Heathrow

EASTERLY ALTERNATION INFRASTRUCTURE PROJECT

Environmental Impact Assessment
Environmental Statement, Volume III
Appendix 2.1: Wake Vortex Statement

DOCUMENT REFERENCE: 19309-XX-EC-XXX-000027

October 2024

Heathrow

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1. Introduction

1.1.1 This Appendix provides an assessment of the effects that arise from circulating currents of air generated by aircraft (a vortex) as a result of the Proposed Development (as described in **Section 2**. An assessment of effects has been undertaken as the Proposed Development results in changes to the distribution of aircraft.

1.1.2 **Section 2** describes how aircraft generate vortices and how damage may result. **Section 3** sets out the information on the current incidences of vortex, including distribution, location, and frequency. **Section 4** sets out an assessment of any significant effects that are likely to occur as a result of operating the Proposed Development.

2. Vortex

2.1.1 A vortex is a circulating current of air generated by planes and such can sometimes strike and damage the roofs of houses located under a flight path. Pitched roofs with loose-laid tiles are more prone to vortex damage.

2.1.2 The phenomenon of vortex refers to the rotating air masses generated from the displacement of air from an aircraft's wing tips whilst in-flight. Pairs of vortices (i.e. counter rotating cylindrical air spirals) trail behind the aircraft and tend to descend and spread laterally as they rotate, eventually dissipating into general air turbulence[1].

2.1.3 Typically, vortex effects are associated with arrivals (particularly during the final stages of approach) when an aircraft's airspeed and altitude are low. Large, wide-bodied aircraft such as B747/777s, and A380s can generate vortices of sufficient strength and residual energy to cause property damage in certain circumstances[2]. This is because the airspeed and altitude of aircraft on take-off and final approach are low, as flaps and landing gear are deployed to stabilise the aircraft on departure or arrival.

2.1.4 The frequency with which vortices cause property damage is driven by many factors, including the number of aircraft movements and the proportion of the large, wide-body aircraft operating to/from the Airport, the prevailing meteorological conditions and the topography and surface features surrounding the Airport. Damaging strikes occur most frequently when conditions are calm, because there is less natural air turbulence to promote the dispersal of vortex energy. The incidence of vortex damage to properties is also highly dependent on the density of development and roof structures of the buildings.

[1] National Air Traffic Services (NATS) (2020) *Wake Turbulence*. [online] Available from: https://nats-uk.ead-it.com/cms-nats/export/sites/default/en/Publications/Aeronautical-Information-Circulars-AICs/pink-aics/EG_Circ_2020_P_083_en.pdf [Accessed 26 September 2024].

[2] Blackmore, P.A. (1994) 'The effects of aircraft trailing vortices on house roofs', *Journal of Wind Engineering and Industrial Aerodynamics*, 52, pp. 155-170.

3. Baseline

3.1.1 Under current westerly operations at the Airport, for aircraft arrivals onto Runway 27R, vortex strikes have occurred more frequently to the east of the Airport in the high-density areas of Cranford and Heston (see **Figure 2.1.1**). Arrivals on Runway 27L (during westerly operations) have led to reported vortex strikes in Hatton and Hounslow. Heathrow Airport Limited ('the Applicant') has designated these areas as 'Blanket Zones' predicated on the verified incidence of vortex strike damage to properties from arriving aircraft and extending up to approximately four kilometres from the runway ends of Runways 27L and 27R.

3.1.2 The Applicant currently operates a Vortex Protection Scheme[3], which provides protection and repairs to properties surrounding the Airport. Any roof damage attributed to vortex strike, once verified by the Applicant's appointed assessors, is repaired with remedial measures such as roof strengthening implemented so that roofs are robust enough to withstand any future strike.

3.1.3 During full runway alternation, departing aircraft will be able to use both runways for both departure and arrival of aircraft whereas previously this was limited to arrivals on Runway 09L and departures on Runway 09R. The Proposed Development will therefore lead to a change in aircraft movement patterns during easterly operations only. There will be an increase in the number of aircraft departing on the northern runway (09L) and arriving on the southern runway (09R). As a result, there will be a decrease in the number of aircraft departing on the southern runway (09R) and landing on the northern runway (09L) during the same mode of operations. The number of annual aircraft movements will be unchanged by the Proposed Development, and there will be no change during westerly operations.

3.1.4 Due to the proposed implementation of full runway alternation, depending on the relative density of development below the flight path, there may be changes in the number of incidences, and in particular location of, vortex strikes. During easterly operations, arrivals from the west under the arrival path for Runway 09R have the most potential for an increase in vortex strikes (including in Stanwell Moor and a section of Coppermill Road).

3.1.5 Westerly operations typically occur for around 73% of the year for the Airport with easterly operations occurring for the remainder (27%)[4]. Historically (since 1974), under these operations where full runway alternation was restricted on easterly operations, the Applicant designated 45 streets within the Blanket Zones of the Vortex Protection Scheme. Streets fall within the Blanket Zone when 50% of properties in the road have

[3] Heathrow Airport Limited (n.d.) *Repair vortex damage*. [online] Available at: https://www.heathrow.com/company/local-community/noise/what-you-can-do/repair-vortex-damage [Accessed: 26 September 2024].
[4] Based on data published by Heathrow – Heathrow Airport Limited (n.d.) *Operational Data*. [online] Available at: https://www.heathrow.com/company/local-community/noise/data/reports/operational-data [Accessed: 26 September 2023].

suffered a vortex strike. **Figure 2.1.1** illustrates the locations of the streets covered by the Blanket Zones, which are located on the east side of the Airport.

Table 3.1 Confirmed vortex strike incidences between 2017 and 2024.

	2017	2018	2019	2020	2021	2022	2023	2024
January	12	9	10	3	2	2	1	2
February	14	5	7	3	2	4	3	2
March	8	7	13	5	0	2	4	5
April	4	4	6	3	3	1	2	3
May	38	12	14	3	1	4	2	4
June	5	8	6	4	9	2	4	8
July	14	9	13	4	6	8	5	10
August	18	16	5	3	1	2	7	9
September	9	11	5	2	3	0	3	-
October	8	21	10	0	1	6	4	-
November	2	3	6	0	2	4	5	-
December	4	0	1	3	0	0	0	-

3.1.6 .A review of vortex strike records for the Airport indicates a monthly average of approximately six verified strikes for the period between 2017 and 2023. As shown above, the incidence of vortex strike has reduced since 2017, however, the reduction in strikes between 2020 and 2022 are a result of a decrease in flights during this period due to the Covid-19 pandemic.

3.1.7 Current operations determine that during westerly operations, the vast majority of vortex strikes occur to the east side of the Airport, all strikes are on arrivals, and the highest number of strikes occur with arrivals onto Runway 27R, most others occur arriving on Runway 27L.

3.1.8 The area most affected by vortex strikes historically is Cranford. To date (from 1974 to current), there have been over 2,100 confirmed incidences of vortex strike within the Cranford area. These strikes are shown on **Figure 2.1.1** and are aligned along the flight approach path to these runways.

3.1.9 Within other risk areas such as Hatton and Poyle, the incidences of confirmed vortex strike have been minimal as these are likely to be most affected on during easterly operations which as previously noted occur much less frequently that westerly operations.

4. Assessment

4.1.1 The anticipated risk areas for potential increases in vortex strikes are located within a relatively small number of homes within Stanwell Moor and a section of Coppermill Road, located approximately 500m due west of the Airport's southern runway (09R). Currently, confirmed vortex strikes have been recorded within the Stanwell Moor location, including on Horton Road and Flintlock Close during times when Heathrow is operating easterly arrivals on the southern runway.

4.1.2 With the proposed full runway alternation operational for easterly operations, changes to arrivals on Runway 09R will occur only up to 15% of the time (up to 15% of arrivals will occur on Runway 09L during runway alternation). Previously, the Cranford Agreement prevented runway alteration during easterly operations, resulting in the northern runway (09L) being used solely for arrivals[5].

4.1.3 Only for a small proportion of homes at Stanwell Moor and a section of Coppermill Road located approximately three kilometres to the west under the arrival path for Runway 09R, is there the potential for an increase in vortex strikes, see **Figure 2.1.2**.

4.1.4 In addition, the final five kilometres of the arrivals flight path for Runway 09R is predominantly over water bodies, semi-rural land, the M25 motorway and other highway infrastructure which are all unlikely to be (or cannot be) affected by vortex.

4.1.5 Properties located in Cranford (approximately 1.2km away from the end of Runway 09L) that could be affected by easterly departures from Runway 09L, including at Waye Avenue, Berkeley Avenue, Meadowbank Garden, Clevedon Gardens, Mornington Crescent, Field Close, Burnham Gardens, and Byron Avenue, are already designated within the 'Blanket Zones' and covered by the Vortex Protection Scheme, as shown in **Figure 2.1.1**. These properties are already covered by the Vortex Protection Scheme due to the potential for vortex effects that arise from arrivals from the east (when on westerly operations), which already occur frequently.

4.1.6 The Applicant will continue to operate the Vortex Protection Scheme and therefore any newly affected areas that may arise as a result of the Proposed Development, would be covered. Once verified by one of the Applicant's appointed assessors as damage caused by arriving aircraft at the Airport, any issues will be repaired with remedial measures such as roof strengthening. This can be in the form of fastening new tiles with purpose-designed clips and nailing systems robust enough to withstand the maximum force of any future strikes. Thus, leading to a reduction in damage to property caused by vortex strikes.

4.1.7 The vortex scheme forms part of the Residential Insulation Scheme. There is no eligibility footprint applicable to the vortex repair scheme. Legal liability for vortex damage rests with airlines, however Heathrow Airport voluntarily funds this scheme as part of its commitment to the local community. This reflects its reactive nature, focusing on

[5] Heathrow Airport Limited (n.d.) *Runway alteration*. [online] Available from: https://www.heathrow.com/company/local-community/noise/operations/runway-alternation [Accessed: 06 August 2024].

locations where instances of vortex roof damage occur. This tends to be concentrated in small areas near the end of runways. In instances where greater than 50% of roofs in a road exhibit vortex damage, Heathrow will offer full roof retiling for 100% of dwellings in the road. The replacement roofs are strengthened by fixing down specified tiles and metal clips that have passed stringent wind tunnel tests.

4.1.8 The proposed full runway alternation is therefore not considered to result in an extensive change in wake vortex strikes and it is expected that any properties likely affected will be covered by the Vortex Protection Scheme.

Annex A
Figures

Key

- Heathrow ownership boundary
- Blanket protection zones
- Confirmed Vortex strikes (2017-2024)

0 1 2 3 Km

Scale at A3: 1:75,322

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Figure 2.1.1
Confirmed Vortex Strikes and Blanket Protection Zones Heathrow Airport (2017-2024)

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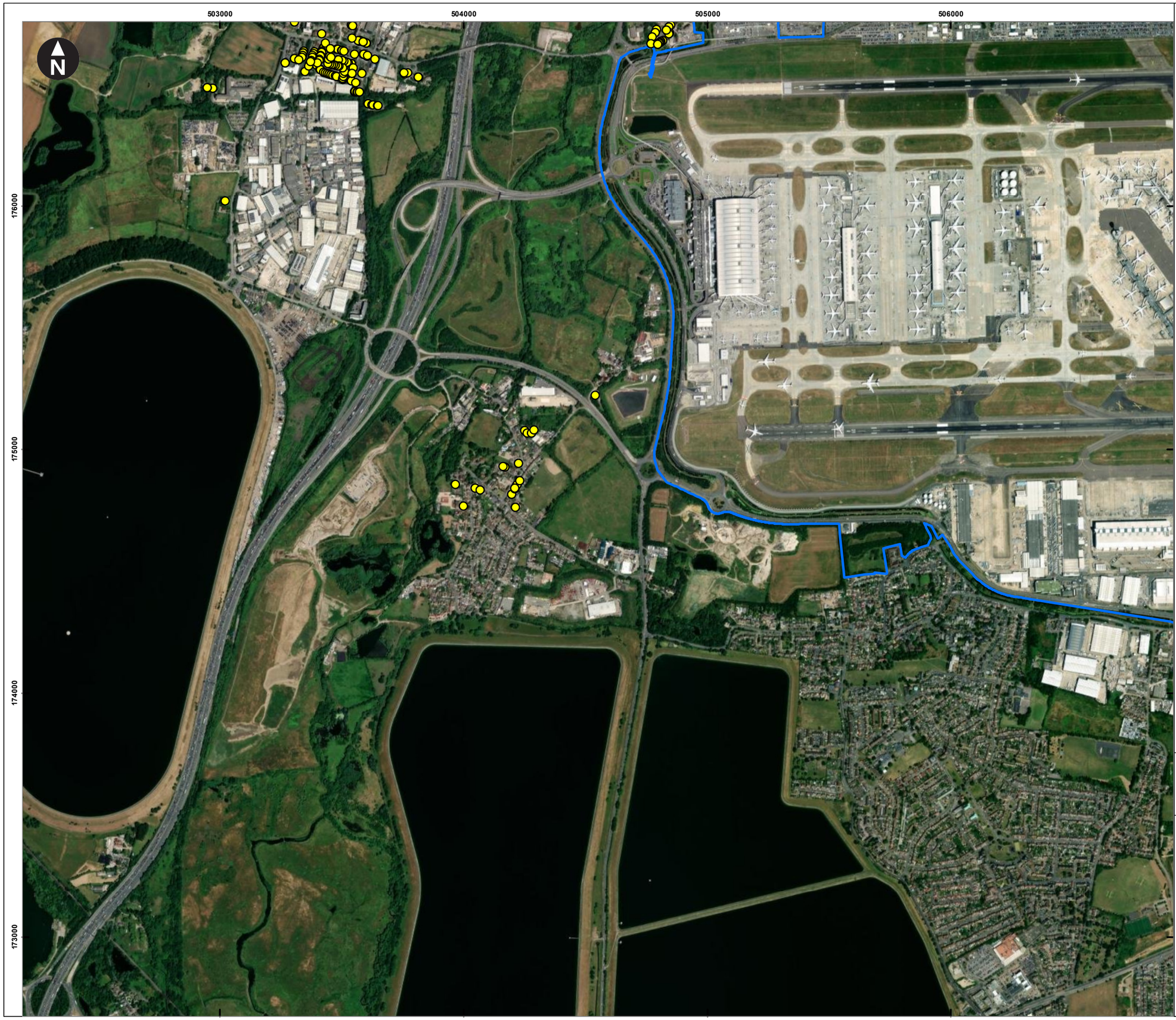
\\uk.wspgroup.com\UKCentral\GISData\WSP_UK\WSP_E\gint\#Projects\Agresso\Noida\Paras Beniwal\Heathrow EAI\MXD\Figure 2.1.1 Confirmed Vortex Strikes and Blanket Protection Zones within the Vicinity of Heathrow Airport 2017 to 2024.mxd Originator: INPB03368



Key

Heathrow ownership boundary

Areas with potential increased risk of vortex strikes

0 0.25 0.5 0.75 Km

Scale at A3: 1:15,000

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Figure 2.1.2
Areas with potential for increased vortex strikes

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