DRAFT AIRPORTS NPS - HABITATS REGULATIONS ASSESSMENT

STATEMENT TO INFORM APPROPRIATE ASSESSMENT

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Department for Transport

WSP | PARSONS BRINCKERHOFF

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1.1.3 The AC undertook a detailed review covering key thematic issues of the UK's aviation capacity and connectivity requirements. This included considering how demand for air travel in the UK was likely to develop across a range of future scenarios. This work concluded that the UK faces no immediate capacity crisis. However, future demand forecasts across a range of scenarios predict significant growth in demand for aviation to 2050.

1.1.4 The AC looked at means to accommodate this future demand including measures to meet the UK's aviation capacity and connectivity needs without the provision of new runway infrastructure. These included measures to redistribute aviation demand to less congested airports and surface access investment to replace the need for air movements. The AC found that none of these options were effective in reducing the capacity shortfall and therefore without the provision of new infrastructure the London airport system is likely to be under very substantial pressure in 2030, and demand will significantly exceed total available capacity by 2050.

1.1.5 The interim findings identified two existing airports as credible locations for an additional runway: Gatwick (LGW) and Heathrow (LHR). At Gatwick, the AC committed to further consideration of a new runway to the south of the existing runway. At Heathrow, two alternative expansion proposals were carried forward: a new runway to the north west of the existing runways; and the extension of the current northern runway to create a runway of double length.

1.1.6 In December 2015 the government accepted the AC's case for airport expansion in the South East and the shortlist of schemes for expansion. They have continued to work on environmental impacts and develop the best possible package of measures to mitigate the impacts on local people and the environment. On 25 October 2016, the Government confirmed that it had completed its further work. It also announced that a new Northwest Runway at Heathrow Airport (LHR-NWR) was its preferred scheme to deliver additional airport capacity in the South East of England and would be taken forward through policy.

1.1.7 The proposed policy will take the form of a National Policy Statement (NPS). Its purpose will be to set out the scale and timing of the requirement for additional capacity. It will set out how any identified need for additional capacity should be met in the long term and the matters to be considered in relation to any application for development consent relating to additional capacity.

1.1.8 The NPS will be underpinned by the evidence in relation to the current position in the UK with regard to aviation demand and connectivity, forecasts for how these are likely to develop, and the expected future pattern of the UK's requirements for international and domestic connectivity. The NPS will seek to ensure that strategic issues are considered and controlled within any future development application for major airports infrastructure in the south east of England.

1.1.9 Under the requirements of the European Council Directive 92/43/EEC 'The Habitats Directive' and the Council Directive 79/409/EEC 'The Wild Birds Directive' it is necessary to consider whether the proposed Policy, being a "plan" for the purposes of the Habitats Directive, may have significant impacts upon areas of nature conservation importance designated/classified under the Directives. Should significant impacts be identified it would be necessary to further consider the impacts of any application by way of an 'AA'. This process of assessment under the requirements of the Habitats Directive (as transposed into UK legislation by The Conservation of Habitats and Species Regulations 2010: 'The Habitat Regulations') is defined as Habitats Regulations Assessment (HRA).

1.1.10 Initial HRA screening identified potential for likely significant effects (LSE) at eight of the European sites as a result of impacts that may arise from the development of LHR-NWR. These effects were assessed further through the AA stage of the HRA which considered: European site data; available environmental condition data; and the potential effects of other plans and projects 'in-combination'. It was concluded that at this stage that it could not be ruled out that the development of the LHR-NWR may have an adverse effect on European site integrity, as summarised.

Table 1-1: Summary of the European sites where adverse effect cannot be ruled out based on the results of the initial HRA screening and the further AA stage.

Potential impact	European site where adverse effect cannot be ruled out
Disturbance	South West London Waterbodies Special Protection Area (SPA) South West London Waterbodies Ramsar
Operational Management	South West London Waterbodies SPA South West London Waterbodies Ramsar
Habitat Loss / Fragmentation	South West London Waterbodies SPA South West London Waterbodies Ramsar
Air Quality	South West London Waterbodies SPA South West London Waterbodies Ramsar Windsor Forest and Great Park Special Area of Conservation (SAC) Richmond Park SAC Burnham Beeches SAC Thursley, Ash, Pirbright and Chobham SAC Wimbledon Common SAC Thames Basin Heaths SPA
Water Quality and Quantity	South West London Waterbodies SPA South West London Waterbodies Ramsar

1.1.11 The conclusions of the HRA are partially limited by the strategic nature of the assessment process and the level of detail available with regard to project design and in relation to mitigation in particular. At this stage, this does not allow for a definitive prediction of effects on the European Sites considered. As such it has been necessary to apply the precautionary principle for a number of assessments where uncertainty remains. The precautionary approach suggests that AA at this strategic level cannot rule out the potential for adverse effects on the integrity of any of the European Sites identified through the screening stage through impacts on water resources and quality, habitat and species loss and fragmentation, disturbance (noise, light, visual) and air quality.

1.1.12 To address the uncertainties inherent in a strategic level HRA, and to most helpfully inform the project level HRA, this AA has proposed a suite of avoidance and mitigation measures to be considered in further detail as part of the project level HRA. At that stage, it is considered that the effective implementation of the proposed suite of avoidance and mitigation measures may help to address the identified adverse effects on European site integrity.

1.1.13 However only an assessment at the project stage supported by detailed data at project level will allow it to be determined whether the development of LHR-NWR could be undertaken without adversely affecting the integrity of European Sites listed above. Only at the project level HRA, with site specific supporting survey data, can a conclusion of no adverse effect on European site integrity be made with any confidence.

1.1.14 Accordingly in relation to the proposed Policy consideration has been given to the tests of whether alternatives, imperative reasons of overriding public interest (IROPI) and compensatory measures are available under Article 6(4) of the Habitats Directive. The assessment of alternatives has considered the short listed schemes and AA has also been undertaken for the two schemes not preferred by the Government. The conclusions of that work have led to no suitable alternatives to LHR-NWR being identified. Further, the requirements for IROPI have been examined and it is considered that the need case underpinning the NPS meets those needs.

1.1.15 In any event the NPS will provide that no consent will be granted unless full compliance with Article 6(3) or Article 6(4) of the Habitats Directive are met and that any necessary compensatory measures will be secured in accordance with Regulation 66.

2 PROJECT BACKGROUND

2.1 INTRODUCTION

2.1.1 The Department for Transport (DfT) is responsible for setting national aviation policy, working with airlines, airports, the Civil Aviation Authority (CAA) and the UK's National Air Traffic Service (NATS). Supporting the development of aviation and improving passenger experience is one of the DfT's priorities.[1]

2.1.2 The Airports Commission (AC), chaired by Sir Howard Davies, was set up in November 2012 to undertake an independent examination of the scale and timing of any necessary steps to maintain the UK's status as Europe's most important aviation hub. The AC published its final report on 1st July 2015.[2]

2.1.3 The ability to move people and goods across the globe in a matter of hours is fundamental to the global economy. Airports can also make an important contribution to their local economies, being major employers in their own right and having the potential to attract companies whose business depends on air travel into their immediate proximity. Airports also contribute to quality of life, enabling people to travel abroad for leisure, broaden their horizons, or visit friends and relatives.

2.1.4 The AC's Interim Report[3] notes that some of the consequences of aviation are negative. Air travel already makes a significant contribution to global greenhouse gas emissions and this relative contribution is set to grow as other industries take steps to decarbonise. Other environmental impacts are more local in scope. Aircraft noise causes considerable annoyance to the communities it affects and there is a growing body of evidence regarding its impacts on human health. New infrastructure developments can alter landscapes and affect natural habitats and cultural heritage. The challenge of getting passengers into and out of airports can also place stress on surface transport networks, potentially leading to congestion and exacerbating air quality issues in addition to emissions caused directly by aircraft.

2.1.5 The AC undertook a detailed review, informed by a series of discussion papers[4] covering key thematic issues, of the UK's aviation capacity and connectivity requirements. This included considering how demand for air travel in the UK was likely to develop across a range of future scenarios.

2.1.6 The AC concluded that the UK faces no immediate capacity crisis. The country is one of the best connected in the world, and London has the largest origin and destination market in the world. However, future demand forecasts across a range of scenarios predict significant growth in demand for aviation to 2050.[3]

2.1.7 The AC looked at accommodating this future demand through a variety of means, including measures to meet the UK's aviation capacity and connectivity needs without the provision of new runway infrastructure. These included measures to redistribute aviation demand to less congested airports and surface access investment to replace the need for air movements. The AC found that none of these options were effective in reducing the capacity shortfall and therefore without the provision of additional runway infrastructure the airport system in the south east of England is likely

[1] Department for Transport, 2015. *Homepage.* [online] Accessed 04/01/2016.
[2] Airports Commission, 2015. *Final Report*. [online] Accessed 04/01/2016.
[3] Airports Commission, 2013. *Interim Report*. [online] Accessed 04/01/2016.
[4] Airports Commission, 2013. *Airports Commission discussion papers*. [online] Accessed 04/01/2016.

to be under very substantial pressure in 2030, and demand will significantly exceed total available capacity by 2050.

2.1.8 The Interim Report reported on the end of Phase 1[5], and identified two existing airports as credible locations for additional runway capacity: Gatwick and Heathrow. At Gatwick, the AC committed to further consideration of a new runway to the south of the existing runway, London Gatwick Second Runway (LGW-2R). At Heathrow, two alternative expansion proposals were carried forward: a new runway to the north west of the existing runways, London Heathrow Northwest Runway (LHR–NWR); and the extension of the current northern runway, London Heathrow Extended Northern Runway (LHR-ENR). Together these three schemes are referred to as the shortlisted schemes.

2.1.9 In December 2015 the government accepted the AC's case for airport expansion in the South East and the shortlist of schemes for expansion – the short-listed schemes. Since then, the Government has continued work on developing the best possible package of measures to mitigate the impacts of additional runway capacity on local people and the environment.

2.1.10 On 25 October 2016, the Government confirmed that it had completed its further work. It also announced that LHR-NWR was its preferred scheme to deliver additional airport capacity in the South East of England and would be taken forward through policy.

2.2 THE PROPOSED POLICY: AVIATION CAPACITY

2.2.1 The proposed policy will take the form of a National Policy Statement (NPS).

2.2.2 Its purpose will be to set out the scale and timing of the requirement for additional capacity to maintain the UK's position as Europe's most important aviation hub. It will set out how any identified need for additional capacity should be met in the long term. The basis of the NPS is set out in the AC's Terms of Reference (ToR) issued by the Government in November 2012.[6]

2.2.3 The proposed policy will be underpinned by the evidence in relation to the current position in the UK with regard to aviation demand and connectivity, forecasts for how these are likely to develop, and the expected future pattern of the UK's requirements for international and domestic connectivity. This includes:

- The assessment of the schemes for meeting the UK's international connectivity needs, including their economic, social and environmental impact;
- The optimum approach to meeting any needs; and
- Ensuring that the need is met as expeditiously as practicable within the required timescale.

2.2.4 The NPS will seek to ensure that strategic issues are considered prior to any future development application for major airports infrastructure.

[5] The first phase of works completed by the Airports Commission included an assessment of options available for delivering extra capacity in the long-term. This first phase of works cumulated in the identification of two credible locations for extra capacity. .

[6] Department for Transport, 2012. *Membership and terms of reference of the Airports Commission*. [online] Accessed 04/01/2016.

2.3 HABITATS REGULATIONS ASSESSMENT (HRA)

2.3.1 Under the requirements of the European Council Directive 92/43/EEC 'The Habitats Directive'[7] and the Council Directive 2009/147/EEC 'The Wild Birds Directive'[8] it is necessary to consider whether the proposed policy may lead to significant effects upon areas of nature conservation importance designated/classified under the Directives ('Natura 2000 Sites'). Should the possibility of significant effects be identified it would be necessary to further consider the potential impacts of the Sites by way of an 'appropriate assessment' (AA). This process of assessment under the requirements of the Habitats Directive (as transposed into UK legislation by The Conservation of Habitats and Species Regulations 2010 as amended[9]: 'The Habitats Regulations') is described within this document as HRA.

2.3.2 Natura 2000 is a network of areas designated/classified to conserve natural habitats and species that are rare, endangered, vulnerable or endemic within the European Community. This includes Special Areas of Conservation (SAC) designated under the Habitats Directive for their habitats and/or species of European importance and Special Protection Areas (SPA) classified under the Conservation of Wild Birds Directive for rare, vulnerable and regularly occurring migratory bird species and internationally important wetlands. In addition, it is a matter of law that candidate SAC (cSAC) are considered in this process. It is a matter of UK Government policy[10] that sites designated under the 1971 Ramsar Convention for their internationally important wetlands (commonly known as Ramsar sites), and potential SACs (pSACs) and potential SPAs (pSPA) are considered. All sites considered in the HRA process are collectively termed 'European sites' in this report.

2.3.3 The European commission guidance on the Habitats Directive sets out four distinct stages for HRA[11].

- Stage 1 Screening[12]: the process which initially identifies the likely effects of a plan or project (either alone or in combination with other plans/projects) upon a Natura 2000 site, and considers whether these potential effects are likely to be significant.
- Stage 2 AA: the more detailed consideration of the potential effects of a plan or project (either alone or in combination with other plans/projects). The AA examines whether such effects could constitute an adverse effect on the integrity of the Natura 2000 sites, having regard to the site's conservation objectives, structure and function. The AA should determine whether adverse effects on the integrity of the site can be ruled out, on the basis of information that is available or can be reasonably obtained.

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[7] 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 04/01/2016.

[8] Council of the European Union, 2009. *Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds*. [online] Accessed 04/01/2016.

[9] UK Government, 2010. *The Conservation of Habitats and Species Regulations 2010/490*. [online] Accessed 04/01/2016.

[10] Department for Communities and Local Government, 2012. *National Planning Policy Framework*, Paragraph 118. [online] Accessed 19/01/2017.

[11] European Commission, 2001. *Assessment of plans and projects significantly affecting Natura 2000 sites.* [online] Accessed 19/01/2017. ()

[12] In the case of R (Champion) v North Norfolk DC [2015] 1 W.L.R. 3710 the Supreme Court ruled that "the Habitats Directive and Regulations contain no equivalent to "screening" under the EIA Regulations" and that "there is nothing in the language of the Habitats Directive to support a separate stage of "screening" in any formal sense." The first stage under *Article 6(3)* is best seen as a "trigger" eg where there is a likely significant effect an appropriate assessment is triggered. Despite this, given the Commission guidance, in this document the use of the words "screening" and "screened" will continue to be used but bearing in mind what was said about this by the Supreme Court.

- Stage 3 Assessment of alternative solutions: Where adverse effects on the integrity of a Natura 2000 site cannot be ruled out, the processes which examine alternative ways of achieving the objectives of the plan or project that can avoid such adverse impacts.
- Stage 4 Assessment: where no alternative solutions exist and where adverse effects remain: an assessment of whether the plan or project 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.

2.4 PREVIOUS HRA WORK UNDERTAKEN

2.4.1 The NPS was screened to assess the potential for likely significant effects (LSE)[13]. This involved considering whether there were any clear cause-effect pathways between the option for delivering the proposed policy and European sites.

2.4.2 The screening assessment undertaken identified an initial zone of influence (ZoI) within which possible impact pathways could potentially allow significant effects to arise as a result of the proposed policy, either alone or in-combination with other policies, plans and projects. Within this ZoI, eight European sites were identified.

2.4.3 Having identified the European sites within the ZoI, a range of impacts that could arise from the policy were identified including:

- Direct habitat loss/fragmentation;
- Disturbance (noise/vibration/visual);
- Hydrological changes (quality/flow);
- Air quality changes; and
- Operation/management and mitigation (species mortality, including bird strike).

2.4.4 These impacts were assessed as likely to arise as a result of the proposed policy, either alone or in-combination with other policies plans and projects. The following European sites were considered to require further assessment either as a result of LSE or due to a lack of certainty on the effects:

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

[13] A possible significant effect; one whose occurrence cannot be excluded on the basis of objective information (C-127/02).

2.4.5 It was determined that these European sites required further consideration through Stage 2 of the HRA process (AA), to establish if adverse effects on the integrity of these sites from the proposed policy could be ruled out. The outcomes of the AA would then be considered in the formation of the proposed policy. It was also determined that should the potential for such adverse effects be identified, consideration of mitigation would be necessary. Where the possibility of an adverse effect on the integrity of the site could not be ruled out even taking into account proposed mitigation measures, further assessment of the proposed policy under Stages 3 (assessment of alternative solutions) and 4 (IROPI) of the HRA process would be required.

2.4.6 The screening assessment was developed in consultation with Natural England and it incorporated Natural England's advice and recommendations. The scope of this AA is also being developed in consultation with Natural England. It was established, recognising the lack of detail in relation to the project design at this screening stage and following advice from Natural England that the AA would seek to include consideration and assessment of any consequential effects (ie the indirect effects that may occur as a result of necessary requirements to enable a project to proceed.)

2.5 SUMMARY OF HRA SCREENING ASSESSMENT

2.5.1 The results of the HRA screening assessment (HRSA) for LHR-NRW are summarised in Tables 2.1 – 2.7 below.

Table 2.1: Screening Matrix of Likely Significant Effects on South West London Waterbodies SPA and Ramsar

			Impact with the Potential to Result in Likely Significant Effects **O No Likely Significant Effects** **X Likely Significant Effects** **X* Not Enough Information Available To Discount LSE - Further information Required)**					
Natura 2000 Site within ZoI / distance (m)	**Qualifying Interest Feature**	**Conservation Objectives (To maintain or restore):**	**Direct Habitat Loss/ Fragmentation**	**Disturbance; Noise**	**Hydrological Changes**	**Air Quality Changes**	**Operation/Management and Mitigation (species**	**In-Combination**
South West London Waterbodies SPA and Ramsar	2.7% European overwintering population of Northern Shoveler (*Anas clypeata*) 2.6% European overwintering population of Gadwall (*Anas strepera*)	The extent and distribution of qualifying natural and habitats of qualifying species	X	X	X	X	X	X*
		The structure and function (including typical species) of qualifying natural habitats	X	X	X	X	X	X*
		The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely;	X	X	X	X	X	X*

Table 2.1: Screening Matrix of Likely Significant Effects on South West London Waterbodies SPA and Ramsar

			Impact with the Potential to Result in Likely Significant Effects O No Likely Significant Effects X Likely Significant Effects X* Not Enough Information Available To Discount LSE - Further information Required)					
		The populations of qualifying species;	X	X	X	X	X	X*
		The distribution of qualifying species within the site	X	X	X	X	X	X*

Table 2.2: Screening Matrix of Likely Significant Effects on Windsor Forest and Great Park SAC

			Impact with the Potential to Result in Likely Significant Effects O No Likely Significant Effects X Likely Significant Effects X* Not Enough Information Available To Discount LSE - Further information Required)					
Natura 2000 Site within ZoI / distance (m)	**Qualifying Interest Feature**	**Conservation Objectives (To maintain or restore):**	**Direct Habitat Loss/ Fragmentation**	**Disturbance; Noise Vibration and Visual**	**Hydrological Changes (Quality/ Flow)**	**Air Quality Changes**	**Operation/Management and Mitigation (species mortality)**	**In-Combination**
Windsor Forest and Great Park SAC	Old acidophilous oak woods with *Quercus robur* on sandy plains Atlantic acidophilous beech forests with Ilex and sometimes also Taxus in the shrublayer (*Quercion robori-petraeae* or *Ilici-Fagenion*) Violet click beetle	The extent and distribution of qualifying natural and habitats of qualifying species	O	O	O	X*	O	X*
		The structure and function (including typical species) of qualifying natural habitats	O	O	O	X*	O	X*
		The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely;	O	O	O	X*	O	X*
		The populations of qualifying species;	O	O	O	X*	O	X*
		The distribution of qualifying species within the site	O	O	O	X*	O	X*

Table 2.3: Screening Matrix of Likely Significant Effects on Burnham Beeches SAC

			Impact with the Potential to Result in Likely Significant Effects **O No Likely Significant Effects** **X Likely Significant Effects** **X* Not Enough Information Available To Discount LSE - Further information Required)**					
Natura 2000 Site within ZoI / distance (m)	**Qualifying Interest Feature**	**Conservation Objectives (To maintain or restore):**	**Direct Habitat Loss/ Fragmentation**	**Disturbance; Noise Vibration and Visual**	**Hydrological Changes (Quality/ Flow)**	**Air Quality Changes**	**Operation/Management and Mitigation (species mortality)**	**In-Combination**
Burnham Beeches SAC	Atlantic acidophilous beech forests with Ilex and sometimes also Taxus in the shrublayer (*Quercion robori-petraeae* or *Ilici-Fagenion*)	The extent and distribution of qualifying natural and habitats of qualifying species	**O**	**O**	**O**	**X***	**O**	**X***
		The structure and function (including typical species) of qualifying natural habitats	**O**	**O**	**O**	**X***	**O**	**X***
		The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely;	**O**	**O**	**O**	**X***	**O**	**X***
		The populations of qualifying species;	**O**	**O**	**O**	**X***	**O**	**X***
		The distribution of qualifying species within the site	**O**	**O**	**O**	**X***	**O**	**X***

Table 2.4: Screening Matrix of Likely Significant Effects on Thursley, Ash, Pirbright and Chobham SAC

			Impact with the Potential to Result in Likely Significant Effects **O No Likely Significant Effects** **X Likely Significant Effects** **X* Not Enough Information Available To Discount LSE - Further information Required)**					
Natura 2000 Site within ZoI / distance (m)	**Qualifying Interest Feature**	**Conservation Objectives (To maintain or restore):**	**Direct Habitat Loss/ Fragmentation**	**Disturbance; Noise Vibration and Visual**	**Hydrological Changes (Quality/ Flow)**	**Air Quality Changes**	**Operation/Management and Mitigation (species**	**In-Combination**
Thursley, Ash, Pirbright and Chobham SAC	Northern Atlantic wet heaths with *Erica tetralix*	The extent and distribution of qualifying natural and habitats of qualifying species	O	O	O	X*	O	X*
	European dry heaths	The structure and function (including typical species) of qualifying natural habitats	O	O	O	X*	O	X*
	Depressions on peat substrates of the *Rhynchosporion*	The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely;	O	O	O	X*	O	X*
		The populations of qualifying species;	O	O	O	X*	O	X*
		The distribution of qualifying species within the site	O	O	O	X*	O	X*

Table 2.5: Screening Matrix of Likely Significant Effects on Wimbledon Common SAC

			Impact with the Potential to Result in Likely Significant Effects **O No Likely Significant Effects** **X Likely Significant Effects** **X* Not Enough Information Available To Discount LSE - Further information Required)**					
Natura 2000 Site within ZoI / distance (m)	**Qualifying Interest Feature**	**Conservation Objectives (To maintain or restore):**	**Direct Habitat Loss/ Fragmentation**	**Disturbance; Noise Vibration and Visual**	**Hydrological Changes (Quality/ Flow)**	**Air Quality Changes**	**Operation/Management and Mitigation (species mortality)**	**In-Combination**
Wimbledon Common SAC	Northern Atlantic wet heaths with *Erica tetralix* European dry heaths Stag beetle	The extent and distribution of qualifying natural and habitats of qualifying species	O	O	O	X*	O	X*
		The structure and function (including typical species) of qualifying natural habitats	O	O	O	X*	O	X*
		The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely;	O	O	O	X*	O	X*
		The populations of qualifying species;	O	O	O	X*	O	X*
		The distribution of qualifying species within the site	O	O	O	X*	O	X*

Table 2.6: Screening Matrix of Likely Significant Effects Richmond Park SAC

			Impact with the Potential to Result in Likely Significant Effects O No Likely Significant Effects X Likely Significant Effects X* Not Enough Information Available To Discount LSE - Further information Required)					
Natura 2000 Site within ZoI / distance (m)	**Qualifying Interest Feature**	**Conservation Objectives (To maintain or restore):**	**Direct Habitat Loss/ Fragmentation**	**Disturbance; Noise Vibration and Visual**	**Hydrological Changes (Quality/ Flow)**	**Air Quality Changes**	**Operation/Management and Mitigation (species mortality)**	**In-Combination**
Richmond Park SAC	Stag beetle (*Lucanus cervus*)	The extent and distribution of qualifying natural and habitats of qualifying species	**O**	**O**	**O**	**X***	**O**	**X***
		The structure and function (including typical species) of qualifying natural habitats	**O**	**O**	**O**	**X***	**O**	**X***
		The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely;	**O**	**O**	**O**	**X***	**O**	**X***
		The populations of qualifying species;	**O**	**O**	**O**	**O**	**O**	**O**
		The distribution of qualifying species within the site	**O**	**O**	**O**	**O**	**O**	**O**

Table 2.7: Screening Matrix of Likely Significant Effects on Thames Basin Heaths SPA

			Impact with the Potential to Result in Likely Significant Effects O No Likely Significant Effects X Likely Significant Effects X* Not Enough Information Available To Discount LSE - Further information Required)					
Natura 2000 Site within ZoI / distance (m)	**Qualifying Interest Feature**	**Conservation Objectives (To maintain or restore):**	**Direct Habitat Loss/ Fragmentation**	**Disturbance; Noise Vibration and Visual**	**Hydrological Changes (Quality/ Flow)**	**Air Quality Changes**	**Operation/Management and Mitigation (species mortality)**	**In-Combination**
Thames Basin Heaths SPA	Northern Atlantic wet heaths with Erica tetralix European dry heaths Stag beetle	The extent and distribution of qualifying natural and habitats of qualifying species	O	O	O	X*	O	X*
		The structure and function (including typical species) of qualifying natural habitats	O	O	O	X*	O	X*
		The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely;	O	O	O	X*	O	X*
		The populations of qualifying species;	O	O	O	X*	O	X*
		The distribution of qualifying species within the site	O	O	O	X*	O	X*

3 APPROPRIATE ASSESSMENT

3.1 STRUCTURE OF REPORT

3.1.1 This AA considers the potential effects identified during the HRSA in more detail in terms of their nature and extent. The objective of the AA is to establish whether adverse effects on the integrity of European sites can be ruled out, taking into account mitigation measures and the potential for further in-combination effects that may arise from other plans or projects.

3.1.2 The following steps have been incorporated into the AA:

- Gathering additional information on, and exploring the reasons for, the relevant European site designations;
- Determining the nature of the environmental conditions required to maintain the integrity of the European sites and the trends in associated environmental processes;
- Identifying whether the proposed policy could lead to an impact on any identified processes that support the European sites;
- Determining whether the identified impact could result in an adverse effect on the integrity of European sites;
- Identifying other plans and projects that might affect these European sites in-combination with the proposed policy and establishing whether there are any adverse in-combination effects; and
- Developing mechanisms to enable the delivery of measures to avoid or mitigate for any identified potential effects.

3.1.3 The following sections of this AA will consider each of the impacts identified in Section 2.4.3 in more detail. It should be noted however that this AA is being undertaken at a strategic level where there are uncertainties regarding the nature, scale and final footprint of LHR–NWR. These uncertainties limit the capacity of the AA to reasonably predict the effects on relevant European sites. In the Opinion of Advocate General Kokott in Case C-6/04 Commission v UK [2005] ECR I-9017 at paragraph 49 she noted that an assessment of plans cannot by definition take into account all effects because "Many details are regularly not settled until the time of the final permission" and "[i]t would also hardly be proper to require a greater level of detail in preceding plans or the abolition of multi-stage planning and approval procedures so that the assessment of implications can be concentrated on one point in the procedure. Rather, adverse effects on areas of conservation must be assessed at every relevant stage of the procedure **to the extent possible on the basis of the precision of the plan. This assessment is to be updated with increasing specificity in subsequent stages of the procedure**".

3.1.4 However, all information that can be reasonably gathered at this stage is being used to inform this high-level strategic HRA. In addition, the AA can provide recommendations for further studies, avoidance and mitigation measures to inform the overall development of the proposed policy and to provide guidance to the DfT to ensure that the findings of this strategic level AA are incorporated into, and explored at the appropriate level of detail at the project-level HRA.

3.2 IN-COMBINATION EFFECTS ON NATURA 2000 AND RAMSAR SITES

3.2.1 It is a requirement of the Habitats Regulations that the impacts and effects of a plan or project are not considered in isolation. Where potential effects could become significant in combination with other plans and projects, these potential effects are also considered within the HRA.

3.2.2 The Appraisal of Sustainability (AoS) which this document accompanies, identifies a number of policies, plans and projects to be considered for in-combination assessment. It is possible to outline at a strategic level the broad types of effects that may arise from the implementation of these policies, plans and projects, notwithstanding the fact that further potential effects may be identified at project-level HRA. Initial consideration of the potential for these effects to act in-combination with the shortlisted schemes and result in adverse effects on the integrity of European sites is provided where appropriate, in Table 3.1 below. At the project level, further scrutiny of plans and projects, including projects coming forward or gaining permission at the time, will need to be undertaken to inform the in-combination assessment.

Table 3.1: Initial Screening of other Policies, Plans and Projects for in-combination Effects

Type	Name	Summary Description
Policy	NPS for National Networks (2014)[14]	The NPS sets out the need for (and Government's policies to deliver), development of nationally significant infrastructure projects (NSIPs) on the national road and rail networks in England. Potential for in-combination effects relating to transport, in particular surface access.
Policy	NPS for Waste Water (2012)[15]	The NPS sets out Government policy for the provision of major waste water infrastructure. It also provides information on two potential NSIPs. These are: a sewage treatment works option at Deephams in North East London and a waste water collection, storage and transfer tunnel (the Thames Tunnel).
Policy	High Speed Two (HS2) Hybrid Bill	HS2 is being delivered to provide Britain's railways with new capacity, better connectivity and quicker journeys. Phase One of HS2, between London and the West Midlands, is currently the subject of a Hybrid Bill. Phase Two will connect Birmingham to Leeds and Manchester. Potential for in-combination effects relating to transport, in particular surface access.
Policy	Crossrail Act 2008[16]	Crossrail is a set of improvements to cross London rail infrastructure which are designed to support London's economic growth. Cross Rail was adopted by the government as an Act of Parliament, the Cross Rail Act 2008. It is intended that Cross Rail will increase London's rail transport capacity by 10%, make journey times shorter and bring an extra 1.5 million people within 45 minutes of London's business centres. Cross Rail connects Heathrow and Reading west of London, with Shenfield and Abbey Wood, east of London. Potential for in-combination effects relating to transport, in particular surface access.
Plans	Local Development Plans	Local planning authorities must prepare a local plan which sets planning policies in a local authority area. The plans also provide the framework for future development of land.

[14] Department for Transport, 2014. *National Policy Statement for National Network*. [online] Accessed 04/01/2016.
[15] Defra, 2012. *National Policy Statement for Waste Water*. [online] Accessed 04/01/2016.
[16] UK Government, 2008. *Cross Rail Act 2008*. [online] Accessed 04/01/2016.

Type	Name	Summary Description
		For the shortlisted schemes, plans for the following local authority areas apply: Crawley District, Horsham District, Reigate and Banstead District, Surrey County; Mole Valley District, Tandridge District, West Sussex County; Runnymede District, Slough Borough, South Bucks District, Spelthorne Borough, The London Borough of Ealing, The London Borough of Hammersmith and Fulham, The London Borough of Hounslow, The London Borough of Hillingdon, The London Borough of Richmond upon Thames ; and The Royal Borough of Windsor and Maidenhead.
Plans	Local Mineral and Waste Plans	All Planning Authorities are required, by law, to develop plans for mineral and waste provision. The plans also provide the framework for mineral extraction and waste management. For the shortlisted schemes, plans for the following local authorities apply: West Sussex County Council, Surrey County Council, London boroughs (as listed above), Buckinghamshire County Council, Slough Borough Council, Windsor and Maidenhead Borough Council.
Plans	London Plan[17]	The London Plan is the statutory spatial development strategy for the Greater London Area, and provides a strategic plan for the borough's within this area. The Plan identifies various options which support the delivery of strategic housing, infrastructure, economic and open space. Much of the area around Heathrow Airport is located within the Greater London boundary. Gatwick is located outside of this boundary.
Plans	River Thames Flood Relief Scheme	Work being led by Environment Agency on plans to reduce flood risk between Datchet and Teddington, the largest area of undefended floodplain in England. Much of this section of the Thames is located to the south of Heathrow and passes through South West London waterbodies complex.

3.2.3 The following sections summarise the AA findings:

- → Effects of disturbance (noise/vibration/visual);
- → Effects of operation/management and mitigation (species mortality, including bird strike);
- → Effects of direct habitat loss/fragmentation;
- → Effects of changes to air quality; and
- → Effects of hydrological changes (quality/flow).

3.3 CONSULTATION

3.3.1 Consultation with Natural England is a statutory requirement for AA. Natural England will be formally consulted on the findings of this AA and due regard will be given to their representations within an agreed timeframe.

[17] Greater London Authority, 2011. *The London Plan – Spatial Development Strategy for Greater London*. [online] Accessed 04/01/2016.

4 EFFECTS OF DISTURBANCE

4.1 INTRODUCTION

4.1.1 Disturbance to the qualifying features of European sites can result from a number of sources including sound, light, visual and vibration and can be influenced by a range of factors such as source (type) of disturbance, timing of disturbance and frequency of disturbance. Furthermore, different species will respond to disturbance in different ways, with some species considered to be of greater sensitivity (ie more prone to react) than others. These factors, whilst not exhaustive, highlight some of the complexities in assessing disturbance impacts.

4.1.2 Recreational use of a European site in the context of airport expansion may arise during the construction phase due to the influx of a temporary work force, which may result in increased visits to vulnerable European sites. Recreational disturbance has the potential to disturb sensitive species (for example, ground-nesting birds and wintering wildfowl). It also may prevent appropriate management or exacerbate existing management difficulties, damage sites through erosion and fragmentation (for example through trampling); and result in nutrient enrichment (for example eutrophication, as a result of dog fouling). European sites are subject to different types of recreational pressures and have different vulnerabilities. Studies across a range of species have shown that the effects from recreation can be complex.

4.2 EUROPEAN SITE BACKGROUND

4.2.1 The European sites identified in the HRSA as sensitive to disturbance and the potential impact pathways resulting from LHR-NWR are provided in Table 4.1.

Table 4.1: Relevant European Sites and Disturbance Pathway

European Site	European Site Vulnerability / Impact Pathway
South West London Waterbodies SPA / Ramsar	Disturbance (noise/vibration/visual) is recognised as a key issue for the site. The site is located immediately adjacent to the proposed LHR-NWR. Whilst some existing baseline habituation is likely it cannot be assumed that additional levels of disturbance would not result in an effect alone or cumulatively with the existing airport operations. In addition, public Access/Disturbance is recognised as a key issue for the site. Most of the component sites have some level of formal or informal public access, including water-based activities (angling, sailing, water-skiing). Such use of the site may increase during the construction phase of airport expansion due to the temporary influx of workers into the area. During periods when the interest features are present these activities could lead to disturbance and displacement. These impacts could occur both alone and cumulatively as a result of increased levels of recreational activity arising through increased numbers of residents within the area.

4.3 APPROPRIATE ASSESSMENT

CURRENT BASELINE

4.3.1 The Southwest (SW) London Waterbodies SPA designation comprises a large series of waterbodies that have been historically created in the south west London area as a result of the development of water-supply reservoirs and the gravel extraction industry. Seven of these waterbodies were designated in 2000 as the SW London Waterbodies SPA (refer to Table 4.2).

Table 4.2: Southwest London Waterbodies SPA Components

Spa Component	Sub-Site	Distance From Heathrow Airport
Staines Moor	King George VI Reservoir	850 m southwest
	Staines Reservoir	650 m southwest
Wraysbury and Hythe End Gravel Pits	Wraysbury Gravel Pit – North	3700 m southwest
	Wraysbury Gravel Pit - South	4100 m southwest
Kempton Park Reservoirs	Kempton Reservoir East	5100 m southeast
	Redhouse	4700 m southeast
Knight and Bessborough Reservoirs	-	7300 m southeast
Sunnymeads Gravel Pits	Wraysbury Gravel Pit – North	4400 m west
	Wraysbury Gravel Pit - South	4100 m west
Thorpe Park Gravel Pit (Pit 1)	-	9400 m southwest
Wraysbury Reservoir	-	1900 m west

4.3.2 The SPA designation implies that the Site of Special Scientific Interest (SSSI) component sites are biologically integrated. However, there are a large number of other non-designated waterbodies including five water supply reservoirs, six active gravel workings, three water-treatment works, one natural lake, and around 45 former gravel pits. It is the combination of both designated and non-designated waterbodies within the area that contribute to the region's waterfowl interest and some of which are thought to be used by the SPA populations of the above species.

4.3.3 The most recent five years of Wetland Bird Survey (WeBS) data for Gadwall and Shoveler both within the SPA and surrounding waterbodies is summarised in Tables 4.3 and 4.4 below.

Table 4.3: Shoveler Peak counts 2010/11 – 2014/15 at the South West London Waterbodies complex and surrounding sites

Water body	2010/11	2011/12	2012/13	2013/14	2014/15	Peak Month	5yr avg
Staines Reservoirs	153	197	106	312	581	Oct	270
King George VI Reservoir	290	38	59	29	43	Sep	92
Knight and Bessborough Reservoirs	93	91	35	13	21	Oct	58
Wraysbury Gravel Pits	19	29	49	77	19	Dec	44
Thorpe Water Park	9	27	23	17	20	Mar	19

Table 4.3: Shoveler Peak counts 2010/11 – 2014/15 at the South West London Waterbodies complex and surrounding sites

Water body	2010/11	2011/12	2012/13	2013/14	2014/15	Peak Month	5yr avg
Queen Mary Gravel Pit	26	0	11	23	11	Oct	14
Wraysbury Reservoir	0	6	44	0	9	Oct	12
Longside Lake				8	12	Feb	10
Island Barn Reservoir	3	4	2	19	1	Apr	6
Halliford Mere	2	0	4	7	8	Jan	4
Egham Hythe Lake		3	6	2	0		3
Queen Elizabeth II Reservoir	2	6	0	2	1	Sep	2
Queen Mary Reservoir	7	1	0	0	0		2
Ferry Lane Gravel Pit	0				0		0
Hersham Gravel Pit		0					0
Molesey Gravel Pit		0		0	0		0

Table 4.4: Gadwall Peak counts 2010/11 – 2014/15 at the South West London Waterbodies complex and surrounding sites

Water body	2010/11	2011/12	2012/13	2013/14	2014/15	Peak Month	5yr avg
Wraysbury Gravel Pits	1,005	173	352	268	511	Feb	462
Thorpe Water Park	187	163	165	146	86	Dec	149
Staines Reservoirs	78	94	87	83	83	Jan	85
King George VI Reservoir	231	73	26	36	52	Feb	84
Queen Mary Reservoir	63	147	29	11	22	Sep	54
Island Barn Reservoir	52	51	20	24	41	Feb	38
Queen Elizabeth II Reservoir	22	61	39	15	24	Mar	32
Knight and Bessborough Reservoirs	14	38	23	20	16	Apr	22

Table 4.4: Gadwall Peak counts 2010/11 – 2014/15 at the South West London Waterbodies complex and surrounding sites

Water body	2010/11	2011/12	2012/13	2013/14	2014/15	Peak Month	5yr avg
Wraysbury Reservoir	18	15	22	12	22	Oct	18
Halliford Mere	4	0	4	4	11	Jan	5
Molesey Gravel Pit		8		0	0		4
Egham Hythe Lake		0	0	3	10	Dec	3
Queen Mary Gravel Pit	0	1	2	1	4	Feb	2
Ferry Lane Gravel Pit	0				0		0
Hersham Gravel Pit		0					0

4.3.4 All the waterbodies that comprise the SPA are man-made. Some are old gravel-extraction sites, which are used for recreational activities such as dog walking, fishing, sailing, and water-skiing. The others are impounded reservoirs that are likely to require decommissioning and re-development.

4.3.5 A comprehensive study of the SW London waterbodies by Briggs was published in 2007[18]. The background to this study stemmed from the considerable direct pressure that SW London waterbodies were exposed to from mineral extraction, decommissioning and redevelopment, and recreation. Furthermore at the time, infrastructure development including airport expansion and widening of the M25 were identified as having potential for further indirect impacts. The aims of Briggs' study were:

- To investigate the use made by Gadwall and Shoveler of waterbodies within and around the SW London Waterbodies SPA;
- To provide information on the state of the SPA and trends in the populations of the citation species;
- To establish a strategic basis for the long-term management of the sites for nature conservation; and
- To document new findings on wildfowl behaviour, habitat choice, and population ecology.

4.3.6 Briggs research is of particular relevance to this assessment by providing an improved understanding of waterbird use both within the designated waterbodies and those that perform an integral function to maintaining the conservation interests of the citation species. A number of the key findings from Briggs' study are summarised below.

[18] Briggs, B., 2007. *The use of waterbodies in South-West London by Gadwall and Shoveler; implications for nature conservation*. University of Oxford Department of Zoology: Oxford.

4.3.7 Wintering Gadwall numbers in the SW London area generally peak in mid-winter. Shoveler numbers peak in autumn, when large numbers of birds move through the area on migration.

4.3.8 The SW London area appears to hold a largely self-contained population of Shoveler each winter. On a more local scale, sub-populations of Shoveler also use a number of smaller waterbody complexes in the Wraysbury and Walton-on-Thames area. The area is considered to be particularly important for Shoveler, which may have a migration strategy that in most winters ensures it is rarely present on wetlands which are vulnerable to freezing at critical times of the winter cycle.

4.3.9 The SW London area does not appear to hold a self-contained population of wintering Gadwall; there is more exchange of Gadwall with sites outside the study area than there is between sites within the area. On a local scale, Gadwall do not often use complexes of waterbodies.

4.3.10 The SW London Waterbodies SPA, when considered independently of the surrounding non-designated waterbodies, does not appear to be used as a complex by either species.

4.3.11 One of the most important general findings of the Briggs study was the extensive variability of the waterbodies in the SW London area, both temporally and physically. From year-to-year bird numbers varied significantly both on individual sites and in the study area as a whole; food and disturbance levels change, and behaviour and patterns of site use change.

4.3.12 The large fluctuations in Gadwall numbers observed over the last 20 + years is considered likely to have occurred in part as a result of increasing levels of human disturbance, either directly through water-based activities, or indirectly through ecological changes resulting from activities such as carp fishing. The stability of Gadwall numbers in the wider Thames region over the same period suggests that the local declines are the result of redistribution rather than density-dependent impacts at the population level.

4.3.13 The long-term foraging strategy used by Shoveler over the Briggs study period likely reflected the unpredictability of their food resource, and that density-dependent mortality (or onward migration leading to increased risk of starvation) may occur when zooplankton is scarce and bird numbers are high. The wintering population is considered to be largely dependent on the SW London waterbodies. Accordingly, Shoveler is considered to be more vulnerable than Gadwall to the effects of human disturbance and environmental change in the area.

4.3.14 The maintenance of internationally important numbers of Shoveler in the SW London area is considered to rely on the protection and management of complexes of sites, the individual components of which may each hold particular value for birds at different times of the day or different winters, or even in different years.

4.3.15 It was identified that to enhance and support the Gadwall in the SW London area, provision of large numbers of macrophyte-rich habitats with little disturbance or disturbance-free zones was required. The potential value of some of the SW London waterbodies for wildfowl is significantly underexploited, and with appropriate action it was considered possible to improve the existing habitats significantly.

4.3.16 The findings of the Briggs study presented a reasoned argument for the inclusion of additional waterbodies in the SPA. It was identified that by including three additional sites the percentage of overwintering Shoveler protected by the designation could be increased from 58% to 81% and of Gadwall from 34% to 56%, (based on data from 2004/5-2006/7). On this evidence it was considered that all of the key sites which make up the complexes used by populations of Shoveler in the Stain Hill reservoirs, Colne Mere & Hythe Lagoon SSSI, and Princes & Bedfont Lakes. Wraysbury and Walton areas would significantly benefit from inclusion in the designation, thus the SPA could reasonably be considered in terms of its ‘coherence of ecological structure and function’, ie its integrity.

4.3.17 A further recommendation was for the development of a 'London Basin Waterfowl Strategy'. 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. Provided the owners of private waterbodies would sign-up to the strategy, it was considered to be an effective way to protect and maintain Gadwall numbers in the area, since this species uses a large number of non-designated sites.

4.3.18 Given the intrinsically variable nature of waterbodies in SW London, the Waterfowl Strategy was also considered to be of value to wintering Shoveler, which relies to some extent on waterbodies outside the SPA boundary. A number of the current Site Improvement Plan (SIP)[19] measures directly relate to taking forward the work completed by Briggs.

POTENTIAL EFFECTS OF CHANGES TO BASELINE AS A RESULT OF LHR–NWR

Disturbance from Construction

4.3.19 Noise disturbance to birds during construction has been the subject of considerable monitoring work and research. Much of this work has been in relation to development at coastal and estuary sites and the associated bird assemblages. This is relevant in the context of SW London Waterbodies on the basis that the interest features share commonality in terms of being migratory waterbirds.

4.3.20 Disturbance events from construction activities can cause an interruption to the feeding, roosting or breeding behaviour of birds[20]. Disturbance can result in birds flying away or ceasing to feed which may cause an increase in their energy requirements or result in them relocating to alternative, less suitable feeding or roosting sites. This may result in possible long-term effects where there is a repetition of such activities and can lead to consequences such as: prolonged displacement from a habitat, effects on energy budgets and food intake, loss of weight, condition and a reduction in reproductive success and potentially survival[21] [22].

4.3.21 Research indicates that some bird species will often habituate to repeated disturbance events, with irregular or unknown visual and noise stimuli often causing the greatest behavioural responses. However the factors surrounding habituation are not well understood and are typically very situation-specific and the uncertainty surrounding habituation is an important consideration in this AA. With respect to piling specifically, it has been concluded that although piling has the potential to create most noise during construction; it often consists of rhythmic "bangs", which birds are likely to become accustomed to after a short period[23].

[19] Natural England, 2016. *Site Improvement Plans*. [online] Accessed 04/01/2016.
[20] Including Peters, K. A. and Otis, D. L., 2006, *Shorebird Roost Site Selection at Two Tempiral Scales: is Human Disturbance a Factor? iJournal of Applied Ecology*. 44: 196-209.
[21] Kaiser, M. J., 2002. Predicting the displacement of the common scoter *Melanitta nigra* from benthic feeding areas due to offshore windfarms, p. 77. Centre for Applied Marine Sciences (COWRIE): Bangor.
[22] Stillman, R. A., West, A. D., Clarke, R. T. and Liley, D., 2012. *Solent Disturbance and Mitigation Project Phase II: Predicting the impact of human disturbance on overwintering birds in the Solent*. Solent Forum: Winchester.
[23] ABP Research. 2001. *ABP Grimsby & Immingham, Immingham Outer Harbour Environmental Statement*. ABP Research & Consultancy Ltd, Research Report No. R.903.

4.3.22 Other research has also indicated that in general, birds appear to habituate to continual noises as long as there is no large amplitude 'startling' component[24]. For example, as part of the construction work for ABB Power Generation Ltd (Pyewipe), winter bird monitoring showed that there was no large-scale disturbance due to construction work on the site. Although some localised disturbance was recorded in response to two sudden events, this was not considered to have a major effect on surrounding bird populations and was found to be no greater than the effect arising from third party disturbance, including walkers and stopped cyclists, which were unrelated to the work carried out by ABB. Observations suggested that it was the initial sudden bang during piling activities, which caused the disturbance, and that subsequent bangs typically resulted in reduced disturbance, demonstrating habituation[25].

4.3.23 For this reason, noise from construction and regular vehicle or vessel movements are often tolerated more by birds than sporadic visits to a feeding or roosting area. Overall, responses to construction noise appear to initiate similar or less disturbance than that of recreational activities[26].

Disturbance from Airport Activities

4.3.24 Noise associated with general airport operations and aircraft movements has the potential to disturb birds and to interrupt key behaviours, leading to impacts on health and breeding, as well as on survival of individual birds and of populations.

4.3.25 Komenda-Zehnder *et al.* (2003)[27] performed experimental overflights on waterbirds in Swiss lowlands and found the disturbance effects of helicopters to be greater than that of aeroplanes. Birds disturbed by aircraft returned to a relaxed behaviour within five minutes of the overflight and the minimum flight level that did not disturb birds was 450 m for helicopters and 300 m for aeroplanes.

4.3.26 Smit and Visser[28] reviewed existing data and showed comparable reactions in birds in the Dutch Wadden Sea and Delta Area. Oystercatchers generally were most tolerant to aircraft noise and Curlew were least tolerant. One study showed a negative impact on foraging behaviour in Knot, with large numbers of birds absent on days in which aircraft activity was high.

4.3.27 Reactions to aircraft noise were more severe in Knot when visibility was reduced and light aircraft caused strong disturbance even when flying above 100 m[29] .

4.3.28 A review of WeBS survey data in relation to disturbance by Robinson and Pollit[30] showed that aircraft noise, particularly from low flying military aircraft, was one of the most common causes of disturbance to waterbirds, although it is recognised that general airport movements will be more regular with increased chances of habituation occurring.

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[24] Hockin, D., Ounsted, M., Gorman, M., Keller, V., and Barker, M.A., 1992. Examination of the effects of disturbance of birds with reference to its importance in ecological assessments. *Journal of Environmental Management*. 36:253-286.
[25] ERM. 1996. *South Humber Power Station, Pyewipe, Bird Monitoring Study*.
[26] IECS. 2009. *Construction and Waterfowl: Defining, Sensitivity, Response, Impacts and Guidance*. Institute of Estuarine and Coastal Studies Report to Humber INCA.
[27] Komenda-Zehnder, S., Cevallos, M. and Bruderer, B. 2003. *Effects of Disturbance by Aircraft Overflight on Waterbirds – An Experimental Approach. International Bird Strike Committee*. IBSC26/WP-LE2.
[28] Smit, C.J. and Visser, J.M. 1993. *Effects of disturbance on shorebirds: a summary of existing knowledge from the Dutch Wadden Sea and Delta area*, In: Disturbance to Waterfowl on Estuaries, August 1993.
[29] Koolhaas, A. Dekinga, A. and Piersma, T. 1993. Disturbance of foraging Knots by aircraft in the Dutch Wadden Sea in August–October 1992. *Wader Study Group Bulletin*. 68, 20–22.
[30] Robinson, J. A. and Pollitt, M. S. 2002. *Sources and extent of human disturbance to waterbirds in the UK: an analysis of Wetland Bird Survey data, 1996/96 to 1998/99. Bird Study,* 49, 205- 211.

4.3.29 Komenda-Zehnder *et al.* found no evidence of habituation of waterbirds during 326 experimental flights, although other studies have shown that habituation to regular noise disturbance can occur. In particular, flocks of waterfowl on the Humber Estuary appeared to habituate to regular approaches of planes towards Humberside Airport, although the same birds appeared to be disturbed by the 'shadow' of an approaching plane in some instances[26]. Furthermore, a report by Brisbane Airport Corporation states that surveys in 2005/06 found no visible reaction from roosting or feeding shorebirds to overhead air traffic[31].

Visual and Recreational Disturbance

4.3.30 Visual disturbance can also interrupt feeding, roosting and breeding behaviour of coastal birds, with similar effects to those caused by noise disturbance. Repeated disturbance can cause habitat displacement, effects on energy budgets and food intake resulting in loss of weight, condition and reduction in reproductive success and potentially survival. Birds will typically disperse when disturbed, with prolonged and repeated disturbance potentially causing more significant displacement. The magnitude of the effects of such disturbance is linked to the number of occurrences and the status of the conditions that are prevalent [32] [33] [34].

4.3.31 The body of research looking at disturbance to waterbirds strongly indicates that one of the more significant sources of disturbance is caused by the human form, visual disturbance through undertaking recreational activities (eg people walking, fishing, kayaking)[26]. It is assumed that waterbirds associate the human form as a predatory threat and as such the presence of the human figure is most likely to disturb birds.

4.3.32 Gill (2001)[35] reviewed the approaches to measuring human disturbance. Gill noted that behavioural responses are always context-dependent, and individual responses will therefore depend on the trade-offs experienced by those individuals. For example, the decision of birds to stay or leave an area in response to disturbance will be influenced by the quality of the area, the availability and relative quality of other areas, relative predation risks etc. Birds may remain in disturbed areas because the cost of moving to a new location is too great, the food resources are more abundant, or predation risk is lower than in alternative sites. Animals that move readily may do so because the costs of moving are small.

4.3.33 Visual disturbance during construction is generally temporary and only short term. The level of impact will however be dependent on the distance of visual disturbance sources from key foraging, roosting and breeding areas for birds.

[31] Brisbane Airport Corporation. 2007. New Parallel Runway Environmental Impact Statement. Volume D: Airspace. Hazards and Risks of Airport Operations.
[32] Liley, D. and Fearnley, H. 2011. Bird Disturbance Study, North Kent 2010/11. Footprint Ecology.
[33] Coleman, R. A., Salmon, N. A and Hawkins, S. J. 2003 Sub-dispersive human disturbance of foraging oystercatchers Haematopus ostralegus. *Ardea*, 91, 263-268.
[34] Ruddock, M. and Whitfield, D. P. 2007. A Review of Disturbance Distances in Selected Bird Species. A report from Natural Research (Projects) Ltd to Scottish Natural Heritage.
[35] J. E. Gill *et al*., 2001.The effects of disturbance on habitat use by black-tailed godwits *Limosa limosa*. *Journal of Applied Ecology*, 38, 846-856.

4.3.34 It typically appears that birds will often habituate to regular and repeated activities, with irregular or unknown visual stimuli causing the greatest behavioural responses[36] [26]. A study of the Forth Estuary found that Redshank, Curlew, Oystercatcher and Shelduck in areas subject to higher levels of disturbance allowed a closer approach by humans than individuals of the same species in less disturbed areas, before becoming alert and moving away[37].

4.4 SUMMARY OF POTENTIAL EFFECTS ON INTEGRITY AS A RESULT OF CONSTRUCTION AND OPERATION

4.4.1 There is no research or evidence to indicate that the existing airport operations at Heathrow result in adverse disturbance effects to the SW London Waterbodies SPA. The Promoter's information assumes that the interest features are tolerant or habituated to these effects. However there is no supporting evidence or studies to substantiate this assumption. Further, regardless of any existing perceived tolerance or habituation, it cannot be assumed that this would also negate additional disturbance impacts occurring cumulatively from increased airport operations and the associated disturbance arising from LHR-NWR.

4.4.2 In addition, as outlined above, there are existing disturbance factors occurring which could be considered significant for the SPA such as those set out by Briggs[18], including recreation, and this baseline must be considered against any further disturbance effects from LHR-NWR cumulatively. In addition, there are disturbance pressures relating to gravel extraction, and operation of the waterbodies as reservoirs.

4.4.3 Cumulatively these effects are difficult to differentiate. Based on the evidence available at this time it is reasonable to assume that the existing levels of disturbance at the SW London Waterbodies SPA represent a limiting factor to the site. Effects on integrity will be effects that cause a deterioration below this limited level.

4.4.4 Given the uncertainty surrounding flight paths and flight heights at this time, and perhaps even more so, a general lack of broader scientific understanding of the effects of aviation disturbance to waterbirds, the precautionary principle requires the assumption that any further disturbance effects would be likely to result in cumulative disturbance to the interest features of the site. As such an adverse effect on the sites integrity cannot be ruled out.

Table 4.5: Potential Effects at Southwest London Waterbodies

Site	Interest feature	Potential effect of Disturbance	Potential adverse effect on conservation objective
Southwest London Waterbodies SPA/Ramsar	Northern shoveler and Gadwall and other waterbirds	The effects of disturbance could lead to species displacement both within the SPA and areas beyond the SPA, fragmentation, increased competition within the SPA and areas beyond the SPA, increased pressure on habitats within the SPA and areas beyond the SPA, increased energetic use leading to reduced breeding success and potentially mortality.	Potential to compromise; The extent and distribution of qualifying natural and habitats of qualifying species The structure and function (including typical species) of qualifying natural habitats The supporting processes on which qualifying natural

[36] ABP Marine Environmental Research Ltd. 2013. *Hub for London Ecology Desk Study – Part B: Marine and Coastal Baseline*. Report No. R2130.

[37] Dwyer, R.G. 2010. *Ecological and anthropogenic constraints on waterbirds of the Forth Estuary: population and behavioural responses to disturbance*. Thesis submitted as candidature for the degree of Doctor of Philosophy Centre for Ecology and Conservation.

Table 4.5: Potential Effects at Southwest London Waterbodies

Site	Interest feature	Potential effect of Disturbance	Potential adverse effect on conservation objective
			habitats and the habitats of qualifying species rely; The populations of qualifying species; The distribution of qualifying species within the site

4.5 AVOIDANCE AND MITIGATION MEASURES

4.5.1 During construction of the Humber international Terminal ("HIT"), long-term changes in trends were not observed in wintering bird activity. It was noted that the construction area became an increasingly important roosting site for some waders, indicating that some wading birds habituated to construction related works (of which, irregular disturbance was a factor). In this study it was noted that irregular disturbance emitting noise levels over 70 dB was much more likely to cause disturbance than regular disturbance under 50 dB[26]

4.5.2 Extrapolating the results of the HIT observations, it is considered reasonably likely that there would be some habituation with the restriction of regular construction noise to below 70 dB and with the avoidance of, sudden irregular noise above 50 dB.

4.5.3 In addition, mitigation should consider the timing of flights, flight paths, and flight heights over the waterbodies. Where feasible this measure could effectively remove operational disturbance. Whilst it is recognised that it may not be operationally viable to implement this measure should be explored fully at the detailed design stage.

4.5.4 Briggs identified a number of measures that would result in benefits to the SPA. This included the development of a 'London Basin Waterfowl Strategy'. 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. A key focus of this strategy would be mitigation through the management of the existing recreational disturbance pressures through relocation and appropriate zonation of water recreation activities. The strategy would seek to reduce site vulnerabilities and contribute towards the achievement of the site's conservation objectives.

4.6 EFFICACY OF MITIGATION PROPOSALS AND RESIDUAL EFFECTS

4.6.1 It is considered likely that a number of potential adverse effects described above will be able to be mitigated through detailed design. However, at this plan stage it is not possible to exclude the likelihood of adverse effects given that more detailed project design information, and detailed proposals for mitigation, are not presently available. Such project detail would need to be reviewed against a baseline disturbance assessment at the SPA/Ramsar.

4.7 EFFECTS IN COMBINATION WITH OTHER PLANS AND PROJECTS

4.7.1 In the context of known disturbance factors and interest feature vulnerabilities, it is also not possible at this strategic plan-level to rule out the likelihood that LHR-NWR could act in-combination with other Plans being brought forward (those described in Table 3.1 above), which may alone result in disturbance effects. These potential effects are summarised in Table 4.6.

Table 4.6: Potential Disturbance Effects In Combination with Other Plans and Projects

Other Plan / Policy	Mole Gap to Reigate Escarpment SAC	Southwest London Waterbodies SPA/Ramsar
NPS for National Networks	Other projects in proximity resulting in disturbance (during construction or operation) within foraging/commuting routes of supporting/connecting habitat may result in fragmentation/isolation effects to the interest features.	Other projects in proximity creating disturbance could lead to species displacement both within the site and areas beyond the site, fragmentation, increased competition within the site and areas beyond the site, increased pressure on habitats within the site and areas beyond the site, increased energetic use leading to reduced breeding success and potentially mortality.
NPS for Waste Water	Unlikely that effects would occur within a ZoI that would result in effects in combination.	Other projects in proximity creating disturbance could lead to species displacement both within the site and areas beyond the site, fragmentation, increased competition within the site and areas beyond the site, increased pressure on habitats within the site and areas beyond the site, increased energetic use leading to reduced breeding success and potentially mortality.
High Speed Two (HS2) Hybrid Bill	Highly unlikely that effects would occur within a ZoI that would result in effects in combination.	Highly unlikely that effects would occur within a ZoI that would result in effects in combination.
Crossrail Act 2008	Highly unlikely that effects would occur within a ZoI that would result in effects in combination.	Highly unlikely that effects would occur within a ZoI that would result in effects in combination.
Local Development Plans	Other projects in proximity resulting in disturbance (during construction or operation) within foraging/commuting routes of supporting/connecting habitat may result in fragmentation/isolation effects to the interest features.	Other projects in proximity creating disturbance could lead to species displacement both within the site and areas beyond the site, fragmentation, increased competition within the site and areas beyond the site, increased pressure on habitats within the site and areas beyond the site, increased energetic use leading to reduced breeding success and potentially mortality.
Local Mineral and Waste Plans	Other projects in proximity resulting in disturbance (during construction or operation) within foraging/commuting routes of supporting/connecting habitat may result in fragmentation/isolation effects to the interest features.	Mineral extraction issues are identified as a cumulative disturbance effect. Other projects in proximity creating disturbance could lead to species displacement both within the site and areas beyond the site, fragmentation, increased competition within the site and areas beyond the site, increased pressure on habitats within the site and areas beyond the site, increased energetic use leading to reduced breeding success and potentially mortality.
London Plan	Highly unlikely that effects would occur within a ZoI that would result in effects in combination.	Other projects in proximity creating disturbance could lead to species displacement both within the site and areas beyond the site, fragmentation, increased competition within the site and areas beyond the site, increased pressure on habitats within the site and areas beyond the site, increased energetic use leading to reduced breeding success and potentially mortality.
River Thames Flood Relief Scheme	Highly unlikely that effects would occur within a ZoI that would result in effects in combination.	Thames flood relief scheme occurs in close proximity creating disturbance could lead to species displacement both within the site and areas beyond the site, fragmentation, increased competition within the site and areas beyond the site, increased pressure on habitats within the site and areas beyond the site, increased energetic use leading to reduced breeding success and potentially mortality. Thames flood relief scheme also

Table 4.6: Potential Disturbance Effects In Combination with Other Plans and Projects

Other Plan / Policy	Mole Gap to Reigate Escarpment SAC	Southwest London Waterbodies SPA/Ramsar
		offers potential for positive effects through indirect habitat creation.

4.8 CONCLUSION

4.8.1 It is considered likely that a number of potential adverse effects described above will be able to be ruled out through detailed design. However, at this plan stage it is not possible to exclude the possibility of adverse effects given that more detailed project design information, and detailed proposals for mitigation, is not presently available.

5 EFFECTS OF OPERATIONAL MANAGEMENT

5.1 INTRODUCTION

5.1.1 Birdstrike has been responsible for the loss of at least 108 aircraft and 276 lives in civil aviation[38]. As well as being a threat to life, less severe birdstrike incidents result in significant operational costs to the industry, either directly, in terms of the costs of damage to aircraft, or as a result of delays and cancellations arising from the need for precautionary checks or emergency return to an airport after a strike has occurred.

5.1.2 The aviation industry has adopted measures to reduce the levels of risk. Fundamentally these measures seek to reduce the presence of birds in areas where they could collide with aeroplanes. Such measures already occur at the operational airport locations; however 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. Further, any compensation habitat provided in areas subject to birdstrike risk management could limit the potential benefits and ultimately compromise the effects of the compensation.

5.2 RELEVANT EUROPEAN SITES

5.2.1 The European sites identified in the HRSA as sensitive to operational management and the potential impact pathways are provided in Table 5.1.

Table 5.1: Relevant European Sites and Potential Recreational Disturbance Impact Pathway

European Site	Location	European site vulnerability / impact pathway
South West London Waterbodies SPA / Ramsar	Adjacent to LHR–NWR	Increased levels of bird scaring/control as part of birdstrike risk management measures could result in significant effects to other non-target waterbird species including the SPA interest features. Further any compensation habitat provided in areas subject to birdstrike risk management could limit the potential biodiversity benefits and ultimately compromise the effects of the compensation.

[38] J. Thorpe, 2010. *Update On Fatalities & Destroyed Civil Aircraft due to Bird Strikes with Appendix for 2008 & 2009*

5.3 APPROPRIATE ASSESSMENT

CURRENT BASELINE

As part of their work for the AC Jacobs commissioned a Birdstrike Report:[39] *The Birdstrike Risk, Needs for Management, and Associated Biodiversity Impacts for Proposed Additional Runways at London Heathrow and London Gatwick Airports.* The key elements of the report which are of particular relevance to this section of the assessment are presented below.

5.3.1 To control the birdstrike risk, the International Civil Aviation Organisation (ICAO) has implemented a series of standards and recommended practices that require airports under their control manage birdstrike risk effectively. In the UK, the CAA implements these measures by requiring airport license holders to manage the birdstrike risk as part of their licensing procedures. The CAA provides guidance on how this should be carried out in their publication CAP 772 Bird Control on Aerodromes (CAA 2008) which is currently undergoing revision.

5.3.2 The actions needed to control the birdstrike risk at UK aerodromes are well understood (e.g. Allan 2006[40]), and these can be extrapolated to airport expansions, providing sufficient information about the numbers of hazardous birds, existing birdstrike rate, current birds control practices etc is available.

5.3.3 The movements of birds from place to place are most significant because it is when birds cross the active airspace that they pose the greatest risk to aircraft. It is also obviously the case that most birdstrikes are caused by common species that are most abundant around the airfield. These are often species which may not typically be included in ecological baseline surveys due to commonality (eg flocks of gulls and pigeons).

5.3.4 All licensed civil airports in the UK are required to have an effective plan in place to monitor and manage the birdstrike risk at the airport. This plan is periodically audited by the CAA as part of their routine safety audit procedures. It is important to note however that risks arising from outside the airport property may be impossible for the airport to control. Nearby landowners are not obliged to allow the airport access to their property to disperse hazardous birds, nor are they required to manage their property to deter hazardous birds from frequenting the area. This means that once features that attract hazardous birds are developed near an airport it can be very difficult to have them removed or otherwise managed in order to control the risk.

5.3.5 It is therefore important that any airport development does not introduce features that will either attract more hazardous birds or include features that will change the behaviour of the existing hazardous birds in a way that increases the risk (eg by making it more likely that they will fly across the active airspace). It is also important that the airport development does not change the behaviour of aircraft in a way that makes it more likely that they will encounter birds (eg by moving a runway closer to known bird concentrations).

[39] Jacobs, 2014. 7. *Biodiversity: Assessment*. [online] Accessed 04/01/2016.
[40] Allan, J. R., 2006. A heuristic risk assessment technique for birdstrike management at airports. *Risk Anal*, 26,723–729.

POTENTIAL EFFECTS OF CHANGES TO BASELINE AS A RESULT OF LHR–NWR

5.3.6 The western approach to the existing northern runway at Heathrow passes over the R.Thames, Queen Mother Reservoir and the R.Coln, whilst the western approach to the southern runway crosses the R.Thames, the complex of flooded gravel pits between Horton and Wraysbury, Wraysbury Reservoir itself and the R.Coln. The normal composition of bird species that would be expected at a UK airport is therefore augmented by very large numbers of gulls that roost on the open waterbodies and by large numbers of waterfowl that occupy these reservoirs and gravel pits all year round.

5.3.7 These areas also attract smaller numbers of other hazardous species such as cormorant and grey heron. The larger than normal numbers of wetland bird species in the area means that any development that influences the number or behaviour of these birds, or brings the aircraft into closer proximity to them, has the potential to increase the birdstrike risk, unless appropriate mitigating action is taken.

5.3.8 The Birdstrike Risk Report suggests that the overall strike rate at Heathrow per 10,000 aircraft movements is low compared to other airports in the UK and to other large international airports around the world.

5.3.9 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 of the new runway 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.

5.3.10 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.

5.3.11 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 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.

5.3.12 It is therefore likely that mitigation of birdstrike will be required; Any such measures that involves large scale bird dispersal from the reservoir has the potential to adversely impact on non-hazardous birds of conservation concern (including the SPA interest features) that currently use the site.

5.3.13 This could result in adverse effects through species displacement both within the site and areas beyond the site. It may also result in fragmentation, increased competition within the site and areas beyond the site, increased pressure on habitats within the site and areas beyond the site, increased energetic use leading to reduced breeding success and potentially, also mortality. Further it could also compromise the efficacy of any mitigation and compensation measures.

5.4 SUMMARY OF POTENTIAL EFFECTS ON INTEGRITY

Table 5.2: Potential Effects of Operational Management at LHR-NWR

Site	Interest feature	Potential effect of Operational management	Potential adverse effect on conservation objective
Southwest London Waterbodies SPA	Northern shoveler and Gadwall and other waterbirds.	The effects of operational management could lead to: → Species displacement both within the site and areas beyond the site; → Fragmentation; → Increased competition within the site and areas beyond the site; → Increased pressure on habitats within the site and areas beyond the site; and → Increased energetic use leading to reduced breeding success; and potentially mortality. It could also compromise the efficacy of mitigation and compensation measures	Potential to compromise: The extent and distribution of qualifying natural and habitats of qualifying species; The structure and function (including typical species) of qualifying natural habitats; The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely; The populations of qualifying species; and The distribution of qualifying species within the site.

5.5 AVOIDANCE AND MITIGATION MEASURES

5.5.1 LHR-NWR contains a commitment to compensation for lost habitat (unrelated, at this stage, to the potential need to mitigate or compensate for adverse effects on European sites). There is also a commitment to improve existing habitat for wildlife, creation of new habitat and development of outdoor leisure opportunities around the airport. The proposals include, amongst other habitats, the 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.

5.5.2 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 re-design 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 in order to remove potential breeding sites for feral geese has the consequence of reducing 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.

5.5.3 Moving the compensation habitat 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.

5.5.4 LHR-NWR 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 would need to be addressed by any promoter 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. If new habitat will be designed to avoid increasing the birdstrike risk, it will need to be clear how this can be achieved whilst maintaining the mitigation value of the new habitats created. Creating compensatory habitat further from the airport might resolve these problems.

5.5.5 Where compensation habitat 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.

5.5.6 Given the uncertainty surrounding flight paths of birds and flight heights of aeroplanes, the precautionary principle requires that the compensation proposals proposed by the promoters would conflict with birdstrike management. The corresponding need for increased bird management has the potential to disturb non-target species including the interest features of the SPA. Such additional 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 site's integrity cannot be ruled out at this stage albeit that this may be possible to do at the project stage

5.6 EFFICACY OF MITIGATION PROPOSALS AND RESIDUAL EFFECTS

5.6.1 It is considered likely that a number of potential adverse effects described above will be able to be mitigated through detailed design. However, at this plan stage it is not possible to exclude the likelihood of adverse effects given that more detailed project design information, and detailed proposals for mitigation, is not presently available. Such project detail would need to be reviewed against a baseline assessment at the SPA/Ramsar.

5.6.2 Given the information currently available, there is uncertainty that the potential adverse effects identified could be avoided via mitigation.

5.7 EFFECTS IN COMBINATION WITH OTHER PLANS AND PROJECTS

5.7.1 In the context of known disturbance factors and interest feature vulnerabilities, it is also not possible to exclude the likelihood of adverse effects occurring as a result of the implementation of the proposed policy in-combination with other Plans and projects being brought forward (such as those described in Table 3.1 above).

5.7.2 These potential effects are summarised in Table 5.3.

Table 5.3: Potential Operational Effects In Combination with Other Plans and Projects

Other Plan / Policy	Southwest London Waterbodies SPA
NPS for National Networks	Other projects in proximity creating disturbance could lead to species displacement both within the site and areas beyond the site, fragmentation, increased competition within the site and areas beyond the site, increased pressure on habitats within the site and areas beyond the site, increased energetic use leading to reduced breeding success and potentially mortality.
NPS for Waste Water	Other projects in proximity creating disturbance could lead to species displacement both within the site and areas beyond the site, fragmentation, increased competition within the site and areas beyond the site, increased pressure on habitats within the site and areas beyond the site, increased energetic use leading to reduced breeding success and potentially mortality.
High Speed Two (HS2) Hybrid Bill	Highly unlikely that effects would occur within a ZoI that would result in effects in combination.
Crossrail Act 2008	Highly unlikely that effects would occur within a ZoI that would result in effects in combination.
Local Development Plans	Other projects in proximity creating disturbance could lead to species displacement both within the site and areas beyond the site, fragmentation, increased competition within the site and areas beyond the site, increased pressure on habitats within the site and areas beyond the site, increased energetic use leading to reduced breeding success and potentially mortality.
Local Mineral and Waste Plans	Mineral extraction issues are identified as a cumulative disturbance effect. Other projects in proximity creating disturbance could lead to species displacement both within the site and areas beyond the site, fragmentation, increased competition within the site and areas beyond the site, increased pressure on habitats within the site and areas beyond the site, increased energetic use leading to reduced breeding success and potentially mortality.
London Plan	Other projects in proximity creating disturbance could lead to species displacement both within the site and areas beyond the site, fragmentation, increased competition within the site and areas beyond the site, increased pressure on habitats within the site and areas beyond the site, increased energetic use leading to reduced breeding success and potentially mortality.
River Thames Flood Relief Scheme	Thames flood relief scheme occurs in close proximity creating disturbance could lead to species displacement both within the site and areas beyond the site, fragmentation, increased competition within the site and areas beyond the site, increased pressure on habitats within the site and areas beyond the site, increased energetic use leading to reduced breeding success and potentially mortality. Thames flood relief scheme also offers potential for positive effects through indirect habitat creation.

5.8 CONCLUSION

5.8.1 It is considered likely that a number of potential adverse effects described above will be able to be ruled out through detailed design. However, at this plan stage it is not possible to exclude the possibility of adverse effects given that more detailed project design information, and detailed proposals for mitigation, is not presently available.

6 EFFECTS OF DIRECT AND INDIRECT LOSS AND FRAGMENTATION ON HABITATS AND SUPPORTING HABITAT

6.1 INTRODUCTION

6.1.1 The AA requires the assessment to test whether or not a plan or project will give rise to an adverse effect on the integrity of the site. For the purpose of this assessment the integrity of a site is defined as 'the coherence of its ecological structure and function, across its whole area, that enables it to sustain the habitat, complex and/or the levels of populations of the species for which it was classified[41] [42].

6.1.2 Accordingly, areas of supporting habitat outside of the designation boundary can be fundamental to the integrity of the site and as such require consideration in the same context as the site itself.

6.1.3 Taking this into account and in consideration of the likely ZoI of the shortlisted schemes, the HRSA concluded that LSE would potentially occur as a result of direct and indirect loss and fragmentation on habitats and supporting habitats.

6.2 RELEVANT EUROPEAN SITES

6.2.1 The European sites identified in the HRSA as sensitive to direct and indirect loss and fragmentation and the potential impact pathways are provided in Table 6.1.

Table 6.1: Relevant European Sites and Potential direct and indirect loss and fragmentation Impact Pathway

European Site	European site vulnerability / impact pathway
South West London Waterbodies SPA / Ramsar	LSE was identified in the HRSA as a result of the surface access proposals for LHR-NWR which may involve land take and disturbance in the southern area of the proposal, 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.

[41] Managing Natura 2000 Sites: The provisions of Article 6 of the 'Habitats' Directive 92/43/EEC

[42] Paragraph. 39 of the judgment of the Court of Justice of the EU in Case C-258/11 ***Sweetman v An Bord Pleanála***: '*in order for the integrity of a site as a natural habitat not to be adversely affected, the site needs to be preserved at a favourable conservation status. This entails the lasting preservation of the constitutive characteristics of the site that are connected to the presence of a natural habitat type whose preservation was the objective justifying the designation of the site'.*

6.3 APPROPRIATE ASSESSMENT

CURRENT BASELINE

6.3.1 A large series of waterbodies have been historically created in the south west London area as a result of the development of water-supply reservoirs and the gravel extraction industry. Seven of these waterbodies were designated in 2000 as the SW London Waterbodies SPA. Hundreds of migratory wintering Gadwall and Shoveler birds spend the winter on and around these waterbodies and their numbers are significant at a European level.

6.3.2 Some sites appear to be favoured by one species more than the other whilst some are used by both, and individual birds move from one waterbody to another. The waterbodies are also of national importance to a number of other species of wintering wildfowl, namely cormorant (*Phalcrocorax carbo*), great crested grebe (*Podiceps cristatus*), tufted duck (*Aythya fuligula*), pochard (*Aythya farina*), and coot (*Fulica atra)*.

6.3.3 As described by Briggs[18] the SPA classification implies that component sites are biologically connected. However, there are more than 50 other waterbodies within the area that contribute to the region's waterfowl interest. Twenty of these were originally included in the pre-selection stage, but were subsequently omitted from the classification.

6.3.4 For the purpose of this AA the complex of SPA and SSSI components (and additional components forming potential supporting habitat) are considered in the assessment.

POTENTIAL EFFECTS OF CHANGES TO BASELINE AS A RESULT OF LHR–NWR

6.3.5 Surface access proposals for LHR-NWR may involve land take and disturbance in the southern area of the proposal, 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. 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 SW London Waterbodies SPA).

6.3.6 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.

6.3.7 The SW London Waterbodies 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 that component being of reduced benefit to the interest features, for example as a result of inadequate size or functional change.

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

6.4 SUMMARY OF POTENTIAL EFFECTS ON INTEGRITY

Table 6.2: Potential Effects of Supporting Habitat Loss at LHR-NWR

Site	Interest feature	Potential effect of Habitat Loss	Potential adverse effect on conservation objective
Southwest London Waterbodies SPA / Ramsar	Northern shoveler and Gadwall and other waterbirds.	There is potential for surface access routes to overlap with the boundaries of sites that include SSSI components of the SPA.	Potential to compromise; The extent and distribution of qualifying natural and habitats of qualifying species; The structure and function (including typical species) of qualifying natural habitats; The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely; The populations of qualifying species; and The distribution of qualifying species within the site.

6.5 AVOIDANCE AND MITIGATION MEASURES

6.5.1 It is considered reasonably likely that at the detailed design stage, impacts as a result of LHR-NWR 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 could be planned in order to avoid land take adjacent to the SAC or within the SPA. These measures are considered to be viable and robust to prevent adverse effects to integrity of the sites.

6.6 EFFICACY OF MITIGATION PROPOSALS AND RESIDUAL EFFECTS

6.6.1 It is considered reasonably likely that at the detailed design stage, the potential adverse effects identified could be avoided at LHR-NWR via mitigation and alignment considerations.

6.6.2 However, at this plan stage it is not possible to exclude the likelihood of adverse effects given that more detailed project design information, and detailed proposals for mitigation, is not presently available. Such project detail would need to be reviewed against a baseline assessment at the SPA/Ramsar.

6.7 EFFECTS IN COMBINATION WITH OTHER PLANS AND PROJECTS

6.7.1 In the context of known site conditions and interest feature vulnerabilities, it is also not possible at this strategic plan-level to rule out the likelihood that LHR-NWR could act in-combination with other Plans being brought forward (those described in Table 3.1 above), which may alone result in additional pressures. These potential effects are summarised in Table 6.3.

Table 6.3: Potential Habitat Loss and Fragmentation Effects In Combination with Other Plans and Projects

Other Plan / Policy	Mole Gap to Reigate Escarpment SAC	Southwest London Waterbodies SPA/Ramsar
NPS for National Networks	Other projects in proximity resulting in habitat loss and/or fragmentation (during construction or operation) within foraging/commuting routes of supporting/connecting habitat may result in fragmentation/isolation effects to the interest features.	Other projects in proximity resulting in habitat loss and/or fragmentation could lead to species displacement both within the site and areas beyond the site, fragmentation, increased competition within the site and areas beyond the site, increased pressure on habitats within the site and areas beyond the site, increased energetic use leading to reduced breeding success and potentially mortality.
NPS for Waste Water	Unlikely that effects would occur within a ZoI that would result in effects in combination.	Other projects in proximity resulting in habitat loss and/or fragmentation creating disturbance could lead to species displacement both within the site and areas beyond the site, fragmentation, increased competition within the site and areas beyond the site, increased pressure on habitats within the site and areas beyond the site, increased energetic use leading to reduced breeding success and potentially mortality.
High Speed Two (HS2) Hybrid Bill	Highly unlikely that effects would occur within a ZoI that would result in effects in combination.	Highly unlikely that effects would occur within a ZoI that would result in effects in combination.
Crossrail Act 2008	Highly unlikely that effects would occur within a ZoI that would result in effects in combination.	Highly unlikely that effects would occur within a ZoI that would result in effects in combination.
Local Development Plans	Other projects in proximity resulting in resulting in habitat loss and/or fragmentation (during construction or operation) within foraging/commuting routes of supporting/connecting habitat may result in fragmentation/isolation effects to the interest features.	Other projects in proximity resulting in habitat loss and/or fragmentation could lead to species displacement both within the site and areas beyond the site, fragmentation, increased competition within the site and areas beyond the site, increased pressure on habitats within the site and areas beyond the site, increased energetic use leading to reduced breeding success and potentially mortality.
Local Mineral and Waste Plans	Other projects in proximity resulting in resulting in habitat loss and/or fragmentation (during construction or operation) within foraging/commuting routes of supporting/connecting habitat may result in fragmentation/isolation effects to the interest features.	Mineral extraction issues are identified as a cumulative disturbance effect. Other projects in proximity resulting in habitat loss and/or fragmentation could lead to species displacement both within the site and areas beyond the site, fragmentation, increased competition within the site and areas beyond the site, increased pressure on habitats within the site and areas beyond the site, increased energetic use leading to reduced breeding success and potentially mortality.
London Plan	Highly unlikely that effects would occur within a ZoI that would result in effects in combination.	Other projects in proximity resulting in habitat loss and/or fragmentation could lead to species displacement both within the site and areas beyond the site, fragmentation, increased competition within the site and areas beyond the site, increased pressure on habitats within the site and areas beyond the site, increased energetic use leading to reduced breeding success and potentially mortality.

Table 6.3: Potential Habitat Loss and Fragmentation Effects In Combination with Other Plans and Projects

Other Plan / Policy	Mole Gap to Reigate Escarpment SAC	Southwest London Waterbodies SPA/Ramsar
River Thames Flood Relief Scheme	Highly unlikely that effects would occur within a ZoI that would result in effects in combination.	Thames flood relief scheme occurs in close proximity creating disturbance could lead to species displacement both within the site and areas beyond the site, fragmentation, increased competition within the site and areas beyond the site, increased pressure on habitats within the site and areas beyond the site, increased energetic use leading to reduced breeding success and potentially mortality. Thames flood relief scheme also offers potential for positive effects through indirect habitat creation.

6.8 CONCLUSION

6.8.1 It is considered likely that a number of the potential adverse effects described above will be able to be ruled out through detailed design. However, at this plan stage it is not possible to exclude the possibility of adverse effects given that more detailed project design information, and detailed proposals for mitigation, is not presently available.

7 EFFECTS OF CHANGES TO AIR QUALITY

7.1 INTRODUCTION

7.1.1 The threshold for effects of atmospheric nitrogen ('Critical Loads' and 'Critical Levels') has been exceeded for many European sites in the UK[43]. Potential outcomes of exceedance include changes in species composition, especially in nutrient-poor ecosystems with a shift towards species associated with higher nitrogen availability and a reduction in species richness.

7.1.2 The air quality assessment module for the proposed LHR–NWR[44] considers the total mass emissions of key pollutants associated with airport activity. The assessment considers the following main categories of sources as a result of the shortlisted schemes:

- Airport related road transport 'Surface Access' (vehicle access including car parking);
- Airport activities (such as aircraft movements, heat & power generation);
- Non-Airport related road transport 'Surface Access' (vehicles on the surrounding roads); and
- Other emissions (such as industry and energy production).

7.1.3 Taking account of the above-described emission sources and in consideration of the likely ZoI of the shortlisted schemes, the HRSA concluded that LSE could occur as a result of changes in air quality.

7.2 RELEVANT EUROPEAN SITES

7.2.1 The European sites identified in the HRSA as vulnerable to nitrogen deposition and the potential impact pathways from LHR–NWR are provided in Table 7.1.

Table 7.1: Relevant European Sites and Potential Air Quality Impact Pathway

European Site	Location In Relation To Scheme	European Site Vulnerability / Impact Pathway
South West London Waterbodies SPA	Adjacent to LHR–NWR	LSE identified in HRSA as a result of the immediate proximity of the site to the scheme. Air quality impacts from the scheme (airport-related activities) as well as a result of surface access may occur.
South West London Waterbodies Ramsar		
Richmond Park SAC	10 km east of LHR–NWR	LSE could not be discounted in the HRSA as a result of the scheme's surface access. Sections of the SAC are located within approximately 200 m of the A3, which may experience greater traffic flows as a result of the scheme. The SAC is not currently identified as vulnerable to nitrogen deposition in the

[43] Carnell, E. J. and Dragosits, U.,2015. *Assessing and Addressing Atmospheric Nitrogen Impacts on Natura 2000 Sites in Wales*. Project Report, Centre of Ecology and Hydrology: Edinburgh.

[44] Jacobs, 2015. Module 6: Air Quality Local Assessment. Detailed Emissions Inventory and Dispersion Modelling. [online] Accessed 19/01/2017.

Table 7.1: Relevant European Sites and Potential Air Quality Impact Pathway

European Site	Location In Relation To Scheme	European Site Vulnerability / Impact Pathway
		SIP; however, it is currently in exceedance of the site-relevant critical load.
Windsor Forest and Great Park SAC	6.2 km west of LHR–NWR	LSE could not be discounted in the HRSA as a result of the scheme's surface access. Sections of the SAC are located within approximately 200 m of the A332 and A329, which may experience greater traffic flows as a result of the scheme. The SAC is identified as vulnerable to nitrogen deposition with levels currently exceeding the site-relevant critical load.
Burnham Beeches SAC	10.2km north-west of LHR–NWR	LSE could not be discounted in the HRSA as a result of the scheme's surface access. Sections of the SAC are located within approximately 200 m of the A355, which may experience greater traffic flows as a result of the scheme. The SAC is identified as vulnerable to nitrogen deposition with levels currently exceeding the site-relevant critical load.
Thursley, Ash, Pirbright and Chobham SAC (and supporting habitats of Thames Basin Heaths SPA)	10.8km south west of LHR–NWR	LSE could not be discounted in the HRSA as a result of the scheme's surface access. Sections of the SAC are located within approximately 200 m of the M3 and A320, which may experience greater traffic flows as a result of the scheme. The SAC is identified as vulnerable to nitrogen deposition with levels currently exceeding the site-relevant critical load.
Wimbledon Common SAC	11.1km east of LHR–NWR	LSE could not be discounted in the HRSA as a result of the scheme's surface access. Sections of the SAC are located within approximately 200 m of the A3, which may experience greater traffic flows as a result of the scheme. The SAC is identified as vulnerable to nitrogen deposition with levels currently exceeding the site-relevant critical load.

7.2.2 The type and degree of effect on each of these European sites will be dependent on the pollutant emitted and process contribution; the nature of the receiving environment; and the distance from the source, as discussed in further detail below.

SOUTHWEST LONDON WATERBODIES SPA (AND RAMSAR)

7.2.3 The habitats supporting the site's qualifying features are considered particularly vulnerable to changes in water quality, which may result through increased nitrogen deposition.

7.2.4 Table 7.2 below provides the critical load for the habitat supporting each interest feature of the site and details where exceedance occurs under the current baseline.

Table 7.2: Critical Loads and Baseline Nitrogen Deposition against Interest Features of Southwest London Waterbodies SPA and Ramsar

Interest Feature	Empirical Critical Load (Kg N/Ha/Yr)	Nitrogen Deposition (2012 – 2014)
Northern shoveler breeding habitat	20 – 30	Maximum: 18.2 Minimum: 14.3 Average: 15.8
Northern shoveler wintering habitat	There is no comparable habitat with an established critical load estimate available. Decisions with regard to potential vulnerability are to be taken at a site specific level since habitat sensitivity depends on N or P limitation.	
Gadwall breeding habitat		Maximum: 11.9 Minimum: 10.6 Average: 11.6
Gadwall wintering habitat		

WINDSOR FOREST AND GREAT PARK SAC

7.2.5 The potential air quality impact pathway for the SAC has been assessed in the HRSA as arising from non-airport related road transport (part of the surface access). This is specifically as a result of the location of the SAC (in proximity to the A332 and A329, which may experience greater traffic volumes as a result of the scheme) and the current evidence base, which identifies effects from road vehicles on vegetation < 200 m of roads[45].

7.2.6 The impact of atmospheric nitrogen deposition is identified as a key issue in the Site Improvement Plan[46]. Heathrow airport is identified as a likely source of existing exceedance of nitrogen critical load.

7.2.7 Critical NOx levels are set nationally for all vegetation at 30 µg NOx/m^3 (annual mean) and 75 µg NOx/m^3 (24-hour mean). Table 7.3 below provides the critical nitrogen deposition loads for each interest feature of the SAC and details where exceedance occurs under the current baseline (current baseline taken to be as reported in APIS)[47].

Table 7.3: Critical Loads and Baseline Nitrogen Deposition against Interest Features of Windsor Forest and Great Park SAC

Interest Feature	Empirical Critical Load (Kg N/Ha/Yr)	Nitrogen Deposition (2012 – 2014)
Old acidophilous oak woods with *Quercus robur* on sandy plains	10 -15	Maximum: 27.9 Minimum: 22.4 Average: 24.2
Atlantic acidophilous beech forests with Ilex and sometimes also Taxus	10 – 20	Maximum: 27.9 Minimum: 22.4 Average: 24.2

[45] Natural England, 2016. *Potential risk of impacts of nitrogen oxides from road traffic on designated nature conservation sites (NECR200)*. [online] Accessed 19/01/2017.
[46] Natural England, 2014. *Site Improvement Plan Windsor Forest*. [online] Accessed 19/01/2017.
[47] Air Pollution Information Systems (APIS), 2016. *'Site Relevant Critical Loads' Tool*. [online] Accessed19/01/2017.

Interest Feature	Empirical Critical Load (Kg N/Ha/Yr)	Nitrogen Deposition (2012 – 2014)
in the shrublayer (*Quercion robori-petraeae* or *Ilici-Fagenion*)		
Violet click beetle (critical load class: Fagus woodland)	10 – 20	Maximum: 27.9 Minimum: 22.4 Average: 24.2

BURNHAM BEECHES SAC

7.2.8 Burnham Beeches SAC is located within 200m of the A355, which may experience greater traffic volumes. The Site Improvement Plan[48] identifies that the interest features of Burnham Beeches SAC are at risk due to nitrogen deposition.

7.2.9 Table 7.4 below provides the critical load for the habitat supporting each interest feature of the site and details where exceedance occurs under the current baseline.

Table 7.4: Critical Loads and Baseline Nitrogen Deposition against Interest Features of Burnham Beeches SAC

Interest Feature	Empirical Critical Load (Kg N/Ha/Yr)	Nitrogen Deposition (2012 – 2014)
Atlantic acidophilous beech forests with Ilex and sometimes also Taxus in the shrublayer (Quercion robori-petraeae or Ilici-Fagenion)	10 -20	Maximum: 26.9 Minimum: 24.8 Average: 25.6

THURSLEY ASH, PIRBRIGHT AND CHOBHAM SAC (AND SUPPORTING HABITATS OF THAMES BASIN HEATHS SPA)

7.2.10 Thursley, Ash, Pirbright and Chobham SAC and Thames Basin Heaths is located within 200 m of the M3 and A320, which may experience greater traffic volumes. The Site Improvement Plan[49] identifies that the European site is in exceedance of the site-relevant critical load and that the interest are at risk due to nitrogen deposition.

7.2.11 Table 7.5 below provides the critical load for the habitat supporting each interest feature of the site and details where exceedance occurs under the current baseline.

Table 7.5: Critical Loads and Baseline Nitrogen Deposition against Interest Features of Thursley, Ash, Pirbright and Chobham SAC (and Thames Basin Heaths Habitats)

Interest Feature	Empirical Critical Load (Kg N/Ha/Yr)	Nitrogen Deposition (2012 – 2014)
Depressions on peat substrates of the Rhynchosporion	10 - 15	Maximum: 16.9 Minimum: 12.7 Average: 13.9
Northern Atlantic wet heaths with *Erica tetralix*	10 - 20	Maximum: 16.9 Minimum: 12.7 Average: 13.9
European dry heaths (and supporting SPA interest features	10 - 20	Maximum: 16.9 Minimum: 12.7 Average: 13.9

[48] Natural England, 2014. *Site Improvement Plan Burnham Beeches*. [online] Accessed 19/01/2017.
[49] Natural England, 2014. *Site Improvement Plan Thames Basin.* [online] Accessed 19/01/2017.

Interest Feature	Empirical Critical Load (Kg N/Ha/Yr)	Nitrogen Deposition (2012 – 2014)
breeding nightjar, woodlark, *and Dartford warbler*		

RICHMOND PARK SAC

7.2.12 Richmond Park SAC is located within 200 m of the A3, which may experience greater traffic volumes. The Site Improvement Plan[50] does not identify any current issues affecting the feature.

7.2.13 Table 7.6 below provides the critical load for the habitat supporting each interest feature of the site and details where exceedance occurs under the current baseline.

Table 7.6: Critical Loads and Baseline Nitrogen Deposition against Interest Features of Wimbledon Common SAC

Interest Feature	Empirical Critical Load (Kg N/Ha/Yr)	Nitrogen Deposition (2012 – 2014)
Stag beetle (Broadleaved mixed and yew woodland)	10 - 20	Maximum: 24.6 Minimum: 23.9 Average: 24.2

WIMBLEDON COMMON SAC

7.2.14 Wimbledon Common SAC is located within 200 m of the A3, which may experience greater traffic volumes. The Site Improvement Plan[51] identifies that the European site is in exceedance of the site-relevant critical load and that the interest are at risk due to nitrogen deposition. Table 7.7 below provides the critical loads for the habitats supporting each interest feature of the site and details where exceedance occurs under the current baseline.

Table 7.7: Critical Loads and Baseline Nitrogen Deposition against Interest Features of Wimbledon Common SAC

Interest Feature	Empirical Critical Load (Kg N/Ha/Yr)	Nitrogen Deposition (2012 – 2014)
Northern Atlantic wet heaths with *Erica tetralix*	10 - 20	Maximum 14.3 Minimum: 14.3 Average: 14.3
European dry heaths	10 -20	Maximum: 14.3 Minimum: 14.3 Average: 14.3
Stag beetle (Broadleaved mixed and yew woodland)	10 -20	Maximum: 24.6 Minimum: 24.6 Average: 24.6

[50] Natural England, 2017. *Site Improvement Plan Richmond Parl*. [online] Accessed 19/01/2017.
[51] Natural England, 2017. *Site Improvement Plan Richmond Park*. [online] Accessed 19/01/2017.

7.3 APPROPRIATE ASSESSMENT

BACKGROUND

7.3.1 In Section 7.2, sensitivities and critical loads have been identified for the interest features of European sites in proximity to LHR–NWR. For all of these European sites, current deposition levels for nitrogen (when compared to critical loads for the qualifying habitats) are recorded as close to, or in exceedance.

7.3.2 Exceedance of critical load does not necessarily infer ecosystem damage and conversely, changes in ecosystem function can occur below the thresholds set. The critical load is a quantitative estimate of exposure to pollutants below which significant harmful effects on sensitive elements of the environment are not considered likely to occur based on present knowledge. But exceedance of the critical load is not a quantitative estimate of damage to the environment; it represents only the potential for damage. It is recognised that further research is required; however, the existing data across a variety of habitats suggests that adverse effects are likely to occur as a result of excess nitrogen deposition[52], and this is the position adopted in this AA.

7.3.3 In addition, in this AA, those sites in exceedance or close to exceedance are considered more sensitive to additional nitrogen deposition in accordance with the protocol adopted by Natural England (2016)[53]. This is in recognition of the fact that whilst further exceedance may not directly lead to further damage, such additional exceedance is likely to take a site further away from the achievement of a given site's Conservation Objectives[54].

CURRENT AIR QUALITY BASELINE

7.3.4 The following European sites have been assessed as largely in 'Favourable Condition'[55] despite an exceedance of critical load[56]:

- Windsor Forest and Great Park SAC;
- Burnham Beeches SAC; and
- Thursley Ash, Pirbright and Chobham SAC (and habitats supporting Thames basin heaths SPA qualifying features).

7.3.5 The following sites are not assessed as in 'Favourable Condition' and are in, or close to, exceedance of critical load:

- SW London Waterbodies SPA and Ramsar;
- Richmond Park SAC; and

[52] Natural England, 2016 *The ecological effects of air pollution from road transport: an updated review (NECR199)*. [online] Accessed 19/01/2017.
[53] Natural England, 2016. *Potential risk of impacts of nitrogen oxides from road traffic on designated nature conservation sites (NECR200)*. [online] Accessed 19/01/2017.
[54] Conservation Objectives define what constitutes favourable condition of each feature by describing broad targets, which should be met if the feature is to be judged favourable.
[55] For species these may include population size, structure, habitat requirements and distribution. Attributes of habitats may include area covered, key species, composition and structure and supporting processes
[56] Natural England, 2016. *Site Improvement Plans*. [online] Accessed 04/01/2016.

→ Wimbledon Common SAC.

7.3.6 In assessing the relevance of Favourable Condition status, it is noted that, to date, it has been difficult to attribute nitrogen deposition as a cause of unfavourable condition[57]. Furthermore, as described above, an exceedance does not necessarily infer damage, and the response of both individual species and communities to vehicle emissions is complex and not fully understood[58].

7.3.7 In the absence of data to provide evidence to the contrary, recourse is given to the Precautionary Principle for all the sites described in Sections 7.3.4 and 7.3.5 above. As such, where there is an existing exceedance, it is considered possible that this will result in baseline adverse effects and potentially will be compromising the achievement of the Conservation Objectives of these European sites.

POTENTIAL EFFECTS OF CHANGES TO BASELINE AS A RESULT OF LHR-NWR

Surface Access

7.3.8 Eight European sites are located in immediate proximity (< 200 m) to major roads potentially leading to Heathrow. All sites are assessed as potentially vulnerable to nitrogen deposition and are currently in exceedance (or in the case of SW London Waterbodies, 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 LHR-NWR.

7.3.9 The maximum predicted annual mean concentrations of nitrogen oxides and nitrogen deposition fluxes were calculated for SW London Waterbodies SPA and Ramsar and it was identified that LHR–NWR 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%. The Staines Moor SSSI is part of SW London Waterbodies SPA and Ramsar.

7.3.10 Although this does not result in a new exceedance as a result of LHR–NWR, 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 (arising from other plans and projects listed in Table 3.1) and result in adverse effects on the integrity of the SPA and Ramsar.

7.3.11 There would, in addition, potentially be a new exceedance of the ambient NOx Critical Level at the South West London Waterbodies 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^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 cannot at this stage be ruled out that the air quality impacts will contribute additional NOx-related adverse effects on the integrity of the European site.

[57] Inter-agency Air Pollution Group, 2015. *A Framework for UK Research and Evidence Needs Relating to Air Pollution Impacts on Ecosystems, Version 1*. [online] Accessed 19/01/2017.
[58] Natural England, 2016. *The Ecological Effects of Air Pollution from Road Transport: an Updated Review (NECR 199)*. [online] Accessed 19/01/2017.

7.3.12 Roads within 200 m of Wimbledon Common SAC fall within the Traffic Simulation Area for the scheme. However, the SAC was not included in the air quality assessment as a sensitive ecological receptor. In addition, Thames Basin Heaths SPA, Thursley SAC, Richmond Park, Windsor Park SAC and Burnham Beeches SAC were also excluded from the assessment (ie roads within 200 m of these European sites were not considered). As such, no data is available regarding the estimated nitrogen deposition rates arising from the scheme. Further assessment is considered necessary to identify whether there will be any significant traffic increases on these roads and a corresponding increase in the deposition of nitrogen.

7.3.13 In the absence of data to provide evidence to the contrary, and in accordance with the Precautionary Principle, it is considered that at this stage it cannot be ruled out that there will be an increase in traffic at these roads and that corresponding air quality impacts will act cumulatively and in-combination and result in adverse effects on the integrity of the European sites as detailed in Table 7.8 below.

Scheme Specific and Construction Impacts

7.3.14 It is recognised that there are insufficient details at this plan level with regard to construction to enable a robust assessment of associated impacts. However, given the probable size and duration of construction, the air quality assessment (using IAQM guidance) would class the construction works as High Risk in proximity to SW London Waterbodies[59].

7.3.15 Further studies are required regarding the sensitivity to dust of the habitats within immediate (< 50 m) proximity as well as any construction-related impacts as a result of surface access improvement works. Sufficient uncertainty remains at present in the absence of project-level detail to establish the absence of adverse air quality-related construction effects.

Changes

Table 7.8: Relevant European Sites and Potential Effects of Air Quality

Site	Interest Feature	Potential Effect Of Exceedance Of Critical Load	Potential Adverse Effect On Conservation Objective
Southwest London Waterbodies SPA	Northern shoveler and Gadwall	Eutrophication, Changes in the species composition of macrophytecommunities, increased algal productivity and a shift in nutrient limitation of phytoplankton from N to P.	Potential to compromise the supporting processes on which the habitats of qualifying species rely and the populations and distribution of qualifying species.
Windsor Forest and Great Park SAC	Old acidophilous oak woods with *Quercus robur* on sandy plains	Decrease in mycorrhiza, loss of epiphytic lichens and bryophytes, changes in ground vegetation.	Potential to compromise the extent, distribution, structure and function of habitats and their supporting processes.
	Atlantic acidophilous beech forests with Ilex and sometimes also Taxus in the shrublayer (*Quercion robori-petraeae* or *Ilici-Fagenion*)	Changes in ground vegetation and mycorrhiza, nutrient imbalance, changes soil fauna.	

[59] Institute of Air Quality Management, 2016. *Guidance on the assessment of dust from demolition and construction.* [online] Accessed 19/01/2017.

Table 7.8: Relevant European Sites and Potential Effects of Air Quality

Site	Interest Feature	Potential Effect Of Exceedance Of Critical Load	Potential Adverse Effect On Conservation Objective
	Violet click beetle (critical load class: Fagus woodland)	Changes in soil processes, nutrient imbalance, altered composition mycorrhiza and ground vegetation.	Potential to compromise the supporting processes on which the habitats of qualifying species rely and the populations and distribution of qualifying species.
Burnham Beeches SAC	Atlantic acidophilous beech forests with Ilex and sometimes also Taxus in the shrublayer (Quercion robori-petraeae or Ilici-Fagenion)	Changes in ground vegetation and mycorrhiza, nutrient imbalance, changes soil fauna.	Potential to compromise the extent, distribution, structure and function of habitats and their supporting processes.
Thursley, Ash, Pirbright and Chobham SAC	Depressions on peat substrates of the Rhynchosporion	Increase sedges and vascular plants, negative effects on bryophytes.	Potential to compromise the extent, distribution, structure and function of habitats and their supporting processes.
	Northern Atlantic wet heaths with *Erica tetralix*	Transition heather to grass. Ericaceous species susceptible to frost and drought.	
	European dry heaths (and supporting SPA interest features breeding nightjar, woodlark *and Dartford warbler*	Transition from heather to grass dominance, decline in lichens, changes in plant biochemistry, increased sensitivity to abiotic stress.	
Wimbledon Common SAC	Northern Atlantic wet heaths with *Erica tetralix*	Transition heather to grass. Ericaceous species susceptible to frost and drought.	Potential to compromise the extent, distribution, structure and function of habitats and their supporting processes.
	European dry heaths	Transition from heather to grass dominance; decline in lichens, changes in plant biochemistry, increased sensitivity to abiotic stress.	
	Stag beetle (broad-leaved mixed woodland)	Changes in soil processes, nutrient imbalance, altered composition mycorrhiza and ground vegetation.	Potential to compromise the supporting processes on which the habitats of qualifying species rely and the populations and distribution of qualifying species.

7.4 SUMMARY OF POTENTIAL EFFECTS ON INTEGRITY

Table 7.9: Summary of Potential Effects on Integrity as a Result of the Construction and Operation of LHR-NWR

European Site	Construction Effects	Operation Effects
Southwest London Waterbodies SPA and Ramsar	Dust-related impacts from scheme-specific development. Surface access improvement Schemes may result in localised impacts.	N-Deposition

European Site	Construction Effects	Operation Effects
Windsor Forest and Great Park SAC	None currently identified. However, surface access improvement Schemes may result in localised impacts.	N-Deposition
Burnham Beeches SAC	None currently identified. However, surface access improvement Schemes may result in localised impacts.	N-Deposition
Thursley, Ash, Pirbright and Chobham SAC and Thames Basin SPA	None currently identified. However, surface access improvement Schemes may result in localised impacts.	N-Deposition
Richmond Park SAC	None currently identified. However, surface access improvement Schemes may result in localised impacts.	N-Deposition
Wimbledon Common SAC	None currently identified. However, surface access improvement Schemes may result in localised impacts.	N-Deposition

7.5 AVOIDANCE AND MITIGATION MEASURES

7.5.1 Air quality impacts have been assessed as having the potential to result in adverse effects on the integrity of European sites as a result of LHR-NWR and as such it is necessary that the NPS takes account of this through its direction to the DfT.

7.5.2 Further detailed assessment and application of avoidance and mitigation measures will be required at the project level HRA. As detailed mitigation has not been designed at this stage, the NPS provides high level direction to ensure that such requirements are given full consideration at the project stage HRA.

7.5.3 It is considered likely that with the implementation of a satisfactory and approved Construction Environmental Management Plan (CEMP), temporary dust impacts during the construction-phase will be minimised. In addition, mitigation can be incorporated into the detailed design including the type, use and timing of vehicles and equipment to reduce emissions.

7.5.4 Traffic emissions generated are determined as a result of the number and type (including performance technology) of vehicles; the speed driven; and congestion levels. As described by Natural England[60], mitigation options require focus on these factors, for example by:

- → Reducing traffic flows in numbers and vehicle type (through traffic restrictions, road relocation, behaviour change);
- → Improving traffic flow and efficiency (traffic control systems to reduce emissions at sensitive sites, road space design and management, driver education); and
- → Promotion of low-emission vehicles (for example the implementation of low emission zones in proximity to sensitive sites).

[60] Natural England, 2016. The ecological effects of air pollution from road transport: an updated review (NECR199). [online] Accessed 19/01/2017.

7.5.5 It will be necessary to demonstrate the ability of sustainable transport plans, in particular the use of carbon-efficient and non-road transport to negate or reduce impacts on European sites during operation and furthermore, measures/incentives to facilitate their implementation should be provided.

7.5.6 The AC, Final Report[61] described that, in parallel with the approvals process, a major shift in mode-share should be implemented for those working at the airport. A focus on employee behaviour change, rail investment and congestion charges for motor vehicles are AC suggested measures to achieve this.

7.5.7 Congestion charges and improved infrastructure for Ultra Low Emission Vehicles for passengers may also be considered.

7.5.8 In addition, the development and application of appropriate air quality management plans and independently certified offsetting options (including for example, renewable energy and fuel-switching) should also be considered within the further development of the NPS.

7.6 EFFICACY OF MITIGATION PROPOSALS AND RESIDUAL EFFECTS

7.6.1 It is considered reasonably likely that construction-phase indirect air quality related impacts can be appropriately mitigated using tried and tested best-practice methods contained within a CEMP as described above.

7.6.2 The efficacy of the mitigation proposals during operation cannot however be demonstrated in the absence of further data. In this strategic AA, given the information currently available, there is uncertainty that the potential adverse effects could be avoided via mitigation.

7.7 EFFECTS IN COMBINATION WITH OTHER PLANS AND PROJECTS

7.7.1 In the context of known air quality conditions and interest feature vulnerabilities, and the possibility of cumulative effects as a result of the implementation of either the scheme's surface access strategies, the precautionary approach at this strategic level requires that adverse effects are assumed. It therefore cannot at this stage be ruled out that the schemes could act in-combination with other Plans and projects being brought forward (such as those described in Table 3.1 above), which may alone result in changes to air quality and in particular, nitrogen deposition.

7.8 CONCLUSION

7.8.1 It is considered likely that a number of the potential adverse effects described above will be able to be ruled out through detailed design. However, at this plan stage it is not possible to exclude the possibility of adverse effects given that more detailed project design information, and detailed proposals for mitigation, is not presently available.

[61] Airports Commission, 2015. *Final Report*. [online] Accessed 06/01/2016.

8 EFFECTS OF CHANGES TO WATER QUALITY AND QUANTITY

8.1 INTRODUCTION

8.1.1 The dynamics of European sites and the composition, assemblage and diversity of associated species can be significantly affected by changes to water quality, quantity and flow. Relevant sites include designated water courses, estuaries and other wetland environments; however, habitats such as heathlands and grasslands can also be affected (hydrological changes may affect terrestrial habitats, for example through groundwater). Inputs of toxic compounds and pesticides may result in negative effects on the health of aquatic life. Increased nutrient levels (for example through effluent discharge) can result in eutrophication. In addition, physical changes from scour may materialise in receiving ecosystems through changes to the flow and quantity of water.

8.1.2 The Biodiversity Assessment[62], identified that the construction and operation of the shortlisted schemes may result in impacts on the local water environment. Relevant activities identified are as follows:

- The diversion and culverting of several watercourses;
- Increases in the risk of contaminants during construction and operation (for example through the use of de-icing fluid);
- Potential changes to flow as a result of flooding; and
- Should additional abstraction and discharge occur as a result of increased water demand, there is the potential for additional impacts on flow.

8.1.3 Taking account of the potential impacts described above and in consideration of the likely ZoI of the shortlisted schemes, the HRSA concluded that LSE would potentially occur as a result of changes in water quality.

8.2 RELEVANT EUROPEAN SITES

8.2.1 The European sites identified in the HRSA as sensitive to water quality or quantity and the potential impact pathways are provided in Table 8.1. Hydrological impacts on European sites arising from LGW-2R were screened out at the HRSA stage.

[62] Jacobs, 2014. *7. Biodiversity: Baseline*. [online] Accessed 04/01/2016.

Table 8.1: Relevant European Sites and Potential Water Quantity and Quality Impact Pathway

European Site	European Site Vulnerability / Impact Pathway
South West London Waterbodies SPA Ramsar	Potential to result in impacts to hydrological systems such as the River Colne and wetland environments adjacent to the SPA that support interest features.

South West London Waterbodies SPA and Ramsar

8.2.2 A large series of waterbodies have been historically created in the south west London area as a result of the development of water-supply reservoirs and the gravel extraction industry. Seven of these waterbodies were designated in 2000 as the SW London Waterbodies SPA. Hundreds of migratory wintering Gadwall and Shoveler spend the winter on and around these waterbodies and their numbers are significant at a European level.

8.2.3 Some sites appear to be favoured by one species more than the other whilst some are used by both, and individual birds move from one waterbody to another. The waterbodies are also of national importance to a number of other species of wintering wildfowl, namely cormorant (*Phalcrocorax carbo*), great crested grebe (*Podiceps cristatus*), tufted duck (*Aythya fuligula*), pochard (*Aythya farina*), and coot (*Fulica atra)*.

8.2.4 As described by Briggs[18] and in detail in Section 4 of this assessment, the SPA designation implies that component sites are biologically connected. However, there are more than 50 other waterbodies within the area that contribute to the region's waterfowl interest. Twenty of these were originally included in the pre-selection stage, but were subsequently omitted from the designation.

8.2.5 For the purpose of this AA the complex of SPA and SSSI components (and additional components forming potential supporting habitat) are considered in the assessment. Further assessment will be required at the project-level to define the extent of supporting habitat and that affected by the scheme.

Table 8.2: Southwest London Waterbodies SPA Components

Spa Component	Sub-Site	Distance From Heathrow Airport
Staines Moor	King George VI Reservoir	850 m southwest
	Staines Reservoir	650 m southwest
Wraysbury and Hythe End Gravel Pits	Wraysbury Gravel Pit – North	3700 m southwest
	Wraysbury Gravel Pit - South	4100 m southwest
Kempton Park Reservoirs	Kempton Reservoir East	5100 m southeast
	Redhouse	4700 m southeast
Knight and Bessborough Reservoirs	-	7300 m southeast
Sunnymeads Gravel Pits	Wraysbury Gravel Pit – North	4400 m west
	Wraysbury Gravel Pit - South	4100 m west
Thorpe Park Gravel Pit (Pit 1)	-	9400 m southwest

Table 8.2: Southwest London Waterbodies SPA Components

Spa Component	Sub-Site	Distance From Heathrow Airport
Wraysbury Reservoir	-	1900 m west

8.3 APPROPRIATE ASSESSMENT

CURRENT WATER QUALITY/QUANTITY BASELINE

8.3.1 The AC's Water Quantity and Quality Assessment has identified that the majority of the water bodies in the ZoI of the LHR–NWR are classified as Artificial/Heavily Modified Water Bodies (A/HMWB) currently not achieving Good Ecological Status in accordance with the objectives of the Water framework Directive.

8.3.2 Further investigations are required as to water quality and quantity status of the European sites and specifically how this currently influences the functioning of the habitat and the population and distribution of the qualifying features. This is necessary in order to quantify the effects of any changes as a result of the scheme.

Potential Effects of Changes to Baseline

8.3.3 LHR-NWR would require the diversion of several rivers and streams and the incorporation of a number of significant culverts beneath the runways. It is assessed that even with the incorporation of careful design and mitigating features, due to proximity and connectivity, residual adverse effects on water quality and quantity from such major diversions would be likely. 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).

8.3.4 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 on the integrity of the European sites cannot at this stage be ruled out, as detailed in 8.3 below.

Table 8.3: Potential Effects of Water Quantity/Quality Changes

Site	Interest feature	Potential effect of changes to water quantity/quality	Potential adverse effect on conservation objective
Southwest London Waterbodies SPA/Ramsar	Northern shoveler and Gadwall and other waterbirds	Eutrophication, Changes in the species composition of macrophyte communities, increased algal productivity and a shift in nutrient limitation of phytoplankton from N to P. This habitat degradation could lead to species displacement both within the site and areas beyond the site, fragmentation, increased competition within the site and areas beyond the site, increased pressure on habitats within the site and areas beyond the site, increased energetic use leading to reduced breeding success and potentially mortality.	Potential to compromise: The extent and distribution of qualifying natural and habitats of qualifying species; The structure and function (including typical species) of qualifying natural habitats; The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely; The populations of qualifying species; and The distribution of qualifying species within the site.

8.4 AVOIDANCE AND MITIGATION MEASURES

The AC's Water Quantity and Quality assessment suggests that a number of mitigation measures are integrated into the design to minimise the impact on water quality and quantity, as described in Table 8.4 below. This in turn would minimise the impact on SW London Waterbodies SPA and Ramsar.

Table 8.4: Mitigation of Effects of Water Quantity/Quality Changes

Impact / feature	Potential mitigation measure
Channel Creation	→ Design should incorporate variations in flow, depth and width to provide a variety of habitats; → Materials used should be environmentally appropriate and include timber and local rock rather than concrete or sheet piling; → Realigned channels should be similar in length, width, depth and gradient to the old (original) channel (if appropriate to the flow and sediment regimes); → Design should incorporate naturalised bed material (which could be characteristic of natural reaches of the same watercourse or neighbouring watercourses); → Banks should be vegetated with native species (to promote stability); → Channel design should be such to naturally convey the full range of flows from high to low; → Possible storage and transfer of original/natural substrate from a redundant channel to a realigned channel should be considered; → New river lengths, widths, depths and gradients should not compromise flow conveyance in adjoining downstream or upstream reaches; and → Design should consider location of areas of contaminated land. Mitigation could include lining of the channel.
River Realignment	→ Design should incorporate variations in flow, depth and width to provide a variety of habitats; → Materials used should be environmentally appropriate and include timber and local rock rather than concrete or sheet piling; → Realigned channels should be similar in length, width, depth and gradient to the old (original) channel (if appropriate to the flow and sediment regimes); → Design should incorporate naturalised bed material (which could be characteristic of natural reaches of the same watercourse or neighbouring watercourses); → Banks should be vegetated with native species (to promote stability); → Channel design should be such to naturally convey the full range of flows from high to low; → Possible storage and transfer of original/natural substrate from a redundant channel to a realigned channel should be considered; → New river lengths, widths, depths and gradients should not compromise flow conveyance in adjoining upstream or downstream reaches; and → Design should consider location of areas of contaminated land. Mitigation could include lining of the channel.
Culverting	→ Design should consider the passage of both water and sediment for a range of flows; → Design should consider the potential for partial or complete blockage of the culvert by debris or sediment during high flow events; → Culvert gradient should be matched to the gradient of an existing stream to avoid erosion at the head or tail of the culvert; → Reduction of river length by shortening the river planform should be avoided → Keeping length of a culvert to a minimum;

Table 8.4: Mitigation of Effects of Water Quantity/Quality Changes

Impact / feature	Potential mitigation measure
	→ Depressing the invert of a culvert to allow for the formation of a natural bed. This could potentially be filled using excavated (and stored) material from the channel being replaced; → A culvert of similar cross-sectional size should be used; → Roughness of culvert inverts should be increased to help reduce the velocity of the water; and → There should be consideration of potential use of lighting options (dependent on surroundings and available resources).
Water Quality	→ Construction: → Development and implementation of a CEMP including: Procedures to respond to any environmental incidents, Pollution prevention and material storage handling measures to be implemented; → Details about location specific risks to groundwater and surface water quality and specific mitigation measures required at each location. Groundwater and surface water monitoring requirements to be carried out before and during construction and during operation; → Storage of potentially polluting substances including fuel, oils, de-icer and other chemicals to be located away from surface watercourses and areas with permeable soils; → Storage of excavated materials would be minimised and any temporary storage would located away from surface watercourses and areas with permeable soils; and → Any contaminated water from excavation or dewatering activities would be passed to attenuation features such as treatment wetlands, ponds or storage tanks. There would be no direct discharge of contaminated water to surface watercourses. → Operation: → Runoff from operational areas where activities such as de-icing, aircraft cleaning and aircraft servicing takes place should be passed to attenuation and treatment features. There should be no direct discharge of contaminated water to surface watercourses. The capacity and treatment levels to be achieved by the drainage system should be agreed with the Environment Agency and/or sewerage undertaker as appropriate, during the design phase; and → Storage of potentially polluting substances including fuel, oils, de-icer and other chemicals to be located away from surface watercourses and areas with permeable soils.
Weirs	→ Installation of fish passes and/or diversion channels to bypass the main weir structure; → Careful design of weir layout; → Headwalls and wing walls to be set within the line of the bank and married into the surroundings; → Use of soft engineering (ie willow and reed pilling or imported natural stone) rather than hard engineering solutions. This should minimise the risk of downstream erosion; → Careful selection of construction material. Soft engineering techniques would be preferred to lessen the impact on hydromorphological quality; → Planting of weir sides with native plants for channel stability; Seeking latest advice on weir design and mitigation measures from the Environment Agency and Natural England; and → Using alternative/compensation ecological mitigation measures (eg nesting boxes, backwaters, bankside planting, otter ramps).

8.5 EFFICACY OF MITIGATION PROPOSALS AND RESIDUAL EFFECTS

8.5.1 It is considered likely that a number of potential adverse effects described above will be able to be mitigated through detailed design. However, at this plan stage it is not possible to exclude the likelihood of adverse effects given that more detailed project design information, and detailed proposals for mitigation, is not presently available. Such project detail would need to be reviewed against a baseline assessment at the SPA/Ramsar.

8.5.2 Given the information currently available, there is uncertainty that all of the potential adverse effects identified could be avoided via mitigation.

8.6 EFFECTS IN COMBINATION WITH OTHER PLANS AND PROJECTS

In the context of known interest feature vulnerabilities, it is also not possible at this strategic plan-level to rule out the likelihood that LHR-NWR could act in-combination with other Plans being brought forward (those described in Table 3.1 above), which may alone result in disturbance effects. These potential effects are summarised in Table 8.5.

Table 8.5: Potential Water Quality Effects In Combination with Other Plans and Projects

Other plan / policy	Southwest london waterbodies spa ramsar
NPS for National Networks	Other projects in proximity creating changes to water quality and quantity could lead to species displacement both within the site and areas beyond the site, fragmentation, increased competition within the site and areas beyond the site, increased pressure on habitats within the site and areas beyond the site, increased energetic use leading to reduced breeding success and potentially mortality.
NPS for Waste Water	Other projects in proximity creating disturbance could lead to species displacement both within the site and areas beyond the site, fragmentation, increased competition within the site and areas beyond the site, increased pressure on habitats within the site and areas beyond the site, increased energetic use leading to reduced breeding success and potentially mortality.
High Speed Two (HS2) Hybrid Bill	Highly unlikely that effects would occur within a ZoI that would result in effects in combination.
Crossrail Act 2008	Highly unlikely that effects would occur within a ZoI that would result in effects in combination.
Local Development Plans	Other projects in proximity creating disturbance could lead to species displacement both within the site and areas beyond the site, fragmentation, increased competition within the site and areas beyond the site, increased pressure on habitats within the site and areas beyond the site, increased energetic use leading to reduced breeding success and potentially mortality.
Local Mineral and Waste Plans	Mineral extraction issues are identified as a cumulative disturbance effect. Other projects in proximity creating disturbance could lead to species displacement both within the site and areas beyond the site, fragmentation, increased competition within the site and areas beyond the site, increased pressure on habitats within the

Table 8.5: Potential Water Quality Effects In Combination with Other Plans and Projects

Other plan / policy	Southwest london waterbodies spa ramsar
	site and areas beyond the site, increased energetic use leading to reduced breeding success and potentially mortality.
London Plan	Other projects in proximity creating disturbance could lead to species displacement both within the site and areas beyond the site, fragmentation, increased competition within the site and areas beyond the site, increased pressure on habitats within the site and areas beyond the site, increased energetic use leading to reduced breeding success and potentially mortality.
River Thames Flood Relief Scheme	Thames flood relief scheme occurs in close proximity creating disturbance could lead to species displacement both within the site and areas beyond the site, fragmentation, increased competition within the site and areas beyond the site, increased pressure on habitats within the site and areas beyond the site, increased energetic use leading to reduced breeding success and potentially mortality. Thames flood relief scheme also offers potential for positive effects through indirect habitat creation.

8.7 CONCLUSION

8.7.1 It is considered likely that a number of the potential adverse effects described above will be able to be ruled out through detailed design. However, at this plan stage it is not possible to exclude all of the likelihood of adverse effects given that more detailed project design information, and detailed proposals for mitigation, is not presently available.

9 ASSESSMENT OF ALTERNATIVE SOLUTIONS

9.1 HABITATS REGULATIONS REQUIREMENTS

The AA has considered: European Site data; available environmental condition data; and the potential effects of other plans and projects 'in-combination' and it has been concluded that it cannot at this stage be ruled out that the development of the new runway at LHR-NWR might have an adverse effect on European Site integrity; that is to say at this stage (the plan stage) there remains uncertainty, as summarised in Table 9.1 below.

Table 9.1: Summary of Potential Adverse Effects

Potential Impact	European Site Where Adverse Effect Cannot Be Ruled Out	Potential Adverse Effect
Disturbance	South West London Waterbodies SPA South West London Waterbodies Ramsar	Located immediately adjacent to the proposed scheme site. Could result in: species displacement both within the site and areas beyond the site; fragmentation; increased competition within the site and areas beyond the site; increased pressure on habitats within the site and areas beyond the site; increased energetic use leading to reduced breeding success and potentially mortality.
Operational management	South West London Waterbodies SPA South West London Waterbodies Ramsar	The effects of operational management could result in: species displacement both within the site and areas beyond the site; fragmentation; increased competition within the site and areas beyond the site; increased pressure on habitats within the site and areas beyond the site; increased energetic use leading to reduced breeding success; and potentially mortality.
Habitat Loss / Fragmentation	South West London Waterbodies SPA South West London Waterbodies Ramsar	There is potential for surface access routes to overlap with the boundaries of sites, including Staines Moor Site of Special Scientific Interest (SSSI) and Wraysbury Reservoir SSSI (and therefore the South West London Waterbodies SPA). 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, effecting extent and distribution, structure and function, supporting processes and populations of qualifying habitats and species.
Air Quality	South West London Waterbodies SPA South West London Waterbodies Ramsar	Located in immediate proximity to major roads leading to Heathrow. All sites are assessed as vulnerable to nitrogen

Table 9.1: Summary of Potential Adverse Effects

Potential Impact	European Site Where Adverse Effect Cannot Be Ruled Out	Potential Adverse Effect
	Windsor Forest and Great Park SAC Richmond Park SAC Burnham Beeches SAC Thursley, Ash, Pirbright and Chobham SAC Wimbledon Common SAC Thames Basin Heaths SPA	deposition. Potential effects of exceedance of critical load for these sites include: eutrophication; changes in the species composition; increased algal productivity; shift in nutrient limitation; changes in ground vegetation; nutrient imbalance; changes soil processes; and species transition. This has the potential to compromise the supporting processes, extent, distribution, structure and function of qualifying habitats and species. Additionally, surface access improvement schemes may result in localised impacts during construction and the South West London Waterbodies SPA / Ramsar may experience dust-related impacts during construction.
Water Quality and Quantity	South West London Waterbodies SPA South West London Waterbodies Ramsar	Habitat degradation (eutrophication; changes in the species composition; shift in nutrient limitation) could lead to species displacement both within the site and areas beyond the site, fragmentation, increased competition within the site and areas beyond the site, increased pressure on habitats within the site and areas beyond the site, increased energetic use leading to reduced breeding success and potentially mortality (Interest Feature: Northern shoveler, Gadwall and other waterbirds).

9.1.1 The Habitats Directive requires that where the assessment undertaken in accordance with Article 6(3) (Stages 1 and 2 of the HRA process outlined in Chapter 2) produces findings that are negative or uncertain, then the plan maker must consider whether there are alternative solutions for delivering the aims of the plan that better respect the integrity of the European Site(s) in question.

9.1.2 The alternatives test is carried out in order to determine whether there are any other feasible ways to deliver the overall objective of the project which would be less damaging to the integrity of European sites. An alternative solution is one that would deliver the same overall objective as the proposal but through different means eg a different route, design, different timing. It must be objectively demonstrated that there are no other feasible alternatives that will not affect the integrity of European sites, and that the proposal is the least damaging of all the solutions as regards the integrity of such sites and the habitat and species therein.

9.1.3 Defra guidance on Article 6(4)[63] outlines that:

> ''*The consideration of alternatives should be limited to options which are financially, legally and technically feasible. An alternative should not be ruled out simply because it would cause greater inconvenience or cost to the applicant. However, there would come a point where an alternative is so very expensive or technically or legally difficult that it would be unreasonable to consider it a feasible alternative. The competent authority is responsible for making this judgement according to the details of each case. If the authority considers an option is not feasible, it would not be necessary to continue to assess its environmental impacts.*
>
> *The consideration of alternatives should also be limited to options which would be less damaging to the affected site(s) or to any other site(s) that could be affected by a given alternative. If the competent authority decides that there are feasible alternative solutions to the plan or project which would have lesser effects on European sites, it cannot give consent for the plan or project to proceed*''.

9.1.4 European Commission Guidance[64] notes that the identification and assessment of alternatives is set out at Stage 3 of the HRA process (Article 6(4)). However, the Guidance also recognises that, in practice, the consideration of alternatives is an iterative process that is integral to the initial assessment undertaken at Article 6(3) and subsequent assessments under Article 6(4), including the determination of IROPI if required.

9.1.5 The HRA of the draft Airports NPS has considered alternatives iteratively in line with European Commission Guidance.

9.2 IDENTIFICATION AND ASSESSMENT OF ALTERNATIVES

DO NOTHING

9.2.1 The assessment of need[65] was the AC analysis setting out the scale and timing of any requirement for additional capacity to maintain the UK's position as Europe's most important aviation hub. In effect the forecasts underpinning the assessment of need provide a picture of what would happen if no additional capacity was added to the system. For this reason the AC used the analysis of the assessment of need as its 'Do Nothing' scheme. From consideration of this scheme it was clear that further capacity is required in London and the South East, and the AC aviation demand forecasts provide a baseline for the comparison of different expansion schemes.

[63] Defra, 2012. *Habitats and Wild Birds Directives: guidance on the application of article 6(4), Alternative solutions, imperative reasons of overriding public interest (IROPI) and compensatory measures*. [online] Accessed 02/12/2016.

[64] European Commission, 2007. *Guidance Document on Article 6(4) of the 'Habitats Directive' 92/43/EEC. Clarification of the Concepts of: Alternative Solutions, Imperative Reasons of Overriding Public Interest, Compensatory Measures, Overall Coherence, Opinion of the Commission*.

[65] Airports Commssion, 2013. *Interim Report, Appendix 2: Assessment of Long-term Options*, p. 7. [online] Accessed 05/01/2016.

PHASE 1 – IDENTIFYING A 'LONG LIST OF SCHEMES

9.2.2 The AC Interim Report[66] describes the approach to identifying a long list of schemes for alleviating future aviation capacity problems. Appendix A[67] provides a summary of the AC work as considerations of alternatives for the purposes of HRA. Specifically it presents the reasons why none of the long-listed alternative proposals amount to a financially, legally and technically feasible way of delivering additional airport capacity in the South East which has less potential to adversely affect the integrity of one or more European sites. As such, it has been concluded that the sifted, long-list schemes do not represent proper alternatives to the plan comprised in the proposed NPS or the project comprised in the Government's preferred scheme, LHR-NWR.

PHASE 2 – SHORT LIST OF SCHEMES

9.2.3 After a three stage sifting process within Phase 1, four remaining schemes were considered in Phase 2. The process identified the two existing airports as credible locations for additional runway capacity: Gatwick and Heathrow. At Gatwick, the AC committed to further consideration of a new runway to the south of the existing runway (LGW-2R). At Heathrow, two alternative expansion proposals were carried forward: a new runway to the north west of the existing runways (LHR-NWR); and the extension of the current northern runway to create a runway of double length (LHR-ENR).

9.2.4 The AC announced its recommendations for expanding aviation capacity and its assessment of the shortlisted schemes in the Final Report (2015). Although the AC considered that all three schemes were credible schemes, the AC concluded that the proposal for LHR–NWR, in combination with "a significant package of measures to address its environmental and community impacts" (Final Report, p. 30), was the preferred scheme.

9.2.5 In relation to the alternatives solutions test required by Article 6(4), the two short-listed alternatives to LHR-NWR were brought forward as viable short-listed schemes by the AC.

HABITATS REGULATIONS ASSESSMENT OF SHORT LIST

LHR-ENR and LGW-2R were subject to a strategic plan-stage HRA incorporating screening and AA (Appendix B). It was concluded, through the AA stage of the HRA, that it cannot be ruled out that the development of the new runway at either site could have an adverse effect on European site integrity or that sufficient uncertainty remained. The AA conclusions are summarised in Table 9.2 below.

Table 9.2: Summary of Appropriate Assessment for LHR-ENR and LGW-2R

Potential Impact	Scheme	European Site Where Adverse Effect Cannot Be Ruled Out
Disturbance	LGW-2R	-
	LHR-ENR	South West London Waterbodies SPA South West London Waterbodies Ramsar

[66] Airports Commission, 2013. *Interim Report,* Section 6.6, and Appendix 2. [online] Accessed 01/08/2015.
[67] WSP | Parsons Brinckerhoff, 2017. *Long List Alternatives considered under the Habitat Regulations*

Table 9.2: Summary of Appropriate Assessment for LHR-ENR and LGW-2R

Potential Impact	Scheme	European Site Where Adverse Effect Cannot Be Ruled Out
Operational management	LGW-2R	-
	LHR-ENR	South West London Waterbodies SPA South West London Waterbodies Ramsar
Habitat Loss / Fragmentation	LGW-2R	-
	LHR-ENR	South West London Waterbodies SPA South West London Waterbodies Ramsar
Air Quality	LGW-2R	Mole Gap to Reigate Escarpment SAC Ashdown Forest SAC Ashdown Forest SPA
	LHR-ENR	South West London Waterbodies SPA South West London Waterbodies Ramsar Windsor Forest and Great Park SAC Richmond Park SAC Burnham Beeches SAC Thursley, Ash, Pirbright and Chobham SAC Wimbledon Common SAC Thames Basin Heaths SPA
Water Quality and Quantity	LGW-2R	-
	LHR-ENR	South West London Waterbodies SPA South West London Waterbodies Ramsar

9.2.6 The AA identified that LHR-ENR resulted in the same impact types on the same European sites as LHR-NWR. On this basis it would be no less damaging to European sites and as such is not considered to be a reasonable alternative.

9.2.7 The AA identified that LGW-2R resulted in fewer types of impact at fewer European sites than LHR-ENR and LHR-NWR. However, impacts from LGW-2R as a result of changes to air quality, could not be discounted at Mole Gap to Reigate Escarpment SAC and as such it was concluded that adverse effects could arise. Unlike the European sites considered for LHR-NWR, Mole Gap to Reigate Escarpment SAC contains a priority natural habitat type, which is defined as one in danger of disappearance, and for the conservation of which the European Community has particular responsibility (see Article 1(d) of the Habitats Directive).

9.2.8 Where the site concerned hosts a priority natural habitat type and/or a priority species, the only considerations which may be raised for IROPI are those relating to human health or public safety, to beneficial consequences of primary importance for the environment. Airport capacity expansion is not applicable to those considerations. Accordingly given the potential for adverse effects to priority habits at LGW-2R opinion from the European Commission would be necessary with regard to other IROPI; in the absence of such an opinion being obtained it is not possible to conclude that LGW-2R is a reasonable alternative. . In Case C-258/11Sweetman [2014] PTSR 1092 the European Court said at para. 55 that maintaining protected sites in a favourable status was "particularly important" where there was a priority species/habitat and in Case C-404/09 Commission v Spain it was said, at para 163, that under the Habitats Directive Member States must take appropriate protective measures to preserve the characteristics of sites which host priority natural habitat types and/or priority and should generally avoid "intervention where there is a risk that the ecological characteristics of those sites will be seriously compromised as a result".

9.2.9 In conclusion based on the information available at this stage it has not been possible to identify any reasonable alternatives to the preferred scheme.

10 IMPERATIVE REASONS OF OVER-RIDING PUBLIC INTEREST AND COMPENSATION

10.1 HABITATS REGULATIONS REQUIREMENTS

10.1.1 The NPS is a plan for the purposes of the Habitats Directive and has been subject to a HRA including AA. The strategic level AA has concluded that the potential for adverse effects on the integrity of European Sites, either from the plan alone, or in combination with other plans, could not be ruled out. The assessment has proposed outline avoidance and mitigation measures but, in the absence of project level detail it has not been possible to conclude beyond reasonable scientific doubt that the identified potential adverse effects on the integrity of European Sites will be effectively avoided or mitigated.

10.1.2 In line with the requirements of the Habitats Directive, the assessment has considered whether there are alternative solutions to delivering the requirements of the plan that would better respect the integrity of the European Sites considered in the HRA process. It is not considered that there are any such solutions.

10.1.3 In accordance with Article 6(4) of the Habitats Directive, where no alternative solutions exist and where adverse effects on European Sites remain, or cannot be ruled out, it is necessary to establish IROPI for why the plan should proceed. The Competent Authority will consider whether:

- → The plan is 'imperative', one that is required or indispensable, or it essential that it proceeds;
- → There is adequate public benefit; any private interests cannot be taken into account in the justification; and
- → Overriding long-term benefits that demonstrably outweigh harm to the European site[68].

10.1.4 The IROPI test is undertaken on the assumption that compensatory measures are available; however consideration of IROPI precedes any consideration of compensation measures.

10.1.5 In the case that a European Site hosts a priority natural habitat/ species[69], i) human health or public safety considerations or ii) benefits which are of primary importance to the environment may only be considered. If IROPI cannot be demonstrated for these criteria an opinion must be sought from the European Commission through the Secretary of State on whether other reasons, such as wider socio-economic reasons, can be considered. Compensatory measures that maintain the coherence of the Natura 2000 network must also be identified and established.

10.2 EXAMINING IMPERATIVE REASONS OF OVERRIDING PUBLIC INTEREST

10.2.1 For the proposed policy, adverse effects on sites hosting either a "priority natural habitat type" or a "priority species" have been ruled out. As such, any IROPI can also include social and economic considerations and an opinion from the European Commission would not be necessary.

[68] DTA Publications, date unknown. The Habitats Regulations Assessment Handbook.,[online] accessed 20/01/2017.
[69] Priority natural habitats and species are those listed and marked with an asterisk (*) in Annexes I and II of the Habitats Directive.

10.2.2 Consistent with European Commission guidance (that before IROPI can be demonstrated) it is necessary to analyse and demonstrate the need for the plan, the alternative of not having the plan, and alternatives ways of meeting the plan. In this report, the Government has considered:

- why new airport capacity is required;
- why there is a need for air transport as part of the transport network;
- why is LHR-NWR assessed as the most suitable scheme for providing new airport capacity and why not sites at different locations; and
- why this NPS is needed.

10.3 WHY NEW AIRPORT CAPACITY IS REQUIRED

10.3.1 Challenges exist in the UK's aviation sector, stemming in particular from capacity constraints. These constraints are affecting the ability to travel conveniently and to a broader range of destinations than in the past. Further the constraints create negative impacts on the UK through increased risk of flight delays and unreliability, restricted scope for competition and lower fares, declining domestic connectivity, erosion of the UK's hub status[70] relative to foreign competitors, and constraining the scope of the aviation sector to deliver wider economic benefits.

10.3.2 The UK has not built a new full length runway in the South East of England since the 1940s. Heathrow is currently the busiest two-runway airport in the world, while Gatwick is the busiest single runway airport in the world. London's airports are approaching capacity, and will all be full by 2040 if no increased capacity is created[2]. As such the UK faces a significant capacity challenge.

10.3.3 Aviation demand is expected to increase significantly between now and 2050[2]. All major airports in the South East of England[71] are expected to be full by 2040, and by 2050, demand in the South East of England is expected to outstrip capacity by 13-15%, even on the lowest demand forecasts.[72] There is relatively little scope to redistribute demand away from the region to less heavily utilised capacity elsewhere in the country.[73]

[70] Defined as the frequency of flights and the density of a route network.
[71] Defined as Gatwick, Heathrow, London City, Luton and Stansted.
[72] Airports Commission, 2013. *Interim Report*, p. 111. [online] Accessed 12/01/2017.
[73] Airports Commission, 2013. *Interim Report*, pp. 117-126 [online] Accessed 12/01/2017.

10.3.4 The UK's hub status, stemming from the convenience and variety of its direct connections across the world, is already being challenged by restricted connectivity.[74] Hub airports at Paris, Frankfurt and Amsterdam have spare capacity and are able to attract new flights to growth markets in China and South America[2]. These competitors have benefited from the capacity constraints at Heathrow Airport, and have seen faster growth over the past few years. The UK's airports also face growing competition from hubs in the Middle East like Dubai, Abu Dhabi, Doha and Istanbul. Heathrow Airport was overtaken by Dubai in 2015 as the world's busiest international passenger airport.[75]

10.3.5 The consequences of not increasing airport capacity in the South East of England – the 'do nothing' or 'do minimum scenarios' – are detrimental to the UK economy and the UK's hub status. International connectivity will be restricted as capacity restrictions mean airlines prioritise their routes, seeking to maximise their profits. Capacity constraints therefore lead to trade-offs in destinations, and while there is scope to respond to changing demand patterns, this necessarily comes at the expense of other connections. Domestic connectivity into the largest London airports will also decline as competition for slots encourages airlines to prioritise more profitable routes.

10.3.6 Operating existing capacity at its limits means there will be little resilience to unforeseen disruptions, leading to delays. Fares are likely to rise as demand outstrips supply, and the lack of available slots makes it more difficult for new competitors to enter the market.

10.3.7 The Government believes that not increasing capacity will impose costs on passengers and on the wider economy. The AC estimated that direct negative impacts to passengers, such as fare increases and delays, would range from £21 billion to £23 billion over 60 years[2]. Without expansion, constraints in the aviation sector would impose increasing costs on the rest of the economy over time, lowering economic output by making aviation more expensive and less convenient to use, with knock-on effects in lost trade, tourism and foreign direct investment.

10.3.8 It is very challenging to put a precise figure on these impacts, but using alternative approaches, the AC estimated these costs to be between £30 billion and £45 billion over 60 years[2]. The AC urged caution interpreting these figures, and they overlap with the direct passenger costs reported above and so are not wholly additional. However they do illustrate that not increasing airport capacity carries real economic costs to the whole economy beyond aviation passengers. Having reviewed this further, the Government accepts this analysis.

10.3.9 The Government also acknowledges the local and national environmental impacts of airports and aviation, for example noise and emissions, and believes that capacity expansion should take place in a way that satisfactorily mitigates these impacts wherever possible. Expansion must be deliverable within national targets and legal limits for air quality and greenhouse gas emissions.

[74] For more analysis on the UK's hub status, see Airports Commission, 2013. *Interim Report*, pp. 90-92. [online] Accessed 12/01/2017.

[75] Airports Council International, 2016. *Airports Council International releases 2015 World Airport Traffic Report The busiest become busier; the year of the international hub airport*. [online] Accessed 12/01/2017.

10.4 WHY THERE IS A NEED FOR AIR TRANSPORT AS PART OF THE TRANSPORT NETWORK

10.4.1 International connectivity, underpinned by strong airports and airlines, is important to the success of the UK economy. It is essential to allow domestic and foreign companies to access existing and new markets, and to help deliver trade and investment, linking us to valuable international markets and ensuring that the UK is open for business. It facilitates trade in goods and services, enables the movement of workers and tourists, and drives business innovation and investment, being particularly important for many of the fastest growing sectors of the economy.

10.4.2 International connectivity attracts businesses to cluster round airports, and helps to improve the productivity of the wider UK economy. Large and small UK businesses rely on air travel, while the airports are the primary gateway for vital time-sensitive freight services. Air travel also allows ever greater freedom to travel across the globe, and brings millions of people to the UK for business and tourism.

10.4.3 The UK benefits from a strong and substantially privatised airport sector, with a regulatory system that supports growth while ensuring the interests of passengers are at its heart. The Government believes this is the right approach for the airport sector, but that Government has an important role to play in strategic decisions like planning future airport capacity.

10.4.4 The UK has the third largest aviation network in the world after the USA and China,[76] and London's airports serve more routes than any other European city. The UK's airports handled over 250 million passengers in 2015, a 5.5% increase from the previous year.[77] The sector benefits the UK economy through its direct contribution to GDP and employment, and by facilitating trade and investment, manufacturing supply chains, skills development and tourism.

10.4.5 In 2014 the UK aviation sector generated around £20 billion[78] of economic output, and directly employed around 230,000 workers,[79] supporting many more jobs indirectly. The UK has the second largest aircraft manufacturing industry in the world after the USA and will benefit economically from growth in employment and exports from future aviation growth.[80] Air Passenger Duty remains an important contributor to Government revenue, raising over £3 billion in 2014/15.[81] Heathrow Airport directly supports around 75,000 jobs on site.[82]

10.4.6 Businesses from across the UK utilise the aviation network to access markets worldwide. The UK's strong services sector, which provides significant export earnings for the country, is particularly reliant on aviation. The sector includes, among others, financial services, insurance, creative industries, education, and health – all of which rely on face-to-face engagement with customers for success.

10.4.7 Air freight is also important to the UK economy. Although only a small proportion of UK trade by weight is carried by air, it is particularly important for supporting export-led growth in sectors where goods are of high value or time critical. Heathrow Airport is the UK's biggest freight port by value. Over £155 billion of air freight was sent between UK and non-European Union countries in 2015, representing over 40% of the UK's extra-European Union trade by value.[83] This is especially important in the advanced manufacturing sector, where air freight is a key element of the time-critical supply chain. By 2030, advanced manufacturing industries such as pharmaceuticals or chemicals, whose components and products are predominately moved by air, are expected to be among the top five UK export markets by their share of value.[84] In the future, UK manufacturing competitiveness and a successful and diverse UK economy will drive the need for quicker air freight.

10.4.8 Aviation also brings many wider benefits to society and individuals, including travel for leisure and visiting family and friends. This drives further economic activity: in 2013, for example, the direct gross value added of the tourism sector, one of the important beneficiaries of a strong aviation sector, was £56 billion.[85] Likewise, 2015 saw the value of inbound tourism rise to over £22 billion,[86] with the wider UK tourism industry forecast to grow significantly over the coming decades.

10.4.9 The importance of aviation to the UK economy, and in particular the UK's hub status, has only increased following the country's decision to leave the European Union. As the UK develops its new trading relationship with the rest of the world, it will be essential that increased airport capacity is delivered to support routes to and from the UK around the world, particularly to emerging and developing economies.

10.5 WHY IT IS NECESSARY FOR THE SITES ASSESSED AS POTENTIALLY SUITABLE TO BE LISTED IN THE NPS IS ASSESSED AS THE MOST SUITABLE OPTION FOR PROVIDING NEW AIRPORT CAPACITY AND WHY NOT SITES AT DIFFERENT LOCATIONS

10.5.1 In September 2012, the Government established the independent AC,[87] led by Sir Howard Davies. The AC had two objectives:

- To produce an Interim Report, setting out the nature, scale and timing of steps needed to maintain the UK's global hub status alongside recommendations for making better use of the UK's existing runway capacity over the next five years; and
- To produce a Final Report, setting out recommendations on how to meet any need for additional airport capacity in the longer term.[88]

10.5.2 The AC was asked to take appropriate account of the national, regional and local implications of any expansion. As well as seven discussion papers and an appraisal framework, the AC delivered its recommendations to Government in its Interim Report in December 2013[89] and its Final Report in July 2015.[90] It also published a summary and decision paper in September 2014 on whether to add an inner Thames Estuary airport proposal to a shortlist for further appraisal.[91]

10.5.3 The AC explored potential alternatives to additional runway capacity, which included:

- Doing nothing;
- A 'do minimum' set of alternatives with very limited provision for additional capacity;
- Redistribution methods, for example changing the rate of Air Passenger Duty, changing slot allocation regimes, traffic distribution rules, and prohibiting certain types of flights;
- Investment in high speed rail and improved surface access options; and
- New technologies.[92]

[87] UK Government, date unknown. *Airports Commission*. [online] Accessed 12/01/2017.
[88] UK Government, date unknown. *Airports Commission Terms of reference*. [online] Accessed 12/01/2017.
[89] Airports Commission, 2013. *Interim Report*, p. 111. [online] Accessed 12/01/2017
[90] Airports Commission, 2015. *Final Report*. [online] Accessed 12/01/2017.
[91] Airports Commission, 2014. *Inner Thames estuary airport: summary and decision*. [online] Accessed 12/01/2017.
[92] Airports Commission, 2015. *Final Report*, p. 84. [online] Accessed 12/01/2017.

10.5.4 The AC found that none of these options delivered a sufficient increase in capacity, and that many required investment far in excess of the cost of runway expansion.

10.5.5 The AC consulted widely on its appraisal framework, which contained its criteria for sifting proposed schemes,[93] and the Government is satisfied that the appraisal framework was appropriate. The AC received 52 proposals, with three schemes developed by the AC itself. The AC took advice from a number of relevant stakeholders, including NATS Holdings, the CAA, Network Rail and the Highways Agency (as it then was). The Government believes that the AC has analysed all the schemes put forward to the appropriate degree of detail, and discounted non-shortlisted schemes fairly and objectively according to the sift criteria.

10.5.6 The three shortlisted schemes were:

- LGW-2R scheme;
- LHR-NWR scheme (which the AC recommended and is the Government's preferred scheme); and
- LHR-ENR scheme.

10.5.7 The Government has made clear in its announcement of 14 December 2015 that it agrees with the AC's three shortlisted schemes for expansion, and has taken forward its further work on this basis.[94] For that reason, the Airports NPS and associated documents do not consider or relate to schemes outside the three schemes shortlisted by the AC. Therefore, as set out at paragraph 1.35 of the Airports NPS, only a scheme located Heathrow Airport for the provision of a Northwest Runway will have the full benefit of favourable presumptions set out in the Airports NPS.

10.6 WHY THIS NPS IS NEEDED

10.6.1 A project to deliver additional airport capacity will inevitably be classed as a nationally significant infrastructure project. NPSs are designed under the Planning Act 2008 to set the framework for such applications for such projects. The Airports NPS and the preferred solution are the best and most appropriate way to deliver additional capacity in the absence of alternatives. The NPS does so in a transparent way with statutory requirements on consultation and Parliamentary scrutiny, and in a way that reduces unnecessary delays to the planning process.

10.6.2 Meeting the needs recited in section 10.4 of this document are considered by the Government to be essential to the national interest and beneficial to the public. Further, the length of time required to deliver significant new airport infrastructure means that whilst there is not a capacity crisis in the UK's airport system today, the timely delivery of new infrastructure in the public interest is imperative.

[93] Airports Commission, 2013. *Sift criteria for long term capacity options at UK airports*. [online] Accessed 12/01/2017.

[94] Department for Transport and The Rt Hon Patrick McLoughlin MP, 2015. *Oral statement to Parliament, Aviation capacity*. [online] Accessed 12/01/2017.

11 COMPENSATORY MEASURES

11.1.1 Article 6(4) of the Habitats Directive (Regulation 105 of the Habitats Regulations) requires that where, in spite of a negative assessment on Natura 2000 site(s) integrity, the competent authority proceeds with the plan on the basis of IROPI, all necessary compensatory measures are taken to ensure that the overall coherence of the Natura 2000 network is protected.

11.1.2 Given the strategic nature of the HRA process for this NPS, the inherent uncertainties of the AA conclusions, and the potential changes that may occur as the plan is implemented, it is not possible at this stage to specify the precise nature or location of any compensation measures that might be required.

11.1.3 The role of the plan is, therefore, to provide a robust framework that sets out the broad parameters for compensation measures, should they be required following the more detailed site level assessments undertaken for plan implementation.

11.1.4 All project level HRAs must firstly take account of the potential adverse effects and the proposed avoidance and mitigation measures identified through the strategic level assessment(s).

11.1.5 The proposed compensation measures must be:

- Appropriate for the area and the loss caused by the project;
- Capable of protecting the overall coherence of the Natura 2000 network;
- Capable of implementation;
- Ensure that, the Natura 2000 site is not irreversibly affected by the project before the compensation is in place;
- Directed in measurable proportions to the habitats and species negatively affected;
- Related to the same biogeographical region (within the UK) and should be as close as possible to the habitat that has been negatively affected;
- Serving functions that are comparable to those that motivated the original area's submission for designation;
- Clearly defined, with implementation goals and managed so that the compensatory measures can achieve the goal of maintaining the overall coherence of Natura 2000. The measures will need to be well managed over the necessary timescales, over the long-term, potentially in perpetuity; and
- Guaranteed to be delivered, legally compliant and enforceable and capable of being effectively monitored.

11.1.6 Actual compensation measures can only be effectively determined at a project level stage through the findings of detailed, site specific AA's focused on the requirements of the Habitats Directive to ensure the ecological functionality of individual European sites. However, initial consideration to appropriate compensation measures has been provided below.

11.1.7 There needs to be confidence that any newly created habitats are created prior to the loss/damage of the European site and can fully provide the intended compensatory function[95].

11.2 INITIAL CONSIDERATION OF COMPENSATION MEASURES:

11.2.1 One of the principal compensation measures required would be for habitat enhancement and/or creation for waterbirds associated with SW London Waterbodies. The specific habitats required are replicable where appropriate hydrology exists and where there is comparable functionality to the initial selection criteria of the original site. Further due to the high level of mobility of the interest features the spatial location of such compensation is less constrained than it might be for other species. This could be significant in terms of siting compensation sufficiently beyond the ZoI of disturbance and operational (bird strike mitigation) effects.

11.2.2 To fully inform these measures at the detailed design stage, updated survey data on patterns of usage or potential usage of the SPA and supporting waterbodies will be needed over a period of time. In addition, 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.

11.2.3 Further, the enhancement of functionally linked[96] waterbodies (identified by Briggs[18]) 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 water birds as well. Greater understanding of bird response to airport operations will also need to be established via targeted studies at the SW London waterbodies. This will need to consider flight paths, heights and the timing of flights. Targeted studies of other disturbance factors from recreation, reservoir operation and gravel extraction at SW London waterbodies will also be required.

11.2.4 A full assessment of the heights at which gulls and other species that may present a bird strike risk fly over the reservoirs and a modelling exercise to determine likely collision rates would be required as part of the detailed assessment process. This will be necessary to inform the specific needs of any birdstrike management plan and the spatial extent of such birdstrike management measures and how this would impact on the SPA species. This information will be necessary to inform the spatial locations for compensation measures so that they are not compromised by bird strike mitigation.

[95] DTA Publications, data unknown. The Habitats Regulations Assessment Handbook. , [online] Accessed 20/01/2017.

[96] The importance of functionally-linked waterbodies, as described by Natural England (Natural England, 2016. Functional linkage: How areas that are functionally linked to European sites have been considered when they may be affected by plans and projects (NECR207). [online] accessed 20/01/2017) will require full consideration at the project-level HRA.

12 APPROPRIATE ASSESSMENT SUMMARY AND FURTHER CONSIDERATIONS

12.1 INTRODUCTION

12.1.1 The HRSA identified LSE on eight of the European Sites as a result of impacts that may arise from the development of a new runway at Heathrow Airport. These effects were assessed further through the AA stage of the HRA which considered: European Site data; available environmental condition data; and the potential effects of other plans and projects 'in-combination'. It was concluded that at this stage it could not be ruled out that the development of the new runway may have an adverse effect on European Site integrity, as summarised in Table 12.1 below.

Table 12.1: Appropriate Assessment Summary

Potential impact	European site where adverse effect cannot be ruled out
Disturbance	South West London Waterbodies SPA South West London Waterbodies Ramsar
Operational management	South West London Waterbodies SPA South West London Waterbodies Ramsar
Habitat Loss / Fragmentation	South West London Waterbodies SPA South West London Waterbodies Ramsar
Air Quality	South West London Waterbodies SPA South West London Waterbodies Ramsar Windsor Forest and Great Park SAC Richmond Park SAC Burnham Beeches SAC Thursley, Ash, Pirbright and Chobham SAC Wimbledon Common SAC Thames Basin Heaths SPA
Water Quality and Quantity	South West London Waterbodies SPA South West London Waterbodies Ramsar

12.1.2 It is considered likely that a number of the potential adverse effects identified will be able to be ruled out through detailed design. However, at this plan stage it is not possible to exclude all of the likelihood of adverse effects given that more detailed project design information, and detailed proposals for mitigation, is not presently available.

12.1.3 Once further project-level detail is available, further detailed analysis of impacts and effects can be carried out. This will need to be informed, where appropriate by updated baseline surveys of the European sites interest features and reliant processes.

12.1.4 An assessment of the potential for adverse effects will be made and full recommendations for mitigation will be provided within each subsequent HRA. These will suggest measures to reduce the potential for any development to result in impacts upon European sites.

12.1.5 In the case of uncertainty regarding changes to air quality and the effect of this on the European sites in question, it is considered that at this stage it cannot be ruled out that there might be negative effects on integrity. The efficacy of mitigation that may negate or reduce the effect is uncertain in the absence of further detail on the degree of change in air quality and the response of each individual site to these changes. As such, in accordance with the requirements of the Habitats Regulations, further consideration by way of Stage 3 (Assessment of Alternatives) and Stage 4 (IROPI) has been necessary and subject to those findings compensatory measures will need to be considered.

12.1.6 This HRA has concluded that there are no reasonable alternatives to the preferred scheme and that the preferred scheme meets the requirements of IROPI

12.1.7 Given the strategic nature of the HRA process for this NPS, the inherent uncertainties of the AA conclusions, and the potential changes that may occur as the plan is implemented, it is not possible at this stage to specify the precise nature or location of any compensation measures that might be required.

12.1.8 To further secure the project level HRA the following qualifying wording will be incorporated within the NPS:

Any development brought forward through the NPS that would be likely to have a significant effect on a European site, either alone or in combination with other plans or projects, will be subject to assessment under Part 6 of the Habitats Regulations at the detailed design stage. Development consent will not be granted unless either: (i) it cannot be ascertained that there would be no adverse effects on site integrity; or (ii) the tests in Regulation 62 of the Regulations is satisfied in which case any necessary compensatory measures will need to be secured in accordance with Regulation 66.

12.2 LIMITATIONS AND REQUIREMENT FOR FURTHER STUDIES

12.2.1 The conclusions of the HRA are partially limited by the strategic nature of the assessment process and the information available, which does not allow for a definitive prediction of effects on the European Sites considered. As such it has been necessary to apply the precautionary principle for a number of assessments where uncertainty remains. The precautionary approach suggests that AA at this strategic level cannot rule out the potential for adverse effects on the integrity of any of the European Sites identified through the screening stage through impacts on water resources and quality, habitat and species loss and fragmentation, disturbance (noise, light, visual and recreation) and air quality.

12.2.2 To address the uncertainties inherent in a strategic level HRA, and to most helpfully inform the project level HRA, this AA has proposed a suite of avoidance and mitigation measures to be considered in further detail as part of the project level HRA. At this stage, it is considered that the effective implementation of the proposed suite of avoidance and mitigation measures may help to address the identified adverse effects on European Site integrity. However a more detailed project level HRA is required to reach conclusions that are in accordance with the requirements of the European Habitats and Birds Directives and domestic Habitats Regulations.

12.2.3 Further assessment supported by detailed data at project level is required to determine whether the development of new runway capacity at Heathrow could be undertaken without adversely affecting the integrity of European Sites described above. Only at the project level HRA with site specific supporting survey data can a conclusion of no adverse effect on European Site integrity be made with any confidence.

12.2.4 An indication of the additional work required at the detailed design assessment stage is summarised in Table 12.2 below. It is important to note that a number of these studies will require sufficient lead time to collect enough data so that meaningful conclusions can be reached. For example as a minimum this would be two years of survey data for over wintering bird populations. Further careful consideration of the scope of the data gathering will be required and this process should seek to engage stakeholders and regulators. Simultaneously, consideration will be needed for any compensatory sites and appropriate due diligence and assessments of the suitability of these sites for their required purpose will need to be undertaken.

Table 12.2: Further data Requirements to Support Project-Level HRA

Potential Impact/Effect	Further Data Requirements
Disturbance	Updated survey data on patterns of usage or potential usage of the SPA and functionally linked waterbodies at Southwest London Establishment of baseline and predicted 'with project' disturbance effects from existing and proposed 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 Comprehensive review of proposed and current aeroplane flight paths Assessment of viable alternative far field locations for compensatory habitats
Operational Management (ie Bird strike management)	Flight paths of interest features and non interest features between the waterbodies Detailed review of proposed flight paths and heights Establishment of baseline and predicted 'with project' impacts from existing and proposed bird strike management Assessment of viable alternative far field locations for compensatory habitats
Habitat Loss	Detailed alignments of footprints that overlap with designated areas and areas of supporting habitats, including surface access proposals.
Air Quality	Effects of current levels of NOx and nitrogen deposition on European sites affected by proposals. Studies should focus on both individual interest features as well as the habitat complex forming the site. Further analysis on the extent of affected road network. Current analysis focuses on DMRB methodology Predicted levels of NOx and nitrogen deposition as a result of the proposals on European sites within 200 m of affected roads.
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. Assessment of water management to River Colne through the design of channel diversions and minimising culverting requirements to maintain water quality, volume and flow rate.