. Potential impacts including, loss, disturbance, habitat severance/fragmentation, air and water quality changes, mortality.	**Habitats** → Deciduous woodland; → Traditional orchard; → Rivers and brooks; → Reedbeds; and → Lowland meadows. **Species** There are birdstrike management issues for LHR-ENR associated with the nearby complex of open water bodies. The closer proximity of the runway and increased air traffic is likely to result in an increased strike risk, and a corresponding requirement for an increase in bird management and control activities is anticipated. Methods of deterring/scaring and controlling bird species potentially hazardous to aviation operations could potentially have an adverse effect on non-target species and biodiversity including those not listed on the designation interest features. A range of protected species including, bats, otter, water vole, reptiles (including grass snake and slow worm), and various species of birds within 2km of the scheme boundary have been identified. It is considered feasible that the area would support a range of other species protected under UK (and EU) wildlife legislation including but not limited to dormice, and great crested newts. Potential impacts including, loss, disturbance, habitat severance/fragmentation, air and water quality changes, mortality.	**Habitats** → Deciduous woodland; → Traditional orchard; → Rivers and brooks; → Reedbeds; and → Lowland meadows. **Species** There are birdstrike management issues for LHR-ENR associated with the nearby complex of open water bodies. The closer proximity of the runway and increased air traffic is likely to result in an increased strike risk, and a corresponding requirement for an increase in bird management and control activities is anticipated. Methods of deterring/scaring and controlling bird species potentially hazardous to aviation operations could potentially have an adverse effect on non-target species and biodiversity including those not listed on the designation interest features. A range of protected species including, bats, otter, water vole, reptiles (including grass snake and slow worm), and various species of birds within 2km of the scheme boundary have been identified. It is considered feasible that the area would support a range of other species protected under UK (and EU) wildlife legislation including but not limited to dormice, and great crested newts. Potential impacts including, loss, disturbance, habitat severance/fragmentation, air and water quality changes, mortality.

SEA TOPIC	LGW-2R	LHR-ENR	LHR-NWR
Direct/ Indirect/ Cumulative	**Direct, Indirect and Cumulative** Effects on habitats and species would be direct (construction and operation of new infrastructure) and indirect (surface access, overhead flights). Cumulative effects to habitats and species may arise from airport expansion in combination with other major infrastructure development.	**Direct, Indirect and Cumulative** Effects on habitats and species would be direct (construction and operation of new infrastructure) and indirect (surface access, overhead flights). Cumulative effects to habitats and species may arise from airport expansion in combination with other major infrastructure development.	**Direct, Indirect and Cumulative** Effects on habitats and species would be direct (construction and operation of new infrastructure) and indirect (surface access, overhead flights). Cumulative effects to habitats and species may arise from airport expansion in combination with other major infrastructure development.
Probability (High, Medium, Low, Very Low)	**High** There is a High probability that adverse effects will occur. However, the significance of these effects will depend on whether it will be possible to provide effective mitigation and compensation.	**High** There is a High probability that adverse effects will occur. However, the significance of these effects will depend on whether it will be possible to provide effective mitigation and compensation.	**High** There is a High probability that adverse effects will occur. However, the significance of these effects will depend on whether it will be possible to provide effective mitigation and compensation.
Phase, Duration (Long-term, Medium-term, Short-term), Frequency	**Construction and Operation** **Long-term, Continuous** Loss of habitats and species would occur at construction. Other effects will occur both during construction and operation. The effects will be ongoing throughout the operational life of the airport.	**Construction and Operation** **Long-term, Continuous** Loss of habitats and species would occur at construction. Other effects will occur both during construction and operation. The effects will be ongoing throughout the operational life of the airport.	**Construction and Operation** **Long-term, Continuous** Loss of habitats and species would occur at construction. Other effects will occur both during construction and operation. The effects will be ongoing throughout the operational life of the airport.
Permanent/ Temporary **Irreversible/ Reversible**	**Permanent and Irreversible** A number of the effects on habitats and species are permanent and irreversible. However, it may be possible to reduce the significance of these effects through mitigation, enhancements and compensation.	**Permanent and Irreversible** A number of the effects on habitats and species are permanent and irreversible. However, it may be possible to reduce the significance of these effects through mitigation, enhancements and compensation.	**Permanent and Irreversible** A number of the effects on habitats and species are permanent and irreversible. However, it may be possible to reduce the significance of these effects through mitigation, enhancements and compensation.
Magnitude and Spatial Extent, incl. Transboundary	**High, National**	**High, National**	**High, National**
Assumptions and	A desk based assessment has been undertaken and there have been no site	A desk based assessment has been undertaken	A desk based assessment has been undertaken

SEA TOPIC	LGW-2R	LHR-ENR	LHR-NWR
Limitation	visits. Precautionary approaches have been adopted for cumulative and in-combination impacts where a lack of detail exists. Uncertainty exists of the cumulative effects of air quality impacts. Uncertainty exists of the viability and efficacy of mitigation and compensation.	and there have been no site visits. Precautionary approaches have been adopted for cumulative and in-combination impacts where a lack of detail exists. Uncertainty exists of the cumulative effects of air quality impacts. Uncertainty exists of the viability and efficacy of mitigation and compensation.	and there have been no site visits. Precautionary approaches have been adopted for cumulative and in-combination impacts where a lack of detail exists. Uncertainty exists of the cumulative effects of air quality impacts. Uncertainty exists of the viability and efficacy of mitigation and compensation.
Significance	**Significant Negative effect (--)**	**Significant Negative effect (--)**	**Significant Negative effect (--)**
	Direct, indirect and cumulative effects on habitats and species; high probability, occurring during construction and operation; long-term permanent and irreversible; High magnitude and national extent.	Direct, indirect and cumulative effects on habitats and species; high probability, occurring during construction and operation; long-term permanent and irreversible; High magnitude and national extent.	Direct, indirect and cumulative effects on habitats and species; high probability, occurring during construction and operation; long-term permanent and irreversible; High magnitude and national extent.

Question 14: Will it increase the exposure of wildlife to transport noise, air pollution, and water pollution?

SEA TOPIC	LGW-2R	LHR-ENR	LHR-NWR
Description of Impact (including receptor)	**International Sites:** → Mole Gap to Reigate Escarpment SAC → Ashdown Forest SAC and SPA Significant adverse effects have been identified with regard to air quality impacts associated with increased traffic flow as a result of the surface access strategy. **National Sites** → Glover's Wood SSSI → Leith Hill SSSI → Vann Lake and Ockley Woods SSSI → Reigate Heath SSSI → Mole Gap to Reigate Escarpment SSSI → Hedgecourt SSSI → Weir Wood Reservoir SSSI → Wakehurst and Chiddingly Woods SSSI → Cow Wood and Harrys Wood SSSI → St Leonards Wood SSSI Potential impacts principally associated with air and water quality changes that could result in adverse effects to the habitats and species interest features of these sites. **Local Sites** → Willoughby Fields SNCI/LNR → Rowley Wood SNCI → Horleyland Wood SNCI → Bridges Wood pSNCI → Bridges Fields pSNCI → The Roughs SNCI	**International Sites:** → SWLW SPA / Ramsar → Windsor Forest and Great Park SAC → Burnham Beeches SAC → Thursley, Ash, Pirbright and Chobham SAC → Thames Basin Heaths SPA → Richmond Park SAC → Wimbledon Common SAC Significant adverse effects have been identified with regard to disturbance, air quality impacts associated with increased traffic flow, and direct and indirect impacts upon supporting habitat as a result of the surface access strategy. **National Sites** → Staines Moor SSSI → Wraysbury Reservoir SSSI → Wraysbury No.1 Gravel Pit SSSI → Wraysbury and Hythe End Gravel Pits SSSI Kempton Park Reservoirs SSSI Potential impacts principally associated with air and water quality changes that could result in adverse effects to the habitats and species interest features of these sites. **Local Sites** → Arthur Jacob LNR → East Poyle Meadows SNCI, → Greenham's Fishing Pond SINC → Lower Colne SMINC → River Colne	**Common SAC** Significant adverse effects have been identified with regard to disturbance, air quality impacts associated with increased traffic flow, and direct and indirect impacts upon supporting habitat as a result of the surface access strategy. **National Sites** → Staines Moor SSSI → Wraysbury Reservoir SSSI → Wraysbury No.1 Gravel Pit SSSI → Wraysbury and Hythe End Gravel Pits SSSI Kempton Park Reservoirs SSSI Potential impacts principally associated with air and water quality changes that could result in adverse effects to the habitats and species interest features of these sites. **Local Sites** → Old Slade Lake LWS → Lower Colne SMINC → Stanwell II SNCI Potential impacts from direct land take due to surface access requirements. **Habitats** → Deciduous woodland; → Traditional orchard; → Rivers and brooks; → Reedbeds; and → Lowland meadows. **Species** A range of protected species including, bats,

SEA TOPIC	LGW-2R	LHR-ENR	LHR-NWR
	Potential impacts including, disturbance, air and water quality changes. **Habitats** → Lowland mixed deciduous woodland, including ancient woodland; → Hedgerow including ancient hedgerow; → Rivers and brooks including canalised or conduited channel; and → Ponds. **Species** A range of species protected under UK (and EU) wildlife legislation including but not limited to bat species (including Bechstein's), dormice, and great crested newts). In addition it is likely the area will support species of principal importance as identified under Section 41 of the NERC Act 2006. Potential impacts including disturbance, habitat severance/fragmentation, air and water quality changes, mortality.	Potential impacts from direct land take due to surface access requirements. **Habitats** → Deciduous woodland; → Traditional orchard,; → Rivers and brooks; → Reedbeds; and → Lowland meadows. **Species** A range of protected species including, bats, otter, water vole, reptiles (including grass snake and slow worm), and various species of birds within 2km of the scheme boundary have been identified. It is considered feasible that the area would support a range of other species protected under UK (and EU) wildlife legislation including but not limited to dormice, and great crested newts. Potential impacts including, disturbance, habitat severance/fragmentation, air and water quality changes, mortality.	otter, water vole, reptiles (including grass snake and slow worm), and various species of birds within 2km of the scheme boundary have been identified. It is considered feasible that the area would support a range of other species protected under UK (and EU) wildlife legislation including but not limited to dormice, and great crested newts. Potential impacts including, disturbance, habitat severance/fragmentation, air and water quality changes, mortality.
Direct/ Indirect/ Cumulative	**Direct, Indirect and Cumulative** Effects on the sites would be direct (construction and operation of new infrastructure) and indirect (surface access, overhead flights). Cumulative effects to sites may arise from airport expansion in combination with other major infrastructure development.	**Direct, Indirect and Cumulative** Effects on the sites would be direct (construction and operation of new infrastructure) and indirect (surface access, overhead flights). Cumulative effects to sites may arise from airport expansion in combination with other major infrastructure development.	**Direct, Indirect and Cumulative** Effects on the sites would be direct (construction and operation of new infrastructure) and indirect (surface access, overhead flights). Cumulative effects to sites may arise from airport expansion in combination with other major infrastructure development.
Probability (High, Medium, Low, Very Low)	**High** There is a High probability that adverse effects will occur. However, the significance of these effects will depend on whether it will be possible to provide effective mitigation and compensation.	**High** There is a High probability that adverse effects will occur. However, the significance of these effects will depend on whether it will be possible to provide effective mitigation and compensation.	**High** There is a High probability that adverse effects will occur. However, the significance of these effects will depend on whether it will be possible to provide effective mitigation and compensation.

SEA TOPIC	LGW-2R	LHR-ENR	LHR-NWR
Phase, Duration (Long-term, Medium-term, Short-term), Frequency	**Construction and Operation** **Long-term, Continuous** Exposure of wildlife to transport noise, air pollution, and water pollution would commence at construction. Effects will occur both during construction and operation. The effects will be on-going throughout the operational life of the airport.	**Construction and Operation** **Long-term, Continuous** Exposure of wildlife to transport noise, air pollution, and water pollution would commence at construction. Effects will occur both during construction and operation. The effects will be on-going throughout the operational life of the airport.	**Construction and Operation** **Long-term, Continuous** Exposure of wildlife to transport noise, air pollution, and water pollution would commence at construction. Effects will occur both during construction and operation. The effects will be on-going throughout the operational life of the airport.
Permanent/ Temporary **Irreversible/ Reversible**	**Permanent and Irreversible** A number of the effects on are permanent and irreversible. However, it may be possible to reduce the significance of these effects through mitigation, enhancements and compensation.	**Permanent and Irreversible** A number of the effects are permanent and irreversible. However, it may be possible to reduce the significance of these effects through mitigation, enhancements and compensation.	**Permanent and Irreversible** A number of the effects are permanent and irreversible. However, it may be possible to reduce the significance of these effects through mitigation, enhancements and compensation.
Magnitude and Spatial Extent, incl. Transboundary	**High, National**	**High, National**	**High, National**
Assumptions and Limitation	A desk based assessment has been undertaken and there have been no site visits. Precautionary approaches have been adopted for cumulative and in-combination impacts where a lack of detail exists. Uncertainty exists of the cumulative effects of air quality impacts. Uncertainty exists of the viability and efficacy of mitigation and compensation.	A desk based assessment has been undertaken and there have been no site visits. Precautionary approaches have been adopted for cumulative and in-combination impacts where a lack of detail exists. Uncertainty exists of the cumulative effects of air quality impacts. Uncertainty exists of the viability and efficacy of mitigation and compensation.	A desk based assessment has been undertaken and there have been no site visits. Precautionary approaches have been adopted for cumulative and in-combination impacts where a lack of detail exists. Uncertainty exists of the cumulative effects of air quality impacts. Uncertainty exists of the viability and efficacy of mitigation and compensation.
Significance	**Significant Negative effect (--)**	**Significant Negative effect (--)**	**Significant Negative effect (--)**
	Indirect, direct and cumulative effects on designated sites, habitats and species; high probability; occurring during construction and operation; long-term, permanent and irreversible; high magnitude and national extent.	Indirect, direct and cumulative effects on designated sites, habitats and species; high probability; occurring during construction and operation; long-term, permanent and irreversible; high magnitude and national extent.	Indirect, direct and cumulative effects on designated sites, habitats and species; high probability; occurring during construction and operation; long-term, permanent and irreversible; high magnitude and national extent.

5.11 MITIGATION

5.11.1 The NPPF states[48]:

'*the planning system should contribute to and enhance the natural and local environment by minimising impacts on biodiversity and providing net gains in biodiversity where possible, contributing to the Government's commitment to halt the overall decline in biodiversity, including by establishing coherent ecological networks that are more resilient to current and future pressures'*.

5.11.2 Further the NPPF states[49]:

'*To minimise impacts on biodiversity and geodiversity, planning policies should:*

- → *Plan for biodiversity at a landscape-scale across local authority boundaries;*
- → *Promote the preservation, restoration and re-creation of priority habitats, ecological networks and the protection and recovery of priority species populations, linked to national and local targets, and identify suitable indicators for monitoring biodiversity in the plan';*

5.11.3 The mitigation hierarchy comprises three tiers[50] and is essential for all development projects aiming for No Net Loss or Net Positive Impact or for adopting a Net Positive Approach. It is based on a series of sequential steps that must be taken throughout a project's life cycle in order to limit any negative impacts on biodiversity.

5.11.4 **1. Avoidance**: the first step of the mitigation hierarchy comprises measures taken to avoid creating impacts from the outset, such as careful spatial or temporal placement of infrastructure or disturbance. Avoidance is often the easiest, cheapest and most effective way of reducing potential negative impacts, but it requires biodiversity to be considered in the early stages of a project.

5.11.5 **2. Mitigation**: measures taken to reduce the duration, intensity and / or extent of impacts that cannot be completely avoided. Effective mitigation can eliminate some negative impacts.

5.11.6 Collectively avoidance and mitigation serve to reduce, as far as possible, the residual impacts that a project has on biodiversity. In some circumstances, however, even after their effective application, compensation will be required to avoid net loss or to create a Net Positive Impact.

5.11.7 **3. Compensation**: involves measures, such as enhancement of existing features to deliver improved habitat function, new habitat creation, taken within or beyond the development boundary that offset the residual impacts that have a detrimental impact upon the interest feature. Compensation is a last resort and should only be considered where there are residual adverse effects on site/species integrity that cannot be mitigated.

5.11.8 Offsetting is an option in the context of compensation. This is defined by Defra[51] as 'conservation activities designed to deliver biodiversity benefits in compensation for losses, in a measurable way. Biodiversity offsets are distinguished from other forms of ecological compensation by the formal requirement for measurable outcomes: the losses due to impact,

[48] Department for Communities and Local Government, 2012. *The National Planning Policy Framework*, pp. 25-26. [online] Accessed 05/07/2016.
[49] Department for Communities and Local Government, 2012. *The National Planning Policy Framework*, p.27. [online] Accessed 05/07/2016.
[50] Department for Communities and Local Government, 2012. *The National Planning Policy Framework*, p.25-26. [online] Accessed 22/09/2016.
[51] Defra, 2012. *Technical paper: The metric for the biodiversity offsetting pilot in England*. [online] Accessed 05/07/2016.

and gains achievable through the offset, are measured in the same way, even if the habitats concerned are different'.

5.11.9 The AoS objectives are to protect and enhance designated sites for nature conservation and to conserve and enhance undesignated habitats, species, valuable ecological networks and ecosystem functionality. These align to the AC's objective of avoiding harm to biodiversity and, where possible, to provide net gains via habitat enhancement and mitigation measures.

5.11.10 Based on the information available it is not possible to determine the consistent application of the mitigation hierarchy for the options or how no net loss or net gain will be achieved though it is acknowledged that further work will be required to inform these considerations in detail both in terms of meeting the AC's objective of avoiding harm to biodiversity and, where possible, to provide net gains via habitat enhancement and mitigation measures.

5.11.11 The schemes discuss a range of compensation ratios which should be considered in more detail at the project design level. The application of 2:1 ratios are considered to represent the minimum requirement, but compensation ratios are best set on a case by case basis. There are other mechanisms for establishing compensation ratios such as Defra's Biodiversity Offsetting metric. Good practice for the application of net gain and offsetting is emerging such as 'Biodiversity Net Gain – Principles and Guidance for UK Construction and Developments'[52].

5.11.12 Equally it is important to note that habitat ratios form only one part of potential compensation which should be considered and the location and quality of any compensation land is of key importance. In that regard habitat creation should be focused on areas where the most ecological and ecosystem services benefits can be realised.

5.11.13 There are further considerations that will be required associated with the maturation of the different habitat types being proposed as compensation and the different lengths of time required to achieve target condition. In this regard the timescales need to be considered along with the potential need for greater offset ratios applied for those habitats which take longest to establish.

5.11.14 Further, the distance between habitat loss and compensation location is an important factor in terms of the potential need for an increased ratio to reduce the effect of that distance. In the case of compensation habitat for protected species there are likely to be limitations to distances of any translocations enforced through the wildlife licencing regime.

5.11.15 Another consideration relates to the proximity of compensation areas in terms of the local value of the biodiversity to local people. The benefits of interaction with biodiversity to human health and wellbeing are well established. The UK National Ecosystem Assessment (UK NEA) carried out the first analysis of the UK's natural environment in terms of the benefits it provides to society[53]. Cultural services were a large category under the NEA and included all non-material benefits obtained from ecosystems. The work carried out by NEA confirmed that time spent outdoors, in either a domestic garden or a public cultural space, has a positive effect on well-being.

5.11.16 Natural England Accessible Natural Greenspace Standard (ANGSt) recommends that everyone, wherever they live, should have accessible natural greenspace within their local area. ANGSt is based on three principals, improving access, naturalness and connectivity.

[52] CIEEM, CIRIA, IEMA 2016 *Biodiversity Net Gain: Good practice principles for development* [online] Accessed 27/09/17.
[53] UK National Ecosystem Assessment, unknown. *Ecosystem Services*. [online] Accessed 12/02/15.

5.11.17 Effective application of landscape-scale green infrastructure could play a valuable role in addressing some of the considerations identified above. Green infrastructure could be especially relevant to the schemes as it can be focused to ensuring development proceeds in parallel with the protection and enhancement of existing environmental assets and the creation of new ones. Good green infrastructure can produce a strategic and linked, multifunctional network of spaces with benefits for people and wildlife. Furthermore it can be developed to include sustainable features for the development by making it resilient to the effects of climate change and enabling authorities to meet their duty to conserve biodiversity under the NERC Act 2006.

LGW-2R

5.11.18 Consideration of mitigation for European Sites has been considered in the HRA AA and is summarised below.

5.11.19 A range of mitigations were considered in the AA to reduce the effects of air quality impacts including:

- Implementation of a Construction Environmental Management Plan (CEMP) to reduce dust and construction emission impacts;
- Effective application of sustainable transport plans, in particular the use of carbon-efficient and non-road transport;
- Congestion charges and improved infrastructure for Ultra Low Emission Vehicles for passengers; and
- Development and application of appropriate air quality management plans and independently certified offsetting options (including for example, renewable energy and fuel-switching).

5.11.20 It was recognised that the efficacy of such mitigation proposals could not be substantiated; residual adverse effects were assumed on the integrity of the interest features of the European sites.

5.11.21 The compensation area identified by the scheme promoter to the west is an existing SSSI with favourable status, and the area east of the airport is within a biodiversity improvement area within the proposed airport development area. It is not clear how the compensation proposals could be delivered adequately within these areas or if other locations outside these are proposed. Further detail at the next stage of project design would address these uncertainties.

5.11.22 Based on the 2:1 area compensation ratio, the LGW-2R compensation strategy would incorporate 124.2 ha of woodland and, taking into account potential surface access losses, 99.4 km of hedgerow (see below for ancient hedgerow), 7 km of rivers and brooks and twelve ponds. The scheme promoter commits to replacing ancient woodland at a 3:1 ratio with newly planted woodland, and ‘other’ woodland at 2:1 (subject to agreement with Natural England and other stakeholders).

5.11.23 The loss of 14 ha of ancient woodland constitutes a significant impact and potentially conflicts with the NPPF. The impact would be exacerbated by the significant loss of connecting ancient hedgerows. It is not only the trees and variety of habitats which are important when considering ancient woodlands but also the soils. Ancient woodland soils contain diverse species assemblages which cannot be replaced by new planting.

5.11.24 The irreplaceable nature of ancient woodland and veteran trees means that loss or damage cannot simply be rectified by mitigation and compensation measures. Therefore, where measures seek to address issues of loss or deterioration of ancient woodland or veteran trees, these should be issues for consideration only after it has been judged that the wider benefits of

a proposed development clearly outweigh the loss or damage of ancient woodland. Ancient woodland is an irreplaceable habitat which cannot be re-created, and that due to its irreplaceability, like for like compensation or biodiversity offsetting is not applicable to ancient woodland.

5.11.25 The location, quality, ecological function and ongoing long term management of woodland creation to compensate for loss of ancient woodland will need detailed consideration. A strategic 'landscape scale' mitigation and compensation strategy for the LGW-2R scheme that reflects the significant losses of ancient woodland and hedgerows could be undertaken.

5.11.26 The application of compensation ratios will need to be considered in more detail. The application of 2:1 ratios are considered to represent the minimum requirement. There are other mechanisms for establishing compensation ratios such as Defra's Biodiversity Offsetting metric.[51]

5.11.27 Equally it is important to note that habitat ratios form only one part of potential compensation which should be considered and the location and quality of any compensation land is of key importance. In that regard habitat creation could be focused on areas where the most ecological and ecosystem services benefits can be realised.

5.11.28 Further desk study assessment and site specific surveys would be required to determine presence/absence of habitats and species and any associated impacts and effects. This would require seasonal surveys, land access and detailed development plans to be in place for effective identification of impacts. The inclusion of additional compensatory habitat for unknown populations is appropriate at this level but should be considered arbitrary and the locations will need to be considered in the context of any specific populations affected.

LHR-ENR

5.11.29 Consideration of mitigation for European Sites has been considered in the HRA AA and is summarised below.

5.11.30 A range of mitigations were considered in the AA to reduce the effects of air quality impacts including:

- Implementation of a CEMP to reduce dust and construction emission impacts;
- Effective application of sustainable transport plans, in particular the use of carbon-efficient and non-road transport;
- Congestion charges and improved infrastructure for Ultra Low Emission Vehicles for passengers; and
- Development and application of appropriate air quality management plans and independently certified offsetting options (including for example, renewable energy and fuel-switching).

5.11.31 It was recognised that the efficacy of such mitigation proposals could not be substantiated; residual adverse effects were assumed on the integrity of the interest features of the European sites.

5.11.32 For habitat loss it is considered likely that at the detailed design stage the impacts could reasonably be avoided through a review of the detailed alignment that avoids encroachment into the designated sites or the immediately adjacent habitats. This together with the construction methods to be used would be planned to avoid land take adjacent to the SWLW SPA. These measures are considered to be viable and robust to prevent adverse effects to integrity. However where loss cannot be avoided it is unlikely that viable mitigation can be provided to reduce the impact and compensation measures will require consideration.

5.11.33 Indirect impacts to Unit 12 of Staines Moor SSSI from works affecting the River Colne could be avoided through the design of channel diversions and minimising culverting requirements. Through maintaining water quality, volume and flow rate (or not adversely affected), then impacts to the SSSI, Management Unit 12, downstream should be avoided.

5.11.34 To mitigate the effects of disturbance the development of a 'London Basin Waterfowl Strategy' was considered. This strategy would have the aim of protecting waterfowl on all waterbodies in the SW London area. It would identify high and low priority sites and 'consultation zones' for waterfowl conservation, and site-specific management statements for waterbody managers.

5.11.35 A key focus of this strategy would be the management of the existing recreational disturbance pressures through relocation and appropriate zonation of water recreation activities. By reducing the existing levels of disturbance there could be increased threshold for potential cumulative disturbance from the scheme (subject to a detailed understanding of the aeroplane flight paths and heights). Further the enhancement of a number of waterbodies would offer additional habitat to the interest features that could reduce energetic expenditure and increase the potential carrying capacity of the site for both the citation features and other waterbirds as well.

5.11.36 To inform these measures updated information will be required on existing levels of baseline disturbance across both the SPA waterbodies and those in the wider area that support the integrity of the site.

5.11.37 Further understanding of bird response to airport operations would need to be established via targeted studies at the SWLW to fully verify the potential efficacy of these measures.

5.11.38 The Water Quantity and Quality assessment provides a number of mitigation measures proposed to be integrated into the design to minimise the impact on water quality and quantity. This in turn would minimise the impact on SWLW SPA and Ramsar. However, in the absence of further data to identify the efficacy of such mitigation proposals, residual adverse effects are assumed on the integrity of the interest features of the European sites.

5.11.39 The LHR-ENR scheme contains a commitment to compensation along with a number of sites where such compensation could be carried out. This includes 26 ha of lakes and ponds, the location of which could have a significant impact on the birdstrike risk at the airport.

5.11.40 Removal of the proximity issue is to move the compensation habitats far enough away from the airport that the impact on birdstrike risk becomes negligible. However this approach conflicts with typically adopted best practice where compensation is carried out as close to the original site as possible, especially so in the case of compensation under the Habitats Regulations. Conversely, locating compensation further away with no design constraints does offer greater opportunity to maximise the benefits for biodiversity benefits.

5.11.41 Given the uncertainty surrounding flight paths of birds and flight heights of aeroplanes the precautionary principle requires that the compensation proposals would conflict with birdstrike management and that increased bird management has the potential to disturb non target species including citation species of the designated site. Further disturbance effects would be likely to result in cumulative disturbance to the interest features of the site and as such an adverse effect to the sites integrity. These issues are particularly complex and will need detailed consideration at the design level assessment.

5.11.42 There is the potential for further direct land take due to new southern access road through Units 12 and 13 on the western side of Staines Moor SSSI, or alternate dualling of A3044 road which runs between units 7 and 8 of the SSSI (these units are also part of the SWLW SPA) which could be further clarified during detailed design.

5.11.43 Application of the mitigation hierarchy will be essential to avoid these significant impacts on the SSSI. There is further work to inform the understanding as to the design and deliverability of such mitigation at the detailed design stage.

5.11.44 A default precautionary multiplier of two has been proposed by the scheme promoter to compensate for losses of habitats. These measures give totals of 146 ha of habitat and 6 km of linear watercourse. A further recommendation of 6ha of scrub and up to 70 ha of pasture / rough grassland to compensate for the loss of these less important (not of Principal Importance) habitats is made by the scheme promoter. Consideration of the potential requirement for areas greater than those proposed has also been made, to compensate for the possibility of adversely impacting the biodiversity resource of the proposed compensation sites themselves. Parcels of land totalling an area of 217 ha have been identified by the scheme promoter as possible compensation sites. This area would just about accommodate the 146 ha requirement above plus the 76 ha for scrub and rough grassland. An additional requirement for 248.8 ha of compensatory habitat which is greater than the scheme promoter's recommendation of 217 ha, was recommended by the Airports Commission due to inclusion of surface access impacts and precautionary allowances for potential indirect effects and protected species.

5.11.45 The scheme contains a commitment to compensation for lost habitat as well as improvement of existing habitat for wildlife, creation of new habitat and development of outdoor leisure opportunities around the airport. The proposals include creation of wetlands, flood meadows, woodland, open water and marginal habitats. All of these areas have the potential to attract hazardous birds to the area or to change the behaviour patterns of birds that are already present and thus create an additional birdstrike risk. The need to manage the birdstrike risk is acknowledged in the scheme promoter's submission. The scheme promoter's assessment concluded that it is often very difficult to redesign environmental mitigation options to exclude hazardous species without reducing their effectiveness as a mitigation measure to a greater or lesser extent.

5.11.46 The preferable scheme to solve these issues is to move the mitigation and compensation actions far enough away from the airport that the impact on birdstrike risk becomes negligible. Although this runs counter to normal practice where mitigation is carried out as close to the original site as possible. In the case of airports, moving the mitigation further away would allow greater freedom to develop mitigation sites to fulfil conservation aims without the restriction imposed by the need to consider birdstrike risk as a design limitation. If the mitigation cannot be moved further away (e.g. in the case of rivers), scrutiny and, potentially, extensive modification of the design and location of the proposed mitigation will be needed, and this may, in some instances, reduce its effectiveness as a mitigation for loss of biodiversity. Schemes would include the use of lasers to disperse the birds as they arrive at the roost site. This has been successfully implemented in trials elsewhere as a means of dispersing a large gull roost. Roost dispersal could be combined with implementing bird control on any local landfill sites that gulls are feeding on prior to moving to the reservoir to roost. Key issues in relation to compensation habitat design will be to avoid creating habitats that attract bird species known to be hazardous to aviation operations by virtue of their size and / or flocking behaviour. Large open waterbodies are to be avoided due to their appeal to larger waterbirds such as swans, (feral) geese, ducks and gulls. Habitats known to support roosts of large numbers of birds are also to be avoided, such as reedbeds which are known to attract starlings, pied wagtails and other passerines in large numbers at night.

5.11.47 Any mitigation that involves large scale bird dispersal from e.g. a reservoir has the potential to adversely impact on non-hazardous birds of conservation concern that currently use the site. As discussed above, SPA qualifying species (gadwall and shoveler) could potentially be adversely affected by increased levels of bird dispersal activity and this would require monitoring and possible compensation measures. The relative use of the SWLW SPA lakes (and nearby non-SPA functional habitat) by gadwall and shoveler are reasonably well understood, meaning habitat mitigation/enhancement measures can be focussed on areas

known to be of importance for these species in an effort to 'separate' these non-target birds from species hazardous to aviation operations.

5.11.48 Ecological information from the Buckinghamshire and Milton Keynes Environmental Records Centre would inform any additional sites that have not been identified.

5.11.49 Further desk study assessment and site specific surveys would determine presence / absence of habitats and species and any associated impacts and effects. The inclusion of additional compensatory habitat for unknown populations is appropriate at this level but should be considered largely arbitrary and the locations will need to be considered in the context of any specific populations affected.

LHR-NWR

5.11.50 Consideration of mitigation for European Sites has been considered in the HRA AA and is summarised below.

5.11.51 A range of mitigations were considered in the AA to reduce the effects of air quality impacts including:

- Implementation of a CEMP to reduce dust and construction emission impacts;
- Effective application of sustainable transport plans, in particular the use of carbon-efficient and non-road transport;
- Congestion charges and improved infrastructure for Ultra Low Emission Vehicles for passengers; and
- Development and application of appropriate air quality management plans and independently certified offsetting options (including for example, renewable energy and fuel-switching).

5.11.52 It was recognised that the efficacy of such mitigation proposals could not be substantiated; residual adverse effects were assumed on the integrity of the interest features of the European sites.

5.11.53 For habitat loss it is considered likely that at the detailed design stage the impacts could reasonably be avoided through a review of the detailed alignment that avoids encroachment into the designated sites or the immediately adjacent habitats. This together with the construction methods to be used would be planned to avoid land take adjacent to the SPA. These measures are considered to be viable and robust to prevent adverse effects to integrity. However where loss cannot be avoided it is unlikely that viable mitigation can be provided to reduce the impact and compensation measures will require consideration.

5.11.54 Indirect impacts from works affecting the River Colne could be avoided through the design of channel diversions and minimising culverting requirements. Through maintaining water quality, volume and flow rate (or not adversely affecting), then impacts to the SSSI, downstream should be avoided. These measures are considered to be viable and robust to prevent adverse effects to integrity.

5.11.55 To mitigate the effects of disturbance the development of a 'London Basin Waterfowl Strategy' was considered. This strategy would have the aim of protecting waterfowl on all waterbodies in the SW London area. It would identify high and low priority sites and 'consultation zones' for waterfowl conservation, and site-specific management statements for waterbody managers.

5.11.56 A key focus of this strategy would be the management of the existing recreational disturbance pressures through relocation and appropriate zonation of water recreation activities. By reducing the existing levels of disturbance there would be increased threshold for potential

cumulative disturbance from the scheme (subject to a detailed understanding of the aeroplane flight paths and heights). Further the enhancement of a number of waterbodies would offer additional habitat to the interest features that could reduce energetic expenditure and increase the potential carrying capacity of the site for both the citation features and other waterbirds as well.

5.11.57 To inform these measures updated information will be required on existing levels of baseline disturbance across both the SPA waterbodies and those in the wider area that support the integrity of the site.

5.11.58 Further understanding of bird response to airport operations would need to be established via targeted studies at the SWLW to fully verify the potential efficacy of these measures.

5.11.59 The Water Quantity and Quality assessment provides a number of mitigation measures proposed to be integrated into the design to minimise the impact on water quality and quantity. This in turn would minimise the impact on SWLW SPA and Ramsar. However, in the absence of further data to identify the efficacy of such mitigation proposals residual adverse effects are assumed on the integrity of the interest features of the European sites.

5.11.60 The LHR-NWR scheme contains a commitment to compensation for lost habitat as well as improvement of existing habitat for wildlife, creation of new habitat and development of outdoor leisure opportunities around the airport. The proposals include creation of wetlands, flood meadows, woodland, open water and marginal habitats etc. All of these areas have the potential to attract hazardous birds to the area or to change the behaviour patterns of birds that are already present and thus create an additional birdstrike risk.

5.11.61 The need to manage the birdstrike risk is acknowledged in the submission and proposes that compensatory habitats are designed in such a way that ducks, geese and gulls are not attracted to the areas. However, it is often very difficult to redesign habitat compensation schemes to exclude hazardous species without reducing their effectiveness as a mitigation measure to a greater or lesser extent. For example, steepening banks of water bodies and removing shallow margins to remove potential breeding sites for feral geese, reduces habitat for marginal plants, invertebrates and amphibians, as well as creating a potential health and safety issue for the public. Similarly, creating woodland and scrubland that is suitable for species of conservation concern may provide communal roosting sites for pigeons, corvids or starlings, all of which can pose significant risks to aircraft.

5.11.62 Moving the compensation away from the approach and departure corridor is, in itself, not sufficient as a precaution, because creating an attractive habitat to one side of the airfield when there is existing habitat on the opposite side may result in birds regularly crossing the active airspace to move from one site to the other thus increasing the risk.

5.11.63 Where compensation cannot be moved further away detailed assessment and, potentially, extensive modification of the design and location of the proposed compensation will be needed, and this may, in some instances, reduce its effectiveness as offsetting for loss of biodiversity.

5.11.64 LHR-NWR scheme offers some birdstrike benefits in that it will remove some habitat close to the airport that is attractive to hazardous birds. However, the new runway is significantly closer to Queen Mother Reservoir which supports a very large gull roost. This issue has not been addressed and might require dispersal of the roost which would have additional ecological impacts. The proposed mitigation will create large quantities of new habitat close to the airport that has the potential to increase the overall birdstrike risk. The scheme promoter states that new habitat will be designed to avoid increasing the birdstrike risk, but it is not clear how this can be achieved whilst maintaining the mitigation value of the new habitats created. Offsetting habitat loss by creating new habitat further from the airport might solve these problems.

5.11.65 Direct land take from internationally and nationally designated sites can be avoided by the NWR proposals. This is dependent on the alignment of surface access routes along the M25 corridor being designed and constructed to ensure no direct impacts on Staines Moor SSSI and Wraysbury Reservoir SSSI (and therefore on the SWLW SPA and Ramsar site (SWLW SPA / Ramsar), of which Wraysbury Reservoir SSSI is a component).

5.11.66 Further detailed design on alignment and construction would seek to avoid impacts on these sites in accordance with the mitigation hierarchy.

5.11.67 There is the potential for significant impacts to the Staines Moor SSSI due to changes to the River Colne, on which the alluvial meadows, for which the SSSI is in-part designated, depend. Mitigation will be essential to avoid impacts on the SSSI.

5.11.68 The River Colne valley presents opportunities for biodiversity enhancement measures, which will be required as mitigation given the proposed culverting and diverting of sections of rivers with resultant biodiversity losses.

5.11.69 The direct loss of priority habitats is identified as being approximately 35.5 ha of mixed deciduous woodland / traditional orchard and 13 km of river. An estimate of approximately 400ha of potentially available compensation space has been made by the scheme promoter. The habitat proposal gain of 400 ha versus the potential direct loss of 120 ha gives a ratio of just over 3:1, which is likely to be sufficient, given the standard ratio of 2:1, but it is important to note that not all the areas would be of inherent significant ecological value (e.g. the children's' play area or the community centre and sports pitches), meaning the extent of habitat actually available for ecological compensation measures is reduced. Further detail would determine the actual volumes of habitat available for biodiversity.

5.11.70 The compensation includes 26 ha of lakes and ponds, the location of which could have a significant impact on the birdstrike risk at the airport. It would be preferable to move any environmental compensation that might attract hazardous birds as far away from the airport as possible, which would both allow the impact to be maximised because the need to compromise designs to reduce birdstrike risk would be removed and also result in an overall safety benefit to the airport as bird attracting habitat close to the site will be removed and re-created at a safer distance.

5.11.71 Key issues in relation to compensation habitat design will be to avoid creating habitats that attract bird species known to be hazardous to aviation operations by virtue of their size and / or flocking behaviour. Large open waterbodies are to be avoided due to their appeal to larger waterbirds such as swans, (feral) geese, ducks and gulls. Habitats known to support roosts of large numbers of birds are also to be avoided, such as reedbeds which are known to attract starlings, pied wagtails and other passerines in large numbers at night.

5.11.72 Ecological information from the Buckinghamshire and Milton Keynes Environmental Records Centre would inform any additional sites that have not been identified.

5.11.73 Further desk study assessment and site specific surveys would determine presence/absence of habitats and species and any associated impacts and effects. The inclusion of additional compensatory habitat for unknown populations is appropriate at this level but should be considered arbitrary and the locations will need to be considered in the context of any specific populations affected.

5.12 ASSUMPTIONS AND LIMITATIONS

5.12.1 The key limitation to this assessment are:

- All assessment work to date has been desk based using published data sources. There will inevitably be gaps in the baseline data that can only be completed by site based surveys. In particular for protected species and species of principal importance precautionary approaches the assessment has assumed presence of these species in appropriate habitats and geographies;
- A precautionary approach has been adopted for cumulative and in-combination impacts where a lack of detail exists, in particular for disturbance and air quality effects. This approach is especially important in association with impacts to Natura 2000 and Ramsar sites and is in keeping with the requirements of the Habitats Regulations; and
- The assessment of impacts to SSSI at this stage is not comprehensive and will require much more detailed consideration at the detailed design stage. This would require seasonal habitat and species surveys, land access and more detailed development plans so that direct and indirect impacts are better understood.

5.12.2 At the detailed design stage the following further data requirements are considered necessary (the identified requirements are not considered to be exhaustive).

Table 5.6: Further Data Requirements

POTENTIAL IMPACT/EFFECT	FURTHER DATA REQUIREMENTS
Disturbance	Updated patterns of usage of the SPA and supporting waterbodies at Southwest London Establishment of baseline disturbance effects from existing aviation, recreation, gravel works and reservoir management Flight paths of interest features between the waterbodies Baseline condition assessment of waterbodies with potential for biodiversity enhancement
Air Quality	Effects of nitrogen deposition on European sites affected by proposals. Levels of nitrogen deposition on European sites as a result of the proposals on European sites within 200 m of affected road.
Water Quantity / Quality	Effects of water quality/quantity on European sites affected by proposals. Extent of changes to water quality/quantity on European sites as a result of the proposals on European sites within 200 m of affected road.
Habitat Loss	Detailed alignments of footprints that overlap with designated areas and areas of supporting habitats Detailed baseline assessment of all affected habitats and presence/absence of species populations Assessment of water management through the design of channel diversions and minimising culverting requirements to maintain water quality, volume and flow rate
Recreational Disturbance	Establishment of baseline disturbance effects from existing aviation, recreation, gravel works and reservoir management
Operational Management	Flight paths of interest features and non interest features between the waterbodies Detailed review of proposed flight paths and heights Assessment of viable alternative far field locations for compensatory habitats

5.13 CONCLUSIONS

AoS Objective 7: To protect and enhance designated sites for nature conservation.

5.13.1 All three schemes have the potential to result in adverse significant effects to European Sites. For LGW-2R the effects are largely indirect and resultant of surface access. For LHR-ENR and LHR-NWR a range of effects have been identified for SWLW along with a number of sites that are subject to indirect effects due to surface access.

5.13.2 On the basis of information that is available or can be reasonably obtained, and in accordance with the precautionary principle, it has not been possible to rule out adverse effects on the integrity of the above Natura 2000 sites, either alone or in combination with other plans and projects, with respect to each site's conservation objectives. Mitigation has the potential to address some of these effects however it is not certain at this time with the information available that all the effects can be avoided through mitigation alone. Where mitigation does not conclude an absence of adverse effects on integrity, both alone and in-combination, further assessment of the policy would be required under Stages 3 and 4 of the HRA process.

5.13.3 In the event that compensation is required (subject to meeting the tests under Stages 3 and 4 of the HRA process) there could be significant challenges in delivering appropriate compensation due to conflicts arising from operational management. Options for addressing these challenges are considered in the HRA and will require further consideration in the project level assessment.

5.13.4 All three schemes have the potential to result in adverse effects to SSSIs. The assessment of impacts to SSSIs at this stage is not comprehensive and will require much more detailed consideration at the detailed design stage.

5.13.5 In the case of LGW-2R the adverse effects are indirect and associated with air and water quality changes. The potential impacts could occur both alone and in-combination. Air and water quality changes could result in adverse effects to the habitats and species interest features of Mole Gap to Reigate Escarpment SAC, Ashdown Forest SAC and SPA, Glover's Wood SSSI, Leith Hill SSSI, Vann Lake and Ockley Woods SSSI, Reigate Heath SSSI, Mole Gap to Reigate Escarpment SSSI, Hedgecourt SSSI, Weir Wood Reservoir SSSI, Wakehurst and Chiddingly Woods SSSI, Cow Wood and Harrys Wood SSSI, St Leonards Wood SSSI.

5.13.6 Surface access proposals for the scheme could have potential impacts due to land take and disturbance at a small number of non-statutory sites adjacent to the M23 motorway, in the general area of Junction 9A. Sites initially identified are Bridges Wood pSNCI, Bridges Fields pSNCI and The Roughs SNCI, all of which carry a degree of importance for biodiversity at the local level.

5.13.7 For LHR-ENR and LHR-NWR the schemes could result in permanent adverse impacts on SSSI. The LHR-ENR scheme would result in a direct impact due to land take from the Staines Moor SSSI from the LHR-ENR proposals, comprising the loss of Unit 1 (Poyle Meadow, 8.74 ha) of the SSSI. Based on scenarios presented in the scheme there is potential for indirect impacts on Unit 12 of Staines Moor SSSI from works affecting the River Colne, this could lead to the loss of 40 ha of the SSSI. The LHR-ENR scheme has the potential for indirect impacts on the following SSSIs from air and water quality changes: Staines Moor SSSI; Wraysbury Reservoir SSSI; Wraysbury No.1 Gravel Pit SSSI; Wraysbury and Hythe End Gravel Pits SSSI; and Kempton Park Reservoirs SSSI. The potential impacts could occur both alone and in-combination. Air and water quality changes could result in adverse effects to the habitats and species interest features of these sites.

5.13.8 The LHR-NWR scheme has the potential for indirect impacts on the following SSSIs from air and water quality changes: Staines Moor SSSI; Wraysbury Reservoir SSSI; Wraysbury No.1 Gravel Pit SSSI; Wraysbury and Hythe End Gravel Pits SSSI; and Kempton Park Reservoirs

SSSI. The potential impacts could occur both alone and in-combination. Air and water quality changes could result in adverse effects to the habitats and species interest features of these sites.

5.13.9 All three schemes have the potential to result in adverse effects to local designated sites. The LGW-2R scheme involves direct land take impacts on two local designated sites, one statutory (Willoughby Fields SNCI / LNR), and one non-statutory (Rowley Wood SNCI). The majority of the area of these two sites would be lost. Further losses may occur at Horleyland Wood SNCI.

5.13.10 The LHR-ENR scheme includes the potential for direct land due to surface access requirements of 4.1 ha from Arthur Jacob LNR, 2.9 ha from East Poyle Meadows SNCI, 0.45 ha from Greenham's Fishing Pond SINC, 10-15 ha from Lower Colne SMINC, and 1.25 ha from the River Colne.

5.13.11 The LHR-NWR scheme involves direct land take impacts on three local non-statutory designated sites (Old Slade Lake LWS, Lower Colne SMINC and Stanwell II SNCI).

5.13.12 All three schemes are considered to result in significant negative effects. When assessed against objective 7 it is considered the LHR-ENR scheme could result in the greatest level of adverse effects to designated sites and LGW-2R could result in lowest level of adverse effects to designated sites.

AoS Objective 8: To conserve and enhance undesignated habitats, species, valuable ecological networks and ecosystem functionality.

5.13.13 LGW-2R would result in loss of lowland mixed deciduous woodland, including significant loss of ancient woodland; hedgerow including ancient hedgerow; rivers and brooks including canalised or conduited channel; and ponds. The existing habitat comprises of woodland of various sizes with a series of interconnecting hedgerows, which are also a priority habitat. The existence of the network of hedgerows joining various woodland blocks provides a functioning habitat throughout this landscape. The loss of such a large extent of this functioning habitat would therefore occur and require consideration on a landscape scale. The scheme could result in air quality impacts on ancient woodland blocks adjacent to affected roads.

5.13.14 The Low Weald NCA in which the LGW-2R scheme is proposed is amongst the most important areas for bats in terms of species diversity and includes internationally important populations of Bechstein's associated with designated sites. The habitat losses occur at a distance from the designated sites (10 km) that exceeds the current known foraging of Bechstein's (typically 3km) although more recent findings for the HS2 development have identified foraging distances of up to 7 km. Fragmentation of ancient woodlands and hedgerows also has the potential to impact this species.

5.13.15 The following priority habitats would be affected as a result of the LHR-ENR scheme: deciduous woodland; traditional orchard; rivers and brooks; and reedbeds and lowland meadows.

5.13.16 The following priority habitats would be affected as a result of the LHR-NWR scheme: deciduous woodland; traditional orchard; rivers and brooks; and reedbeds and lowland meadows.

5.13.17 All three schemes would be likely to result in adverse effects to protected species and species of principal importance. It is considered likely that the all three schemes have the potential to support a range of species protected under UK (and EU) wildlife legislation including but not limited to bat species, dormice, and great crested newts. In addition it is likely the area will support species protected under the WCA and species of principal importance as identified under Section 41 of the NERC Act 2006.

5.13.18 There are birdstrike management issues for the LHR-ENR and LHR-NWR schemes associated with the nearby complex of open water bodies. The western threshold of the extended runway will be significantly closer to the complex of reservoirs and gravel pits to the west of the airport (including sites designated as part of the SWLW SPA and Ramsar site). The closer proximity of the runway and increased air traffic is likely to result in an increased strike risk, and a corresponding requirement for an increase in bird management and control activities is anticipated. Methods of deterring/scaring and controlling bird species potentially hazardous to aviation operations could potentially have an adverse effect on non-target species and biodiversity including those not listed on the designation interest features.

5.13.19 For LHR-ENR and LHR-NWR bird management measures present a range of complex challenges both in terms of avoiding impacts but also in the siting of any compensation habitats.

5.13.20 Given the scope of the proposals all three schemes would be likely to increase the exposure of wildlife to transport noise, air pollution, and water pollution.

5.13.21 All three schemes are considered to result in significant negative effects. When assessed against objective 8 based on the information and excluding species linked to designated sites it is considered at this stage, with the information available at this time that the LGW-2R scheme could result in the greatest level of adverse effects to undesignated habitats, species, valuable ecological networks and ecosystem functionality. There is considered to be negligible difference between the LHR-ENR and LHR-NWR schemes.

5.13.22 Overall, all three schemes result in significant negative impacts, based on the information available at this time there is no preference in relation to the biodiversity objective.