Airspace Change Masterplan

CAP 2527 Habitats Regulations Screening Report

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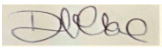
Final	February 2023	Alan Kirby Technical Director Logika Consultants Ltd	Diane Corfe Technical Director Waterman Infrastructure & Environment Ltd	Diane Corfe Technical Director Waterman Infrastructure & Environment Ltd 

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1. Introduction

1.1. The Civil Aviation Authority (CAA) have appointed Waterman Infrastructure & Environment Ltd (Waterman), to prepare this Habitats Regulation Assessment (HRA) Screening Report for the Airspace Change Masterplan (the 'Masterplan') for the United Kingdom (UK). Waterman prepared this HRA Screening Report together with their sub consultant, Logika Consultants Limited (Logika).

1.2. This HRA Screening Report is being used to inform the development of the Masterplan iterations and subsequently the regulatory decision the CAA will make when accepting the final version of the Masterplan.

Background to the Modernisation of UK Airspace and the Airspace Change Masterplan

1.3. UK airspace is an invisible but vital piece of our national infrastructure. The basic design has remained the same for decades, despite technological advances and an increase in demand from airspace users. Modernisation is long overdue and is critical to ensure that UK airspace is fit for purpose in the future. The Department for Transport and CAA are working together to deliver it through an Airspace Modernisation Strategy (AMS)[1].

1.4. Airspace modernisation will be achieved, in part, through of a series of individual airspace change proposals initiated by airports (for routes close to airports) and the en-route air traffic control provider NATS (for upper airspace routes connecting airports). The airspace changes proposed by these 'sponsors' are being coordinated by the ACOG, which was set up to prepare an airspace change masterplan. The masterplan is a single coordinated implementation plan for airspace changes in the UK up to 2040 to upgrade the UK's airspace and deliver the objectives of airspace modernisation at a system level. The masterplan must be consistent with the delivery of airspace modernisation as described in the AMS.

1.5. The Masterplan, through the individual constituent airspace change proposals, may alter where aircraft fly. This could have consequential environmental impacts, including noise levels on the ground, greenhouse-gas emissions and local air quality.

1.6. The Masterplan will:

- Identify where and when airspace change proposals need to be developed in coordination to support delivery of the objectives of the CAA's AMS;
- Describe how individual airspace change proposals relate to each other (i.e. interdependencies[2]) and where there are potential conflicts in their proposed designs;
- Explain how trade-off[3] decisions to resolve those conflicts[4] have been made;
- Set out the proposed timelines for implementation of the individual airspace changes;
- Demonstrate the anticipated cumulative impact of the airspace change proposals.

[1] The first version of the AMS was published in December 2018, superseding the UK's Future Airspace Strategy published in June 2011. A refreshed version of the AMS was published in January 2023 (CAP 1711 and CAP 1711a).
[2] An interdependency can be described as two or more airspace change proposals that are linked together in some way. For example, there is a potential conflict in their design options or there is a potential cumulative impact on stakeholders on the ground.
[3] A trade-off is the choice or decision to resolve a conflict and could be between two or more sponsors of separate airspace changes, or between two or more objectives (such as achieving noise reduction and achieving fuel efficiency).
[4] A conflict can be described as two or more airspace change proposals that cannot both proceed in their proposed form.

1.7. The CAA has published further detail about what the Masterplan must contain within CAP 2156a[5].

Masterplan Iterations

1.8. The Masterplan is being produced by ACOG in iterations. More detail is added with each iteration as the individual airspace change proposals are themselves developed. The CAA and Department for Transport check that each submission of the masterplan covers the right material. The CAA then decides whether to accept it into the AMS.

1.9. Iteration 1 was assessed, but did not need to be accepted because it was only a high-level plan. Iteration 2 of the masterplan was accepted in January 2022. ACOG is currently working on Iteration 3. The final iteration of the masterplan for each 'cluster' or deployment, Iteration 4, will act as a framework for the constituent airspace change proposals. Further explanation of deployment and clusters are presented later within this Section.

Iteration 3

1.10. Iteration 3 will describe the proposed airspace structure and route network envisaged by the airspace change proposals when viewed as a collective, but without the detailed designs of all the routes. It will explain the specific airspace design trade-offs between interdependent airspace change proposals in greater detail than Iteration 2, with more information about the cumulative impacts of different design choices and the methods used to calculate them.

1.11. ACOG will create Iteration 3 by working with the sponsors of the constituent airspace change proposals to incorporate the outputs that are available from the 'options appraisals' that form part of the CAP 1616 airspace change process. The options appraisal is used by the airspace change sponsor to determine, in a transparent way, which option(s) to take forward to the public consultation on their airspace design.

1.12. For each interdependency, ACOG will coordinate input from the sponsors concerned as to what types of solutions could potentially be deployed in the masterplan to resolve any conflicts between their collective airspace change proposals for them to work as a system. Iteration 3 will describe the intended approach to coordinating the CAP 1616 consultations within the relevant cluster or deployment. It will include the high-level consultation plans of constituent airspace change proposals and ensure stakeholders understand how they will be able to respond.

1.13. As part of Iteration 3, ACOG is developing a 'cumulative assessment framework' tool to guide sponsors in assessing the cumulative impacts (positive or negative) of different options in interdependent airspace change proposals, and thus inform the decision to choose their preferred design option(s).

Iteration 4

1.14. Iteration 4 will describe the final proposed trade-offs between interdependent airspace change proposals, taking account of the outputs of the sponsors' coordinated consultations. It will provide a description of the proposed airspace structure and route network when viewed as a collective, but without the detailed designs of all the routes.

Consistency of Airspace Change Proposals with the Masterplan

1.15. The Masterplan is a UK strategic plan made up of individual airspace change proposals, and it is those individual proposals that determine the detailed airspace design (such as actual flightpaths). The masterplan coordinates, but does not determine, those designs. This is because any airspace

[5] CAA (2022). CAP 2156a Airspace change masterplan – CAA acceptance criteria. (2nd Edition, December 2022).

change proposal must follow the CAA's 'CAP 1616' airspace change process. This process ensures that when the CAA decides whether or not to approve a proposal to change the airspace design, it does so in an impartial and evidence-based way that takes proper account of the needs and interests of all affected stakeholders, including appropriate consultation. The airspace change proposals making up the masterplan and the CAA's decisions on them must of course remain consistent with the Masterplan.

Taking SEA and HRA into Account in the Masterplan

1.16. For Iteration 3 and Iteration 4, ACOG will show how the SEA and HRA have been taken into account in developing the Masterplan.

Clustering Approach

1.17. The CAA has accepted that ACOG can organise the airports involved in the masterplan into four geographical 'clusters', as shown in **Figure 1** of **Appendix A**. Airspace change proposals in one cluster can thus progress at their own speed without delaying those in other parts of the UK. Each cluster also has at least one NATS airspace change proposal to connect the airports to the network. ACOG refers to these clusters as:

- West terminal airspace
- Scottish TMA
- Manchester TMA
- London TMA

(TMA Means Terminal Control Area)

1.18. For the Scottish TMA, ACOG expects to submit Iteration 3 to the CAA for assessment in summer 2023. Submissions of Iteration 3 for other clusters will follow. The London TMA is expected to be implemented in phases, which are referred to as 'deployments'. Northern Ireland is not currently in scope of the Masterplan..

ACOG Public Engagement Exercise

1.19. In preparation for submitting Iteration 3, ACOG will run a public engagement exercise. This will include providing information about the content of Iteration 3, giving stakeholders the opportunity to input on key aspects, including a series of regional engagements as the proposals in each cluster progress.

1.20. Later on in the process, each sponsor will also run a consultation about the specific airspace design of its airspace change proposal, coordinated within each cluster as needed. For the Scottish TMA, those consultations would probably be in the first half of 2024.

Purpose of Report

1.21. The Masterplan can be considered a plan[6] with reference to the Conservation of Habitats and Species Regulations 2017 (as amended) and the Conservation of Offshore Marine Habitats and

[6] A plan, in this context, sets out where future activities or developments should take place within a certain area.

Species Regulations 2017 (as amended)[7]. This makes it necessary to consider whether or not it may result in a significant effect on a European site[8]. This report describes:

- The definition of the scope of the screening assessment and the potential Likely Significant Effects (LSE) on European sites that may result from the implementation of the Masterplan;
- All European sites, their designated features and conservation objectives that may be subject to LSE through implementation of the Masterplan, either alone or in-combination with other plans and projects;
- Literature reviews of the potential effects and LSE identified as regards the operation of aircraft when below 7,000ft. This information (provided in **Appendix B, Appendix C** and **Appendix D**) is used / will be used to inform the screening assessment and later stages of the Appropriate Assessment process.

Habitats Regulations Assessment

1.22. Council Directive 92/43/EEC on the conservation of wild fauna and flora (known as the Habitats Directive) and Directive 2009/147/EC on the conservation of wild birds (known as the Birds Directive) have been transposed into UK legislation through the Conservation of Habitats and Species Regulations 2017 (as amended) and the Conservation of Offshore Marine Habitats and Species Regulations 2017 (as amended). These regulations provide, inter alia, a framework for the protection of European sites. Within this report the regulations are collectively referred to as the 'Habitats Regulations' given their approach to protecting European sites are very similar having been derived from the same European Directives and case law.

1.23. The Habitats Regulations define the approach for the assessment of the implications for European sites of the implementation of plans and projects. This process is known as the Habitats Regulations Assessment in England and Wales and Habitats Regulation Appraisal in Scotland (together termed HRA in this report). There are a number of guidance documents/web-based information provided by Government agencies that describe the process. The most relevant are:

- Habitats Regulations Assessment: protecting a European site (2021) - https://www.gov.uk/guidance/habitats-regulations-assessments-protecting-a-european-site

[7] Regulations 2(2)(d)(I) and (ii) and 2(3)(b) of the Conservation of Habitats and Species Regulations 2017 (as amended) extend the provisions of Chapter 1 (assessments of plans and projects) of Part 6 of those Regulations to Scotland in respect of plans and projects which relate to a reserved matter (within the meaning of Schedule 5 to the Scotland Act 1998). The regulation of aviation and air transport, including the subject matter of the Civil Aviation Act 1982 (which governs the constitution and functions of the Civil Aviation Authority), is a reserved matter (per para E4 of Head E of Part II of Schedule 5 to the Scotland Act 1998. Consequently, the Conservation (Natural Habitats etc.) Regulations 1994 are not applicable, and the Masterplan's effects on European Sites in Scotland will be assessed in accordance with the procedure prescribed in the Conservation of Habitats and Species Regulations 2017 (as amended). In practice, however, the procedure required under the Scottish Regulations is not substantially different to that required under the English and Welsh Regulations. Furthermore, the Civil Aviation Authority is committed to consulting with the Scottish Government, Nature Scot and the public in Scotland, over the Masterplan and its likely significant effects on the environment, commencing with consultation over this HRA Screening Report. The legislative position in Northern Ireland is excluded from consideration as the Masterplan does not cover airspace below 7,000ft above Northern Ireland, although equivalent provisions in the Conservation of Habitats and Species Regulations 2017 (as amended) extend those Regulations to plans and projects in Northern Ireland where they relate to an excepted matter (within the meaning given by section 4(1) of the Northern Ireland Act 1998)..

[8] In England and Wales European sites are Special Areas of Conservation (SAC) and Special Protection Areas (SPA); these together make up the National Site Network. The Government, through policy, also consider potential SACs (pSAC), proposed SPAs (pSPA), Ramsar sites, proposed Ramsar sites and areas secured as compensation for damage to a European site as European sites – see https://www.gov.uk/guidance/habitats-regulations-assessments-protecting-a-european-site In Scotland, European sites are defined as SACs, SPAs and candidate SACs (cSAC) – see https://www.nature.scot/doc/legislative-requirements-european-sites. One adopted cSAC is primarily listed as a Site of Community Importance (SCI) (Sound of Barra SCI) – this is due to this site's designation process beginning with submission of information to the European Commission prior to Brexit implementation.

- Appropriate assessment – Guidance on the use of Habitats Regulations Assessment (2019) - https://www.gov.uk/guidance/appropriate-assessment
- Habitats Regulations Appraisal (2021) - https://www.nature.scot/professional-advice/planning-and-development/environmental-assessment/habitats-regulations-appraisal-hra

1.24. In determining whether or not a plan or project can be adopted or consented, the competent authority (the CAA with regards the Masterplan) must comply with Regulation 63 of the Habitat Regulations.

1.25. *"63(1) A competent authority, before deciding to undertake, or give any consent, permission or other authorisation for a plan or project which:*

- *(a) is likely to have a significant effect on a European site or a European offshore marine site (either alone or in combination with other plans and projects), and*
- *(b) is not directly connected with or necessary to the management of that site,*

must make an appropriate assessment of the implications for that site in view of that site's conservation objectives."

1.26. *"63(4) In the light of the conclusions of the assessment, and subject to regulation 64, the competent authority may agree to the plan or project only after having ascertained that it will not adversely affect the integrity of the European site or the European offshore marine site (as the case may be)."*

1.27. Should an adverse effect on the integrity of a European site be identified under Regulation 63, further consideration is required with regard Regulation 64 and Regulation 68.

1.28. *"64(1) If the competent authority is satisfied that, there being no alternative solutions, the plan or project must be carried out for imperative reasons of overriding public interest (which, subject to paragraph (2), may be of a social or economic nature), it may agree to the plan or project notwithstanding a negative assessment of the implications for the European site or the European offshore marine site (as the case may be)."*

1.29. *"68 Where in accordance with regulation 64 –*

a) A plan or project is agreed to, notwithstanding a negative assessment of the implications for a European site or a European offshore marine site, or

b) A decision, or a consent, permission or other authorisation, is affirmed on review, notwithstanding such an assessment,

The appropriate authority must secure that any necessary compensatory measures are taken to ensure that the overall coherence of Natura 2000[9] is protected."

1.30. In order to undertake an assessment that accords with legislation, a staged process has developed over time that has been shaped by guidance and case law. This case law is derived from both the UK courts and the Court of Justice of the European Union (CJEU). The case law of the CJEU has

[9] To be construed as "the national site network", per Reg 3(10) of the Habs Regs 2017, inserted by Reg 4(4) of the Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019/579.

been retained as it stood on 31st December 2020[10]; CJEU cases decided post 1st January 2021 may be persuasive but are not binding on UK courts.

1.31. There are four recognised stages of the HRA process. These are:

- Stage 1 – Screening. This stage identifies LSE that may occur due to the implementation of a plan or project alone or in-combination with other plans and projects. If LSE are identified assessment at Stage 2 is required; where no LSE are identified Stage 2 is not necessary;
- Stage 2 – Appropriate assessment. This stage focuses on establishing, beyond reasonable scientific doubt, whether any of the LSE may adversely affect the integrity of a European site in light of its conservation objectives, either alone or in combination with other plans and projects; where no adverse effect on site integrity is identified Stage 3 is not necessary;
- Stage 3 – Assessment of alternatives. Where an adverse effect on site integrity is concluded, it is necessary to determine whether there are alternatives to the proposed plan or project that would avoid or lessen the effects on a European site(s);
- Stage 4 – Imperative Reasons of Overriding Public Interest (IROPI). Where there are no alternative solutions available, an IROPI assessment is undertaken to determine the need for the plan or project with respect to the type and scale of the public benefit.

1.32. This report covers the screening stage of the process only.

[10] The Supreme Court and the Court of Appeal are not bound by retained EU case law and can depart from it. However, these Courts will generally continue to follow retained EU case law and will only depart from it where satisfied that it appears right to do so. The lower courts remain bound to determine any questions as to the meaning, validity, or effect of the Habitats Regulations in accordance with retained EU case law (unless it is changed by Parliament or the Supreme Court or the Court of Appeal departs from it).

2. HRA Screening Methodology

Background

2.1. The basis for the HRA screening methodology described in this report is taken from case C-127/02 of the CJEU, known as the 'Waddenzee judgement'. Paragraph 3a of the decision states "*In the light of the precautionary principle, a risk of significant effects exists if it cannot be excluded on the basis of objective information that the plan or project will have significant effects on the conservation objectives of the site concerned; in case of doubt as to the absence of significant effects an appropriate assessment must be carried out. All aspects of the plan or project which can, either individually or in combination with other plans or projects, affect those objectives must be identified in the light of the best scientific knowledge in the field*."

2.2. Guidance on the screening stage has been provided by the Government[11], who describe it as a simple assessment to check if a proposal:

- *"is directly connected with or necessary for the conservation management of a European site;*
- *risks having a significant effect on a European site on its own or in combination with other proposals".*

2.3. It is immediately apparent that the modernisation of the UK's airspace is not directly connected to the conservation management of European sites. Therefore, the Masterplan must be assessed in terms of the risk of significant effects on European sites it poses, either alone or in combination with other plans or projects.

2.4. Consideration of Stage 2 – Appropriate Assessment is only required if one or more LSE are identified at the screening stage. Those potential effects discounted must be done so on the basis that there is no identifiable effect pathway or there is objective information available that supports exclusion.

2.5. Proposed or potential mitigation measures cannot be considered during the screening stage in accordance with the judgement made in Case C-323/17 (known as 'People over Wind') in 2018. Therefore, the screening assessment below does not take into account any measures/policy within the Masterplan that are specifically intended to reduce harmful effects on a European site(s).

2.6. Transboundary effects (those that may affect a state in the European Economic Area (EEA)) are not considered within this screening assessment. This is because the operation of the airspace, and how this may affect European states in these countries is covered on a state by state basis. The Masterplan does not alter the pattern of airspace in any country outside of UK airspace and at the point where different airspace jurisdictions meet the altitude of operating aircraft is well in excess of 7,000ft[12] and, therefore, at an altitude where effects on European sites or functionally linked land are not expected.

Approach

2.7. The Masterplan is a plan that includes both specific, albeit high level, proposals associated with airspace change at specific locations (i.e. air space associated with specific airports) and describes how individual ACPs relate to each other (i.e. interdependencies) and where there are potential

[11] Guidance – Habitats regulations assessments: protecting a European site (2021). Online guidance located at: https://www.gov.uk/guidance/habitats-regulations-assessments-protecting-a-european-site#screening (accessed 08/06/2021)
[12] Confirmation provided by the Airspace Change Organising Group (ACOG).

conflicts between them. Where conflicts have been identified the adopted Masterplan identifies how trade-off decisions to resolve those conflicts have been made.

2.8. Where location specific consideration is given within the Masterplan, it is necessary to understand whether changes in how the airspace operates may result in LSEs on one or more European sites. For example, where the Masterplan contains decisions (whether agreed between ACP Sponsors or imposed by the CAA) on conflicts and trade-offs that result in a requirement that a particular sponsor does, or does not, use particular airspace or a particular flight path.

2.9. To identify potential effects, it is necessary to understand what effects aircraft operation can have on designated features (and the habitats and species that support them both within and outside of a site boundary (i.e. functionally linked land, as per Case C-461/17) of European sites. The potential effects associated with aircraft operation are well known and have been considered in a range of plan and project level HRA screening assessments, such as:

- Airports National Policy Statement: new runway capacity and infrastructure at airports in the south-east of England (Department for Transport, 2018);
- Noise Abatement Objective and regulatory Decision relating to Aircraft Noise Management at Dublin Airport: Appropriate Assessment – Nature Impact Statement (Aircraft Noise Competent Authority, 2022);
- Heathrow Airport Expansion – Habitat Regulations Assessment Screening Report (Heathrow Airport, 2019);
- Manston Airport Development Consent Order – Report to Inform Appropriate Assessment (Riveroak Investments, 2018);
- Gatwick Airport Northern Runway – Environmental Impact Assessment Scoping Report (GAL, 2019).

2.10. In order to ascertain the European sites that may be affected by aircraft operation requires the setting of precautionary Zones of Influence (ZoI) for each potential effect.

2.11. The Chartered Institute of Ecology and Environmental Management (CIEEM) defines the ZoI in their Ecological Impact Assessment guidelines (2018) as:

"The 'zone of influence' for a project is the area over which ecological features may be affected by biophysical changes as a result of the proposed project and associated activities".

2.12. Although this definition is written specifically for the impact assessment of projects, the nature of the Masterplan is such that the locations of ACPs that will come forward are known, allowing for potential effects to be understood geographically. Therefore, the setting of suitably precautionary (this being precautionary because it encompasses the widest possible effect extent) ZoI are applied to each potential plan activity.

2.13. The ZoI used within this screening assessment have been derived from peer-reviewed scientific literature (see **Appendix B-D**) and systematically collected and verified data (e.g. bird strike reporting records to the CAA). The potential significant effects considered and the ZoI defined for each are presented in **Table 1**. **Appendix B-D** provides a literature review associated with each potential effect.

2.14. It is noted that Impact Risk Zones (IRZs)[13] around Sites of Special Scientific Interest (SSSI) (which form constituent parts of European sites) identified by Natural England for the '*Airports, helipads*

[13] Natural England. 2022. SSSI Impact Risk Zones (England) dataset. [online] Available from: SSSI Impact Risk Zones (England) - data.gov.uk [Accessed October 2022].

and other aviation proposals' category extend beyond the ZoI distances described in **Table 1**. However, the IRZ bands are broad, focussed on ground level changes and represent the need for more detailed consideration and consultation with Natural England (for sites under their jurisdiction) only.

Table 1: Potential Effects and Related Zones of Influence

Impact	Potential effect	Zone of Influence (measured as a linear distance at ground level)	Justification
Increases in the atmospheric concentration and deposition of nitrogen	Direct toxicity to flora and fauna and changes in habitat composition including reduction in floristic diversity; resulting in degradation of designated habitats and species. Degradation of habitats supporting designated features of European sites.	18km[14] from airfield boundary	All aircraft, whether departing or arriving, will be at altitudes greater than 3,000ft when more than 18km from an airfield. This is a precautionary ZoI with UK's Air Quality Expert Review Group suggesting that ground level effects are unlikely to be detectable once an aircraft is above 100m (~330ft), but with assessment typically being undertaken out to 1,000m (~3,300ft).
Aircraft collision with wildlife (birds and bats)	Death or injury to individual animals reducing the fitness of the local population. Detrimental effects to migratory routes.	13km from airfield boundary	CAA data shows that between 2012 and 2016 ~97% of bird strikes reported in the UK or Channel Islands occurred under 1,500ft (215 of 7,101 recorded incidences across a 4 year period were recorded above this altitude). However, there is a 13km safeguarding area for wildlife hazard management specified by the CAA. Therefore, this is considered to be an appropriate distance for HRA screening purposes. Birds flying at high altitude on migration are not accounted for within the ZoI as data (see **Appendix D**) clearly shows that collisions at altitude enroute are rare occurrences.
Presence of aircraft / aircraft noise	Disturbance of designated features (or fauna supporting designated features) resulting in a reduction in the fitness of individuals and local population	18km from airfield boundary	All aircraft, whether departing or arriving, will be at altitudes greater than 3,000ft when more than 18km from an airfield. This is precautionary based on the upper range of recorded disturbance to birds within the scientific literature and does not take account of lateral distances from individual flightlines.

[14] The departure and arrival altitude bands for each airport covered by the Masterplan have been provided by ACOG. All 3,000ft contours (measured from appropriate end of runway) for all airports are less than 18km (typically ranging between 14 and 17km) from the runway ends. Therefore, 18km from the airfield boundary has been used as an appropriately precautionary distance that can be applied across all airports within the Masterplan.

2.15. In **Section 3** each of the European sites identified through the application of these ZoI are detailed.

2.16. Should any changes to airspace design above 7,000ft occur these will be driven by making airspace more efficient (albeit operating safely will be the first priority) in terms of routes flown, for instance by making routes flown more direct or reduce stacking. Nevertheless, the potential effects associated with aircraft overflight and biodiversity can be scoped out of consideration. Disturbance due to noise and shadow cast, and the effects of emissions on sensitive habitats, have not been shown to operate at altitudes in excess of 3,000ft, whilst collision of birds with aircraft occurs mainly at very low altitudes and within close proximity to the aerodrome.

2.17. The identification of other plans and projects that may operate in-combination with the Masterplan will include any activities that could include airport expansion with resultant changes in ATMs or proposed changes to other airspace activities (e.g. civilian or military flight activity). There is limited opportunity for ACPs to act in-combination with other plans and projects that are ground based, but these could include development resulting in increased levels of nitrogen deposition on European sites or disturbance of the features for which they are designated. As the Masterplan will evolve, prior to final publication, it will be informed by the developing ACPs and the airspace options that are under consideration. It is at this stage when in-combination assessment can be considered most appropriately. Therefore, the in-combination assessment will be considered in detail within the Report to Inform the Appropriate Assessment that will be provided during Stage 2. This approach is robust as none of the three potential effects identified in **Table 1** are screened out during Stage 1.

3. Screening Assessment

Background

3.1. As outlined in **Table 1**, this European site screening assessment has adopted a precautionary 18km radius from each of the 22 airport boundaries[15] to be affected by the Masterplan (see **Figure 1**). In this instance we have applied a precautionary approach whereby the distance from the airport to European site is measured from the airport boundary not runway end or aircraft take off / landing point.

3.2. Using data from Multi-Agency Geographic Information for the Countryside (MAGIC)[16], European sites within this ZoI of each airport which may be affected by the Masterplan are listed in **Table 2**, **Table 3, Table 4** and **Table 5** (one table per TMA), with distances from each airport given as the closest part of the airport to the European site (see **Figure 2 -5a/b**).

3.3. Further ecological information has been gathered to inform this screening assessment and is presented in **Table 2** to **Table 5**. For each European site, this includes a summary of qualifying features and the most up-to-date information available on existing threats and pressures. These draw on a range of documents produced and held by Natural England, Nature Scot, Natural Resources Wales and the Joint Nature Conservation Committee (JNCC):

- European site citations;
- Natura 2000 Standard Data Forms;
- Information Sheet on Ramsar Wetlands (RIS); and
- Site improvements Plans[17].

Screening Assessment

3.4. The European sites within the ZoIs are listed in **Table 2** to **Table 5** and shown on **Figures 2-5a/b**.

3.5. Currently the Masterplan does not contain sufficient information to screen out from more detailed assessment those European sites that are identified in **Table 2** to **Table 5**. However, further information that will be used to narrow the list of European sites that require detailed assessment in Stage 2 is presented in **Appendix D**.

3.6. A total of 113 European sites spanning England, Scotland and Wales have been identified as occurring within the ZoIs. Of these 17 relate to the ZoIs of the STMA, 21 in the MTMA, 19 in the WTMA and 66 in the LTMA. They include Special Areas of Conservation (SACs), Special Protection Areas (SPAs) and Ramsar sites both in the terrestrial environment and those with marine features.

3.7. There are 19 European sites which fall within the ZoIs of more than one airport. These are:

- Midland Meres and Mosses – Phase 1 Ramsar site (Liverpool John Lennon Airport and Manchester Airport);
- South Pennine Moors SAC (Manchester Airport and Leeds Bradford Airport);

[15] Airport boundaries generated using OS OpenMap Local Buildings (OS data © Crown Copyright 2022).
[16] Natural England. 2022. SSSI Impact Risk Zones (England) dataset. [online] Available from: SSSI Impact Risk Zones (England) - data.gov.uk [Accessed October 2022].
[17] Natural England. 2022. Site Improvement Plans by region. [online] Available from: Natural England Access to Evidence - Site Improvement Plans by region [Accessed October 2022].

- Severn Estuary[18] SAC, SPA and Ramsar site (Bristol International Airport and Cardiff Airport);
- Thursley, Ash, Pirbright and Chobham SAC (Heathrow Airport and Farnborough Airport);
- Thames Basin Heaths SPA (Heathrow Airport and Farnborough Airport);
- South West London Waterbodies SPA / Ramsar site (Heathrow Airport and RAF Northolt);
- Burnham Beeches SAC (Heathrow Airport and RAF Northolt);
- Richmond Park SAC (Heathrow Airport and RAF Northolt);
- Wimbledon Common SAC (Heathrow Airport and RAF Northolt);
- Windsor Forest and Great Park SAC (Heathrow Airport, Farnborough Airport and RAF Northolt);
- Lee Valley SPA and Ramsar site (London Stansted Airport and London City Airport);
- New Forest SAC, SPA, Ramsar site (Southampton Airport and Bournemouth Airport);
- Solent and Dorset Coast SPA (Southampton Airport and Bournemouth Airport); and
- Mole Gap to Reigate Escarpment SAC (London Gatwick Airport and Biggin Hill Airport).

Table 2: European Sites Vulnerable to Effects Arising from Airspace Change in the STMA

European Site	Distance from Airport	Summary of Qualifying feature	Existing Threats and Pressures
Black Cart SPA	Within ZoI of Glasgow (<0.01km)	Article 4.1 Annex I species: Whooper swan *Cygnus cygnus*	Hunting and collection of wild animals (terrestrial), including damage caused by game (excessive density), and taking/removal of terrestrial animals (including collection of insects, reptiles, amphibians, birds of prey, etc., trapping, poisoning, poaching, predator control, accidental capture (e.g. due to fishing gear), etc. Renewable abiotic energy use Utility and service lines Changes in biotic conditions Other forms of pollution
Endrick Water SAC	Within ZoI of Glasgow (17.6km)	Annex II species: 1096 Brook lamprey *Lampetra planeri* 1099 River lamprey *Lampetra fluviatilis* 1106 Atlantic salmon *Salmo salar*	Mining and quarrying Discharges Renewable abiotic energy use Use of biocides, hormones and chemicals Human induced changes in hydraulic conditions Grazing Pollution to surface waters (limnic & terrestrial, marine & brackish) Air pollution, air-borne pollutants Cultivation

[18] Refers to both English and Welsh designations (noting that they are counted as individual European sites in Table 3.3

European Site	Distance from Airport	Summary of Qualifying feature	Existing Threats and Pressures
			Introduced genetic material, GMO Changes in biotic conditions Interspecific faunal relations Modification of cultivation practices Forest and Plantation management & use Other ecosystem modifications Urbanised areas, human habitation Fishing and harvesting aquatic resources Utility and service lines Annual and perennial non-timber crops Abiotic (slow) natural processes Changes in abiotic conditions Marine and Freshwater Aquaculture Invasive non-native species
Firth of Forth Ramsar	Within ZoI of Edinburgh (3.5km)	Criterion 6: Waterbird assemblages: Pink-footed goose *Anser brachyrhynchus* Common shelduck *Tadorna tadorna* Redshank *Tringa totanus* Ruddy turnstone *Arenaria interpres* Goosander *Mergus merganser* Wintering species: Slavonian grebe *Podiceps auratus* Common goldeneye *Bucephala clangula* Red knot *Calidris canutus islandica* Bar-tailed godwit *Limosa lapponica*	Marine water pollution Invasive non-native species Fishing and harvesting aquatic resources Human induced changes in hydraulic conditions Changes in biotic conditions Changes in abiotic conditions Hunting and collection of wild animals (terrestrial), including damage caused by game (excessive density), and taking/removal of terrestrial animals (including collection of insects, reptiles, amphibians, birds of prey, etc., trapping, poisoning, poaching, predator control, accidental capture (e.g. due to fishing gear), etc. Utility and service lines Renewable abiotic energy use Outdoor sports and leisure activities, recreational activities Marine and Freshwater Aquaculture Other ecosystem modifications Modification of cultivation practices Exploration and extraction of oil or gas Pollution to surface waters (limnic & terrestrial, marine & brackish)

European Site	Distance from Airport	Summary of Qualifying feature	Existing Threats and Pressures
Firth of Forth SPA	Within ZoI of Edinburgh (4km)	Article 4.1 Annex I species: Red-throated diver *Gavia stellata* Slavonian grebe *Podiceps auratus* Common tern *Sterna hirundo* Arctic tern *Sterna paradisaea* Little gull *Larus minutus* Article 4.2 Migratory species: Common Eider *Somateria mollissima* Long-tailed duck *Clangula hyemalis* Common scoter *Melanitta nigra* Velvet scoter *Melanitta fusca* Common goldeneye *Bucephala clangula* Red-breasted merganser *Mergus serrator* European shag Phalacrocorax aristotelis Northern gannet *Morus bassanus* Breeding season species: Atlantic puffin *Fratercula arctica* Black-legged kittiwake *Rissa tridactyla* Manx shearwater *Puffinus puffinus* Common guillemot *Uria aalge* Herring gull *Larus argentatus* Non-breeding season species: Razorbill *Alca torda* Herring gull *Larus argentatus* Black-headed gull *Chroicocephalus ridibundus* Common gull *Larus canus* Common guillemot *Uria aalge* European shag Phalacrocorax aristotelis Black-legged kittiwake *Rissa tridactyla*	Marine water pollution Invasive non-native species Fishing and harvesting aquatic resources Human induced changes in hydraulic conditions Changes in biotic conditions Changes in abiotic conditions Hunting and collection of wild animals (terrestrial), including damage caused by game (excessive density), and taking/removal of terrestrial animals (including collection of insects, reptiles, amphibians, birds of prey, etc., trapping, poisoning, poaching, predator control, accidental capture (e.g. due to fishing gear), etc. Utility and service lines Renewable abiotic energy use Outdoor sports and leisure activities, recreational activities Marine and Freshwater Aquaculture Other ecosystem modifications Modification of cultivation practices Exploration and extraction of oil or gas Pollution to surface waters (limnic & terrestrial, marine & brackish)

European Site	Distance from Airport	Summary of Qualifying feature	Existing Threats and Pressures
Forth Islands SPA	Within ZoI of Edinburgh (5.6km)	Article 4.1 Annex I species: Arctic tern *Sterna paradisaea* Roseate tern *Sterna dougallii* Common tern *Sterna hirundo* Sandwich tern *Sterna sandvicensis* Article 4.2 Migratory species: Northern gannet *Morus bassanus* European shag *Phalacrocorax aristotelis* Lesser black-backed gull *Larus fuscus* Atlantic puffin *Fratercula arctica* Waterbird assemblages: Razorbill *Alca torda* Common guillemot *Uria aalge* Black-legged kittiwake *Rissa tridactyla* Herring gull *Larus argentatus* Northern gannet *Morus bassanus* Great cormorant *Phalacrocorax carbo* Lesser black-backed gull *Larus fuscus* European shag *Phalacrocorax aristotelis* Atlantic puffin *Fratercula arctica* Arctic tern *Sterna paradisaea* Roseate tern *Sterna dougallii* Common tern *Sterna hirundo* Sandwich tern *Sterna sandvicensis*	Inundation (natural processes Changes in biotic conditions Marine water pollution Renewable abiotic energy use Invasive non-native species Changes in abiotic conditions Outdoor sports and leisure activities, recreational activities Other ecosystem modifications Interspecific faunal relations Fishing and harvesting aquatic resources
Imperial Dock Lock, Leith SPA	Within ZoI of Edinburgh (10.6km)	Article 4.1 Annex I species: Common tern *Sterna hirundo*	Changes in abiotic conditions Renewable abiotic energy use Changes in biotic conditions Invasive non-native species Interspecific faunal relations
Inner Clyde Estuary Ramsar	Within ZoI of Glasgow (1.6km)	Criterion 6: Common Eider *Somateria mollissima* Slavonian grebe *Podiceps auratus*	

European Site	Distance from Airport	Summary of Qualifying feature	Existing Threats and Pressures
		Common goldeneye *Bucephala clangula* Eurasian oystercatcher *Haematopus ostralegus* Common greenshank *Tringa nebularia*	
Inner Clyde Estuary SPA	Within ZoI of Glasgow (1.6km)	Article 4.2 Wintering species: Redshank *Tringa tetanus*	Changes in abiotic conditions
Loch of Skene Ramsar	Within ZoI of Aberdeen (9.4km)	Criterion 4 Goldeneye *Bucephala clangula* Goosander *Mergus merganser* Criterion 6: Greylag goose *Anser answer*	No threats or pressures reported.
Loch of Skene SPA	Within ZoI of Aberdeen (9.4km)	Article 4.2 Migratory species: Greylag goose *Anser answer* Goldeneye *Bucephala clangula* Goosander *Mergus merganser*	Hunting and collection of wild animals (terrestrial), including damage caused by game (excessive density), and taking/removal of terrestrial animals (including collection of insects, reptiles, amphibians, birds of prey, etc., trapping, poisoning, poaching, predator control, accidental capture (e.g. due to fishing gear), etc. Pollution to surface waters (limnic & terrestrial, marine & brackish) Changes in biotic conditions Other forms of pollution
Outer Firth of Forth and St Andrews Bay Complex SPA	Within ZoI of Edinburgh (5.8km)	Article 4.1 Annex I species: Red-throated diver *Gavia stellata* Slavonian grebe *Podiceps auratus* Common tern *Sterna hirundo* Arctic tern *Sterna paradisaea* Little gull *Larus minutus* Article 4.2 Migratory species: Common Eider *Somateria mollissima* Long-tailed duck *Clangula hyemalis* Common scoter *Melanitta nigra*	Marine and Freshwater Aquaculture Fishing and harvesting aquatic resources Outdoor sports and leisure activities, recreational activities Hunting, fishing or collecting activities not referred to above Utility and service lines Shipping lanes, ports, marine constructions Changes in biotic conditions Marine water pollution Discharges Other human intrusions and disturbances Renewable abiotic energy use

European Site	Distance from Airport	Summary of Qualifying feature	Existing Threats and Pressures
		Velvet scoter *Melanitta fusca* Common goldeneye *Bucephala clangula* Red-breasted merganser *Mergus serrator* European shag Phalacrocorax aristotelis Northern gannet *Morus bassanus* Breeding season species: Atlantic puffin *Fratercula arctica* Black-legged kittiwake *Rissa tridactyla* Manx shearwater *Puffinus puffinus* Common guillemot *Uria aalge* Herring gull *Larus argentatus* Non-breeding season species: Razorbill *Alca torda* Herring gull *Larus argentatus* Black-headed gull *Chroicocephalus ridibundus* Common gull *Larus canus* Common guillemot *Uria aalge* European shag *Phalacrocorax aristotelis* Black-legged kittiwake *Rissa tridactyla*	Airports, flightpaths Pollution to surface waters (limnic & terrestrial, marine & brackish) Changes in abiotic conditions Other ecosystem modifications
Red Moss of Netherley SAC	Within ZoI of Aberdeen (16.8km)	Annex I Habitats: 7110 Active raised bogs 7120 Degraded raised bogs still capable of natural regeneration	Industrial or commercial areas Livestock farming and animal breeding (without grazing) Problematic native species Unknown threat or pressure Grazing Discharges Sport and leisure structures Changes in abiotic conditions Outdoor sports and leisure activities, recreational activities Changes in biotic conditions Other human intrusions and disturbances Biocenotic evolution, succession

European Site	Distance from Airport	Summary of Qualifying feature	Existing Threats and Pressures
			Human induced changes in hydraulic conditions Storm, cyclone Invasive non-native species Military use and civil unrest Abiotic (slow) natural processes Pollution to surface waters (limnic & terrestrial, marine & brackish) Mining and quarrying Urbanised areas, human habitation
Renfrewshire Heights SPA	Within ZoI of Glasgow (13.1km)	Article 4.1 Annex I species: Hen harrier *Circus cyaneus*	Grazing Other ecosystem modifications Hunting and collection of wild animals (terrestrial), including damage caused by game (excessive density), and taking/removal of terrestrial animals (including collection of insects, reptiles, amphibians, birds of prey, etc., trapping, poisoning, poaching, predator control, accidental capture (e.g. due to fishing gear), etc. Interspecific faunal relations
River Dee SAC	Within ZoI of Aberdeen (8.5km)	Annex II species: 1029 Freshwater pearl mussel *Margaritifera margaritifera* 1106 Atlantic salmon *Salmo salar* 1355 Otter *Lutra lutra*	Marine and Freshwater Aquaculture Fishing and harvesting aquatic resources Annual and perennial non-timber crops Pollution to surface waters (limnic & terrestrial, marine & brackish) Changes in biotic conditions Utility and service lines Grazing Human induced changes in hydraulic conditions Other ecosystem modifications Abiotic (slow) natural processes Introduced genetic material, GMO Changes in abiotic conditions Marine water pollution Hunting, fishing or collecting activities not referred to above Mining and quarrying Interspecific faunal relations

European Site	Distance from Airport	Summary of Qualifying feature	Existing Threats and Pressures
			Air pollution, air-borne pollutants Roads, paths and railroads Renewable abiotic energy use Hunting and collection of wild animals (terrestrial), including damage caused by game (excessive density), and taking/removal of terrestrial animals (including collection of insects, reptiles, amphibians, birds of prey, etc., trapping, poisoning, poaching, predator control, accidental capture (e.g. due to fishing gear), etc. Utility and service lines Use of biocides, hormones and chemicals
Sands of Forvie SAC	Within ZoI of Aberdeen (17km)	Annex I Habitats: 2110 Embryonic shifting dunes 2120 Shifting dunes along the shoreline with *Ammophila arenaria* 2140 Decalcified fixed dunes with *Empetrum nigrum* 2190 Humid dune slacks	Air pollution, air-borne pollutants Fire and fire suppression Inundation (natural process) Forest planting on open ground
Ythan Estuary and Meikle Loch Ramsar	Within ZoI of Aberdeen (16.4km)	<u>Criterion 2:</u> Common tern *Sterna hirundo* Little tern *Sterna albifrons* <u>Criterion 4</u> Common Eider *Somateria mollissima* <u>Criterion 5:</u> Waterbird assemblages of international importance. <u>Criterion 6:</u> Sandwich tern *Sterna sandvicensis* Pink-footed goose *Anser brachyrhynchus* Waterbird assemblages: Redshank *Tringa tetanus* Northern lapwing *Vanellus vanellus*	No threats or pressures reported.
Ythan Estuary,	Within ZoI of Aberdeen	<u>Article 4.1</u> Annex I species:	Inundation (natural processes) Utility and service lines

European Site	Distance from Airport	Summary of Qualifying feature	Existing Threats and Pressures
Sands of Forvie and Meikle Loch SPA	(7.2km)	Sandwich tern *Sterna sandvicensis* Common tern *Sterna hirundo* Little tern *Sterna albifrons* <u>Article 4.2</u> Migratory species: Pink-footed goose *Anser brachyrhynchus* Waterbird assemblages: Common Eider *Somateria mollissima* Redshank *Tringa totanus* Northern lapwing *Vanellus vanellus*	Marine water pollution Invasive non-native species Forest and Plantation management & use Pollution to surface waters (limnic & terrestrial, marine & brackish) Outdoor sports and leisure activities, recreational activities Renewable abiotic energy use Changes in biotic conditions Changes in abiotic conditions Marine and Freshwater Aquaculture Hunting, fishing or collecting activities not referred to above Airports, flightpaths Interspecific faunal relations Shipping lanes, ports, marine constructions Fishing and harvesting aquatic resources Discharges Other ecosystem modifications Other human intrusions and disturbances

Table 3: European Sites Vulnerable to Effects Arising from Airspace Change in the MTMA

European Site	Distance from Airport	Summary of Qualifying feature	Existing Threats and Pressures
Liverpool Bay / Bae Lerpwl SPA	Within ZoI of Liverpool John Lennon (8km)	<u>Annex I species:</u> Red-throated diver *Gavia stellata* Little gull *Hydrocoloeus minutus* Little tern *Sternula albifrons* Common tern *Sterna hirundo* Non-breeding species: Common scoter *Melanitta nigra*	Fisheries: Commercial marine and estuarine Transportation and service corridors Fisheries: Recreational marine and estuarine Extraction: non-living resources Siltation Water Pollution
Manchester Mosses SAC	Within ZoI of Manchester (14.5km)	Annex I Habitats: 7120 Degraded raised bogs still capable of natural regeneration	Hydrological changes Air pollution: impact of atmospheric nitrogen deposition
Mersey Estuary Ramsar	Within ZoI of Liverpool John Lennon (<0.01km)	<u>Criterion 5:</u> Waterbird assemblages of international importance. <u>Criterion 6:</u>	No factors reported.

European Site	Distance from Airport	Summary of Qualifying feature	Existing Threats and Pressures
		Shelduck *Tadorna tadorna* Black-tailed godwit *Limosa limosa islandica* Redshank *Tringa totanus* Teal *Anas crecca* Pintail *Anas acuta* Dunlin *Calidris alpina alpina*	
Mersey Estuary SPA	Within ZoI of Liverpool John Lennon (<0.01km)	Annex I Species: Golden plover *Pluvialis apricaria* Migratory species: Redshank *Tringa totanus* Shelduck *Tadorna tadorna* Teal *Anas crecca* Pintail *Anas acuta* Dunlin *Calidris alpina alpina* Black-tailed godwit *Limosa limosa islandica=*	Changes in species distributions Invasive species Public access/ Disturbance
Mersey Narrows & North Wirral Foreshore Ramsar	Within ZoI of Liverpool John Lennon (12.3km)	Criterion 4: Little gull *Hydrocoloeus minutus* Common tern *Sterna hirundo* Criterion 5: Waterbird assemblages of international importance. Criterion 6: Red knot *Calidris canutus islandica* Bar-tailed godwit *Limosa lapponica*	Unspecific development urban use Recreation/tourism disturbance Vegetation succession
Mersey Narrows & North Wirral Foreshore SPA	Within ZoI of Liverpool John Lennon (12.3km)	Wintering species: Sanderling *Calidris alba* Red knot *Calidris canutus islandica* Eurasian oystercatcher *Haematopus ostralegus* Bar-tailed godwit Limosa lapponica Great cormorant *Phalacrocorax carbo* Grey Plover *Pluvialis squatarola* Non-breeding species: Little gull Hydrocoloeus minutus Common tern *Sterna hirundo* Redshank *Tringa tetanus*	Public access/ disturbance Changes in species distributions Invasive species Climate change Coastal squeeze Inappropriate scrub control Water pollution Fisheries: commercial marine and estuarine Inappropriate coastal management Overgrazing Direct impact from third party Marine litter Predation Planning permission: general

European Site	Distance from Airport	Summary of Qualifying feature	Existing Threats and Pressures
			Marine consents and permits
		Breeding species:	Wildfire/ arson
		Common tern *Sterna hirundo*	Air pollution: impact of atmospheric nitrogen decomposition
		Waterbird assemblage	Transportation and service corridors
			Physical modification
Midland Meres & Mosses - Phase 1 Ramsar	Within ZoI of Liverpool John Lennon (14km) Within ZoI of Manchester (5.6km)	Criterion 2 Nationally scarce plants: Cowbane *Cicuta virosa* Elongated sedge *Carex elongata* Bryophytes *Dicranum affine* *Sphagnum pulchrum* Wintering birds: Cormorant *Phalacrocorax carbo* Gadwall *Anas strepera* Pochard *Aythya ferina* Shoveler *Anas clypeata*	Water pollution Hydrological changes Air pollution: impact of atmospheric nitrogen deposition Inappropriate scrub control Game management: pheasant rearing Forestry and woodland management Habitat fragmentation
North Pennine Moors SAC	Within ZoI of Leeds Bradford (8.6km)	**North Pennine Moors SAC** Annex I Habitats: 4030 European dry heaths 5130 *Juniperus communis* formations on heaths or calcareous grasslands 7130 Blanket bogs 7220 Petrifying springs with tufa formation 8220 Siliceous rocky slopes with *chasmophytic* vegetation 91A0 Old sessile oak woods with *ilex* and *blechnum* in the British Isles Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site: 4010 Northern Atlantic wet heaths with *Erica tetralix* 6130 *Calaminarian* grasslands of the *Violetalia calaminariae* 6150 Siliceous alpine and boreal grasslands 6210 Semi-natural dry grasslands and scrubland facies	Low breeding success/ poor recruitment Managed rotational burning Inappropriate grazing Change in land management Disease Hydrological changes Game management: grouse moors Direct land take from development Air pollution: risk of atmospheric nitrogen deposition Fertiliser use Inappropriate cutting/ mowing Invasive species Agricultural management practices Vehicles Vehicles: illicit Public access/ disturbance Deer Feature location/ extent/ condition unknown Climate change

European Site	Distance from Airport	Summary of Qualifying feature	Existing Threats and Pressures
		on calcareous substrates (*Festuco-Brometalia*) (* important orchid sites) 7230 Alkaline fens 8110 Siliceous scree of the montane to snow levels (*Androsacetalia alpinae* and *Galeopsietalia ladani*) 8210 Calcareous rocky slopes with *chasmophytic* vegetation Annex II species present as a qualifying feature, but not a primary reason for selection of this site: 1528 Marsh saxifrage *Saxifraga hirculus*	
North Pennine Moors SPA	Within ZoI of Leeds Bradford (8.6km)	Annex I species: Golden plover *Pluvialis apricaria* Hen harrier *Circus cyaneus* Merlin *Falco columbarius* Peregrine *Falco peregrinus*	Low breeding success/ poor recruitment Managed rotational burning Inappropriate grazing Change in land management Disease Hydrological changes Game management: grouse moors Direct land take from development Air pollution: risk of atmospheric nitrogen deposition Fertiliser use Inappropriate cutting/ mowing Invasive species Agricultural management practices Vehicles Vehicles: illicit Public access/ disturbance Deer Feature location/ extent/ condition unknown Climate change
Peak District Moors (South Pennine Moors Phase 1) SPA	Within ZoI of Manchester (17.6km)	Annex I breeding Species: Golden plover *Pluvialis apricaria* Merlin *Falco columbarius* Short-eared owl *Asio flammeus*	Hydrological changes Managed rotational burning Low breeding success/ poor recruitment Inappropriate management practices Public access/ disturbance Air pollution: impact of atmospheric nitrogen deposition

European Site	Distance from Airport	Summary of Qualifying feature	Existing Threats and Pressures
			Wildfire/ arson Vehicles Overgrazing Forestry and woodland management Changes in species distributions Disease Undergrazing Invasive species Planning permission: general
River Dee and Bala Lake / Afon Dyfrdwy a Llyn Tegid SAC (Wales)	Within ZoI of Liverpool John Lennon (15.5km)	Annex I Habitats: 3260 Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation Annex II species: S1099 *Lampetra fluviatilis*: River lamprey S1106 *Salmo salar*: Atlantic salmon S1163 *Cottus gobio*: Bullhead S1095 *Petromyzon marinus*: Sea lamprey S1096 *Lampetra planeri*: Brook lamprey S1831 *Luronium natans*: Floating water-plantain	No factors recorded.
River Dee and Bala Lake SAC (England)	Within ZoI of Liverpool John Lennon (15.5km)	Annex I Habitats: 3260 Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation Annex II species: S1099 *Lampetra fluviatilis*: River lamprey S1106 *Salmo salar*: Atlantic salmon S1163 *Cottus gobio*: Bullhead S1095 *Petromyzon marinus*: Sea lamprey S1096 *Lampetra planeri*: Brook lamprey S1831 *Luronium natans*: Floating water-plantain	No factors recorded.
River Mease SAC	Within ZoI East Midlands (13.2km)	Annex I habitats present as a qualifying feature, but not a primary reason for selection of	Water Pollution Drainage Inappropriate weirs, dams and other

European Site	Distance from Airport	Summary of Qualifying feature	Existing Threats and Pressures
		this site: 3260 Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation Annex II species: 1149 Spined loach *Cobitis taenia* 1163 Bullhead *Cottus gobio* Annex II species present as a qualifying feature, but not a primary reason for site selection 1092 White-clawed (or Atlantic stream) crayfish *Austropotamobius pallipes* 1355 Otter *Lutra lutra*	structures Invasive species Siltation Water abstraction
Rixton Clay Pits SAC	Within ZoI of Manchester (13km)	Annex II species: Great crested newt *Triturus cristatus* are known to occur in at least 20 ponds across the site.	Other human intrusions and disturbances
Rochdale Canal SAC	Within ZoI of Manchester (16.8km)	Annex II species: 1831 Floating water-plantain *Luronium natans*	Physical modification Air pollution: impact of atmospheric nitrogen deposition
Rostherne Mere Ramsar	Within ZoI of Manchester (4.4km)	Criterion 3 Shoveler *Anas clypeata* Pochard *Aythya ferina*	Hydrological changes Invasive species Water pollution
South Pennine Moors (Phase 2) SPA	Within ZoI of Leeds Bradford (6.5km)	Annex II species: Short-eared owl *Asio flammeus* Merlin *Falco columbarius* Golden plover *Pluvialis apricaria.* During breeding season, the SPA supports: Golden plover *Pluvialis apricaria*, common sandpiper *Actitis hypoleucos*, dunlin *Calidris alpina schinzii* , twite *Carduelis flavirostris,* Snipe *Gallinago gallinago*, curlew *Numenius arquata*, wheatear *Oenanthe oenanthe*, whinchat *Saxicola rubetra*, redshank *Tringa totanus*, ring ouzel *Turdus torquatus*, lapwing *Vanellus vanellus* and short-	Hydrological changes Managed rotational burning Low breeding success/ poor recruitment Inappropriate management practices Public access/ disturbance Air pollution: impact of atmospheric nitrogen deposition Wildfire/ arson Vehicles Overgrazing Forestry and woodland management Changes in species distributions Disease Undergrazing Invasive species Planning permission: general

European Site	Distance from Airport	Summary of Qualifying feature	Existing Threats and Pressures
		eared owl *Asio flammeus*. Breeding bird assemblage	
South Pennine Moors SAC	Within ZoI of Manchester (17.8km) Within ZoI of Leeds Bradford (6.5km)	Annex I Habitats: 4030 European dry heaths 7130 Blanket bogs 91A0 Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site: 4010 Northern Atlantic wet heaths with *Erica tetralix* 7140 Transition mires and quaking bogs	Hydrological changes Managed rotational burning Low breeding success/ poor recruitment Inappropriate management practices Public access/ disturbance Air pollution: impact of atmospheric nitrogen deposition Wildfire/ arson Vehicles Overgrazing Forestry and woodland management Changes in species distributions Disease Undergrazing Invasive species Planning permission: general
The Dee Estuary Ramsar	Within ZoI of Liverpool John Lennon (14.3km)	<u>Criterion 1:</u> Annex I Habitats: H1130 Estuaries H1140 Mudflats and sandflats not covered by seawater at low tide H1210 Annual vegetation of drift lines H1230 Vegetated sea cliffs of the Atlantic and Baltic coasts H1310 Salicornia and other annuals colonising mud and sand H1330 Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) H2110 Embryonic shifting dunes H2120 Shifting dunes along the shoreline with *Ammophila arenaria* (“white dunes”) H2130 Fixed dunes with herbaceous vegetation (“grey dunes”) H2190 Humid dune slacks <u>Criterion 2:</u>	Introduction/invasion of exotic animal species Introduction/invasion of non-native plant species Overfishing Pollution – industrial waste General disturbance from human activities Transport infrastructure development Sand dune erosion and accretion along the North Wales open coast

European Site	Distance from Airport	Summary of Qualifying feature	Existing Threats and Pressures
		Supports breeding coloies of Natterjack Toad *Epidalea calamita* <u>Criterion 5:</u> Waterbird assemblages of international importance. <u>Criterion 6:</u> Oystercatcher *Haematopus ostralegus* Curlew *Numenius arquata* Shelduck *Tadorna tadorna* Black-tailed godwit *Limosa limosa islandica* Redshank *Tringa totanus* Teal *Anas crecca* Pintail *Anas acuta* Dunlin *Calidris alpina alpina* Bar-tailed godwit *Limosa lapponica*	
The Dee Estuary SAC	Within ZoI of Liverpool John Lennon (14.3km)	Annex I Habitats: 140 Mudflats and sandflats not covered by seawater at low tide 1310 *Salicornia* and other annuals colonizing mud and sand 1330 Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site: 1130 Estuaries 1210 Annual vegetation of drift lines 1230 Vegetated sea cliffs of the Atlantic and Baltic Coasts 2110 Embryonic shifting dunes 2120 Shifting dunes along the shoreline with *Ammophila arenaria* (""white dunes"") 2130 Fixed coastal dunes with herbaceous vegetation (""grey	Public access/ disturbance Changes in species distributions Invasive species Climate change Coastal squeeze Inappropriate scrub control Water pollution Fisheries: commercial marine and estuarine Inappropriate coastal management Overgrazing Direct impact from third party Marine litter Predation Planning permission: general Marine consents and permits Wildfire/ arson Air pollution: impact of atmospheric nitrogen decomposition Transportation and service corridors Physical modification

European Site	Distance from Airport	Summary of Qualifying feature	Existing Threats and Pressures
		dunes"") 2190 Humid dune slacks Annex II species: 1095 Sea lamprey *Petromyzon marinus* 1099 River lamprey *Lampetra fluviatilis* 1395 Petalwort *Petalophyllum ralfsii*	
The Dee Estuary SPA	Within ZoI of Liverpool John Lennon (14.3km)	Article 4.1 Annex I species: Bar-tailed godwit *Limosa lapponica* Common tern Sterna hirundo Little Tern *Sterna albifrons* Sandwich Tern *Sterna sandvicensis* Article 4.2 Black-tailed godwit *Limosa limosa islandica* Curlew *Numenius arquata* Dunlin *Calidris alpina* Grey plover *Pluvialis squatarola* Knot *Calidris canutus* Oystercatcher *Haematopus ostralegus* Pintail *Anas acuta* Redshank *Tringa totanus* Shelduck *Tadorna tadorna* Teal *Anas crecca*.	Public access/ disturbance Changes in species distributions Invasive species Climate change Coastal squeeze Inappropriate scrub control Water pollution Fisheries: commercial marine and estuarine Inappropriate coastal management Overgrazing Direct impact from third party Marine litter Predation Planning permission: general Marine consents and permits Wildfire/ arson Air pollution: impact of atmospheric nitrogen decomposition Transportation and service corridors Physical modification

Table 4: European Sites Vulnerable to Effects Arising from Airspace Change in the WTMA

European Site	Distance from Airport	Summary of Qualifying feature	Existing Threats and Pressures
Avon Gorge Woodlands SAC	Within ZoI of Bristol (8.6km)	Annex I Habitats: 9180 *Tilio-Acerion* forests of slopes, screes and ravines Annex I Habitats (not primary reason for selection of site): 6210 Semi-natural dry grasslands and scrubland facies on calcareous substrates *Festuco-Brometalia*.	Invasive species Undergrazing Public access/ disturbance Disease Changes in species distribution Air pollution: impact of atmospheric nitrogen deposition

European Site	Distance from Airport	Summary of Qualifying feature	Existing Threats and Pressures
Cardiff Beech Woods SAC	Within ZoI of Cardiff (14.9km)	Annex I Habitats: 9130 *Asperulo-Fagetum* beech forests Annex 1 Habitats (not primary reason for selection of site): 9180 *Tilio-Acerion* forests of slopes, screes and ravines are also present.	Interspecific floral relations Invasive non-native species Outdoor sports and leisure activities, recreational activities
Chew Valley Lake SPA	Within ZoI of Bristol (6.2km)	Annex II of non-breeding season populations of: Shoveler *Anas clypeata.*	Hydrological changes Public access/ disturbance
Dawlish Warren SAC	Within ZoI of Exeter (13.1km)	Annex I Habitats: 2190 Humid dune slacks supporting 1395 petalwort *Petalophyllum ralfsii* Other Annex I Habitats present: 2120 Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes) 2130 Fixed coastal dunes with herbaceous vegetation (grey dunes) Annex II species: 1395 Petalwort *Petalophyllum ralfsii* with the dune slacks grazed by rabbits *Oryctolagus cuniculus*.	Public access/ disturbance Changes in species distributions Coastal squeeze Change in land management Public access/ disturbance Fisheries: commercial marine and estuarine
Dunraven Bay SAC	Within ZoI of Cardiff (16.9km)	Annex II species: 1441 Shore dock *Rumex rupestris*	Abiotic (slow) natural processes
East Devon Heaths SPA	Within ZoI of Exeter (4.6km)	Annex I species (breeding): Dartford warbler *Sylvia undata* European nightjar *Caprimulgus europaeus*	Inappropriate scrub control Undergrazing Change in land management Public access/ disturbance Air pollution: impact of atmospheric nitrogen deposition Water pollution Hydrological changes
East Devon Pebblebed Heaths SAC	Within ZoI of Exeter (4.4km)	Annex I Habitats: 4010 Northern Atlantic wet heaths with Erica tetralix including Annex II 1044 Southern damselfly *Coenagrion mercuriale*. European nightjar *Caprimulgus europaeus*, Eurasian hobby *Falco subbuteo* and Dartford warbler *Sylvia undata* can all be found. 4030 European dry heaths Annex II species: 1044 Southern damselfly *Coenagrion mercuriale*	Inappropriate scrub control Undergrazing Change in land management Public access/ disturbance Air pollution: impact of atmospheric nitrogen deposition Water pollution Hydrological changes

European Site	Distance from Airport	Summary of Qualifying feature	Existing Threats and Pressures
Exe Estuary Ramsar	Within ZoI of Exeter (6km)	Criterion 5: Important waterfowl assembelages Criterion 6: Qualifying Species/populations (as identified at designation): Dark-bellied brent goose *Branta bernicla* Species/populations identified subsequent to designation for possible future consideration under criterion 6. Black-tailed godwit *Limosa limosa islandica*	No factors reported.
Exe Estuary SPA/ Ramsar	Within ZoI of Exeter (6km)	Annex I species: Avocet *Recurvirostra avosetta* Slavonian grebe *Podiceps auritus* Article 4.2 Annex II species: Black-tailed Godwit *Limosa limosa islandica* Dunlin *Calidris alpina alpine* Lapwing *Vanellus vanellus* Grey Plover *Pluvialis squatarola* Oystercatcher *Haematopus ostralegus* Red-breasted Merganser *Mergus serrator* Wigeon *Anas Penelope* Dark-bellied Brent Goose *Branta bernicla bernicla* Cormorant *Phalacrocorax carbo* Avocet *Recurvirostra avosetta* Horned grebe *Podiceps auritus* Waterfowl population	Public access/ disturbance Changes in species distributions Coastal squeeze Change in land management Public access/ disturbance Fisheries: commercial marine and estuarine
Mendip Limestone Grasslands SAC	Within ZoI of Bristol (10.8km)	Annex I Habitats: 6210 Semi-natural dry grasslands and scrubland facies on calcareous substrates *Festuco-Brometalia* Other qualifying features: 4030 European dry heaths 8310 Caves not open to the public 9180 *Tilio-Acerion* forests of slopes, screes and ravines Annex II species (but not primary reason for site selection): 1304 Greater horseshoe bat *Rhinolophus ferrumequinum*.	Inappropriate scrub control Change in land management Disease Air pollution; impact of atmospheric nitrogen deposition

European Site	Distance from Airport	Summary of Qualifying feature	Existing Threats and Pressures
Mendip Woodlands SAC	Within ZoI of Bristol (10.1km)	9180 *Tilio-Acerion* forests of slopes, screes and ravines The site is in the centre of the range of common dormouse *Muscardinus avellanarius* and holds a large population of this species.	Vehicles: illicit Deer Disease Air pollution: impact of atmospheric nitrogen deposition
North Somerset & Mendip Bats SAC	Within ZoI of Bristol (2km)	Annex I Habitats: 6210 Semi-natural dry grasslands and scrubland facies on calcareous substrates *Festuco-Brometalia* 9180 *Tilio-Acerion* forests of slopes, screes and ravines Other qualifying features: 8310 Caves not open to the public Annex II species: 1303 Lesser horseshoe bat *Rhinolophus hipposideros* 1304 Greater horseshoe bat *Rhinolophus ferrumequinum*	Undergrazing Planning permission: general Change to site conditions Forestry and woodland management Disease Air pollution: impact of atmospheric nitrogen deposition
Severn Estuary (England) Ramsar	Within ZoI of Cardiff (15.9km) Within ZoI of Bristol (10.7km)	Criterion 1: H1110 Sandbanks which are slightly covered by sea water all the time H1130 Estuaries H1140 Mudflats and sandflats not covered by seawater at low tide H1330 Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) Criterion 3: Due to unusual estuarine communities, reduced diversity and high productivity. Criterion 4: Important for the run of migratory fish between sea and river via estuary. Species include Salmon *Salmo salar*, sea trout *S. trutta*, sea lamprey *Petromyzon marinus*, river lamprey *Lampetra fluviatilis*, allis shad *Alosa alosa*, twaite shad *A. fallax*, and eel *Anguilla anguilla*. It is also of particular importance for migratory birds during spring and autumn. Criterion 5: Winter waterfowl assemblage Criterion 6: Qualifying Species/populations (as identified at designation):	Recreational/tourism disturbance

European Site	Distance from Airport	Summary of Qualifying feature	Existing Threats and Pressures
		Tundra swan *Cygnus columbianus bewickii* Greater white-fronted goose *Anser albifrons* Common shelduck *Tadorna tadorna* Gadwall *Anas strepera* Dunlin *Calidris alpina* Common redshank *Tringa totanus* Species/populations identified subsequent to designation for possible future consideration under criterion 6. Species regularly supported during the breeding season: Lesser black-backed gull *Larus fuscus graellsii* Species with peak counts in winter: Eurasian teal *Anas crecca* Northern pintail *Anas acuta* <u>Criterion 8:</u> The fish of the whole estuarine and river system is one of the most diverse in Britain, with over 110 species recorded. Salmon *Salmo salar*, sea trout *S. trutta*, sea lamprey *Petromyzon marinus*, river lamprey *Lampetra fluviatilis*, allis shad *Alosa alosa*, twaite shad *A. fallax*, and eel *Anguilla anguilla* use the Severn Estuary as a key migration route to their spawning grounds in the many tributaries that flow into the estuary. The site is important as a feeding and nursery ground for many fish species particularly allis shad *Alosa alosa* and twaite shad *A. fallax* which feed on mysid shrimps in the salt wedge.	
Severn Estuary (England) SAC	Within ZoI of Cardiff (11.8km) Within ZoI of Bristol (10.7km)	Annex I Habitats: 1130 Estuaries 1140 Mudflats and sandflats not covered by seawater at low tide 1330 Atlantic salt meadows *Glauco-Puccinellietalia maritimae* Annex 1 Habitats (not primary reason for selection of site): 1110 Sandbanks which are slightly covered by sea water all the time	Public access/ disturbance Physical modification Impacts of development Coastal squeeze Change in land management Changes in species distributions Water pollution Air pollution: impact of atmospheric nitrogen decompositon Marine consents and permits:

European Site	Distance from Airport	Summary of Qualifying feature	Existing Threats and Pressures
		1170 Reefs Annex II species: 1095 Sea lamprey *Petromyzon marinus* 1099 River lamprey *Lampetra fluviatilis* 1103 Twaite shad *Alosa fallax*	minerals and waste Fisheries: recreational marine and estuarine Fisheries: commercial marine and estuarien Invasive species Marine litter Marine pollution incidents
Severn Estuary (England) SPA	Within ZoI of Cardiff (11.9km) Within ZoI of Bristol (10.7km)	Annex II non-breeding species: Bewick's swan *Cygnus columbianus bewickii* Curlew *Numenius arquat* Dunlin *Calidris alpina alpine* Pintail *Anas acuta* Redshank *Tringa totanus* Shelduck *Tadorna tadorna* Ringed plover *Charadrius hiaticula* (on passage) Gadwall *Anas strepera* Greater white-fronted goose *Anser albifrons albifrons* Waterbird assemblages	Public access/ disturbance Physical modification Impacts of development Coastal squeeze Change in land management Changes in species distributions Water pollution Air pollution: impact of atmospheric nitrogen decompositon Marine consents and permits: minerals and waste Fisheries: recreational marine and estuarine Fisheries: commercial marine and estuarien Invasive species Marine litter Marine pollution incidents
Severn Estuary (Wales) Ramsar	Within ZoI of Cardiff (8.7km) Within ZoI of Bristol (10.8km)	<u>Criterion 1:</u> H1110 Sandbanks which are slightly covered by sea water all the time H1130 Estuaries H1140 Mudflats and sandflats not covered by seawater at low tide H1330 Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) <u>Criterion 3:</u> Due to unusual estuarine communities, reduced diversity and high productivity. <u>Criterion 4:</u> Important for the run of migratory fish between sea and river via estuary. Species include Salmon *Salmo salar*, sea trout *S. trutta*, sea lamprey *Petromyzon marinus*, river lamprey *Lampetra fluviatilis*, allis shad *Alosa alosa*, twaite shad *A. fallax*, and eel *Anguilla anguilla*. It is also of particular importance for migratory birds during spring	Recreational/tourism disturbance

European Site	Distance from Airport	Summary of Qualifying feature	Existing Threats and Pressures
		and autumn. Criterion 5: Winter waterfowl assemblage Criterion 6: Qualifying Species/populations (as identified at designation): Tundra swan *Cygnus columbianus bewickii* Greater white-fronted goose *Anser albifrons* Common shelduck *Tadorna tadorna* Gadwall *Anas strepera* Dunlin *Calidris alpina* Common redshank *Tringa totanus* Species/populations identified subsequent to designation for possible future consideration under criterion 6. Species regularly supported during the breeding season: Lesser black-backed gull *Larus fuscus graellsii* Species with peak counts in winter: Eurasian teal *Anas crecca* Northern pintail *Anas acuta* Criterion 8: The fish of the whole estuarine and river system is one of the most diverse in Britain, with over 110 species recorded. Salmon *Salmo salar*, sea trout *S. trutta*, sea lamprey *Petromyzon marinus*, river lamprey *Lampetra fluviatilis*, allis shad *Alosa alosa*, twaite shad *A. fallax*, and eel *Anguilla anguilla* use the Severn Estuary as a key migration route to their spawning grounds in the many tributaries that flow into the estuary. The site is important as a feeding and nursery ground for many fish species particularly allis shad *Alosa alosa* and twaite shad *A. fallax* which feed on mysid shrimps in the salt wedge.	
Severn Estuary (Wales) SAC	Within ZoI of Cardiff (11.1km) Within ZoI of Bristol (10.7km)	Annex I Habitats: 1130 Estuaries 1140 Mudflats and sandflats not covered by seawater at low tide 1330 Atlantic salt meadows	Human induced changes in hydraulic conditions Changes in abiotic conditions Modification of cultivation practices

European Site	Distance from Airport	Summary of Qualifying feature	Existing Threats and Pressures
		G*lauco-Puccinellietalia maritimae* Annex 1 Habitats (not primary reason for selection of site): 1110 Sandbanks which are slightly covered by sea water all the time 1170 Reefs Annex II species: 1095 Sea lamprey *Petromyzon marinus* 1099 River lamprey *Lampetra fluviatilis* 1103 Twaite shad *Alosa fallax*	Other urbanisation, industrial and similar activities Outdoor sports and leisure activities, recreational activities
Severn Estuary (Wales) SPA	Within ZoI of Cardiff (8.7km) Within ZoI of Bristol (10.7km)	Annex II non-breeding species: Bewick's swan *Cygnus columbianus bewickii* Curlew *Numenius arquat* Dunlin *Calidris alpina alpine* Pintail *Anas acuta* Redshank *Tringa totanus* Shelduck *Tadorna tadorna* Ringed plover *Charadrius hiaticula* (on passage) Gadwall *Anas strepera* Greater white-fronted goose *Anser albifrons albifrons* Waterbird assemblages	
Sidmouth to West Bay SAC	Within ZoI of Exeter (13.4km)	Annex I Habitats: 1230 Vegetated sea cliffs of the Atlantic and Baltic Coasts 9180 *Tilio-Acerion* forests of slopes, screes and ravines Annex I (not primary reason for selection of site): 1210 Annual vegetation of drift lines	Invasive species Disease Direct impact from third party Planning permission: general Water pollution Vehicles Habitat fragmentation Inappropriate coastal management Air pollution: impact of atmospheric nitrogen deposition

Table 5: European Sites Vulnerable to Effects Arising from Airspace Change in the LTMA

European Site	Distance from Airport	Summary of Qualifying feature	Existing Threats and Pressures
Ashdown Forest SAC	Within ZoI of Gatwick (13km)	Annex I Habitats: 4010 Northern Atlantic wet heaths with *Erica tetralix* The site supports important assemblages of beetles, dragonflies, damselflies and butterflies, including the nationally rare silver-studded blue *Plebejus argus* and birds of European importance, such as: European nightjar *Caprimulgus europaeus* Dartford warbler *Sylvia undata* Eurasian hobby *Falco subbuteo*. 4030 European dry heaths Annex II species present, but not primary reason for selection of site: 1166 Great crested newt *Triturus cristatus*	Change in land management Air Pollution: risk of Threat Not yet determined atmospheric nitrogen deposition Public access/ disturbance Hydrological changes
Ashdown Forest SPA	Within ZoI of Gatwick (13km)	Annex II species: European nightjar *Caprimulgus europaeus* Dartford warbler *Sylvia undata*	Change in land management Air Pollution: risk of Threat Not yet determined atmospheric nitrogen deposition Public access/ disturbance Hydrological changes
Avon Valley Ramsar	Within ZoI of Bournemouth (1.2km)	<u>Criterion 1a:</u> The site shows a greater range of habitats than any other chalk river in Britain, including fen, mire, lowland wet grassland and small areas of woodland. <u>Criterion 2a:</u> The site supports a diverse assemblage of wetland flora and fauna including several nationally-rare species. <u>Criterion 3c:</u> Over winter the site regularly supports internationally important populations of Gadwell *Anas strepera*	Drainage/ reclamation for agriculture Water extraction
Avon Valley SPA	Within ZoI of Bournemouth (1.2km)	Annex II species: Gadwell *Anas strepera* Bewick's swan *Cygnus columbianus bewickii*	Pollution to surface waters (limnic & terrestrial, marine & brackish) Human induced changes in hydraulic conditions Changes in biotic conditions

European Site	Distance from Airport	Summary of Qualifying feature	Existing Threats and Pressures
Benfleet and Southend Marshes Ramsar	Within ZoI of London Southend (3.1km)	Criterion 6: internationally important wintering populations of the following migratory waterfowl species: Dark-bellied Brent goose *Branta bernicla bernicla* Grey plover *Pluvialis squatarola* Red knot *Calidris canutus* Common ringed plover *Charadrius hiaticula* Dunlin *Calidris alpina alpina* Criterion 5 The site is regularly host to over 20,000 waterfowl in winter.	Erosion Pollution – domestic sewage Pollution – unspecified Recreational/ tourism disturbance (unspecified)
Benfleet and Southend Marshes SPA	Within ZoI of London Southend (3.1km)	Annex II species: Dark-bellied Brent goose *Branta bernicla bernicla* Dunlin *Calidris alpina alpina* Red knot *Calidris canutus* Common ringed plover *Charadrius hiaticula* Grey plover *Pluvialis squatarola*	Coastal squeeze Public access/ disturbance Invasive species Changes in species distributions Fisheries: commercial marine and estuarine Invasive speices Vehicles: illicit Air Pollution: risk of Threat Not yet determined atmospheric nitrogen deposition
Blackwater Estuary (Mid-Essex Coast Phase 4) Ramsar	Within ZoI of London Southend (13.4km)	Criterion 1: Qualifies by virtue of the extent and diversity of saltmarsh habitat present. This site, and the four others in the Mid-Essex Coast complex, includes a total of 3,237 ha that represent 70% of the saltmarsh habitat in Essex and 7% of the total area of saltmarsh in Britain. Criterion 2 The site is an important feeding resources for wintering waterbirds including endangered species such as: Northern lapwing *Vanellus vanellus* Great northern loon *Gavia immer*. A stable population of otters *Lutra lutra* can also be found. Criterion 3: This site supports a full and representative sequences of saltmarsh plant communities covering the range of variation in	Erosion Pollution – agricultural fertilisers

European Site	Distance from Airport	Summary of Qualifying feature	Existing Threats and Pressures
		Britain. Criterion 5: Waterfowl assemblages. Criterion 6: Qualifying Species/populations (as identified at designation): Wintering species: Dark-bellied brent goose *Branta bernicla* Grey plover *Pluvialis squatarola* Dunlin *Calidris alpina* Black-tailed godwit *Limosa limosa islandica*	
Blackwater Estuary (Mid-Essex Coast Phase 4) SPA	Within ZoI of London Southend (13.4km)	Annex II breeding species: Common Pochard *Aythya ferina* Dark-bellied Brent goose *Branta bernicla bernicla* Common ringed plover *Charadrius hiaticula* Little tern *Sterna albifrons* Non-breeding: Dunlin *Calidris alpina alpina* Hen harrier *Circus cyaneus* Black-tailed godwit *Limosa limosa islandica* Grey plover *Pluvialis squatarola*	Coastal squeeze Public access/ disturbance Fisheries: commercial marine and estuarine Planning permission: general Changes in species distributions Invasive species Fisheries: recreational marine and estuarine Fisheries: commercial marine and estuarine Invasive species Air Pollution: risk of Threat Not yet determined atmospheric nitrogen deposition
Blean Complex SAC	Within ZoI of Manston (11.5km)	Annex 1 habitat 9160 Sub-Atlantic and medio-European oak or oak-hornbeam forests of the *Carpinion betuli*	Air Pollution: risk of Threat Not yet determined atmospheric nitrogen deposition
Burnham Beeches SAC	Within ZoI of Heathrow (12.5km) Within ZoI of RAF Northholt (13.4km)	Annex I Habitats: 9120 Atlantic acidophilous beech forests with Ilex and sometimes also Taxus in the shrublayer *Quercion robori-petraeae or Ilici-Fagenion*	Air Pollution: risk of Threat Not yet determined atmospheric nitrogen deposition Public access/ disturbance Habitat fragmentation Deer Species decline Invasive species
Chilterns Beechwoods SAC	Within ZoI of Luton (13.2km)	Annex I Habitats: 9130 Asperulo-Fagetum beech forests Annex I habitats present, but not primary reason for selection of site: 6210 Semi-natural dry grasslands and scrubland facies on calcareous substrates *Festuco-Brometalia* A distinctive	Forestry and woodland management Deer Changes in species distributions Invasive species Disease Public access/ disturbance Air Pollution: risk of Threat Not yet determined atmospheric nitrogen deposition

European Site	Distance from Airport	Summary of Qualifying feature	Existing Threats and Pressures
		feature in the woodland flora is the occurrence of the rare coralroot *Cardamine bulbifera.* Annex II species present, but not primary reason for selection of site: 1083 Stag beetle *Lucanus cervus*	
Crouch & Roach Estuaries (Mid-Essex Coast Phase 3) Ramsar	Within ZoI of London Southend (1.8km)	<u>Criterion 2</u> The Dark-bellied Brent Goose *Branta bernicla bernicla* (important wintering bird), occurs in internationally important numbers, and three other species of wader and wildfowl occur in nationally important numbers. The site supports a diversity of aquatic and terrestrial invertebrates such as: Damselfly *Lestes dryas* (vulnerable) Beetle *Graptodytes bilineatus* (rare) Ground lackey *Malacosoma castrensis Eucosma catoptrana* and an outstanding assemblage of nationally scarce plants including: Soft hornwort *Ceratophyllum submersum* Sea barley *Hordeum marinum*, Sea lavender *Limonium humile* Tiny mousetail *Myosurus minimus* Curved hard-grass *Parapholis incurva* Shrubby seablight *Suaeda vera* Sea clover *Trifolium squamosum* <u>Criterion 5:</u> Waterfowl assemblages. <u>Criterion 6:</u> Dark-bellied Brent goose *Branta bernicla*	Erosion Persistent drought
Crouch & Roach Estuaries (Mid-Essex Coast Phase 3) SPA	Within ZoI of London Southend (1.8km)	Annex II species: A046a Dark-bellied brent goose *Branta bernicla bernicla* (Non-breeding) Waterbird assemblage	Coastal squeeze Public access/ disturbance Fisheries: commercial marine and estuarine Planning permission: general Changes in species distributions Invasive species

European Site	Distance from Airport	Summary of Qualifying feature	Existing Threats and Pressures
			Fisheries: recreational marine and estuarine Fisheries: commercial marine and estuarine Invasive species Air Pollution: risk of Threat Not yet determined atmospheric nitrogen deposition
Dengie (Mid-Essex Coast Phase 1) Ramsar	Within ZoI of London Southend (15.6km)	Criterion 1: Qualifies by virtue of the extent and diversity of saltmarsh habitat present. Dengie, and the four other sites in the Mid-Essex Coast Ramsar site complex, includes a total of 3,237 ha, that represent 70% of the saltmarsh habitat in Essex and 7% of the total area of saltmarsh in Britain. Criterion 2 The site supports internationally and nationally important populations of wintering wildfowl and waders. In summer the range of breeding coastal birds includes rare species. Criterion 5 Waterfowl assemblages. Criterion 6: Dark-bellied Brent goose *Branta bernicla* Grey plover *Pluvialis squatarola* Red knot *Calidris canutus*	Erosion
Dengie (Mid-Essex Coast Phase 1) SPA	Within ZoI of London Southend (15.6km)	Annex II non-breeding species: Dark-bellied Brent goose *Branta bernicla* Hen harrier *Circus cyaneus* Grey plover *Pluvialis squatarola* Red knot *Calidris canutus*	Coastal squeeze Public access/ disturbance Fisheries: commercial marine and estuarine Planning permission: general Changes in species distributions Invasive species Fisheries: recreational marine and estuarine Fisheries: commercial marine and estuarine Invasive species Air Pollution: risk of Threat Not yet determined atmospheric nitrogen deposition
Dorset Heathlands Ramsar	Within ZoI of Bournemouth (<0.01km)	Criterion 1a: Contains particularly good examples of (i) northern Atlantic wet heaths with cross-leaved heath *Erica tetralix* and (ii) acid	Commercial scale forest exploitation Habitat burning Vegetation succession Introduction/ invasion of exotic plant

European Site	Distance from Airport	Summary of Qualifying feature	Existing Threats and Pressures
		mire with *Rhynchosporion*. Criterion 1d: Contains largest example in Britain of southern Atlantic wet heaths with Dorest heath *Erica ciliaris* and cross-leaved heath *Ericia tetralix*. Criterion 2a: Supports 1 nationally rare and 13 nationally scarce wetland plant species, and at least 28 nationally rare wetland invertebrate species. Criterion 2b: Has a high species richness and high ecological diversity of wetland habitat types and transitions, and lies in one of the most biologically rich wetland areas of lowland Britain being continuous with threes other Ramsar sites: Poole Harbour, Avon Valley and New Forest.	species Pollution – unspecified Recreational/ tourism disturbance (unspecified) Mining exploitation/ exploration
Dorset Heaths SAC	Within boundary of Bournemouth Airport	Annex I Habitats: 4010 Northern Atlantic wet heaths with *Erica tetralix* 4030 European dry heaths 7150 Depressions on peat substrates of the *Rhynchosporion* Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site: 6410 Molinia meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*) 7210 Calcareous fens with *Cladium mariscus* and species of the *Caricion davallianae* 7230 Alkaline fens 9190 Old acidophilous oak woods with *Quercus robur* on sandy plains Annex II species that are a primary reason for selection of this site: 1044 Southern damselfly	Biocenotic evolution, succession Invasive non-native species Outdoor sports and leisure activities, recreational activities Grazing Human induced changes in hydraulic conditions

European Site	Distance from Airport	Summary of Qualifying feature	Existing Threats and Pressures
		Coenagrion mercurial Annex II species present as a qualifying feature, but not a primary reason for site selection: 1166 Great crested newt *Triturus cristatus*	
Dorset Heathlands SPA	Within boundary of Bournemouth Airport	Annex II species: Nightjar *Caprimulgus Europaeus* Hen Harrier *Circus cyaneus* Merlin *Falco columbarius* Woodlark *Lullula arborea* Dartford Warbler *Sylvia undata*	Outdoor sports and leisure activities, recreational activities Invasive non-native species Grazing Human induced changes in hydraulic conditions Biocenotic evolution, succession
Dorset Heaths (Purbeck & Wareham) & Studland Dunes SAC	Within ZoI of Bournemouth (12.5km)	Annex I habitats that are a primary reason for selection of this site: 2110 Embryonic shifting dunes 2120 "Shifting dunes along the shoreline with *Ammophila arenaria* (""white dunes"")" 2150 Atlantic decalcified fixed dunes (*Calluno-Ulicetea*) 2190 Humid dune slacks 3110 Oligotrophic waters containing very few minerals of sandy plains (*Littorelletalia uniflorae*) 4010 Northern Atlantic wet heaths with *Erica tetralix* 4020 Temperate Atlantic wet heaths with *Erica ciliaris* and *Erica tetralix* 4030 European dry heaths 7150 Depressions on peat substrates of the *Rhynchosporion* 91D0 Bog woodland Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site: 6410 Molinia meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*) 7210 Calcareous fens with *Cladium mariscus* and species of the *Caricion davallianae* 7230 Alkaline fens 9190 Old acidophilous oak woods with *Quercus robur* on sandy plains	Biocenotic evolution, succession Outdoor sports and leisure activities, recreational activities Grazing Human induced changes in hydraulic conditions Invasive non-native species

European Site	Distance from Airport	Summary of Qualifying feature	Existing Threats and Pressures
		Annex II species that are a primary reason for selection of this site: 1044 Southern damselfly *Coenagrion mercuriale* Annex II species present as a qualifying feature, but not a primary reason for site selection: 1166 Great crested newt *Triturus cristatus*	
Dover to Kingsdown Cliffs SAC	Within ZoI of Manston (km)	Annex I Habitats: 1230 Vegetated sea cliffs of the Atlantic and Baltic Coasts Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site: 6210 Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia*) (* important orchid sites)	Inappropriate scrub control Undergrazing Air pollution: impact of atmospheric nitrogen deposition
East Hampshire Hangers SAC	Within ZoI of Farnborough (13.6km)	Annex I Habitats: 9130 *Asperulo-Fagetum* beech forests 9180 *Tilio-Acerion* forests of slopes, screes and ravines Annex I Habitats (not primary reason for selection of site): 6210 Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia*) 91J0 *Taxus baccata* woods of the British Isles Annex II species (not primary reason for selection of site): 1654 Early gentian *Gentianella anglica*	Air pollution: impact of atmospheric nitrogen decomposition Invasive species Forestry and woodland management
Emer Bog SAC	Within ZoI of Southampton (6.5km)	Annex I Habitats: 7140 Transition mires and quaking bogs	Public access/ disturbance Hydrological control Air Pollution: impact of Pressure atmospheric nitrogen deposition
Epping Forest SAC	Within ZoI of London City (8.1km)	Annex I Habitats: 9120 Atlantic acidophilous beech forests with Ilex and sometimes also *Taxus* in the shrublayer (*Quercion robori-petraeae* or *Ilici-Fagenion*) 4010 Northern Atlantic wet heaths with *Erica tetralix* 4030 European dry heaths	Air Pollution: risk of Threat Not yet determined atmospheric nitrogen deposition Undergrazing Public access/ disturbance Changes in species distributions Inappropriate water levels Water pollution

European Site	Distance from Airport	Summary of Qualifying feature	Existing Threats and Pressures
		Annex II species: 1083 g beetle *Lucanus cervus*	Invasive species Disease Invasive species
Essex Estuaries SAC	Within ZoI of London Southend (1.7km)	Annex I Habitats: 1130 Estuaries with species including the reef-building worm *Sabellaria spinulosa*, brittlestar *Ophiothrix fragilis*, crustaceans and ascidians. 1140 Mudflats and sandflats not covered by seawater at low tide 1310 Salicornia and other annuals colonizing mud and sand 1320 Spartina swards *Spartinion maritimae* 1330 Atlantic salt meadows *Glauco-Puccinellietalia maritimae* 1420 Mediterranean and thermo-Atlantic halophilous scrubs *Sarcocornetea fruticosi* Annex I habitats present, but not primary reason for selection of site: 1110 Sandbanks which are slightly covered by sea water all the time.	Coastal squeeze Public access/ disturbance Fisheries: commercial marine and estuarine Planning permission: general Changes in species distributions Invasive species Fisheries: recreational marine and estuarine Fisheries: recreational marine and estuarine Fisheries: commercial marine and estuarine Invasive species Air Pollution: risk of Threat Not yet determined atmospheric nitrogen deposition
Foulness (Mid-Essex Coast Phase 5) Ramsar	Within ZoI of London Southend (5.7km)	Criterion 2 Nationally rare/ scarce plant species and British Red Data Book invertebrates. Criterion 3: The site contains extensive saltmarsh habitat, with areas supporting full and representative sequences of saltmarsh plant communities covering the range of variation in Britain. Criterion 5: Waterfowl assemblages. Criterion 6 Internationally important waterfowl assemblage (greater than 20,000) supporting internationally important number of Bar-taled godwit *Limosa lapponica* Dark-bellied Brent goose *Branta bernicla bernicla* Grey plover *Pluvialis squatarola*	Erosion

European Site	Distance from Airport	Summary of Qualifying feature	Existing Threats and Pressures
		Knot *Calidris canutus* Oystercatcher *Haematous ostralegus* Redshank *Tringa totanus*	
Foulness (Mid-Essex Coast Phase 5) SPA	Within ZoI of London Southend (5.7km)	Annex II species: Dark-bellied Brent goose *Branta bernicla bernicla* Red knot *Calidris canutus* Common ringed plover *Charadrius hiaticula* Hen harrier *Circus cyaneus* European oystercatcher *Haematopus ostralegus* Bar-tailed godwit *Limosa lapponica* Grey plover *Pluvialis squatarola* Pied avocet *Recurvirostra avosetta* Little tern *Sterna albifrons* Common tern *Sterna hirundo* Sandwich tern *Sterna sandvicensis* Redshank *Tringa totanus*	Coastal squeeze Public access/ disturbance Fisheries: commercial marine and estuarine Planning permission: general Changes in species distributions Invasive species Fisheries: recreational marine and estuarine Fisheries: commercial marine and estuarine Invasive species Air Pollution: risk of Threat Not yet determined atmospheric nitrogen deposition
Isle of Portland to Studland Cliffs SAC	Within ZoI of Bournemouth (15.7km)	Annex I Habitats: 6210 Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia*) Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site: 1210 Annual vegetation of drift lines Annex II species that are a primary reason for selection of this site: 1654 Early gentian *Gentianella anglica*	Biocenotic evolution, succession Cultivation Invasive non-native species Outdoor sports and leisure activities, recreational activities Grazing
Lee Valley Ramsar	Within ZoI of Stanstead (17km) Within ZoI of London City (10.2km)	<u>Criterion 2:</u> Whorled water-milfoil *Myriophyllum verticillatum* A Water boatman *Micronecta minutissima* <u>Criterion 6:</u> Shoveler and Gadwall	No factors reported.
Lee Valley SPA	Within ZoI of Stanstead	Annex I Species: Bittern *Botaurus stellaris*	Water pollution Hydrological change

European Site	Distance from Airport	Summary of Qualifying feature	Existing Threats and Pressures
	(17km) Within ZoI of London City (10.2km)	Migratory species: Shoveler *Anas clypeata* Gadwall *Anas strepera*	Public access/ disturbance Inappropriate scrub control Fisheries: stock fishing Invasive species Inappropriate cutting/ mowing Air Pollution: risk of Threat Not yet determined atmospheric nitrogen deposition
Margate and Long Sands SAC	Within ZoI of Manston (6.7km)	Annex I Habitats: 1110 Sandbanks which are slightly covered by sea water all the time with reef-forming ross worm *Sabellaria spinulosa* is found on site.	Fisheries: commercial marine and estuarine
Mole Gap to Reigate Escarpment SAC	Within ZoI of Gatwick (11.2km) Within ZoI of Biggin Hill (17.2km)	Annex I Habitats: 5110 Stable xerothermophilous formations with Buxus sempervirens on rock slopes *Berberidion p.p.* 6210 Semi-natural dry grasslands and scrubland facies on calcareous substrates *Festuco-Brometalia* 5110 Stable xerothermophilous formations with *Buxus sempervirens* on rock slopes 91J0 yew *Taxus baccata* woods Chalk heath (4030 European dry heaths). Annex I habitats present, but not primary reason for selection of site: 4030 European dry heaths 9130 *Asperulo-Fagetum* beech forests Annex II species present, but not primary reason for selection of site: 1166 Great crested newt *Triturus cristatus* 1323 Bechstein's bat *Myotis bechsteinii*	Disease Inappropriate scrub control Change in land management Public access/ disturbance Air Pollution: risk of Threat Not yet determined atmospheric nitrogen deposition
Mottisfont Bats SAC	Within ZoI of Southampton (16.5km)	Annex II species: 1308 Barbastelle *Barbastella barbastellus*	Feature location/ extent/ condition unknown Forestry and woodland management Offsite habitat availability/ management
New Forest Ramsar	Within ZoI of Bournemouth (6.1km) Within ZoI of	Criterion 2 Several species of plants birds occurring at the site are rare, vulnerable, endangered or nationally scarce.	

European Site	Distance from Airport	Summary of Qualifying feature	Existing Threats and Pressures
	Southampton (15.3km)	The site is important for breeding, feeding and roosting birds characteristic of the heathland environment and wintering raptors, with up to 15 hen harriers *Circus cyaneus* feeding or roosting in the area. Criterion 3 The site is also important for its scarce and rare wetland invertebrate fauna.	
New Forest SAC	Within ZoI of Bournemouth (6.1km) Within ZoI of Southampton (10.0km)	Annex I Habitats: 3110 Oligotrophic waters containing very few minerals of sandy plains (*Littorelletalia uniflorae*) 3130 Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or of the *Isoëto-Nanojuncetea* 4010 Northern Atlantic wet heaths with *Erica tetralix* 4030 European dry heaths 6410 Molinia meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae)* 7150 Depressions on peat substrates of the *Rhynchosporion* 9120 Atlantic acidophilous beech forests with Ilex and sometimes also Taxus in the shrublayer (*Quercion robori-petraeae* or *Ilici-Fagenion)* 9130 *Asperulo-Fagetum* beech forests 9190 Old acidophilous oak woods with *Quercus robur* on sandy plains 91D0 Bog woodland 91E0 Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae and Salicion albae*) Annex 1 habitat (not primary reason for selection of site): 7140 Transition mires and quaking bogs 7230 Alkaline fens Annex II species: 1044 Southern damselfly *Coenagrion mercuriale* 1083 Stag beetle *Lucanus*	Drainage Inappropriate scrub control Fish stocking Deer Air Pollution: impact of Pressure atmospheric nitrogen deposition Public access/ disturbance Change in land management Changes in species distributions Water pollution Forestry and woodland management Inappropriate ditch management Invasive species Vehicles Inappropriate cutting/ mowing Direct impact from third party

European Site	Distance from Airport	Summary of Qualifying feature	Existing Threats and Pressures
		cervus Annex 2 species (not primary reason for selection of site): 1166 Great crested newt *Triturus cristatus*	
New Forest SPA	Within ZoI of Bournemouth (6.1km) Within ZoI of Southampton (10.0km)	Annex II species: European nightjar *Caprimulgus europaeus* Hen harrier *Circus cyaneus* Hobby *Falco subbuteo* Woodlark *Lullula arborea* European honey buzzard *Pernis apivorus* Wood warbler *Phylloscopus sibilatrix* Dartford warbler *Sylvia undata*	Human induced changes in hydraulic conditions Biocenotic evolution, succession Air pollution, air-borne pollutants Fishing and harvesting aquatic resources
Outer Thames Estuary SPA	Within ZoI of Manston (4.3km)	Annex II Species: Red-throated loon *Gavia stellata* Little tern *Sterna albifrons* Common tern *Sterna hirundo*	Fisheries: Commercial Pressure marine and estuarine
Poole Harbour Ramsar	Within ZoI of Bournemouth (9.8km)	Criterion 1b: The site is the best and largest example of a bar-built estuary with lagoonal characteristics (a natural Harbour) in Britain Criterion 2a: The site supports two species of nationally rare plant and on nationally rare alga. There are at least three red data book species of invertebrate. Criterion 2b: The site includes examples of natural habitat types of community interest – Mediterranean and thermos Atlantic halophilous scrubs, in this case dominated by *Suaeda vera,* as well as calcareous fens with *Cladium mariscus.* Transitions from saltmarsh through to peatland mires are of exceptional conservation importance as few such examples remain in Britain. Criterion 3a: Internationally important waterfowl assemblage	Drainage / reclamation (unspecified) Dredging Introduction/ invasion of exotic animal and plant species Pollution – domestic sewage Pollution – industrial waste Recreational/tourism disturbance (unspecified) Disturbance from transport/roads Transport infrastructure development Unspecified: development urban use

European Site	Distance from Airport	Summary of Qualifying feature	Existing Threats and Pressures
		Criterion 3b: The site supports nationally important populations of breeding waterfowl Criterion 3c: Internationally important overwintering birds.	
Poole Harbour SPA	Within ZoI of Bournemouth (9.8km)	Annex II species: Little Egret *Egretta garzetta* Mediterranean Gull *Larus melanocephalus* Black-tailed Godwit *Limosa islandica* Eurasian spoonbill *Platalea leucorodia* Pied Avocet *Recurvirostra avosetta* Common Tern *Sterna hirundo* Sandwich Tern *Sterna sandvicensis* Common Shelduck *Tadorna tadnora*	Grazing Pollution to surface waters (limnic & terrestrial, marine & brackish) Exploration and extraction of oil or gas Fishing and harvesting aquatic resources Pollution to surface waters (limnic & terrestrial, marine & brackish) Urbanised areas, human habitation Air pollution, air-borne pollutants Other human intrusions and disturbances Discharges Outdoor sports and leisure activities, recreational activities Shipping lanes, ports, marine constructions
Portsmouth Harbour Ramsar	Within ZoI of Southampton (16.9km)	Criterion 2 The mudflats, supporting extensive beds of eelgrass, green algae, and sea lettuce, provide feeding grounds for internationally important numbers of wintering dark-bellied Brent Geese. A unique and high-quality flora and fauna occur at the site. Nationally important numbers of grey plover, dunlin, and black-tailed godwit are supported.	Public access/ disturbance Coastal squeeze Fisheries: commercial marine and estuarine
Portsmouth Harbour SPA	Within ZoI of Southampton (16.9km)	Annex II species: Brent Geese *Branta bernicla bernicla* Dunlin *Calidris alpina alpina* Black-tailed godwit *Limosa limosa islandica*	Public access/ disturbance Coastal squeeze Fisheries: commercial marine and estuarine Water pollution Changes in species distribution Climate change Change to site conditions Invasive species Direct land take from development Biological resource use

European Site	Distance from Airport	Summary of Qualifying feature	Existing Threats and Pressures
			Change in land management Inappropriate pest control Air pollution: impact of atmospheric nitrogen decomposition Hydrological changes Direct impact from 3rd party Extraction: non-living resources Other
Richmond Park SAC	Within ZoI of Heathrow (9km) Within ZoI of RAF Northolt (13.4km)	Annex II species: 1083 Stag beetle *Lucanus cervus*	No factors recorded.
River Avon SAC	Within ZoI of Bournemouth (4.1km)	Annex I Habitats: 3260 Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation Annex II species: 1016 Desmoulin's whorl snail *Vertigo moulinsiana* 1095 Sea lamprey *Petromyzon marinus* 1096 Brook lamprey *Lampetra planeri* 1106 Atlantic salmon *Salmo salar* 1163 Bullhead *Cottus gobio*	Changes in biotic conditions Pollution to surface waters (limnic & terrestrial, marine & brackish) Human induced changes in hydraulic conditions
River Itchen SAC	Within ZoI of Southampton (0.09km)	Annex I Habitats: 3260 Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation. Annex II species: 1044 Southern damselfly *Coenagrion mercuriale* 1163 Bullhead *Cottus gobio* Annex II species (not primary reason for selection of site): 1092 White-clawed (or Atlantic stream) crayfish *Austropotamobius pallipes* 1096 Brook lamprey *Lampetra planeri* 1106 Atlantic salmon *Salmo salar* 1355 Otter *Lutra lutra*	Water pollution Physical modification Siltation Overgrazing Water abstraction Inappropriate wee control Hydrological changes Inappropriate water levels Change in land management Inappropriate cutting/ mowing Invasive species Undergrazing Inappropriate ditch management Inappropriate scrub control Forestry and woodland management

European Site	Distance from Airport	Summary of Qualifying feature	Existing Threats and Pressures
Sandwich Bay SAC	Within ZoI of Manston (1.2km)	Annex I Habitats: 2110 Embryonic shifting dunes with lyme-grass *Leymus arenarius* and sand couch *Elytrigia juncea* present. 2120 Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes) Shifting dunes along the shoreline containing marram grass *Ammophila arenaria,* sea bindweed *Calystegia soldanella,* sea spurge *Euphorbia paralias and* sea-holly *Eryngium maritimum.* 2130 Fixed coastal dunes with herbaceous vegetation (grey dunes) containing evening-primrose *Oenothera stricta*, bedstraw broomrape *Orobanche caryophyllacea* and sand catchfly *Silene conica*, as well as the UK's largest population of lizard orchid *Himantoglossum hircinum*. 2170 Dunes with Salix repens ssp. argentea *Salicion arenariae* Annex I habitats present, but not primary reason for selection of site: 2190 Humid dune slacks	Changes in species distributions Invasive species Public access/ disturbance Hydrological changes Air Pollution: risk of Threat Not yet determined atmospheric nitrogen deposition Water pollution Fisheries: commercial marine and estuarine
Shortheath Common SAC	Within ZoI of Farnborough (16.9km)	Annex I Habitats: 7140 Transition mires and quaking bogs Annex 1 habitat (not primary reason for selection of site): 4030 European dry heaths 91D0 Bog woodland	Inappropriate scrub control Public access/ disturbance Direct impact from third party Air pollution: impact of atmospheric nitrogen decomposition
Solent & Southampton Water Ramsar	Within ZoI of Southampton (3.0km) Within ZoI of Bournemouth (17.9km)	<u>Criterion 1:</u> The site is one of the few major sheltered channels between a substantial island and mainland in European waters, exhibiting an unusual strong double tidal flow and has long periods of slack water at high and low tide. It includes many wetland habitats characteristic of the biogeographic region: saline lagoons, saltmarshes, estuaries, intertidal flats, shallow coastal waters, grazing marshes, reedbeds, coastal woodland and rocky boulder reefs. <u>Criterion 2:</u>	Erosion

European Site	Distance from Airport	Summary of Qualifying feature	Existing Threats and Pressures
		The site supports an important assemblage of rare plants and invertebrates. At least 33 British Red Data Book invertebrates and at least eight British Red Data Book plants are represented on site. Criterion 5 The site supports internationally important numbers of wintering waterfowl (51,361 over the winter) common ringed plover *Charadrius hiaticula*, and important breeding gull and tern populations. Criterion 6 Supports species of: Black-tailed godwit *Limosa limosa islandica* Dark-bellied brent goose *Branta bernicla bernicla* Eurasian teal *Anas crecca* Criterion 2 The site supports important assemblage of rare plants and invertebrates.	
Solent & Southampton Water SPA	Within ZoI of Southampton (3.5km) Within ZoI of Bournemouth (17.9km)	Supports breeding: Common tern *Sterna hirundo* Little tern *Sterna albifrons* Mediterranean gull *Larus melanocephalus* Roseate tern *Sterna dougallii* Sandwich tern *Sterna sandvicensis*. And overwintering: Black-tailed godwit *Limosa limosa islandic* Dark-bellied brent goose *Branta bernicla bernicla* Ringed plover *Charadrius hiaticula* Teal *Anas crecca*	Public access/ disturbance Coastal squeeze Fisheries: commercial marine and estuarine Water pollution Changes in species distribution Climate change Change to site conditions Invasive species Direct land take from development Biological resource use Change in land management Inappropriate pest control Air pollution: impact of atmospheric nitrogen decomposition Hydrological changes Direct impact from 3rd party Extraction: non-living resources Other
Solent and Dorset Coast SPA	Within ZoI of Southampton (1.1km)	Annex II breeding species of: Sandwich tern *Sterna sandvicensis* Common tern *Sterna hirundo* Little tern *Sternula albifrons*	Public access/ disturbance Coastal squeeze Fisheries: commercial marine and estuarine Water pollution

European Site	Distance from Airport	Summary of Qualifying feature	Existing Threats and Pressures
			Changes in species distribution Climate change Change to site conditions Invasive species Direct land take from development Biological resource use Change in land management Inappropriate pest control Air pollution: impact of atmospheric nitrogen decomposition Hydrological changes Direct impact from 3rd party Extraction: non-living resources Other
Solent Maritime SAC	Within ZoI of Southampton (7.4km)	Annex I Habitats: 1130 Estuaries 1320 Spartina swards (*Spartinion maritimae*) 1330 Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) 1110 Sandbanks which are slightly covered by sea water all the time 1140 Mudflats and sandflats not covered by seawater at low tide 1150 Coastal lagoons 1210 Annual vegetation of drift lines 1220 Perennial vegetation of stony banks 1310 Salicornia and other annuals colonizing mud and sand 2120 Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes) Annex II species (not primary reason for selection of site): 1016 Desmoulin's whorl snail *Vertigo moulinsiana*	Public access/ disturbance Coastal squeeze Fisheries: commercial marine and estuarine Water pollution Changes in species distribution Climate change Change to site conditions Invasive species Direct land take from development Biological resource use Change in land management Inappropriate pest control Air pollution: impact of atmospheric nitrogen decomposition Hydrological changes Direct impact from 3rd party Extraction: non-living resources
South West London Waterbodies Ramsar	Within ZoI of Heathrow (0.7km) Within ZoI of RAF Northolt (10.8km)	Criterion 6 Gadwall *Anas strepera* Shoveler *Anas clypeata*	No factors reported.
South West London Waterbodies SPA	Within ZoI of Heathrow (0.7km) Within ZoI of	Annex II species: Gadwall *Anas strepera* Northern shoveler *Anas clypeata*	Public access/ disturbance Changes in species distributions Invasive species

European Site	Distance from Airport	Summary of Qualifying feature	Existing Threats and Pressures
	RAF Northolt (10.8km)		Natural changes to site conditions Fisheries: fish stocking Inappropriate weed control Invasive species
Stodmarsh Ramsar	Within ZoI of Manston (7.7km)	Criterion 2 Sharp leaved pondweed *Potamogeton acutifolius*,e Whorled water-milfoil *Myriophyllum verticillatum* Rootless duckweed *Wolffia arrhiza* and *Carex divisa*. The site finds the presence of otter *Lutra lutra*.	No factors reported.
Stodmarsh SAC	Within ZoI of Manston (7.7km)	Annex II species: 1016 Desmoulin's whorl snail *Vertigo moulinsiana*	Water pollution Invasive species Inappropriate scrub control Air Pollution: risk of Threat Not yet determined atmospheric nitrogen deposition
Stodmarsh SPA	Within ZoI of Manston (7.7km)	Annex 1 listed species: A021 Botaurus stellaris; Great bittern (Non-breeding) A082 Circus cyaneus; Hen harrier (Non-breeding) Qualifying individual species not listed in Annex I of the Wild Birds Directive: Gadwall *Anas strepera* (breeding/ non-breeding) Northern shoveler *Anas clypeata* (non-breeding) Annex II species: Shoveler *Anas clypeata* Wigeon *Anas Penelope* Mallard *Anas platyrhynchos* Gadwall *Anas strepera* Greater white- fronted goose *Anser albifrons albifrons* Common Pochard *Aythya ferina* Tufted duck *Aythya fuligula* Bittern *Botaurus stellaris* Hen harrier *Circus cyaneus* Snipe *Gallinago gallinago* Water rail *Rallus aquaticus* Northern lapwing *Vanellus vanellus* Assemblage of breeding/ non-breeding birds	Water pollution Invasive species Inappropriate scrub control Air Pollution: risk of Threat Not yet determined atmospheric nitrogen deposition

European Site	Distance from Airport	Summary of Qualifying feature	Existing Threats and Pressures
Thames Basin Heaths SPA	Within ZoI of Farnborough (<0.01km) Within ZoI of Heathrow (12km)	Article 4.2 species: Annex II migratory: European nightjar *Caprimulgus europaeus* Woodlark *Lullula arborea* Native: Dartford warbler *Sylvia undata*	Public access/ disturbance Undergrazing Forestry and woodland management Forestry and woodland management Hydrological changes Inappropriate scrub control Invasive species Wildfire/ arson Air pollution: impact of atmospheric nitrogen decomposition Feature location/ extent/ condition unknown Military Habitat fragmentation
Thames Estuary & Marshes Ramsar	Within ZoI of London Southend (8.5km)	Criterion 2 The site supports more than 20 British Red Data Book invertebrates and populations of the GB Red Book endangered Least lettuce *Lactuca saligna* (endangered), as well as Slender hare's-ear *Bupleurum tenuissimum* (vulnerable) Divided sedge *Carex divisa*, Sea barley *Hordeum marinum* Borrer's saltmarsh-grass *Puccinellia fasciculata* Dwarf eelgrass *Zostera noltei* Criterion 5 Wetland regularly supports 20,000 or more waterbirds Criterion 6 Qualifying species: Black-tailed godwit *Limosa limosa islandica* Dunlin *Calidris alpina alpina* Red knot *Calidris canutus*	Dredging Erosion Eutrophication General disturbance from human activities
Thames Estuary & Marshes SPA	Within ZoI of London Southend (8.5km)	Article 4.1 Annex II species: Dunlin *Calidris alpina alpina* Red knot *Calidris canutus* Common ringed plover *Charadrius hiaticula* Hen harrier *Circus cyaneus* Bar-tailed godwit *Limosa lapponica* Grey Plover *Pluvialis squatarola* Avocet *Recurvirostra avosetta*	Coastal squeeze Public access/ disturbance Invasive species Changes in species distributions Fisheries: commercial marine and estuarine Invasive species Vehicles: illicit Air Pollution: risk of Threat Not yet determined atmospheric nitrogen deposition

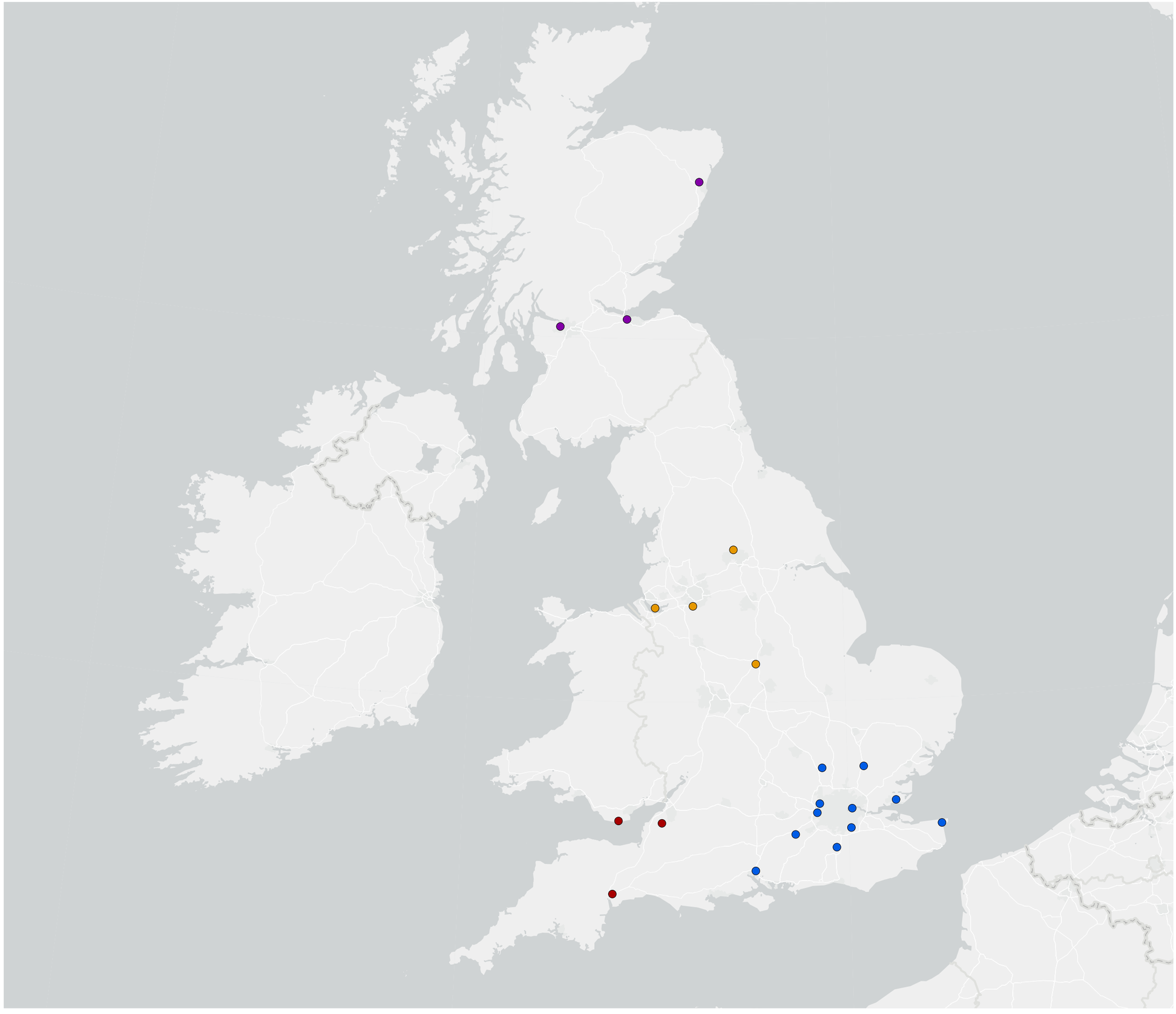
European Site	Distance from Airport	Summary of Qualifying feature	Existing Threats and Pressures
		Redshank *Tringa totanus* Waterbird assemblages	
Thanet Coast & Sandwich Bay Ramsar	Within ZoI of Manston (1.1km)	Criterion 2 Supports 15 British Red Data Book wetland invertebrates. Criterion 6: Wintering: Ruddy Turnstone *Arenaria interpres*	Vegetation succession Water diversion for irrigation/ domestic/ industrial use Eutrophication Pollution – pesticides/agricultural runoff Recreational / tourism disturbance (unspecified) Unspecified development: urban use
Thanet Coast & Sandwich Bay SPA	Within ZoI of Manston (1.1km)	Annex II species: Turnstone *Arenaria interpres* European golden plover *Pluvialis apricaria* Little tern *Sterna albifrons*	Changes in species distributions Invasive species Public access/ disturbance Hydrological changes Air Pollution: risk of Threat Not yet determined atmospheric nitrogen deposition Water pollution Fisheries: commercial marine and estuarine
Thanet Coast SAC	Within ZoI of Manston (1.4km)	Annex I Habitats: 1170 Reefs 8330 Submerged or partially submerged sea caves supporting very specialised algal and lichen communities containing species such as *Pseudendoclonium submarinum* and *Lyngbya spp*.	Changes in species distributions Invasive species Public access/ disturbance Hydrological changes Air Pollution: risk of Threat Not yet determined atmospheric nitrogen deposition Water pollution Fisheries: commercial marine and estuarine
Thursley & Ockley Bogs Ramsar	Within ZoI of Farnborough (11.7km)	Criterion 2 Supports rare wetland invertebrates including notable number of breeding dragonflies Criterion 3 Supports all six native reptile species European nightjar Caprimulgus europaeus Woodlark *Lullula arborea*	No factors reported.
Thursley, Ash, Pirbright & Chobham SAC	Within ZoI of Farnborough (2.8km) Within ZoI of Heathrow (11.6km)	Annex I Habitats: 4010 Northern Atlantic wet heaths with *Erica tetralix* 4030 European dry heaths 7150 Depressions on peat substrates of the *Rhynchosporion*	Public access/ disturbance Undergrazing Forestry and woodland management Forestry and woodland management Hydrological changes Inappropriate scrub control Invasive species

European Site	Distance from Airport	Summary of Qualifying feature	Existing Threats and Pressures
			Wildfire/ arson Air pollution: impact of atmospheric nitrogen decomposition Feature location/ extent/ condition unknown Military Habitat fragmentation
Thursley, Hankley & Frensham Commons SPA	Within ZoI of Farnborough (10.4km)	Article 4.2 Annex II species: Migratory: European nightjar *Caprimulgus europaeus* Woodlark *Lullula arborea* Native: Dartford warbler *Sylvia undata*	Public access/ disturbance Undergrazing Forestry and woodland management Forestry and woodland management Hydrological changes Inappropriate scrub control Invasive species Wildfire/ arson Air pollution: impact of atmospheric nitrogen decomposition Feature location/ extent/ condition unknown Military Habitat fragmentation
Wealden Heaths Phase II SPA	Within ZoI of Farnborough (14.8km)	Article 4.2 Annex II species: Migratory: European nightjar *Caprimulgus europaeus* Woodlark *Lullula arborea* Native: Dartford warbler *Sylvia undata*	Change in land management Invasive species Hydrological changes Feature location/ extent/ condition unknown Public access/ disturbance Feature location/ extent/ condition unknown Military Air pollution: impact of atmospheric nitrogen decomposition Wildfire/ arson
Wimbledon Common SAC	Within ZoI of Heathrow (12km) Within ZoI of RAF Northholt (16.4km)	Annex I Habitats: 4010 Northern Atlantic wet heaths with *Erica tetralix* 4030 European dry heaths Annex II species: 1083 Stag beetle *Lucanus cervus*	Forest and Plantation management & use Air pollution, air-borne pollutants Invasive non-native species Other ecosystem modifications
Windsor Forest & Great Park SAC	Within ZoI of Heathrow (6.8km) Within ZoI of RAF Northholt (15.5km) Within ZoI of Farnborough (17km)	Annex I Habitats: 9190 Old acidophilous oak woods with *Quercus robur* on sandy plains Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site: 9120 Atlantic acidophilous	Invasive non-native species Air pollution, air-borne pollutants Interspecific floral relations Forest and Plantation management & use

European Site	Distance from Airport	Summary of Qualifying feature	Existing Threats and Pressures
		beech forests with Ilex and sometimes also Taxus in the shrublayer (*Quercion robori-petraeae* or *Ilici-Fagenion*) Annex II species: 1079 Violet click beetle *Limoniscus violaceus*	

APPENDICES

A. Figures



Esri UK, Esri, HERE, Garmin, FAO, NOAA, USGS

South-East

- Biggin Hill Airport
- Farnborough Airport
- London City Airport
- London Gatwick
- London Heathrow Airport
- London Luton Airport
- London Southend Airport
- Manston Airport
- Northolt Aerodrome
- Southampton Airport
- Stanstead Airport

West

- Bristol International Airport
- Cardiff Airport
- Exeter Airport

North

- East Midlands Airport
- Leeds Bradford International Airport
- Liverpool John Lennon Airport
- Manchester Airport

Scotland

- Aberdeen International Airport
- Edinburgh Airport
- Glasgow Airport

N

0 50 100 200 km

Project Details	WIE19330-101: Airspace Change Masterplan
Figure Title	Figure 1: Airport Locations
Figure Ref	WIE19330-101_GIS_HRA_1A
Date	October 2022
File Location	\\S-BM\WIEL\Projects\WIE19330 CAA ACM SEA and HRA\101 HRA Screening\9_GIS\WIE19330-101_GIS_EC\

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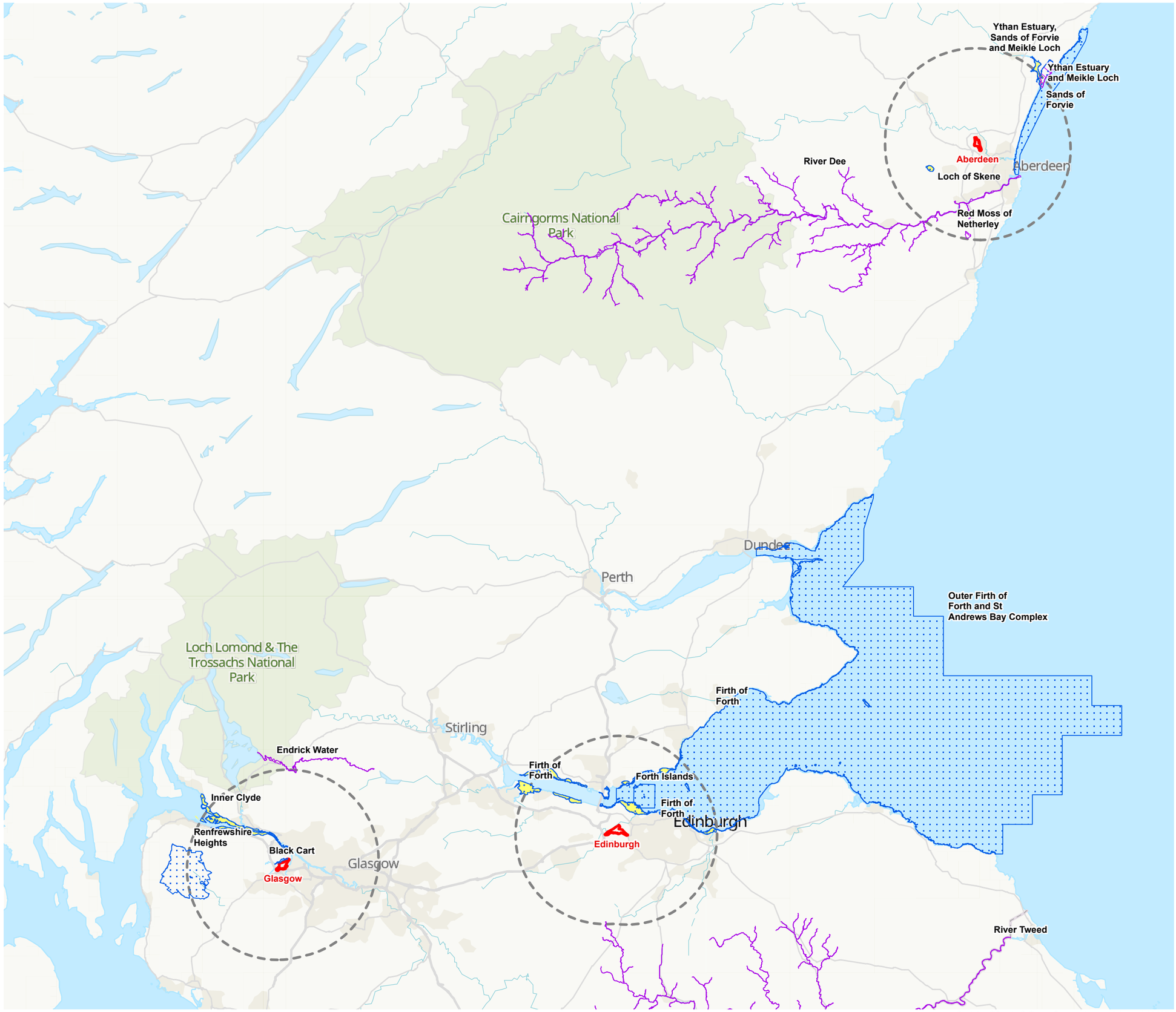

Airport Boundary

Zone of Influence (18km)

Ramsar

Special Areas of Conservation

Special Protection Areas

N

0 10 20 40 km

Project Details	WIE19330-101: Airspace Change Masterplan
Figure Title	Figure 2: European Sites Vulnerable to Effects Arising from the Airspace Change in the STMA
Figure Ref	WIE19330-101_GIS_HRA_2A
Date	November 2022
File Location	\\S-BM\WIEL\Projects\WIE19330 CAA ACM SEA and HRA\101 HRA Screening\9_GIS\WIE19330-101_GIS_EC\

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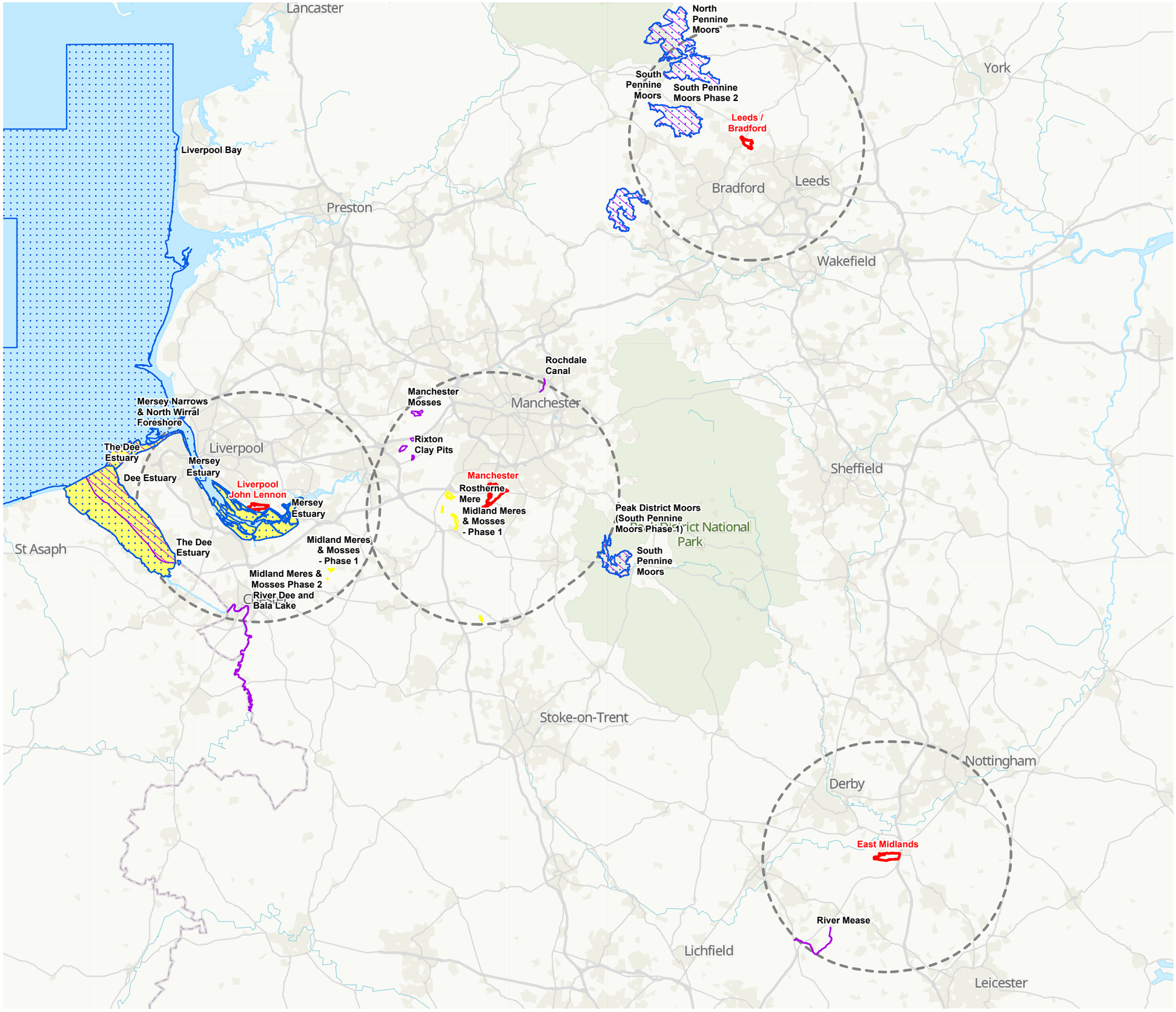

Airport Boundary

Zone of Influence (18km)

Ramsar

Special Areas of Conservation

Special Protection Areas

N

0 5 10 20 30 km

Project Details	WIE19330-101: Airspace Change Masterplan
Figure Title	Figure 3: European Sites Vulnerable to Effects Arising from the Airspace Change in the MTMA
Figure Ref	WIE19330-101_GIS_HRA_3A
Date	November 2022
File Location	\\S-BM\WIEL\Projects\WIE19330 CAA ACM SEA and HRA\101 HRA Screening\9_GIS\WIE19330-101_GIS_EC\

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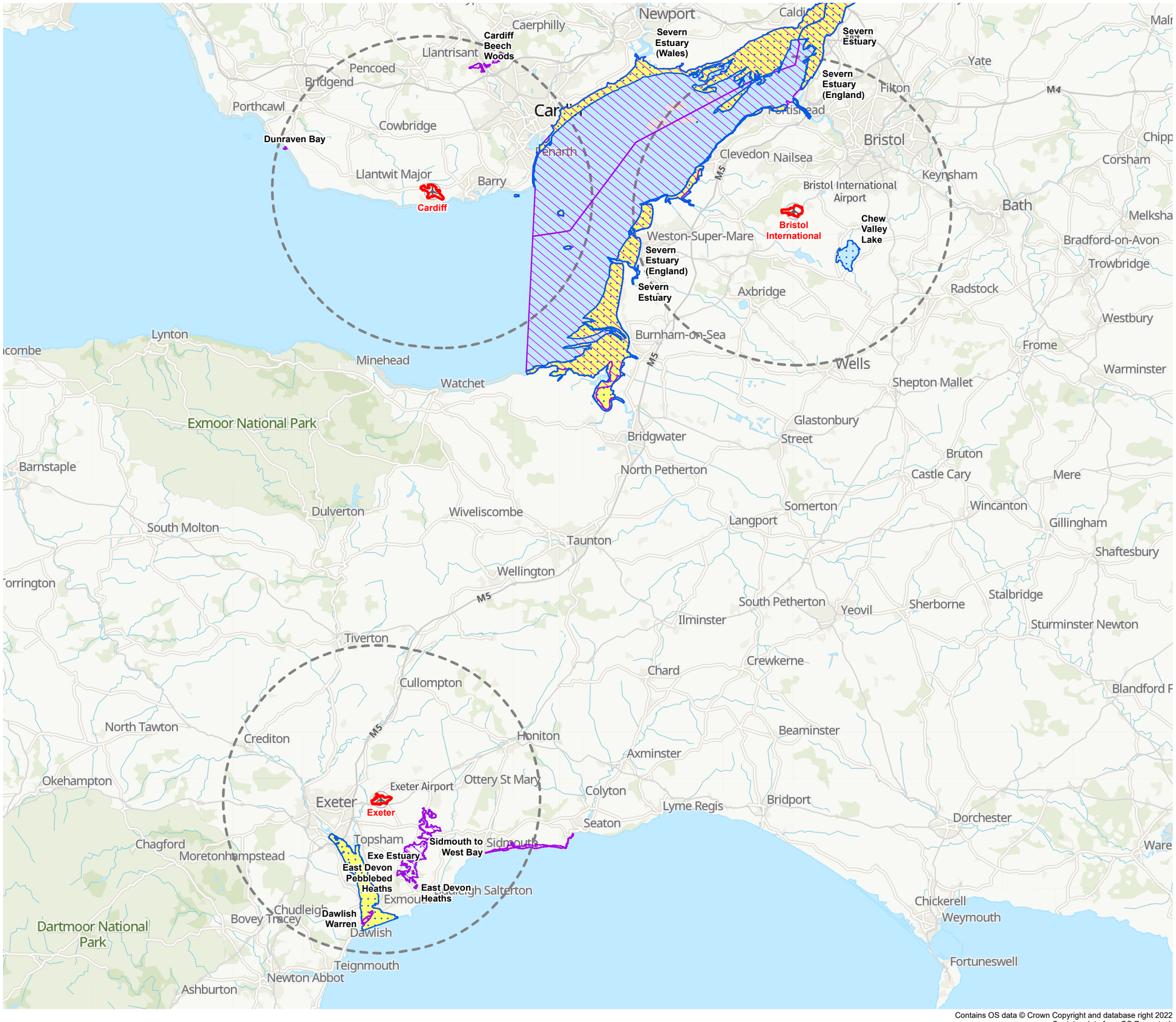

Airport Boundary

Zone of Influence (18km)

Ramsar

Special Areas of Conservation

Special Protection Areas

N

0 2.5 5 10 15 20 km

Project Details	WIE19330-101: Airspace Change Masterplan
Figure Title	Figure 4: European Sites Vulnerable to Effects Arising from the Airspace Change in the WTA
Figure Ref	WIE19330-101_GIS_HRA_4A
Date	November 2022
File Location	\\S-BM\WIEL\Projects\WIE19330 CAA ACM SEA and HRA\101 HRA Screening\9_GIS\WIE19330-101_GIS_EC\

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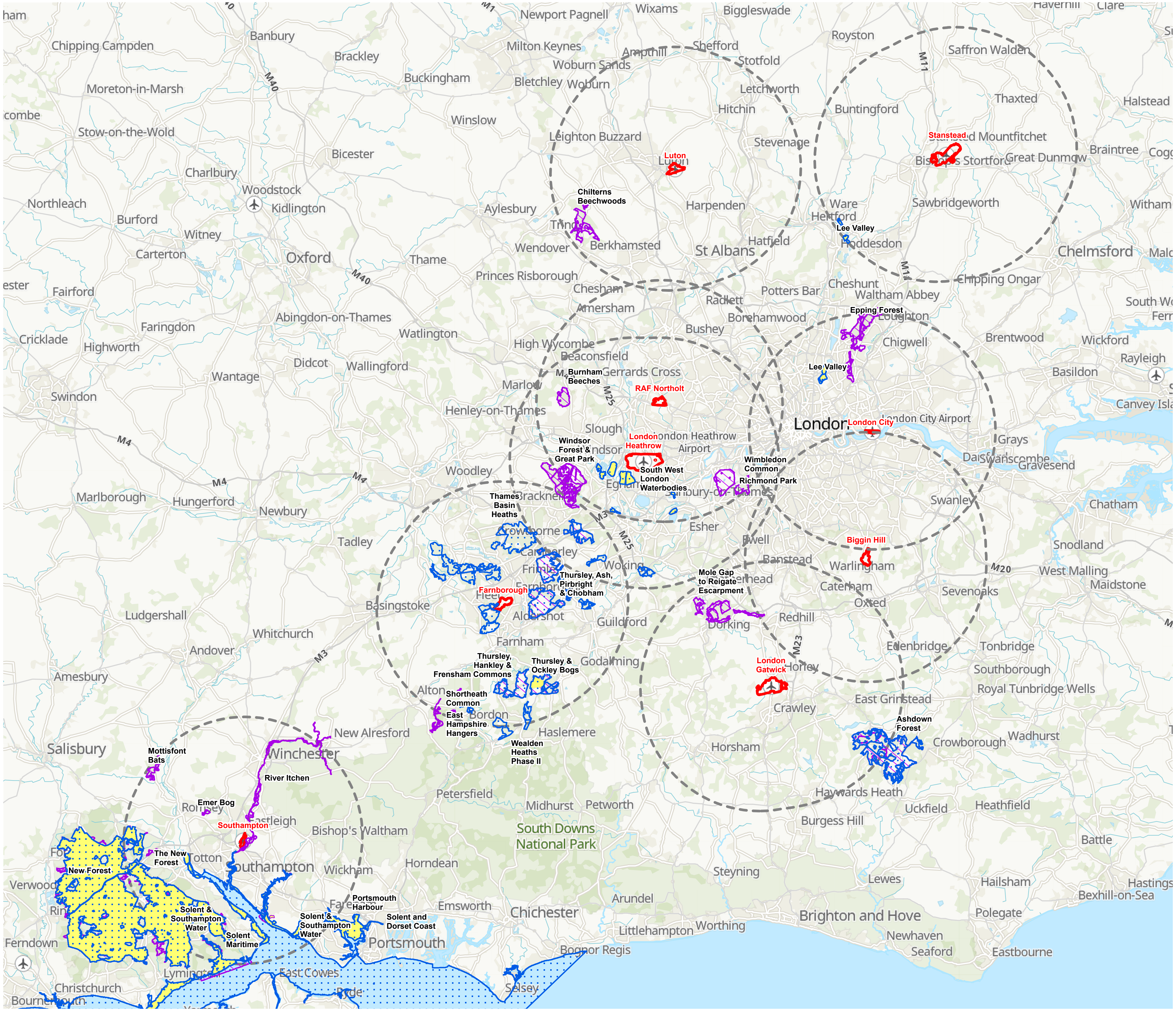

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Airport Boundary

Zone of Influence (18km)

Ramsar

Special Areas of Conservation

Special Protection Areas

N

0 5 10 20 30 km

Project Details	WIE19330-101: Airspace Change Masterplan
Figure Title	Figure 5a: European Sites Vulnerable to Effects Arising from the Airspace Change in the LTMA (West)
Figure Ref	WIE19330-101_GIS_HRA_5a_A
Date	November 2022
File Location	\\S-BM\WIEL\Projects\WIE19330 CAA ACM SEA and HRA\101 HRA Screening\9_GIS\WIE19330-101_GIS_EC\

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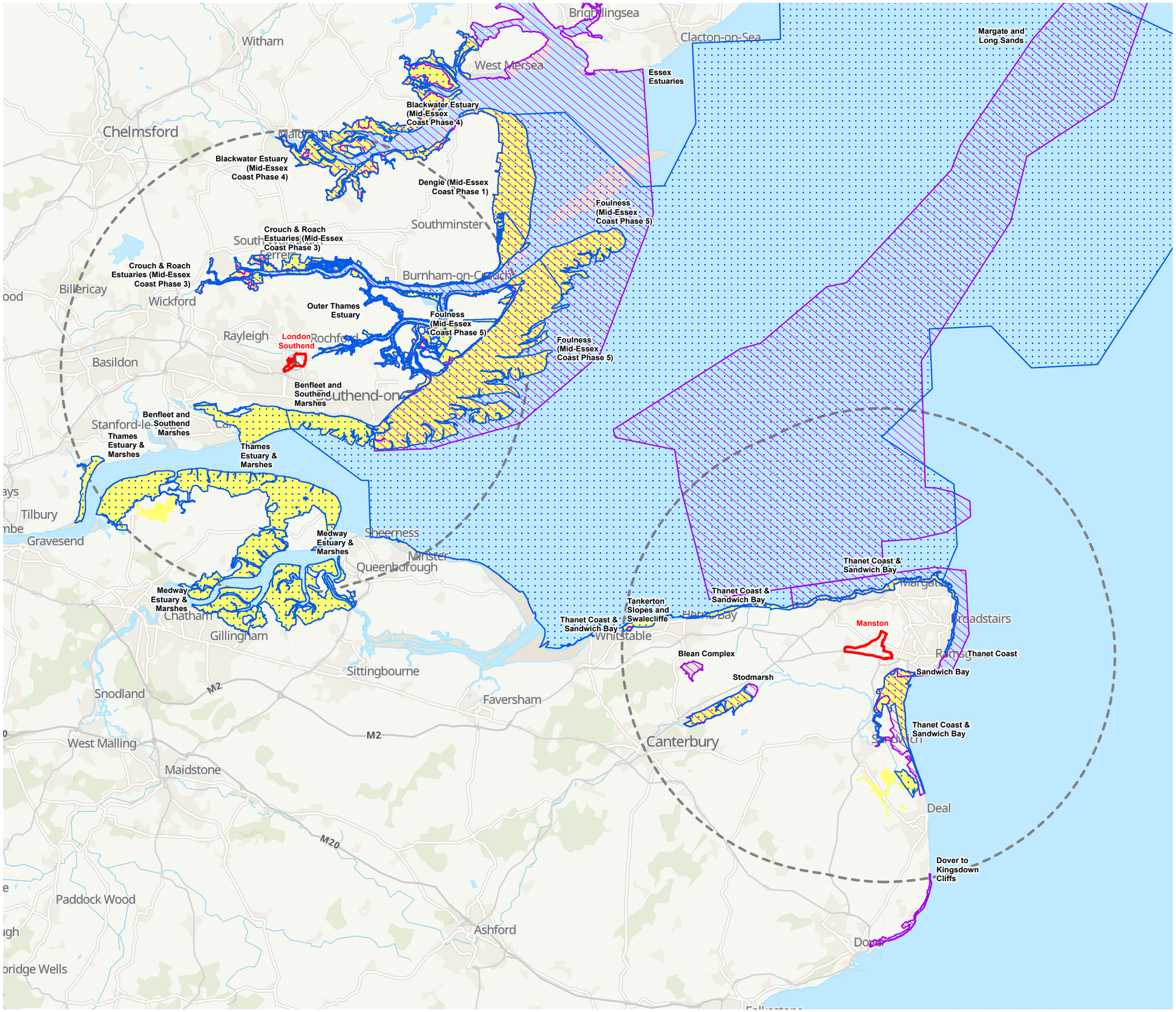

Airport Boundary

Zone of Influence (18km)

Ramsar

Special Areas of Conservation

Special Protection Areas

N

0 1.5 3 6 9 12 15 km

Project Details	WIE19330-101: Airspace Change Masterplan
Figure Title	Figure 5b: European Sites Vulnerable to Effects Arising from the Airspace Change in the LTMA (East)
Figure Ref	WIE19330-101_GIS_HRA_5b_A
Date	November 2022
File Location	\\S-BM\WIEL\Projects\WIE19330 CAA ACM SEA and HRA\101 HRA Screening\9_GIS\WIE19330-101_GIS_EC\

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B. Literature Review – Disturbance Due to Aircraft Overflight

Disturbance

European sites may support designated features that may be disturbed by aircraft over-flight. These are birds, sea mammals and bats; below is a review of scientific literature and other information relating to disturbance of these species groups by aircraft overflight. In addition, guidance is given as to how this information will be used to refine Zones of Influence (ZoI) for use within the Report to Inform the Appropriate Assessment stages.

The approach to identifying relevant literature was based on an understanding that the references would be a mixture of peer-reviewed scientific journal articles and grey literature. Initially relevant information on wildlife issues at airports published by the International Civil Aviation Authority (ICAO), the Civil Aviation Authority (CAA) and Irish Aviation Authority (IAA). As well as using the information published directly, searches for cited references were also carried out. Further, Google and GoogleScholar were used to identify sources using mixtures of the following search terms:

- Aircraft / Airplane / Aeroplane overflight;
- Airport / airfield / aerodrome;
- Unmanned aerial vehicle;
- Bird disturbance;
- Bat disturbance;
- Sea mammal disturbance;
- Seal / sea lion disturbance;
- Wildlife disturbance;
- Noise disturbance;
- Sound level;
- Shadow cast;
- Bird strike[19];
- Wildlife strike.

Birds

Birds can be both disturbed and displaced by airport operations, as well as attracted to the habitats that aerodromes support (i.e. extensive grassland). The Civil Aviation Authority (CAA) and Irish Aviation Authority (IAA) list the most common species that can pose a hazard to airport operations by aggregating on airfields (see CAA, 2017 and IAA, 2021). Many of the species listed are also designated features of Special Protection Areas (SPA) or Ramsar sites. The range of bird species that are attracted to airfields include:

- Gulls (common, black-headed, herring, lesser black-backed and great black-backed);
- Waders (lapwing, golden plover, oystercatcher and curlew);
- Corvids (rooks, carrion crow, hooded crow and jackdaw);
- Waterfowl (swans, geese and duck – largely associated with flightlines across airfields, as opposed to grazing on airfield grassland);
- Pigeons (wood pigeon, feral pigeon, stock dove);
- Small birds (starlings, swifts, swallows, martins, skylarks, meadow pipits, fieldfares redwings);
- Raptors (kestrel, buzzard, red kite).

[19] Information on bird strike occasionally considers disturbance from the perspective of increasing risk of strike.

The birds that frequent airfields tend to do so at certain times of year only, mainly using the airfield grassland as a foraging resource, with few species breeding within the boundary (noting that skylarks and meadow pipits can breed in relatively high density in comparison to surrounding areas due to lack of predators and disturbance from dog walkers etc.). Their presence demonstrates a degree of tolerance to the noise and human presence associated with airfield operation. It is therefore, important to note in any ornithological assessment whether or not the species in question is known as a frequent visitor of airfields or not (i.e. they are choosing to tolerate the disturbance).

There have been a number of studies focused on recording behavioural and physiological effects of aircraft overflight on birds. These research efforts tend to focus on birds using habitats close to airfields (such as mudflats and other coastal habitats) and include studies looking for behavioural responses (e.g. escape flights) and physiological differences (e.g. increases in stress hormones). Aircraft overflight can disturb birds through both visual (i.e. the plane or its shadow) and aural (i.e. noise) stimuli, although most research undertaken is not capable of disentangling these different stimuli. The research is also inherently variable in output as it concentrates on a whole range of different forms of flight including helicopters, military jets, commercial airlines, microlights, small planes and drones and in different areas (including remote bird colonies unused to human presence on uninhabited islands or in the Arctic and Antarctic). Augmenting this scientific literature are the publicly available results of surveys that have been carried out in support of recent planning applications for busy commercial airports in the UK and Ireland, namely Heathrow Airport and Dublin Airport (both considering the effects of overflight on SPAs supporting waterbirds).

Outlined below is a review of literature associated with bird disturbance and aircraft overflight, with a recommendation of an appropriate zone of influence (expressed as an aircraft altitude) that can be used within Stage 2 of the Habitats Regulations Assessment for airspace change proposals where growth in air traffic movements are not expected. The review of data considers both birds outside of and during the breeding season.

Breeding Birds

Breeding birds may exhibit responses to disturbance of aircraft overflight by altering behaviour to attract mates (e.g. altering the timing of main singing periods), showing elevated levels of stress hormones with assumed reductions in fitness and in overall falls in productivity (including through nest abandonment).

For example, Gil et al. 2015 presented advancement in the time of the dawn chorus by birds near airports (70 – 75 L_{den} – with point recordings in excess of 110 db), responding in advance to the time when aircraft activity began increase. This result has been repeated for European blackbirds (closest runway approximately 200m from forest edge, 65 – 75 L_{den}) close to Madrid Airport which sang for longer, advanced the time at which the dawn chorus began and altered song design in response to aircraft noise (Sierro et al., 2017), whilst five species of passerine, near Tegel Airport, Berlin (between 430 and 1,190m from the runway), European robins, blackbirds, blue tits, great tits and chaffinches, sang significantly earlier as daytime noise levels increased, with chaffinches also pausing singing during aircraft take-offs when noise levels increased beyond 78 db(A) (range 70 to 87 dB(A)) (Dominoni et al. 2016). Similarly, in the US, wood thrush sang more frequently when closer (distances between 450m and 1,350m and sound levels 67.3 dB(A) and 73.8 dB(A)) to an airport boundary (Injaian, et al. 2021). These changes in song activity could lead to increased energy expenditure thereby reducing fitness of individuals and reducing the rate of reproduction. It should be noted that the behaviour of birds does differ dependent on situation, for example chaffinches at Manchester Airport reduced song frequency, changed song design (more lower frequency syllables) and acted more aggressively to simulated intruders with increasing sound levels (measured between 180m and 2,100m from the runway) (Wolfenden et al. 2019), which was different to the results reported by Dominoni et al. (2016). This suggests that the effect of aircraft noise will differ between species, distance from the runway, habitat structure and flight schedule.

The sound levels associated with behavioural response of breeding birds differ, with Brown (1990) reporting behavioural responses in crested terns between 65 db(A) and 95 db(A), but with strong responses (preparedness to fly or flying off) restricted to exposures over 85 db(A), with those quoted above noting responses in similar bounds. Harlequin ducks began to show behavioural changes when noise levels exceeded 80 dB(A) from military jets flying between 30 to 100m (~100 to 330ft) above ground level (Goudie & Jones, 2004). The birds disturbed by overflight typically looked up or changed position on the nest but did not leave the nest in response to aircraft. There was no difference in nesting success attributable to differential levels of aircraft overflight.

There are examples of research focusing on the sensitivity of breeding birds to the altitude of overflight. Black et al. (1984) recorded limited or no response to flights of military jets below 500 ft by a range of wading birds breeding in Florida at sound levels between 55 and 100 dB(A). However, Bunnel et al. (1981) recorded low flying aircraft (averaging 2 aircraft per day above 610m) as a significant factor in the decline of a white pelican colony. Conversely, Dunnet (1977) noted no apparent effects of fixed wing aircraft flying at 100m above cliff top on seabird colonies including herring gulls and shags, whilst Grubb (1978) noted no visible response to nesting herons that were deliberately overflown at 50m (note both Dunnet, 1977 and Grubb, 1978 are reported from Jurick, 1985). More recently Hillman et al. (2015) reported no response in nesting behaviours of least terns, common terns, gull-billed terns and black-skimmers despite frequent military aircraft activity below 3,000ft (~915m). Other recent research on unmanned aerial vehicles used to survey colonial waterbirds has shown that few colony wide effects with drones flown at a maximum altitude of 122m (250m lateral distance maintained), with laughing gull showing most propensity for disturbance when altitude was lowered to 91m (Barr et al. 2020).

Wintering and Migratory Birds

Wintering and migratory birds may be disturbed by aircraft overflight causing a reduction in foraging time and increased energy expenditure. There have been a number of research efforts recording responses of wintering and migratory birds (mainly wildfowl and waders) to aircraft overflight, with a number of literature reviews drawing together this information. The literature tends to report findings of disturbance with regards to sound levels or aircraft altitude, or both.

The Federal Highway Association review (FHWA, 2004) details a review of studies on the effect, in terms of behavioural and physiological responses, of aircraft noise on wildlife including migratory wildfowl and dabbling ducks. Migratory waterfowl were noted as making brief flights in response to aircraft overflights. However, in the majority of cases described wildfowl and waders showed limited or no responses to sound levels ranging from between 55 to 100 dB(A)[1]. Conomy et al. (1998) found no significant change to the time-activity budgets of black ducks, American wigeon, gadwall and green-winged teal, and other dabbling ducks at a mean sound level of 85dB(A) when exposed to low-flying military aircraft (Leq 24 hr. = 63 dB(A)) This study concluded that across all species observed, ≤1.4% of their time was spent reacting to aircraft, and that only 2% of the birds surveyed were disturbed at all.

Owens (1977) recorded the response of brent geese to human disturbance around Southend-on-Sea, the Dengie Peninsular and Foulness (Essex, UK). One of the sources of disturbance was aircraft overflight (presumably, given the location, by both commercial and military aircraft). Flights below 500m (~1,640ft) and up to 1.5km away (lateral measurement) often elicited flight responses from brent geese, with low, slow flying aircraft and helicopters being reacted to most frequently. Owens documents brent geese becoming tolerant to overflight, although this tolerance was relatively slow to develop. During ~167 hours of field survey 49 disturbance events caused by aircraft were recorded; of these events 35 were due to small propeller-driven aircraft, 11 by transport aircraft, 1 by a jet aircraft and 2 by helicopter. The suggestion that small, slow and low flying aircraft are responsible for greater levels of disturbance than other types of over-flight is also backed up by a synthesis of data presented by Smit & Visser (1993), Davidson & Rothwell (1993),

Kempf & Hüppop (1998)[2] and Hoang (2013). Van der Kolk et al. (2020) provide analysis of data for oystercatcher in the Wadden Sea which supports the general tenet of slow and low flying aircraft being the most disturbing but note that large military transport aircraft elicited the greatest response in their study. The greatest levels of disturbance are likely to be associated with responses to noise (i.e. lower flying aircraft are noisier at ground level) and visual cues (i.e. slow, low flying aircraft elicit a similar response as that made with regards aerial predators).

Hoang (2013) presents a collation of results from various studies that quote the altitudes and lateral distances over which birds have been recorded as reacting to fixed wing aircraft and helicopters. The majority of examples provided show that responses are rarely noted when aircraft are above 500m (~1,640ft), which accords with observations made by Evans (1994) who registered no response by pink-footed geese by microlights at altitudes of ~150m/500ft or above and Komenda-Zehnder et al. (2003) who conclude disturbance is reduced significantly if fixed wing aircraft are at altitudes greater than 300m (~1,000ft) and helicopters above 450m (~1,500ft). Ward et al. (1999) did record responses by brent geese at altitudes beyond 1,000m (~3,300ft), although noting that the greatest level of response was recorded between 305 and 760m (1,000 to 2,500ft) for helicopters and noisy, relatively small aircraft (not commercial airlines). Van der Kolk et al. (2020) support the legal minimum flight height in parts of the Wadden Sea of 450m as being appropriate, although with some reservations for large, slow moving transport planes that operate infrequently.

The field survey data gathered within the last 6 years at Heathrow and Dublin Airport's provides similar conclusions to those described in the scientific literature. At Heathrow Airport the Southwest London Waterbodies SPA is located approximately 1km from the airport boundary (at the closest point) and is directly overflown hundreds of times per day (dependent on wind direction). Over the course of two winters 9,240 overflights of waterbodies (making up the SPA and other associated functionally linked waterbodies) located between 1 and 5km from the airfield were monitored. Of these only 82 elicited disturbance responses from wildfowl despite noise levels reaching 88 dB and aircraft (including large Code F models such as Boeing 747-800 and Airbus A-380) being at altitudes of between 300 and 900m (~1,000 and 3,000ft) (Heathrow Airport Ltd, 2019). These disturbances were caused mainly by unusual low-level manoeuvring by large aircraft. It is also notable that the vast majority of bird disturbance in the area around Heathrow was due to other types of human activity (e.g. dog walking, jogging etc.). The field survey reported for Dublin Airport (Aecom, 2020) demonstrates that across 228 hours of recording (between July 2016 and December 2017 and between April and May 2018) in Rogerstown Estuary SPA and Balydoyle Bay SPA at different times of day, different tidal states and different weather conditions, no disturbance events associated with the operation of Dublin Airport were recorded. Within this recording period 184 disturbance events from other sources were recorded (mainly walkers/dog walkers) with only a single event related to an aircraft (a low flying coast guard helicopter). This suggests that the birds present within the closest SPAs to Dublin Airport are tolerant of the noise and visual disturbance associated with aircraft overflight. This is likely, in part, due to the distance between the airfield and the designated sites meaning that all (or at least the vast majority) of aircraft arriving or departing the airport will be at heights well in excess of 500m (~1,640ft) when overflying any of the SPAs. These contemporary field studies focusing on the effects of overflight from busy commercial airfields suggest that there is a high level of tolerance for aircraft over-flight.

There is no standard recommendation of a minimum altitude at which breeding colonies or aggregations of wintering birds should be overflown to avoid / minimise disturbance, although it is generally accepted that limiting minimum flight altitude above sensitive areas is an effective way to reduce disturbance. The US Federal administration sets minimum altitude at 610m (2,000ft) over land administered by the US National Parks Service, Fish and Wildlife Service and Bureau of Land Management (reported in Harris, 2005), whilst many of the authors referenced above note that 500m (~1,640ft) is an appropriate level, with the range given between 150m (~500ft) to 750m (~2,500ft) (Kempf & Hüppop 1998). Most also note that birds regularly over-flown build up

tolerance to aircraft. It is also of interest that authors considering various sources of disturbance tend to conclude that other human disturbance agents (e.g. dog walking, road traffic etc.) tend to elicit greater responses from aircraft overflight. This is of particular interest with respect to a study by Rees et al. (2005) who identified this relationship with disturbance for whooper swan in habitats adjacent to and within 2km of Glasgow Airport, a result reflected in the data collected on behalf of both Heathrow and Dublin Airports.

Sea Mammals

Sea mammals may be disturbed by aircraft over-flight; with those spending time on land at most risk (e.g. common and grey seals). Cetaceans, and seals when underwater, are not considered to be at risk of disturbance from overflight as noise from aircraft does not propagate underwater in such a way as to be sufficiently intense to cause harassment or injury (Eller & Cavanagh, 2000).

Seal populations (including pups) are regularly counted in the UK by the Sea Mammal Research Unit (University of St. Andrews). They are counted at haul out sites (where they are at most risk of disturbance) using small fixed wing aircraft and helicopters flying at altitudes between 150m and 250m (Morris et al., 2014) suggesting that these species are tolerant of aircraft operating in close proximity. This observation is supported by a study that recorded no avert behavioural reactions of grey seal at haul outs being overflown by unoccupied aerial systems flying at altitudes between 75 and 85m (~250 – 280ft) (Arona et al., 2018).

Bats

There is little information of the disturbance of bats by aircraft overflight with a study of New Zealand long-tailed bats showing no apparent effects of aircraft noise (Le Roux & Waas, 2012), whilst Japanese pipistrelle bats showed that reduced foraging activity around an airport was negatively related to levels of noise and aircraft activity (Wang et al. 2022). The difference in result may be due to the location of the bat monitoring, with Le Roux & Waas (2012) recording in woodland approximately 2.5km from the runway, whilst Wang et al. (2022) were recording in a number of locations on the edge of the airfield.

Use of Information at Stage 2

The Report to Inform the Appropriate Assessment of the Airspace Change Masterplan will use the information described above to provide a robust assessment of disturbance based on the best available objective and scientific information to enable a decision to be made on whether or not there will be adverse effects on integrity on one or more European sites. The following will be used as the basis for the assessment:

- The list of European sites identified within the HRA screening exercise will be narrowed to include those that are in areas where aircraft may operate below 610m (2,000ft);
- Further narrowing of the list of European sites will then take place, to the extent possible based on the level of design detail available, based on whether or not they will be overflown (with each flight line representing a centre line of a width of 3.2km) following airspace change (based on information available at the time) and are currently regularly overflown.

Assessment of individual European sites (as relevant) will then consider the likely altitude of overflight (e.g. above or below 500m), whether the pattern of overflight will alter (i.e. some European sites are overflown when approach and departures are flying in line with the runway and are unable to deviate) and the type of habitats and species present.

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[1] Sound levels used in this report are expressed in units as dB(A), LA_{max} and L_{max}. Different units of measurement are used by different authors and have been expressed in the same terms in this report. LA_{max} is the maximum a-weighted sound level of an event and is the same as an expression of dB(A). Both of these units are A weighted meaning the level is adjusted to correspond to human hearing range. Lmax is not adjusted in this way (when L_{max} is converted to LA_{max} the quoted number reduces).

[2] Reviewed document is an update and translation of a Dutch publication of 1998. The date of publication of the updated translation is not provided.

C. Literature Review - Defining a Zone of Influence for Air Quality Effects of Aircraft Overflight on European sites

Emissions released from aircraft during the landing and take-off cycle, including nitrogen, can result in the acidification and nutrification of sensitive habitats causing changes in the floral community through altering the competitiveness of different plants, through direct toxicity or eutrophication of the water environment.

The UK's Air Quality Expert Group (2004) state that 'A*round a third of all NOx emissions from the aircraft (including ground-level emissions from auxiliary power units, engine testing etc, as well as take-off and landing) occur below 100 m in height. The remaining two-thirds occur between 100 and 1000 m and contribute little to ground-level concentrations*'. The CAA goes further within CAP 1616 and note '*Due to the effects of mixing and dispersion emissions from aircraft above 1,000 feet (amsl)* [~305m] *are unlikely to have a significant impact on local air quality'*. It is generally understood that emissions from aircraft become negligible, in terms of their effect on ground-level air quality, once aircraft are more than approximately 350-650 ft (100-200m) above the ground on departure, and when greater than approximately 160-350 ft (50-100m) on arrival. Typically, air quality assessments for airport expansion activities (not associated with road traffic) where additional ATMs are expected extend up to 15km (e.g. Manston Airport and Gatwick Airport Northern Runway) from the centre of the airport, with modelling undertaken for individual European sites.

At low altitudes, either on approach or departure, aircraft are typically flying in line with the runway they are to land on or have just departed from. Standard rules dictate that approaching aircraft must be stabilised from a minimum of 3 nautical miles (~5.6km) out from the end of the runway at a 1000ft altitude (so called "3:1" ratio). This ratio translates into the standard 3 degree glideslope for the approach. Exceptions to this rule do apply at a single UK airport (London City) where there are obstructions means that steeper approaches are operated, however this ensures aircraft are at greater altitudes for longer. On departure aircraft are allowed a 15 degree offset trajectory from the end of the runway to a distance of approximately 1 nautical mile (~1.9km) at which point they have the freedom to turn. The climb-gradient is normally determined by factors such as aircraft type, loading, prevailing weather, other proximate departure/arrival tracks, and any typography/obstacles in the vicinity of the airport.

Use of Information at Stage 2

On final approaches and initial take-off pathways airspace change proposals will not alter current practice. Therefore, European sites lying within ~1.9km of the runway ends (that doesn't extend outside of this area) will not see any changes in local air quality (other than a general reduction in emissions as the aircraft fleet modernises). Those lying between 2 and 18km away may experience changes in air quality from aircraft overflight should the pattern of flights reduce or increase the number of flights across them (I.e. up to 3,000ft) and will be assessed at Stage 2.

Reference List

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D. Literature Review – Wildlife Strike and European Sites

Wildlife strike (mostly associated with birds but can also apply to bats and terrestrial mammals that can access runways) presents a risk to aircraft that can prove catastrophic. Due to the potential for wildlife strikes to cause damage to aircraft the CAA ensure that airport operators manage the risk actively through the implementation of CAP 772: Wildlife Hazard Management at Aerodromes (CAA, 2017). CAP 772 provides advice on how to effectively manage habitats and deter birds on airfield and within 13km of its boundary. The risk reduction programmes associated with commercial airports are self-evidently effective in reducing the number of collisions given the low strike rate recorded in the UK.

The International Civil Aviation Organisation (ICAO) gather statistics globally on bird strikes. The data show that the majority (91%) of recorded incidents take place during the landing and take-off cycle. Only 4% of bird strikes are recorded as occurring en-route (i.e. flights above 3,000ft), with the remaining 5% being unknown (ICAO), 2017). In the UK, between 2012 and 2016, 12,971 bird strikes were recorded (noting that there is a mandatory requirement to report incidents to the CAA). Of the 7,101 recorded strikes where a location and phase of flight was recorded 85% occurred under 500ft (~150m), with a further 12% occurring between 500ft and 1,500ft (~460m), meaning that strikes are mainly occurring on airfield or in the very near vicinity (CAA, 2017).

The bird groups that collide most frequently are gulls (~1,350 between 2012 and 2016), swallows and martins (~1,000), pigeons and doves (~800), swifts (~450), larks (~450) and falcons and allies (~380).

Use of Information at Stage 2 Appropriate Assessment

European sites supporting birds within the groups identified in the CAA's publicly available bird strike data (CAA, 2017) that lie within a distance where aircraft are present at 1,500ft or less will be subject to detailed assessment. Further, consideration of the designated avian features of other European sites identified during the screening assessment will be given should a reasonable link to the airport or its close environs be expected (I.e. birds maybe attracted by functionally linked land). A general assessment of the potential for collisions with birds over 1,500ft compromising conservation objectives of any European site will also be considered.

Reference List

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People orientated

Individually and collectively, people are our business.
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Pragmatic by nature and dedicated to getting the job done to the highest possible standard.

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We understand our responsibility to the environment, it shapes our decision making and informs our practice.

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