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London Borough of Hillingdon Council

12 September 2024
Ref: 19309-XX-EC-XXX-000071

Subject: Easterly Alternation Infrastructure – Sequential Test

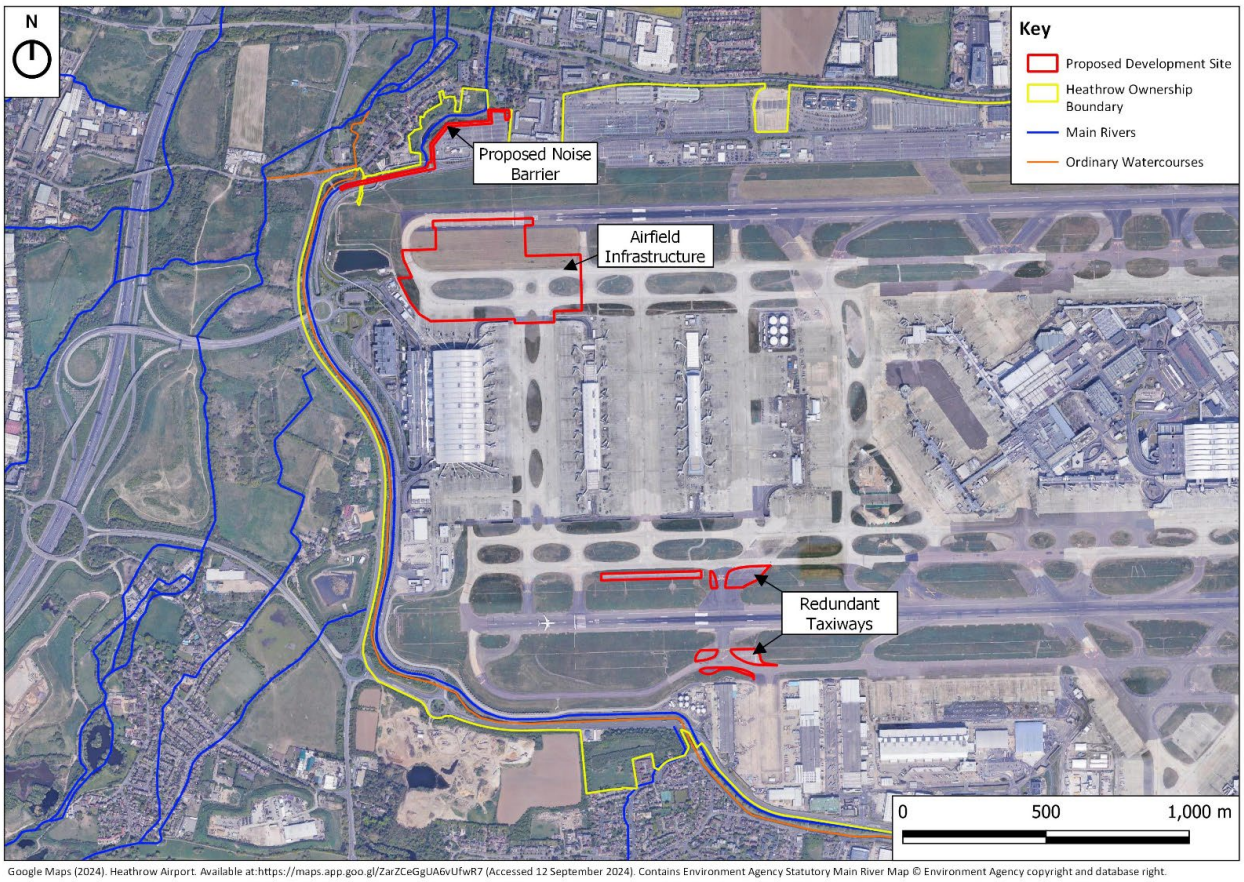
1. Introduction

Logika have been commissioned by Heathrow Airport Limited to undertake a Sequential Test assessment in relation to the Proposed Development, comprising infrastructure development that will facilitate full runway alternation when Heathrow Airport ('the Airport') is operating in an easterly direction.

1.1 Proposed Development

The Proposed Development area (Figure 1) is located in the west of the Airport adjacent to the western end of the southern and northern runways. The Proposed Development site (hereafter referred to as 'the Site') encompasses eight separate boundaries, with a combined area of approximately 21.01 hectares (ha).

Figure 1: Site Location Plan



Google Maps (2024). Heathrow Airport. Available at:https://maps.app.goo.gl/ZarZCeGgUA6vUfwR7 (Accessed 12 September 2024). Contains Environment Agency Statutory Main River Map © Environment Agency copyright and database right.

The Proposed Development comprises a noise barrier component located in the north, airfield infrastructure in the centre where new hard standing is proposed to support aircraft movements, and a concrete breakout component in the south where redundant taxiways are to be broken out with hard surfacing removed and replaced with airfield grassland.

The proposed noise barrier general arrangement and a catchment plan detailing the proposed changes in surfacing are included as Appendix A1.

2. Policy

2.1 Sequential Test

Paragraph 167 of the National Planning Policy Framework (NPPF)[1] states that all development plans should apply a sequential, risk-based approach to the location of development to avoid where possible flood risk to people and property. This should be achieved through, among other things, the application of the Sequential Test.

The aim of the Sequential Test is to steer development to areas with the lowest risk of flooding from any source, both now and in the future, and should conclude whether any alternative sites with a lower flood risk than the Proposed Development site are available for development in its place.

The Planning Practice Guidance (PPG)[2] states that the Sequential Test should be applied to 'Major' and 'Non-major development' in areas at risk of flooding, and also provides guidance on when the Sequential Test is not required. A development is exempt from the Sequential Test if:

- The Site has been allocated for development and subject to the Sequential Test at the plan making stage (provided the Proposed Development is consistent with the use for which the Site was allocated and provided there have been no significant changes to the known level of flood risk to the Site);
- The Site is in an area at low risk from all sources of flooding, unless the Strategic Flood Risk Assessment, or other information, indicates there may be a risk of flooding in the future; or
- The application is for a development type that is exempt from the test, as specified in the NPPF (householder development, small non-residential extensions and changes of use).

Supplementary guidance for the application of the Sequential Test within the Borough of Hillingdon is provided within the West London Strategic Flood Risk Assessment (SFRA)[3]. This is in line with the principles set out within the NPPF and PPG (as referred to above).

2.2 Exception Test

The Exception Test requires two additional elements to be satisfied before allowing development to be permitted in situations where suitable sites at lower risk of flooding are not available following the application of the Sequential Test. As part of the Exception Test, it should be demonstrated that development will provide wider sustainability benefits to the community that outweigh flood risk, and be safe for its lifetime without increasing flood risk elsewhere.

Annex 3 of the NPPF splits flood risk vulnerability into five classifications. Of these classifications, the Proposed Development is considered to be 'Less vulnerable', comprising a noise barrier and taxiways. The requirement for the

[1] Department for Levelling Up, Housing and Communities, December 2023. National Planning Policy Framework. Available at: https://www.gov.uk/government/publications/national-planning-policy-framework--2

[2] Department for Levelling Up, Housing and Communities and the Ministry of Housing, Communities and Local Government, August 2022. Planning Practice and guidance: Flood Risk and Coastal Change. Available at: https://www.gov.uk/guidance/flood-risk-and-coastal-change

[3] London Boroughs of Barnet, Brent, Ealing, Harrow, Hillingdon and Hounslow, Accessed 06/09/2024. West London Strategic Flood Risk Assessment. Available at: https://westlondonsfra.london/

application of the Exception Test is set out in Table 2 of the PPG (reproduced as Table 1 below), which indicates that this classification of development is considered appropriate within Flood Zones 1, 2 or 3a without the application of the Exception Test.

Table 1: Flood risk vulnerability and flood zone 'incompatibility'

Flood Zone	Essential Infrastructure	Highly Vulnerable	More Vulnerable	Less Vulnerable	Water Compatible
Zone 1	✓	✓	✓	✓	✓
Zone 2	✓	Exception Test Required	✓	✓	✓
Zone 3a	Exception Test Required	X	Exception Test Required	✓	✓
Zone 3b	Exception Test Required	X	X	X	✓
Notes: **✓ Exception Test is not required.** **X Development should not be permitted.**					

Source: Table 2, PPG.

3. Flood Risk

3.1 Tidal and Fluvial

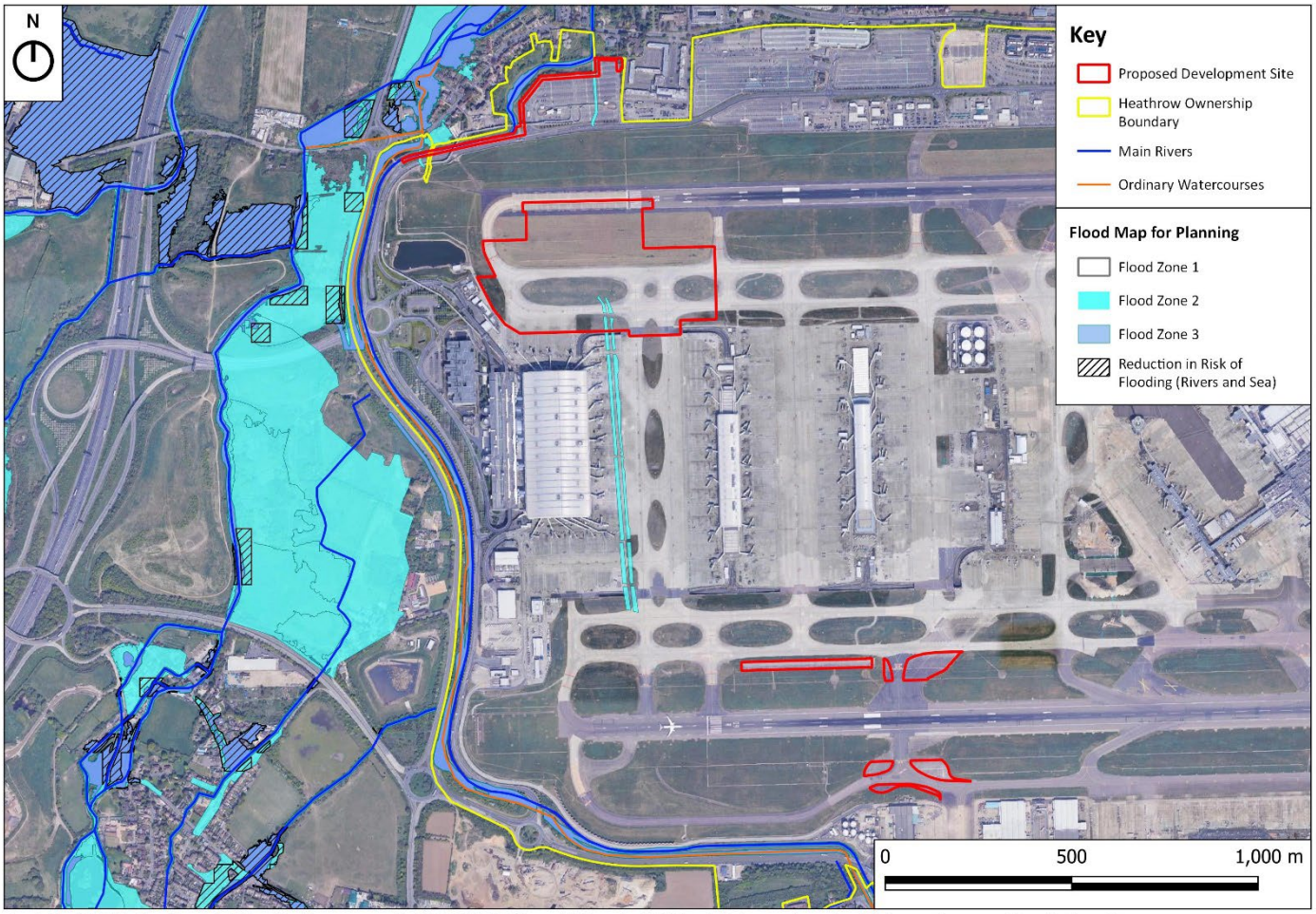
Flood Map for Planning

The EA Flood Map for Planning (Figure 2) indicates the Airport is predominantly situated within Flood Zone 1 indicating a low probability of tidal and fluvial flooding. There are two longitudinal areas of Flood Zone 2 in the west of the Airport which indicate a medium probability of flooding from fluvial or tidal sources. These areas of Flood Zone 2 slightly encroach within the Site, in particular the noise barrier and airfield infrastructure component areas. The redundant taxiway component area is located solely within Flood Zone 1.

Given the Site's inland location, tidal flood risk is considered to be low. Therefore, flood risk associated with Flood Zones 2 and 3 in this location is considered to be fluvial in nature.

Flood Zone 2 is ordinarily defined as land with between a 1 in 100 and 1 in 1,000 annual probability of river flooding, or land with between a 1 in 200 and 1 in 1,000 annual probability of sea flooding, however in some locations historic flood extents are used to inform the Flood Zone 2 extent.

Figure 2: Environment Agency Flood Map for Planning

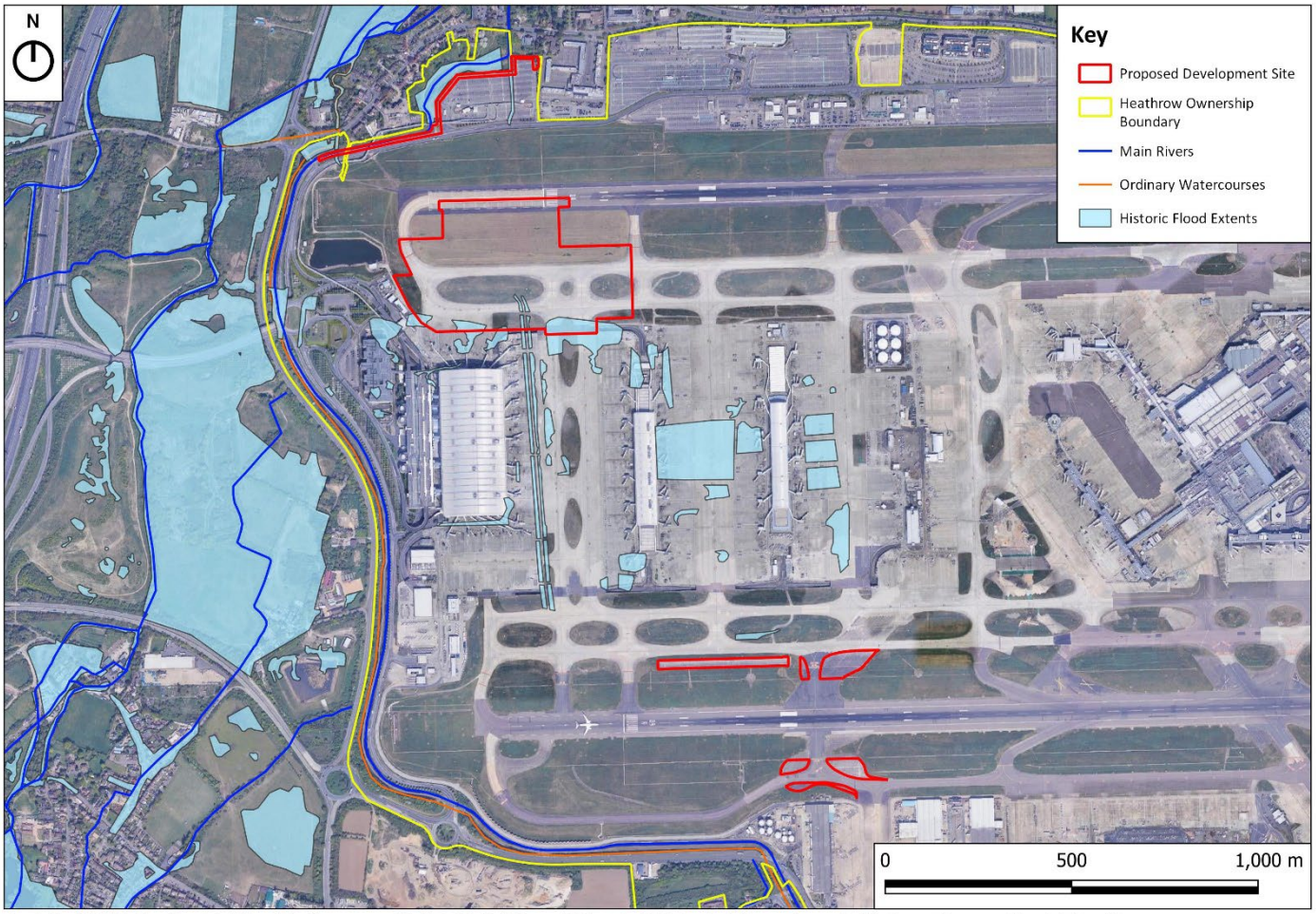


Google Maps (2024). Heathrow Airport. Available at:https://maps.app.goo.gl/ZarZCeGgUA6vUfwR7 (Accessed 12 September 2024). Contains Environment Agency data © Environment Agency copyright and database right.

The Environment Agency (EA) were consulted regarding this classification and have confirmed that Flood Zone 2 in this location is informed by the December 2002 /January 2003 historic flood extent, as shown in Figure 3. The EA stated within their response that in order to argue that this land should not be considered Flood Zone 2 in a Flood Risk Assessment, it would need to be demonstrated that the land has changed sufficiently since 2003 so that this flooding would no longer be physically possible.

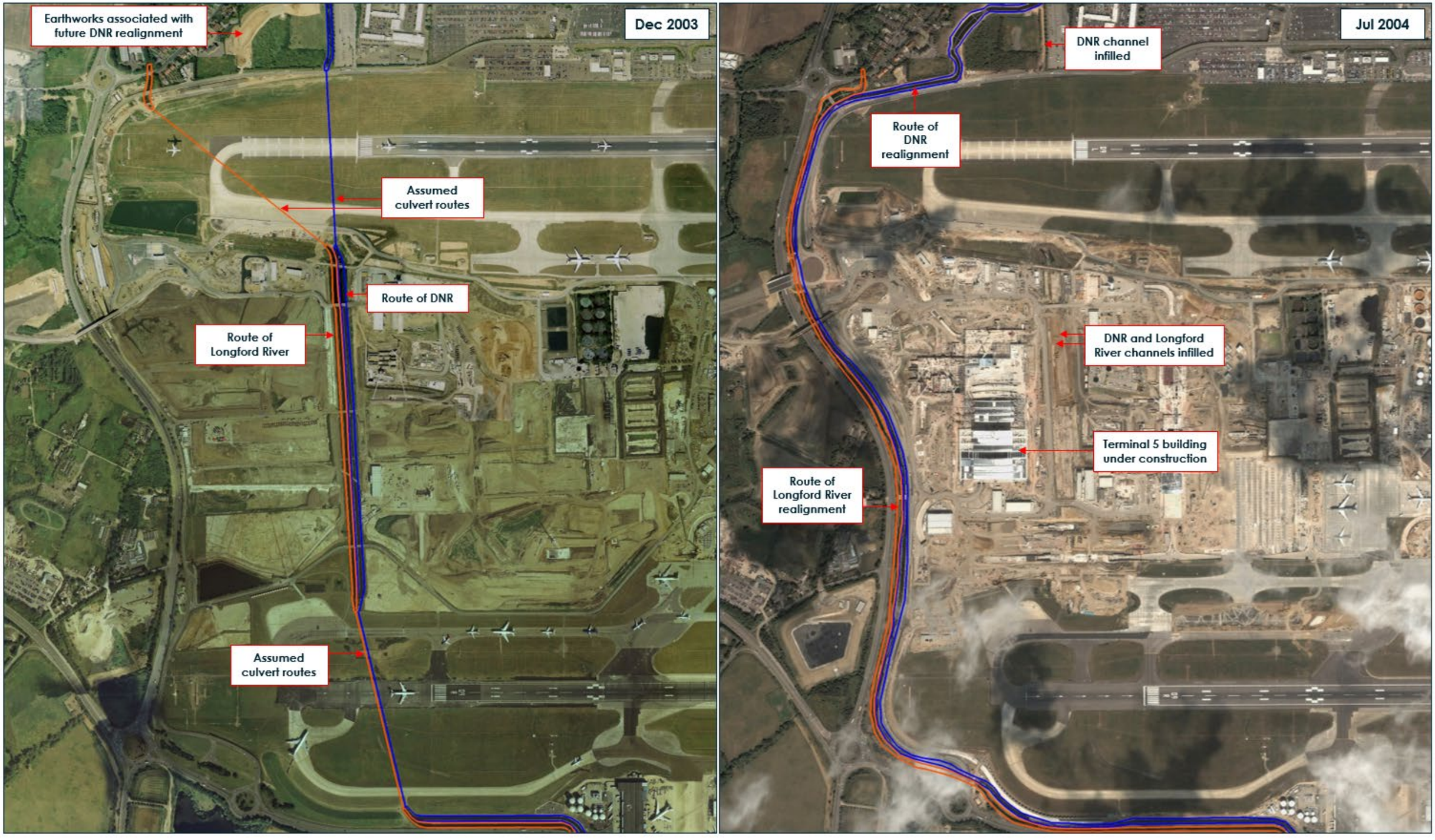
Following a review of historic Google Earth imagery, it was determined that Duke of Northumberland's River (DNR) and Longford River used to flow through the Site, to the east of where the Terminal 5 building now stands. The river locations shown in the 2003 aerial imagery correspond to the Flood Zone 2 extents that extend into the Proposed Development Site. It appears that at some point between December 2003 and July 2004 the DNR and Longford River were diverted around the edge of the Airport, likely associated with the construction of Terminal 5. A comparison of Google Earth aerial imagery from December 2003 and July 2004 is provided in Figure 4.

Figure 3: Environment Agency Historic Flood Outlines



Google Maps (2024). Heathrow Airport. Available at: https://maps.app.goo.gl/ZarZCeGgUA6vUfwR7 (Accessed 12 September 2024). Contains Environment Agency data © Environment Agency copyright and database right.

Figure 4: Google Earth Historic Aerial Imagery Comparison

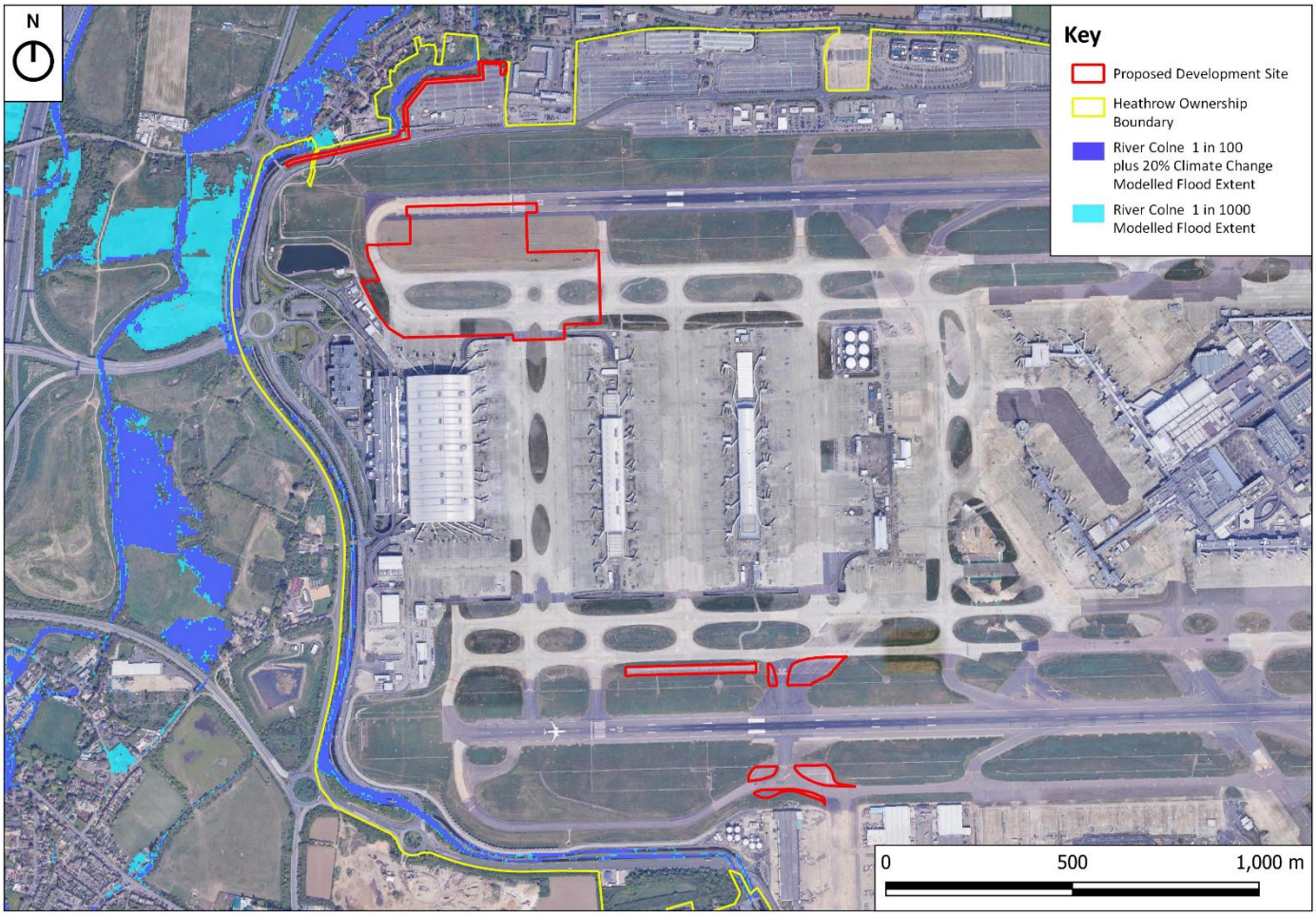


Hydraulic Modelling

The EA's River Colne Modelling and Mapping Study completed in 2012 includes the DNR and reflects the current (post 2004) river alignment. Results of this study indicate that both the 1 in 100 year plus 20% climate change and 1 in 1000 year flood extents remain within the banks of the DNR and would not affect the Site.

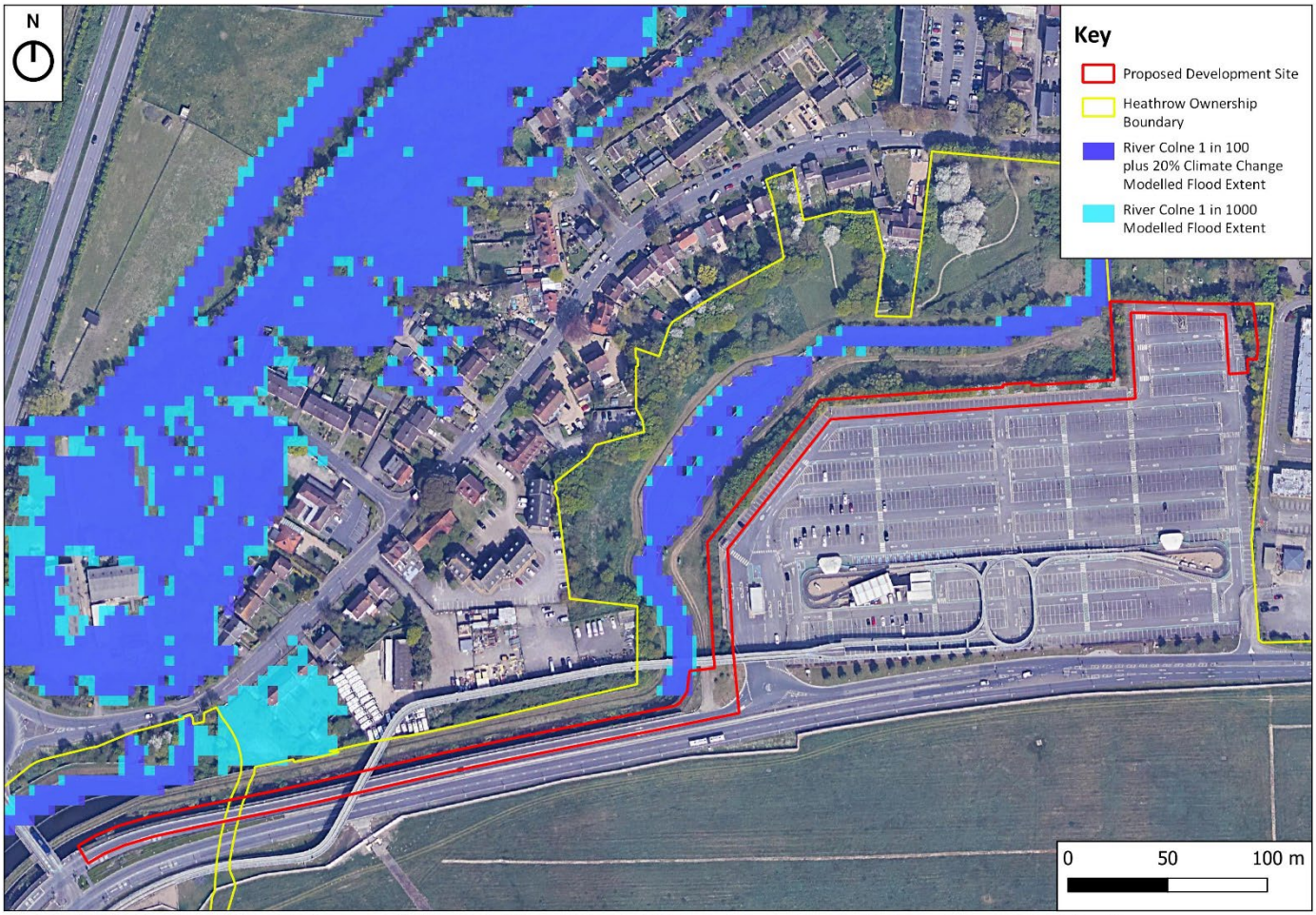
The modelled flood extent is shown in Figures 5 and 6, and a comparison between the 1D in-channel modelled flood levels and adjacent ground levels is provided in Table 2, confirming that all flood water for both the 1 in 100 year plus 20% climate change and 1 in 1000 year scenarios is anticipated to stay within the channel.

Figure 5: Environment Agency River Colne Modelled Flood Extents



Google Maps (2024). Heathrow Airport. Available at: https://maps.app.goo.gl/ZarZCeGgUA6vUfwR7 (Accessed 12 September 2024). Contains Environment Agency data © Environment Agency copyright and database right.

Figure 6: Environment Agency River Colne Modelled Flood Extents – Noise Barrier Component



Google Maps (2024). Heathrow Airport. Available at: https://maps.app.goo.gl/ZarZCeGgUA6vUfwR7 (Accessed 12 September 2024). Contains Environment Agency data © Environment Agency copyright and database right.

Table 2: Flood and Ground Level Comparison

Location	Flood Event	In Channel Water Level (m AOD)	Minimum Top of Bank Ground Level (m AOD)	Freeboard (m)
Northern Extent of Car Park (505218, 176859)	1 in 100 plus 20% climate change	23.37	23.99 [a]	0.62
Northern Extent of Car Park (505218, 176859)	1 in 1000	23.46	23.99 [a]	0.53
South of Heathrow Pod (505010, 176662)	1 in 100 plus 20% climate change	23.34	23.54 [b]	0.20
South of Heathrow Pod (505010, 176662)	1 in 1000	23.43	23.54 [b]	0.11

[a] Ground level taken from LiDAR data

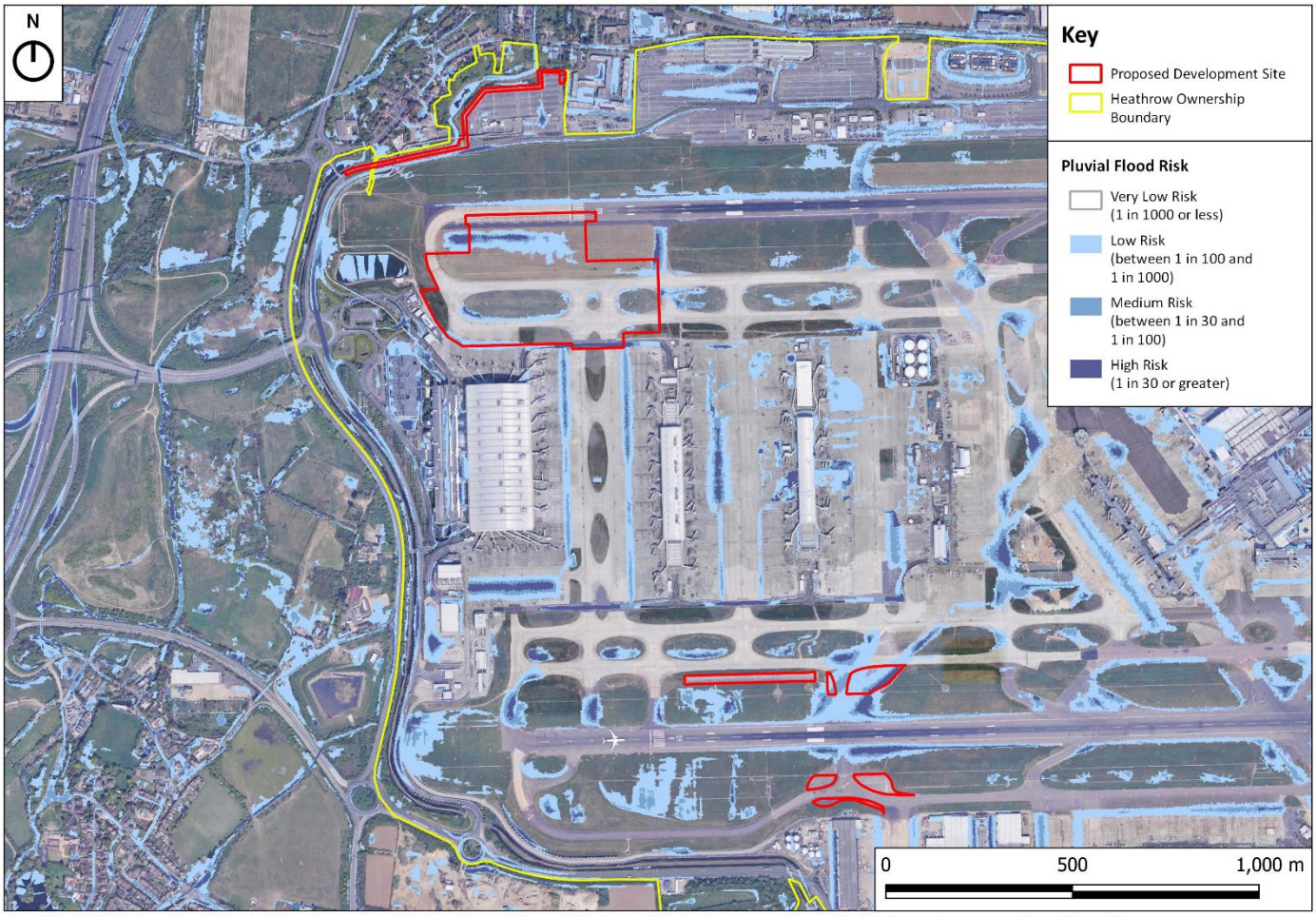
[b] Ground level taken from topographic data

Following review of Google Earth's historic aerial imagery and EA hydraulic modelling outputs, is it considered that the current Flood Zone 2 extents that cross the Proposed Development Site and follow the route of the preexisting DNR channel are not an accurate representation of flood risk at the Site, as these channels have now been diverted and infilled. Hydraulic modelling undertaken by the EA in 2012 indicates that fluvial flood risk to the Site is considered to be low, with flows remaining within the banks of the DNR during all events up to and including the 1 in 1,000 year event. In reality the entire Site is therefore considered to lie within Flood Zone 1.

3.2 Surface Water

The EA Flood Risk from Surface Water mapping indicates that the majority of the Site is at a very low risk of flooding from pluvial sources. There are however, localised areas of ponding within the Site which are shown to be at low, medium, and high risk, as indicated in Figure 7. These areas are likely due to localised topographic low points within the Site and do not appear to form overland flow routes emanating from off Site areas.

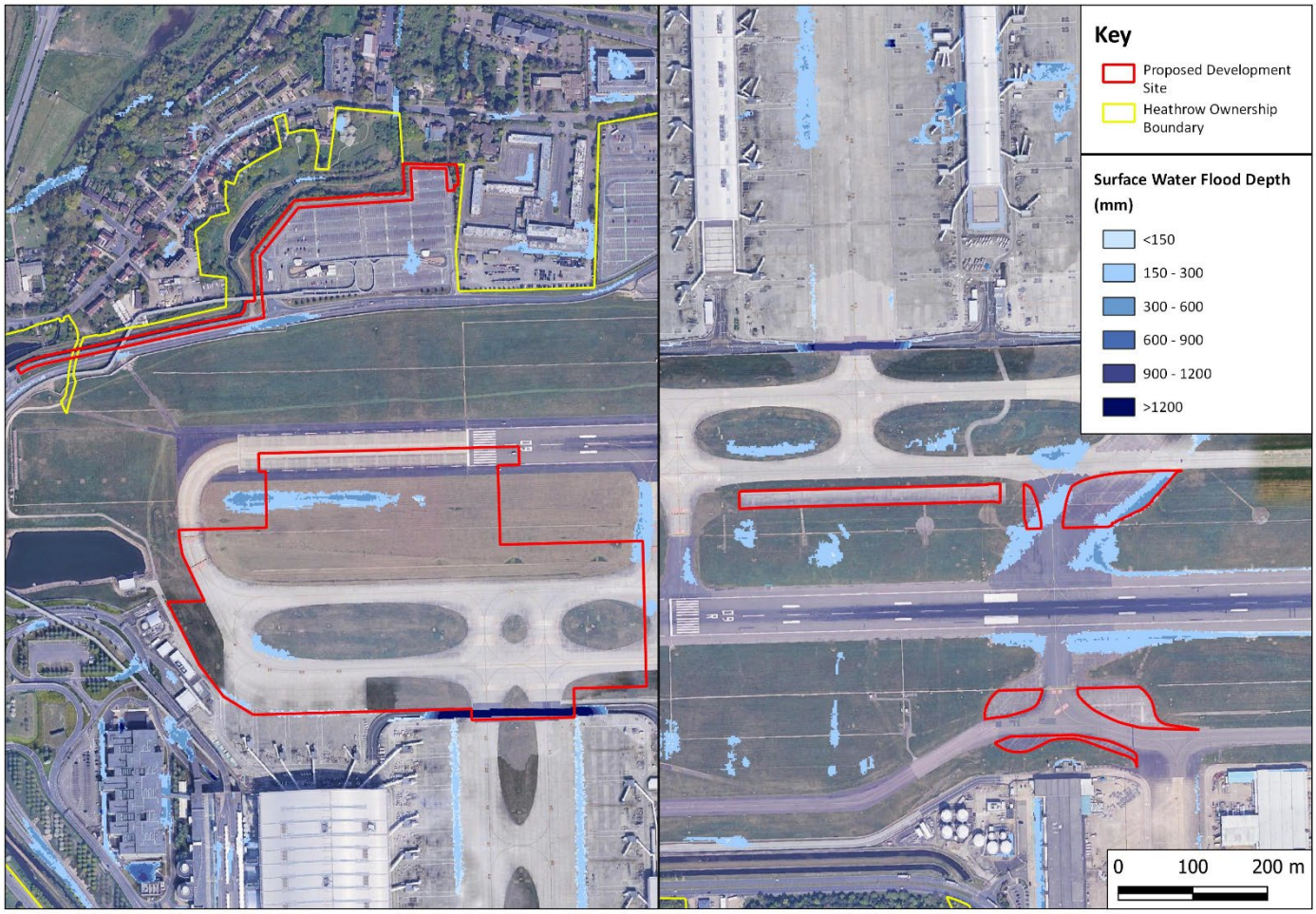
Figure 7: Environment Agency Risk of Flooding from Surface Water mapping



Google Maps (2024). Heathrow Airport. Available at: https://maps.app.goo.gl/ZarZCeGgUA6vUfwR7 (Accessed 12 September 2024). Contains Environment Agency data © Environment Agency copyright and database right.

EA mapping indicates that in the medium risk scenario (up to the 1 in 100 year event), surface water flood depths are generally less than 150mm, however some localised areas could be affected by 150mm – 300mm of flooding (Figure 8).

Figure 8: Environment Agency Risk of Flooding from Surface Water mapping – 1 in 100 year flood depth



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Immediately to the south of the airfield infrastructure component boundary is an area shown to have potential flood depths of >1200mm. From review of existing levels this is a topographically low area associated with an underpass beneath the taxiway, and would therefore not affect the Site or operations on the taxiway above.

As the proposals primarily comprise changes to taxiways, ground levels would remain broadly as existing with no significant areas of land raising or lowering. Where existing hardstanding is to be removed, an improvement will be made as surface water will be able to infiltrate.

The modelling that informs the EA Flood Risk from Surface Water dataset does not include drainage networks and therefore is considered to form a conservative assessment of flood risk at the Site. The Airport is served by a complex surface water drainage system designed to remove standing water from areas of hardstanding to ensure safety of aircraft movements, and provide treatment. As part of the development, the existing drainage network within the Airport will be amended to serve the new areas of hardstanding. This will be quantifiably modelled at the detailed design stage, ensuring that discharge from the Airport remains in line with the current discharge permits. Overall there will be no increase in runoff volume from the Site, as the area of removed redundant pavement (3.88ha) is greater than the new hard standing proposed (3.50ha).

As set out above, the areas of potential surface water ponding do not form part of wider flow routes outside of the Heathrow ownership boundary and any minor onsite ponding will be removed by the Airport's surface

water drainage system. The risk of flooding from surface water to the Proposed Development is therefore considered to be low.

3.3 Groundwater

British Geological Survey (BGS) mapping indicates that the Site is underlain by bedrock geology of London Clay, with superficial deposits of Taplow Gravel Member (consisting of sand and gravel).

Borehole and trial pit logs undertaken within the Airport between February 1946 and August 2002, confirm the presence of Taplow Gravel Member and London Clay, and also identify the presence of Langley Silt Member in less than half of the borehole locations at the Airport. Airport ground investigation findings also indicate the following:

- Shallow groundwater in superficial deposits is at shallow depth, within 1-3m below ground level (bgl), but is deeper towards the north of the Airport;
- Shallow groundwater flow in the superficial deposits is generally from north to south; and
- Shallow groundwater provides baseflow into rivers close to the Airport, such as the River Crane and Colne.

Susceptibility to Groundwater Flooding maps included within the SFRA indicate that the Site lies within an area with greater than 75% susceptibility to groundwater flooding. This is anticipated to be due to the permeable superficial deposits of sand and gravel, which is further corroborated by the SFRA's Increased Potential for Elevated Groundwater mapping, and the Airport's records of shallow groundwater.

The subbase construction of taxiways has the potential to interact with shallow groundwater flows. However, given that the proposed taxiway alterations are relatively small, it is expected that any interaction would be minor and shallow groundwater flows would still be able to flow around and below the taxiways.

The proposals do not include any other below ground structures that could affect groundwater flows beneath the Site. The risk of flooding from groundwater sources to the Proposed Development is as such considered to be relatively low, and irrespective of this the development generally comprises taxiways, which would not be overly sensitive to groundwater.

3.4 Sewers

Review of the SFRA online mapping shows that there are no recorded incidents of sewer flooding where the works are proposed, however between 1 and 20 incidents of internal sewer flooding have been reported in Terminals 1, 2 and 3 to the east of the works.

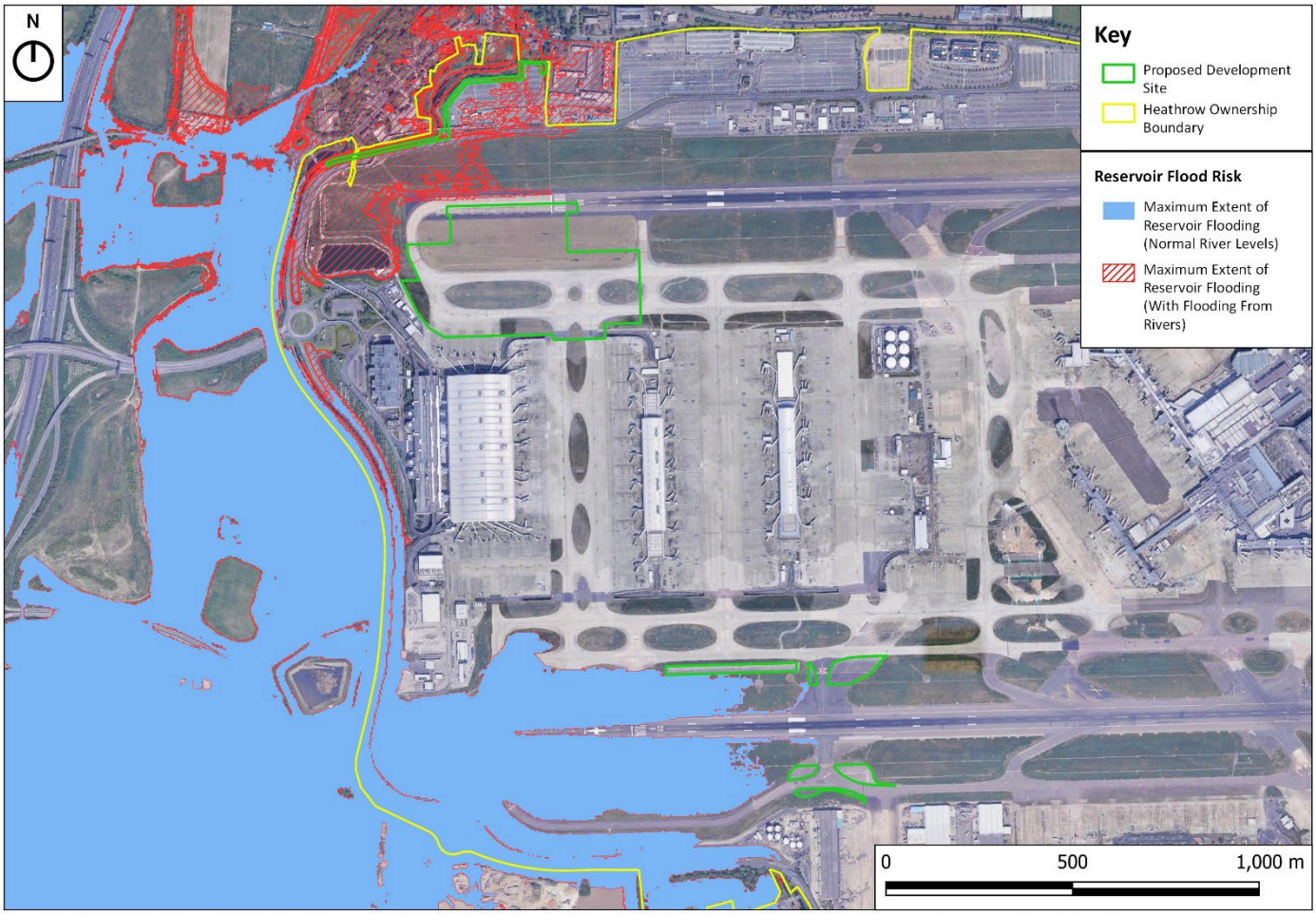
The risk of flooding from sewers is considered to be low, and it is important to note that the proposals only comprise external changes to taxiways that would not be sensitive if this was to occur.

3.5 Artificial Sources

The EA's Flood Risk from Reservoirs mapping (Figure 9) indicates that the majority of the Site does not fall within the reservoir flood extents. However, the noise barrier component is shown to be within the maximum extent of flooding from reservoirs when there is also flooding from rivers. It is worth noting that reservoirs are maintained to a high standard and are inspected regularly, the chance of a reservoir failure is therefore considered to be extremely unlikely.

There are no other artificial bodies of water in close proximity to the Site which could cause a risk, and the risk of flooding from artificial sources is therefore considered to be low.

Figure 9: Environment Agency Risk of Flooding from Reservoirs mapping



Google Maps (2024). Heathrow Airport. Available at: https://maps.app.goo.gl/ZarZCeGgUA6vUfwR7 (Accessed 12 September 2024). Contains Environment Agency data © Environment Agency copyright and database right.

4. Site Selection

The NPPF states that development should not be permitted if there are reasonably available sites appropriate for the Proposed Development in areas with a lower risk of flooding.

Given the relatively minor changes proposed to the Site and the strategic use of the Site as an International Airport, it is not considered pragmatic for the Proposed Development to be located at an alternative site. The proposed airfield infrastructure and redundant taxiway components of the development cannot be positioned elsewhere as they rely on the existing Airport infrastructure in those areas to function as designed, and the aircraft movements required to operate in an easterly direction. The proposed hard standing can therefore not be located elsewhere.

Similarly, detailed noise modelling has been undertaken to inform the design and alignment of the proposed noise barrier, so that sufficient mitigation is provided to the village of Longford to the northwest. The specific location of the noise barrier is therefore paramount to providing the mitigation required, and cannot be relocated elsewhere.

It is therefore not possible for the Proposed Development to be accommodated at an alternative location, or within different areas of the Airport.

5. Conclusion

In summary, as the development proposals rely on the existing infrastructure present at the Site, no reasonably alternative sites would be appropriate or feasible. The minor amendments to the current infrastructure must be located at the Airport itself, and in the specific locations proposed.

In addition to this, the Proposed Development Site is considered to be at a low risk of flooding from fluvial, tidal, and artificial sources. The risk of flooding from groundwater and surface water is also deemed to be relatively low, and the proposed infrastructure would not be susceptible to flooding from these sources.

As outlined above, and in line with the PPG, it is considered that the Sequential Test would not apply in this instance. In line with Table 2 of the PPG, there is no requirement to apply the Exception Test for a less vulnerable development in Flood Zones 1 or 2.

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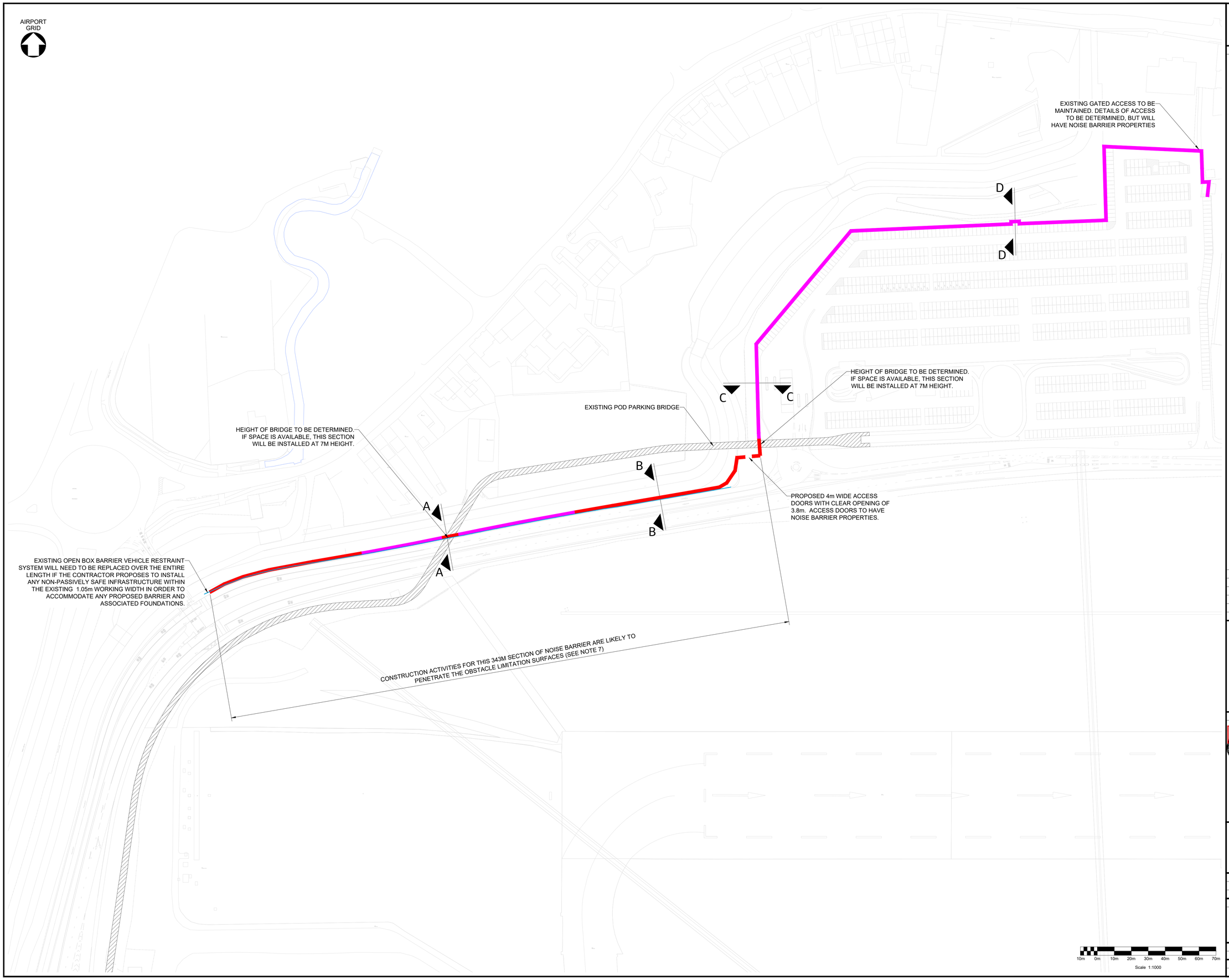
Approved by:	Sophie McCabe (Technical Director)
Date:	12 September 2024

Appendix A1 – Development Proposals

AIRPORT GRID



Model / Content References List - Number, Version & Status:

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19309-YY-M2-XXX-100006

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3. ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE STATED.
4. DO NOT SCALE FROM THIS DRAWING.
5. FOR TYPICAL SECTIONS OF PROPOSED NOISE BARRIER PLEASE SEE DRAWINGS 19219-XX-SE-247-000001 & 19219-XX-SE-247-000002.
6. THE PROPOSED VEHICLE RESTRAINT SYSTEM SHALL HAVE A VELOCITY CLASS OF 50km/h, AN IMPACT SEVERITY LEVEL OF CLASS B, AND A CONTAINMENT LEVEL OF N2. CONTRACTOR TO ENSURE WORKING WIDTH SUFFICIENT FOR CONTRACTOR'S PROPOSALS AND LOCATION OF LIGHTING COLUMNS. TERMINALS TO HAVE PERMANENT LATERAL DISPLACEMENT ZONE OF CLASS D.1.1 AND EXIT BOX CLASS Z1 ON APPROACH AND DEPARTURE SIDES.
7. CONTRACTOR TO CONFIRM FULL WORKING ARRANGEMENT WITH HAL. SOME AREAS MAY BE RESTRICTED TO NIGHT WORKS TO COMPLY WITH AIRFIELD OPERATIONAL REQUIREMENTS.
8. CONTRACTOR TO DESIGN ACCESS DOORS FOR JACOBS REVIEW. DOORS TO OPEN TO FULL HEIGHT OF BARRIER AND HAVE HEAVY DUTY HASP AND STAPLE FOR PADLOCK. LATCHES ARE REQUIRED TO SECURE THE DOORS WHEN OPEN.

LEGEND

- PROPOSED NOISE BARRIER ALIGNMENT (5m HEIGHT) TOTAL LENGTH 235m
- PROPOSED NOISE BARRIER ALIGNMENT (7M HEIGHT) TOTAL LENGTH 546m
- EXISTING PERSONAL RAPID TRANSIT SYSTEM (PRT)
- EXISTING OPEN BOX BEAM (OBB) VEHICLE RESTRAINT SYSTEM (VRS)

10m 0m 10m 20m 30m 40m 50m 60m 70m

Scale 1:1000

Ver	Date	Description Of Change	Drawn By
1.0	07/08/24	FIRST ISSUE - FOR INFORMATION	JS

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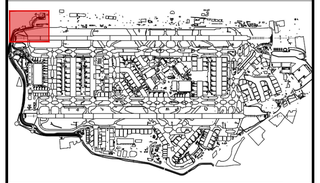
Key Plan



Heathrow

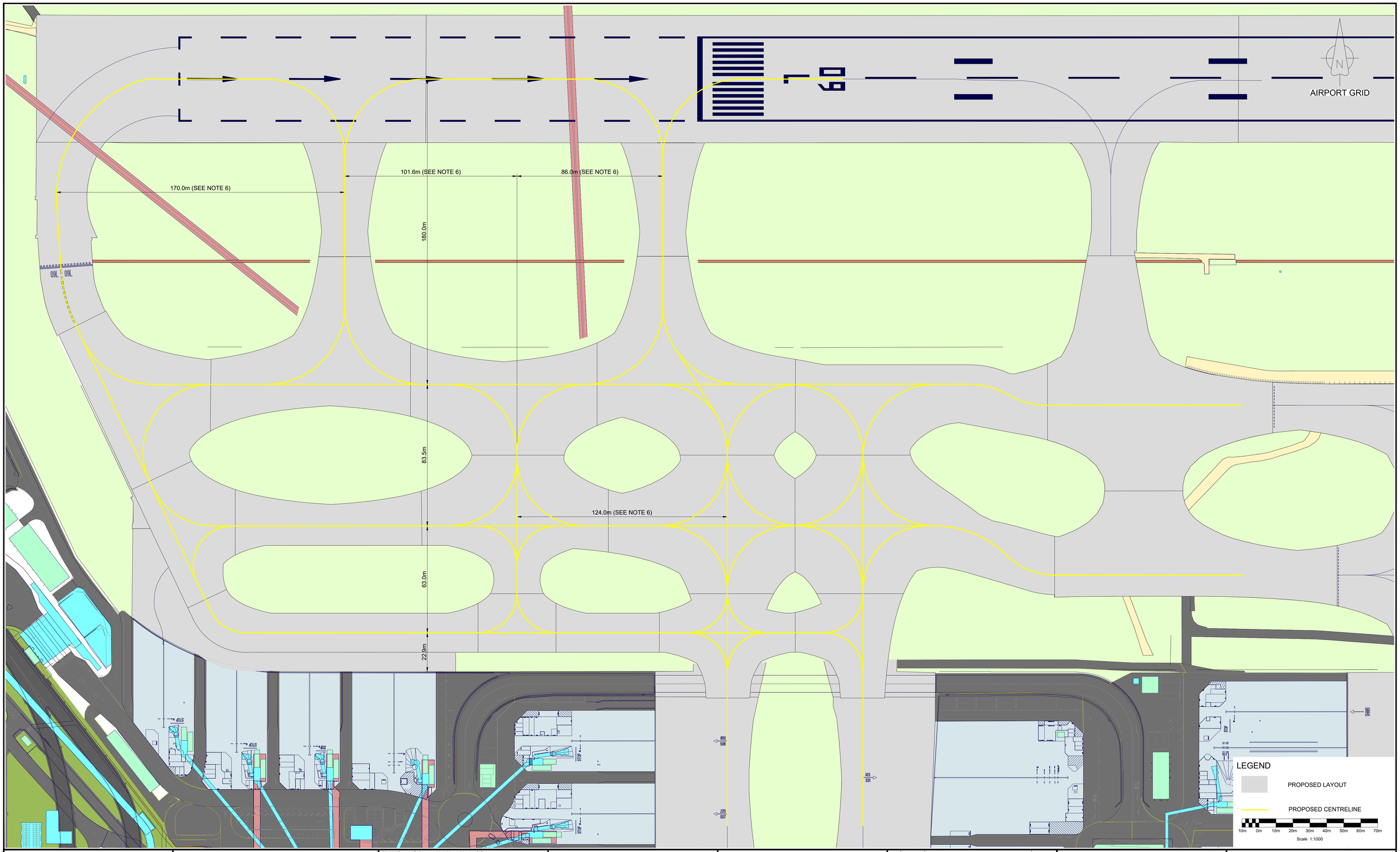
Scale: 1:1000 @ A1	
Project Name	Heathrow Project No.
EASTERLY ALTERNATIONS INFRASTRUCTURE	B7239

Title

EASTERLY ALTERNATIONS INFRASTRUCTURE
PROPOSED NOISE BARRIER
GENERAL ARRANGEMENT

Company	Drawn By	Chk/Approved	Drawn Date	Status
JACOBS	JS	CW / CW	07/08/24	A2

Location-Level-Sub Series/System-Identifier	Version
19219-00-GA-247-000001	1.0



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6. EAST-WEST POSITION OF PROPOSED RUNWAY ACCESS TAXIWAYS AND PROPOSED LINK SUBJECT TO CHANGE UP TO 20M DURING DETAILED DESIGN.

Model / Content References List - Name, Version & Status:

19309-YY-M2-193-000047
HAL_10000-XX-M3-XXX-000079
19309-YY-M2-193-000049

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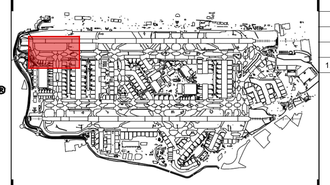
Key Plan



Ver	Date	Description Of Change	Drawn By
1.0	07/08/24	FIRST ISSUE - FOR INFORMATION	JS

Title

EASTERLY ALTERNATIONS INFRASTRUCTURE
PROPOSED 09L RUNWAY HOLD AREA
GENERAL ARRANGEMENT

Heathrow

Project Name			Heathrow Project No.	
EASTERLY ALTERNATIONS INFRASTRUCTURE			B7239	
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Company	Drawn By	Chk/Approved	Drawn Date	Status
JACOBS	JS	CW / CW	07/08/24	A2
Location-Level-Sub Series/System-Identifier				Version
19309-00-GA-193-000002				1.0