Gatwick Airport Northern Runway Project

Environmental Statement
Appendix 11.9.6: Flood Risk Assessment – Clean Version

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0 Executive Summary

Background

0.1.1 The proposal to make best use of London Gatwick Airport's existing runways and infrastructure (referred to within this report as 'the Project') is located within areas at risk of flooding. Therefore, to comply with national planning policy a Flood Risk Assessment (FRA) is required to demonstrate that the development would be safe for users for its lifetime and not increase flood risk to other parties.

0.1.2 This FRA considers flood risk from all sources to the development and the risk of flooding as a result of the development for its lifetime taking the predicted impact of climate change into account. The FRA has informed the assessment of impact reported in **ES Chapter 11: Water Environment** (APP-036).

Flood Risk Context (Section 5, ANPS 5.154, NPS 9.94[1])

0.1.3 The primary sources of flood risk at Gatwick Airport are fluvial flooding from local watercourses: the River Mole, Gatwick Stream, Crawter's Brook and Man's Brook and surface water flooding when the capacity of the drainage network is exceeded (these are shown on Figure 2.1.1). Hydraulic modelling has been undertaken to assess these sources of flood risk to inform this FRA.

0.1.4 The assessment of fluvial flood risk has utilised the Upper Mole hydraulic model developed collaboratively by the Environment Agency (EA) and Gatwick Airport Limited (GAL) in 2018 (further modelling details are provided in Annex 5). The assessment of surface water flood risk has been based on modelling of the airport surface water drainage network and separate hydraulic models of the highways drainage networks. An integrated (ICM) hydraulic model has been developed combining local watercourses and the airfield drainage network into a single model to undertake a sensitivity test of the resilience of the latter during a fluvial flood event. The baseline fluvial hydraulic modelling was accepted by the EA in August 2023, further details regarding the position of the EA are provided in 10.1.12 Statement of Common Ground between Gatwick Airport Limited and Environment Agency Version 2 [REP5-057]

0.1.5 The flood extents developed for the Project from the hydraulic modelling have informed the assessment of flood risk in the baseline (see Section 5) and for the with-scheme scenarios for a range of assessment timescales.

[1] Paragraph 5.131 in March 2024 NNNPS

0.1.6 All areas within the Project site boundary falling within flood extents for the 3.33 per cent (1 in 30) AEP event (equivalent to Flood Zone 3b) are directly related to watercourses and do not encroach into areas that would be developed for the Project, except for a small area at the western end of the airport, where parts of the Project Taxiway Juliet West Spur, the edge of Taxiway Juliet, the surface access works to the A23 at the northern terminal access roundabout and at Longbridge roundabout (see paragraph 7.2.37). No reasonably available sites were available for the elements of the proposed development in these areas, but fluvial mitigation measures are provided to ensure no increase in flood risk to other parties for this event.

0.1.7 There are other areas of the Project that are located within Flood Zones 2 and 3.

0.1.8 The predicted impact of climate change on flood risk has been assessed in accordance with Environment Agency Flood Risk Assessments: Climate Change Allowances guidance (Environment Agency, 2022a) and has been found to increase the risk of fluvial and surface water flooding to the airport in the future (see Section 3.7).

Vulnerability Assessment (Section 5)

0.1.9 The flood risk vulnerability of the Project has been assessed in accordance with Annex 3 of the National Planning and Policy Framework (NPPF). Table 5.10.1 sets out the vulnerability classification for the Project elements, the majority of which have been assessed as Essential Infrastructure.

Adopted Design Life (Sections 3.7 and 7, ANPS 5.154)[2]

0.1.10 The mitigation measures for the Project prevent any increase in off-site fluvial flood risk for its lifetime based on a 1 per cent (1 in 100) AEP plus a 20 per cent allowance for climate change, equivalent to adopting a 100-year design life. However, considered individually the highways scheme and airports element adopt separate design lives consistent with the character of these elements of the development and the effects when flooding occurs. This section explains the design criteria adopted and the reasons for these.

0.1.11 The surface access highways improvement elements adopt a 100-year design life to 2132 from the first full year of opening in 2032. Following consideration of the changes brought by the Project and the sources of flooding, a 40-year design life has been adopted for the airfield. This follows review of the infrastructure

[2] Paragraph 5.131 in March 2024 NNNPS

being altered, the likelihood of the continued evolution of the airfield over the longer term, and of where flooding actually occurs.

0.1.12 A 40-year design horizon from 2029 extends to 2069. A realistic appraisal is that the airfield is likely to continue to change beyond 2038 by which time all of the major airfield components of the Project will have been completed. Evidence for this conclusion draws on the changes at Gatwick airport visible from aerial photographs for example:

- Aircraft size and performance changes over time leading to changes in locations of runway exit taxiway (RET) infrastructure, including withdrawal of RETs from service;
- Areas within the footprint have been reconfigured – e.g. the original central fuel farm was replaced with a large block of drive through aircraft stands in circa 1997.
- The original Pier 1 (circa 1965) has been demolished and replaced, and
- Piers 2 and 3 will be approaching 80 years old by 2059, parts of South Terminal will be approaching 100 years old;

0.1.13 Despite different design lives across the proposed development, the Project secures a holistic fluvial mitigation strategy, mitigating collectively for the airfield and highways improvement elements to the standard of the longer design life. The shorter design life for the airfield is, in effect, ignored and the whole project is mitigated up to the 1 per cent (1 in 100) AEP plus a 20 per cent allowance for climate change event, which based on the EA Guidance for the consideration of climate change is equivalent to adopting a 100-year design life for fluvial flood risk for all Project elements.

0.1.14 While a 40-year design life has been adopted for the airfield elements, for surface water flood risk a sensitivity test of plus 40 percent for the airfield drainage network (equivalent to a 100-year design life) has been undertaken that demonstrates that there would be no increase to other parties in a more extreme event than the lifetime of the airfield elements.

Consideration of Climate Change (Sections 3.7 and 7, ANPS 5.154)[3]

0.1.15 The FRA incorporates the predicted impact of climate change in accordance with EA Guidance (Flood Risk Assessments: Climate Change Allowances Guidance, Environment Agency, 2022). This is applied through uplift allowances based on

[3] Paragraph 5.131 in March 2024 NNNPS

UKCP18 published by the EA for peak river flow for fluvial flood risk and rainfall intensity for surface water drainage.

0.1.16 The climate change allowances applied for peak river flow are based on the Project's location (Thames River Basin District), vulnerability classification (essential Infrastructure as a worst-case, see paragraph 0.1.9) and design life (40 and 100 years to 2069 and 2132 respectively, see paragraph 0.1.10). Based on these criteria, the Higher Central allowances have been applied to the Project for the 2050s epoch for the airfield and the 2080s epoch for the highways elements as indicated in **red bold** in Table 0.1.

Table 0.1 Climate Change Allowances Applicable to Peak River Flow

Allowance	Total potential uplift anticipated		
	2020s (up to 2039)	2050s (2040-2069)	2080s (2070-2125)
Upper End	27%	26%	**40%***
Higher Central	**16%**	**12%**	**20%**
Central	11%	6%	12%

* Plus 40% Allowance applied for the Credible Maximum Scenario, see paragraph 0.1.18.

0.1.17 Based on the EA guidance as reproduced in Table 0.1 an uplift factor of plus 12 per cent is applicable to the consideration of fluvial flood risk on the airfield and plus 20 per cent for the surface access highways improvements elements. The plus 16 per cent allowance applies to the construction period assessments. All uplift factors are applied to the 1 per cent (1 in 100) Annual Exceedance Probability (AEP) event.

0.1.18 In accordance with EA Guidance, a Credible Maximum Scenario (CMS) has been applied to test the sensitivity of the Project to a more extreme change in peak river flow due to climate change of plus 40 per cent. It should be noted that the guidance does not provide a CMS for rainfall intensity (see paragraph 0.1.23).

0.1.19 The 100-year design life for the highways elements would extend to 2132, seven years beyond the end of the 2070's epoch of 2125. It is considered that based on current predictions, an additional seven years of climate change beyond 2125 would not impact significantly on the assessment of flood risk for the Project. Additionally the CMS would cover the additional seven years beyond 2025. The CMS sensitivity test of plus 40 per cent on the 1 per cent (1 in 100) AEP event has assessed the impact of the Project in the event of climate change impacts exceeding those currently predicted as reproduced in Table 0.1.

0.1.20 The analysis demonstrates that with the incorporation of the mitigation measures secured by the Project it would not increase flood risk to other parties in the 1 per cent (1 in 100) plus 40 per cent event (see FRA Figure 7.2.8). Given the difference between the uplift of 20 per cent to 2125 and the CMS of 40 percent, it is considered that the additional 20% would be sufficient to address the potential additional climate change impacts that would result in the seven-year period post 2125 to the 100-year design life horizon for the Project of 2132.

0.1.21 Climate change allowances for rainfall intensity applicable to the Project are set out as indicated in **red bold** in Table 0.2. Following EA Guidance these are based on the design life of the Project and its location as set out in paragraph 0.1.16.

Table 0.2 Climate Change Allowances Applicable for Rainfall Intensity

Rainfall Event	Allowance	Total potential uplift anticipated	
		2050s (up to 2060)	2070s (2061 – 2125)
3.3% (1 in 30) AEP	Upper End	35%	35%
	Central	20%	20%
1% (1 in 100) AEP	Upper End	40%	**40%**
	Central	20%	**25%**

0.1.22 Developments with a lifetime between 2061 and 2100 adopt the Central allowance for the 2070s epoch, so as the design life for the airfield is 40-years to 2069 an uplift factor of plus 25 per cent is applied. As the surface access highways elements has a longer design life of 100 years, extending beyond 2100 it adopts the Upper End allowance of plus 40 per cent. Both uplift factors are applied to the 1 per cent (1 in 100) AEP event.

0.1.23 Although the EA Guidance does not provide criteria for a CMS for rainfall intensity, the 40 per cent uplift has been tested (as a sensitivity analysis) for the airfield drainage, in order to test the impact of a larger than predicted change in rainfall as a result of climate change. This has not identified any new significant effects beyond those for the design (20 per cent) event: modelling demonstrates that there would be betterment or negligible change at all locations that previously experienced flooding (see ES Appendix 11.9.6 Figure 7.3.5 and Figure 7.3.6), except for a very localised area of increase near Taxiway Juliet West that would not be expected to impact airport operations.

Fluvial Mitigation Strategy (Section 7.2, ANPS 5.154, NPS 9.94[4] and 5.105[5])

0.1.24 Without mitigation the project would increase flood risk to other parties due to the encroachment into and truncation of the floodplain. Therefore a mitigation strategy has been developed to address this and ensure flood risk is not increased to other parties and that the development is safe for users for its lifetime. The proposed fluvial mitigation measures are set out in Section 7.2 and indicative designs are provided in Annex 1. The mitigation measures are a combination of floodplain compensation areas (FCA) plus syphons and culverts to maintain floodplain connectivity to address fluvial flood risk impacts. An explanation of the nature and anticipated operation of the two FCAs is included in Annex 5. These are all proposed to be secured through the **draft DCO** [REP5-005]

0.1.25 The fluvial mitigation strategy has been developed holistically for both airfield and surface access highways elements. Seeking to separate them would introduce additional complexity and potentially environmental effects due to more wide-scale works being required. Instead a single holistic strategy was developed to ensure no increase to flood risk to other parties for a 100-year lifetime including the predicted impacts of climate change. This in effect supersedes the shorter (40-year) design life adopted for the airfield elements, mitigating for any fluvial flood risk impacts from the airfield works to a 100-year design life. The strategy has therefore been designed for the 1 per cent (1 in 100) plus 20 percent event.

Surface Water Drainage Mitigation Strategy (Section 7.3, ANPS 5.154 and 5.163, NPS 9.94[6] and 5.105[7])

0.1.26 The surface access highways improvements result in an increase of impermeable area that without mitigation could increase flood risk to other parties. Consequently the Project includes mitigation measures consisting of a combination of basins, swales and online storage to store and attenuate peak rates of runoff to ensure no increase in flood risk to other parties. These are described in Section 7.3 and Annex 2.

0.1.27 The Project would increase the impermeable area across the airfield. Consequently the Project includes additional storage and attenuation within the airfield drainage network (including a significant new below-ground storage tank beneath Car Park Y) that mitigates for the additional runoff on the airfield for the

[4] Paragraph 5.131 in March 2024 NNNPS
[5] Paragraph 5.150 in March 2024 NNNPS
[6] Paragraph 5.131 in March 2024 NNNPS
[7] Paragraph 5.150 in March 2024 NNNPS

40-year design life including a corresponding allowance for climate change (see Table 0.2). The measures are described in Section 7.3. These are all proposed to be secured through the draft DCO [REP5-005].

0.1.28 For those airfield drainage catchments that would experience an increase in impermeable area as a result of the project their discharge is restricted either by vortex flow controls or pumping capacity to the receiving watercourse. These will not be altered by the Project. Therefore peak rates of discharge off-site cannot increase, resulting in no increase in flood risk to other parties for all flood events. The airfield surface water mitigation strategy has been designed for a 40-year design life but a sensitivity test has been undertaken with a 40 per cent uplift that is commensurate to a 100-year design life. This demonstrates that there would be increases in flood depths on the airfield compared to the baseline in such an event (see Figures 7.3.5 and 7.3.6). However the safety of passengers and staff would be maintained through existing GAL response procedures as set out in the FRS, see Annex 6 which is secured by DCO Requirement 24.

0.1.29 The Project and associated mitigation measures have been developed to an outline design level and are therefore subject to modification during detailed design post the Development Consent Order (DCO) examination. However the design principles set out in Appendix 1 of the Design and Access Statement and Requirements secured through the draft DCO will ensure that the Project continues to adhere with the principle that the Project will not increase flood risk to other parties and will be safe for users for its lifetime.

Increased Risk to the Airfield (Sections 6.2 and 7.2, ANPS 5.154[8])

0.1.30 The Project would increase flood risk to the airfield while not increasing flood risk to other parties, this is predominantly away from operational areas on the airfield in the vicinity of the fire training ground to the north-west of the airfield. The response to such events is set out in the FRS that demonstrates how the safety of passengers and staff would be maintained during a flood event and which is secured by DCO Requirement 24.

Sequential and Exception Tests (Paragraphs 5.10.3 to 5.10.6 and 5.10.8 to 5.10.12 and Section 7.6, ANPS 5.154[9])

0.1.31 The intention of the Project is to make best use of existing infrastructure in accordance with national aviation planning policy (Making the Best Use of Existing Runways, Department for Transport, 2018). Consequently, the new

[8] Paragraph 5.131 in March 2024 NNNPS
[9] Paragraph 5.131 in March 2024 NNNPS

elements of the Project would be located within or connected to existing infrastructure that is within Flood Zones 2 and 3 as there is limited space to provide a revised northern runway, taxiways and associated infrastructure and not encroach into floodplain. The spacings of runways and taxiways is in accordance with specific criterion approved by the UK Civil Aviation Authority (CAA). A wider separation of runways and taxiways, or changed relative positions, would involve greater disruption to the interior airport layout and increase the likelihood of the need to take land outside of the existing airport boundary. In any event, the course of the River Mole and its tributaries at Gatwick means that any movement of infrastructure would still be likely to intersect with areas of floodplain. Paragraphs 5.10.6 and 5.10.7 of the FRA demonstrate that alternative options for the Project elements have been considered but as no options are available, the Sequential Test has been met.

- The Exception Test has been applied to the Project, demonstrating how the Project would provide wider sustainability benefits and how it will be safe for users for its lifetime, without increasing flood risk elsewhere, and where possible reduce flood risk. The Planning Statement [APP-245] sets out the economic and socio-economic benefits of the Project:
- addresses unmet aviation demands in the South East
- creation of 14,000 additional jobs (and employ at its peak 1,400 during construction) and productivity benefits;
- new opportunities to emerge from the Gatwick Employment, Skills and Business Strategy (see ES Appendix 17.8.1: Employment, Skills and Business Strategy [APP-198]);
- contribution of £1.75bn in GVA across the UK;
- Just over £1bn in taxes;
- increased and improved aviation connectivity;
- highways and surface access improvements (including improvements to public transport accessibility);
- induced investment and agglomeration benefits (businesses wanting to locate next to the airport);
- increased trade and foreign direct investment (FDI) – increased expenditure;
- tourism benefits (jobs and visitor spending benefits to the economy);
- bringing operational resilience to the UK aviation system;
- increased freight capacity;
- increased competition which could result in reduced fares and increased efficiencies; and
- environmental enhancements including new landscaping/open space areas; creation of new ecological habitats; improved flood mitigation measures.

0.1.32 In addition the Project's sustainability framework reflects both the objectives used by the Government in the Airports National Policy Statement (Department for Transport, 2018) and the sustainability priorities relevant to the host local authorities within the context of local aspects. More information on wider aspects of sustainability can be found within the ES, with a brief description of GAL's ongoing sustainability objectives included in ES Chapter 5: Project Description [REP1-016].

1.1.1 The FRA demonstrates that the Project would not increase flood risk to other parties for its lifetime, incorporating the predicted impacts of climate change. The Project would increase flood risk within the airport due to encroachment and truncation of floodplain. These areas of increased flood risk are not expected to affect the ability of the airport to remain operational and safe. The planned response to an event (including the management flow chart during such an event) of this magnitude is set out in the FRS, see Annex 6 that would ensure the safety of staff and passengers in such circumstances (DCO Requirement 24).

0.1.33 Therefore the requirements of the Exception Test have been met as the wider sustainability benefits have been set out and the development would be safe for users for its lifetime.

Residual Flood Risk Response (Flood Resilience Statement (ES Appendix 11.9.6: Annex 6 [REP5-027]) and ANPS 5.154[10])

0.1.34 GAL acknowledges that the airport is at risk of flooding in the baseline situation and this will continue to be the case with the Project, while ensuring existing risk is not exacerbated for other parties. GAL has developed response procedures including routes for safe access and egress as set out in the FRS. The FRS includes a summary of the evacuation procedures but due to the sensitive nature of the infrastructure and security precautions the full details of the procedures cannot be shared publicly. The FRS is secured by DCO Requirement 24.

0.1.35 The risk of extreme flood events beyond the design standard has been considered as part of this FRA. Hydraulic modelling indicates that there would be safe and dry egress from both airport terminals to the A23 and M23 during all conceivable flood events, see Section 5.3 of the FRS.

Conclusions

0.1.36 The FRA demonstrates that through the inclusion of fluvial and surface water mitigation measures the development will not increase flood risk to other parties

[10] Paragraph 5.131 in March 2024 NNNPS

for its lifetime, taking the predicted impact of climate change into account. While the Project will increase fluvial flood risk to certain areas of the airfield this would be managed via existing flood response plans and procedures as set out in the FRS (Annex 6) to ensure the safety of passengers and staff. The Project therefore complies fully with the ANPS and the NNNPS..

1 Introduction

1.1 General

1.1.1 This **Flood Risk Assessment (FRA)** forms **ES Appendix 11.9.6** (Doc Ref. 5.3) of the Environmental Statement (ES) prepared on behalf of Gatwick Airport Limited (GAL). The ES presents the findings of the Environmental Impact Assessment (EIA) process for the proposal to make best use of London Gatwick Airport's (Gatwick) existing runways and infrastructure (referred to within this report as 'the Project'). The Project proposes alterations to the existing northern runway which, together with the lifting of the current restrictions on its use, would enable dual runway operations. The Project includes the development of a range of infrastructure and facilities which, with the alterations to the northern runway, would enable the airport passenger and aircraft operations to increase. Further details regarding the components of the Project can be found in the **ES Chapter 5: Project Description** (Doc Ref. 5.1).

1.1.2 All technical terms and abbreviations used within this FRA report are defined in the Glossary included in Section 10.

1.2 Objectives

1.2.1 The purpose of this FRA is to demonstrate that the Project complies with flood risk requirements of relevant national and local planning policy, including the Airports National Policy Statement (Airports NPS) and the National Planning Policy Framework (NPPF). Primarily, that the Project would not exacerbate existing levels of flood risk to other parties and that it would be safe for users for its lifetime including a consideration of the predicted impacts of climate change.

1.2.2 To achieve this, the FRA:

- includes an assessment of flood risk to the Project, demonstrating that the intended land use is appropriate in terms of flood risk;
- includes an assessment of the predicted impact of the Project upon flood risk, taking account of future climate change impacts;
- demonstrates that the Project would not increase flood risk to surrounding areas and third parties and would be safe for its lifetime; and
- details mitigation measures required to achieve this outcome.

1.3 FRA Structure

1.3.1 This section describes the main objectives of the FRA and provides a brief summary of the report structure and contents.

1.3.2 Section 1 describes the planning and development requirements that have been considered as part of this assessment and explains how these have been addressed within the FRA. This section covers national planning policies, local planning requirements and Strategic Flood Risk Assessment (SFRA) recommendations relevant to the Project and flood risk.

1.3.3 Section 2 briefly describes the study area and provides the overview of the Project elements that could affect or be affected by flood risk. This section also describes some specific study area characteristics that are of interest to flood risk in general, including topography, local watercourses, rainfall, geology and hydrogeology, as well as land use. Further information about the Project site and the components of the Project is provided in **ES Chapter 4: Existing Site and Operation** (Doc Ref. 5.1) and the **ES Chapter 5: Project Description** (Doc Ref. 5.1). Only information that underpins this FRA is summarised in this appendix.

1.3.4 Section 3 provides an overview of the national and local planning policies relevant to the application for development consent for the Project. It refers to national guidance and drivers, as well as specific requirements for nationally significant infrastructure. It also explains the flood risk vulnerability classification for proposed developments and the application of the Sequential and Exception Tests as set out in the NPPF (Department for Levelling Up, Housing and Communities, 2021) and its supporting guidance. Finally, Section 3 describes guidance and requirements regarding the impact of climate change on flood risk, throughout the lifetime of the Project.

1.3.5 Section 4 defines the scope of the assessment and any issues that have been scoped out of this FRA. This section also includes the assumptions made during the assessment and any related limitations that could potentially affect the conclusions.

1.3.6 Section 5 describes the existing level of flood risk to the Project, considering all potential sources of flooding. The assessment includes fluvial, surface water and groundwater flooding, as well as flooding due to reservoir failure, flood defence failure and sewer/ water distribution infrastructure flooding. The data used include publicly available information and site-specific hydraulic modelling that has been developed by GAL (surface water drainage and wastewater) and in partnership with the Environment Agency (fluvial). This section also briefly describes historic flood events that have affected Gatwick.

1.3.7 Section 6 describes how flood risk could be affected, including to third parties, assuming no mitigation was provided by the Project. Hydraulic modelling results have been used to determine the degree of fluvial and surface water drainage

flood risk due to the Project, providing the basis for the assessment of environmental effects reported in this FRA and the **ES Chapter 11: Water Environment** (Doc Ref. 5.1). A desktop study including BGS mapping, limited data from GI from 2006 to 2018, and two project specific GI investigations undertaken in 2022 in the vicinity of Museum Field and the Project Highways realignments (SOCOTEC 2022a, SOCOTEC 2022b) has been undertaken to consider potential qualitative impacts on groundwater flooding.

1.3.8 Section 7 describes the flood mitigation strategy that has been developed as part of the Project. This includes flood compensation areas (FCA), syphons, watercourse diversions and where required, the introduction, relocation and reconfiguration of surface water drainage storage and attenuation features. Hydraulic modelling results have been used to determine the effectiveness of the proposed measures in mitigating fluvial, wastewater and surface water flooding.

1.3.9 Finally, Section 8 provides the summary and conclusions of this FRA.

2 Project and Environmental Overview

2.1 Study Area

2.1.1 A full description of the Project site and Project is provided in **ES Chapter 4: Existing Site and Operation** (Doc Ref. 5.1) and **ES Chapter 5: Project Description** (Doc Ref. 5.1). Only information that underpins this FRA is summarised in this chapter.

2.1.2 The land subject to the application for development consent extends to approximately 735 hectares, all within the ownership of GAL, as stated in **ES Chapter 5: Project Description** (Doc Ref. 5.1) Section 5.2.4. The Project site boundary and study area for the purposes of this FRA is shown in **ES Appendix 11.9.6 Figure 2.1.1** (Doc Ref. 5.3).

2.1.3 The study area adopted for this FRA is defined by a 2 km radius beyond the Project site boundary. Taking into account the nature of the Project, impacts are expected to occur in close proximity to the Project site boundary and it is considered that a 2 km study area would be sufficient to identify any significant flood risk effects to third parties.

2.2 Project Description

2.2.1 The Project includes a number of proposed elements which are shown in **ES Appendix 11.9.6 Figure 2.2.1** (Doc Ref. 5.3).

2.2.2 The following key airfield works components are considered most likely to affect or be affected by flood risk and are considered relevant to this assessment:

- amendments to the existing northern runway including repositioning its centreline 12 metres further north to enable dual runway operations;
- reconfiguration of taxiways;
- pier and stand alterations (including a proposed new pier);
- reconfiguration of other airfield facilities;
- extensions to the existing airport terminals (north and south);
- provision of additional hotel and office space;
- provision of reconfigured car parking, including new car parks;
- demolition and relocation of Central Area Recycling Enclosure (CARE) facility;
- a water treatment facility on the site of Rolls Farm;
- reconfiguration of existing utilities, including surface water, foul drainage and power;
- landscape/ecological planting and environmental mitigation (including a new weir on one box of the River Mole runway culvert); and
- two farm bridges over the Man's Brook.

2.2.3 Together with the alterations to the airfield works, the Project would include surface access (including highway) improvements comprising improvements to:

- M23 Spur, east of Balcombe Road;
- South Terminal Roundabout, including a new flyover and adjoining slip roads;
- Airport Way;
- North Terminal Roundabout, including a new flyover and connection to the A23 London Road;
- A23 London Road;
- Longbridge Roundabout, including the segregated left turn from A23 Brighton Road into A23 London Road; and
- A23 Brighton Road, including the bridge over the River Mole.

2.2.4 Further details of these Project elements are included in **ES Chapter 5: Project Description** (Doc Ref. 5.1).

2.2.5 The details of construction methods, timing and periods are broad at this stage and would be dependent on securing development consent and the discharge of associated requirements. The construction programme is based on the following construction periods which are used to assess the effects during construction:

- Initial construction period commencing in 2024 to 2029;
- First full year of opening: 2029 (up to 2032);

- Interim assessment year: 2032 (up to 2037);
- Design Year: 2038; and
- and a further assessment year of 2047.

2.2.6 The indicative construction periods of the Project are described in **ES Chapter 5: Project Description** (Doc Ref. 5.1).

2.3 Study Area Characteristics

Topography

2.3.1 Gatwick is generally flat at an average ground level of around 58 to 59 metres Above Ordnance Datum (AOD). However, areas around the North and South Terminals have ground levels ranging from approximately 56 metres to 58 metres AOD.

Local Watercourses

2.3.2 Gatwick is located within the Upper River Mole catchment within the Thames River Basin District. The River Mole flows through the airport, south to north, passing under the main and existing northern runways in a twin culvert and a syphon. Tributaries of the River Mole, including Burstow Stream, Crawter's Brook, the Gatwick Stream, Man's Brook and Westfield Stream all run through or close to the Project site boundary. Most of these watercourses, including the River Mole, have been previously diverted. Main Rivers and Ordinary Watercourses in the vicinity of the Project site are shown in **ES Appendix 11.9.6 Figure 2.1.1** (Doc Ref. 5.3).

2.3.3 The Burstow Stream rises at the A2220 to the east of the M23 in Crawley. It flows northwards under the M23 before turning north-westwards skirting the east and north of Horley to join the River Mole northwest of the town, approximately 2 km north of Gatwick. The Burstow Stream tributary rises to the east of the South Terminal roundabout and flows northwards under the M23 spur before its confluence with Burstow Stream.

2.3.4 Crawter's Brook enters the airport boundary to the east of the industrial area of Lowfield Heath and has been previously diverted into an engineered channel, along the southern edge of the airside operational area. Its confluence with the River Mole is located just upstream (south) of the culvert under both runways.

2.3.5 The Gatwick Stream runs along the eastern airport boundary, between the eastern end of the airside operational area and the London to Brighton mainline railway. It is culverted under the South Terminal before running north-west

through Riverside Garden Park to its confluence with the River Mole at Longbridge roundabout.

2.3.6 Man's Brook originates to the west of Gatwick and north of Ifieldwood, where it flows north-east through Brook Farm and runs along a small part of the north-west airport boundary before discharging into the River Mole, west of the Boeing Hangar and Pond M.

2.3.7 Westfield Stream runs through the airport, north of the existing fire training ground, from its source to the west of the airfield. The watercourse comprises open channel sections with earth banks and a number of culverts with associated headwalls where the channel passes under obstructions such as access roads and airport boundary fences. The watercourse has previously been diverted to its current location discharging to the River Mole downstream (north) of the existing Pond A.

Geology and Hydrogeology

2.3.8 Further information on the geological strata and hydrogeology for the Project site is presented in **ES Chapter 11: Water Environment** (Doc Ref. 5.1) (Section 11.6: Baseline Environment) and in **ES Chapter 10: Geology and Ground Conditions** (Doc Ref. 5.1).

2.3.9 The study area is underlain by made ground, superficial deposits and bedrock strata.

2.3.10 Made ground is widespread near the surface, particularly beneath airport buildings and associated infrastructure. This varies in thickness, composition and extent.

2.3.11 The superficial deposits comprise Alluvium, Head and River Terrace Deposits (RTD). The Alluvium and RTD are primarily associated with existing and former courses of the River Mole, Crawter's Brook and Gatwick Stream, to the west, centre and east of the airport. These deposits occur in broad, but mostly separated 'bands' beneath the airport. These are primarily orientated south to north, although toward the northern perimeter of the airport there is a band of Alluvium and RTD aligned east west, parallel with a former course of the River Mole. From the airport, to the north east of the A23, there is a wider expanse of RTD.

2.3.12 The Alluvium comprises clay, silt, sand and gravel and where present is likely to be relatively thin, perhaps up to 2 metres thick. The RTD comprises sand and gravel and is likely to be thicker, of the order of 5 metres. Both deposits are likely

to thin toward their margins. Head deposits, comprising clay, silt, sand and gravel occur only in a small area to the centre of the airport.

2.3.13 For the large majority of the study area, these superficial deposits are underlain by the Weald Clay Formation. This comprises mudstone, with seams of clay-ironstone in the south east and west. Although absent from the far south and east of the study area, this formation is likely to be of significant thickness.

2.3.14 To the south east of the airport the underlying bedrock is the Upper Tunbridge Wells Sand Formation. This comprises sandstone, siltstone and mudstone, but only occurs with very limited sub-crop within the extreme south east of the Project site boundary (to the south and east of the A23 London Road/ Perimeter Road South).

2.3.15 The Alluvium and RTD, in combination, are classified by the Environment Agency as a Secondary A aquifer. Groundwater is likely to occur in these deposits although this is unlikely to comprise a continuous body of groundwater and there may be isolated pockets of groundwater, with both vertical and horizontal discontinuity.

2.3.16 Typically, groundwater levels within the superficial deposits are shallow and have been observed between 0.8 metres to 3 metres below ground level (mbgl).

2.3.17 Perched groundwater contained within layers of the superficial deposits may be present. There is likely to be a good hydraulic connectivity between groundwater in superficial deposits and the surface watercourses, but this may vary locally depending on the nature of superficials (ie ranging from clay layers within the Alluvium to RTD).

2.3.18 The Weald Clay Formation is classified by the Environment Agency as Unproductive Strata and generally contains little groundwater, however, near surface weathering of this formation may allow some groundwater storage and flow, perhaps in hydraulic continuity overlying superficial deposits. Groundwater has been encountered within the weathered layers of the Weald Clay Formation, between shallow depths of 1-2 mbgl up to 8 mbgl. Groundwater has been encountered at depths of around 10 metres within this formation.

2.3.19 The Upper Tunbridge Wells Sand Formation is classified as a Secondary A aquifer, although the mudstones within the formation are classified as unproductive strata. There is some sub-crop of this strata to the extreme south east of the site, although it is largely isolated from the surface by the mudstone of the overlying Weald Clay and there is unlikely to be significant connectivity with the surface.

Land Use

2.3.20 Gatwick has two main passenger terminals – South Terminal, which is located on the eastern side of the airport and North Terminal on the north side. In addition to the two main passenger terminals it is characterised by substantial areas of built development comprising an airfield environment of stands, taxiways and runways which are separated by extensive grassed areas; the airport's road network; surface and decked car parking; and ancillary developments such as hotels, maintenance and cargo facilities.

3 Legislation and Policy

3.1 National Planning Policy

Airports National Policy Statement: new runway capacity and infrastructure at airports in the South East of England

3.1.1 NPSs set out the Government's objectives for the development of nationally significant infrastructure and are therefore relevant sources of planning policy against which applications for development consent are determined by the Secretary of State.

3.1.2 The Airports NPS (Department for Transport, 2018), although primarily provided in relation to a new runway at Heathrow Airport, remains a relevant consideration for other applications for airport infrastructure in London and the south east of England.

3.1.3 Paragraphs 5.147 to 5.171 of the Airports NPS refer to flood risk and set out the policies regarding climate change impacts, FRA requirements, flood risk management bodies and responsibilities, sustainable drainage systems and the application of the Sequential and Exception Tests.

3.1.4 Paragraph 5.154 states that:

'In preparing a flood risk assessment the applicant should:

- *Consider the risk of all forms of flooding arising from the development comprised in the preferred scheme, in addition to the risk of flooding to the project, and demonstrate how these risks will be managed and, where relevant, mitigated, so that the development remains safe through its lifetime;*

- *Take into account the impacts of climate change, clearly stating the development lifetime over which the assessment has been made;*
- *Consider the need for safe access and exit arrangements;*
- *Include the assessment of residual risk after risk reduction measures have been taken into account, and demonstrate that this is acceptable for the development;*
- *Consider if there is a need to remain operational during a worst case flood over the preferred scheme's lifetime; and*
- *Provide evidence for the Secretary of State to apply the Sequential Test and Exception Test, as appropriate.'*

3.1.5 These FRA requirements have been addressed within this report. Compliance with planning policy is set out in Section 3.3.

National Policy Statement for National Networks

3.1.6 The NPS for National Networks (Department for Transport, 2014)11 covers flood risk within paragraphs 5.90 to 5.115. These paragraphs refer to the same flood risk policies as the Airports NPS (Department for Transport, 2018) and add some specific considerations for linear infrastructure. These would be relevant to surface access (including highways) improvements works that are proposed as part of the Project. Paragraphs 5.102 to 5.104 of the NPS for National Networks (Department for Transport, 2014) state that:

'The Secretary of State should expect that reasonable steps have been taken to avoid, limit and reduce the risk of flooding to the proposed infrastructure and others. However, the nature of linear infrastructure means that there will be cases where:

[11] The Department for Transport (DfT) published a revised draft National Policy Statement for National Networks ("NPSNN") for consultation on 14 March 2023. The consultation closed on 6 June 2023 and the DfT is currently analysing responses. The draft NPSNN confirms in paragraph 1.16 that the existing NPSNN remains the relevant government policy and has full force and effect in relation to any applicable applications for development consent accepted for examination before designation of the updated NPSNN. The draft NPSNN further notes in paragraph 1.17 that the emerging draft NPSNN is capable of being an important and relevant consideration in the Secretary of State's decision making process. As such, the Applicant will continue to monitor the progress of the NPSNN review process and incorporate any updates to the Project's application documentation where considered appropriate in due course.

- *Upgrades are made to existing infrastructure in an area at risk of flooding;*
- *Infrastructure in a flood risk area is being replaced;*
- *Infrastructure is being provided to serve a flood risk area; and*
- *Infrastructure is being provided connecting two points that are not in flood risk areas, but where the most viable route between the two passes through such an area.*

The design of linear infrastructure and the use of embankments in particular, may mean that linear infrastructure can reduce the risk of flooding in the surrounding area. In such cases, the Secretary of State should take account of any positive benefit to placing linear infrastructure in a flood-risk area.

Where linear infrastructure has been proposed in a flood risk area, the Secretary of State should expect reasonable mitigation measures to have been made, to ensure that the infrastructure remains functional in the event of predicted flooding.'

National Planning Policy Framework

3.1.7 The National Planning Policy Framework (NPPF) (Department for Levelling Up, Housing and Communities, 2021) sets out the planning policies for England. It sets strict tests to protect people and property from flooding which all local planning authorities are expected to follow. Where these tests are not met, national policy is clear that new development should not be allowed. The main steps are designed to ensure that if there are better sites in terms of flood risk, or a proposed development cannot be made safe, it should not be permitted.

3.1.8 Paragraphs 152 to 173 set out flood risk policies to be followed by all proposed developments to which the NPPF (Department for Levelling Up, Housing and Communities, 2021) applies.

National Planning Practice Guidance

3.1.9 The National Planning Practice Guidance (NPPG) (Department for Levelling Up, Housing and Communities and Ministry of Housing, Communities & Local Government, 2021) supports the NPPF (Department for Levelling Up, Housing and Communities, 2021) and provides guidance on flood risk.

3.1.10 Climate change guidance (Department for Levelling Up, Housing and Communities and Ministry of Housing, Communities & Local Government, 2019a) focuses on suitable mitigation and adaptation measures in the planning process. This includes considering availability of water and water infrastructure for the lifetime of a development and designing responses to promote water efficiency and protect water quality. Also, assessing the impact of and promoting design responses to flood risk for the lifetime of a development, accounting for how climate change would increase that risk.

3.1.11 Flood risk and coastal change guidance (Department for Levelling Up, Housing and Communities and Ministry of Housing, Communities & Local Government, 2022) sets out the steps to be followed in order to ensure development is steered to areas at low risk of flooding, providing evidence that it would remain safe for its lifetime and would not increase flood risk elsewhere.

3.1.12 Water supply, wastewater and water quality guidance (Department for Levelling Up, Housing and Communities and Ministry of Housing, Communities & Local Government, 2019b) includes advice on how planning can ensure acceptable water quality and the delivery of adequate water and wastewater infrastructure.

3.1.13 Flood risk policies within National Policy relevant to the Project are included in Table 3.3.1.

3.2 Local Planning Policy and Guidance

3.2.1 Gatwick lies within the administrative area of Crawley Borough Council and adjacent to the boundaries of Mole Valley District Council to the north west, Reigate and Banstead Borough Council to the north east and Horsham District Council to the south west. The administrative area of Tandridge District Council is located approximately 1.9 km to the east of Gatwick. Gatwick is located in the county of West Sussex and immediately adjacent to the bordering county of Surrey.

3.2.2 Relevant local planning policies applicable to flood risk, as well as supporting documents regarding flood risk are summarised in this section. A more detailed summary of the relevant water environment related local planning policy that has been taken into account for this assessment can be found in **ES Appendix 11.2.1: Summary of Local Planning Policy – Water Environment** (Doc Ref. 5.3).

Crawley Local Plan 2015-2030

3.2.3 Crawley Local Plan, Crawley 2030, was adopted in December 2015. It forms the Council's development plan and sets out the planning policies under which development control decisions are taken. Policy ENV8 refers to flood risk considerations for development applications.

Policy ENV8: Development and Flood Risk

3.2.4 Policy ENV8 sets out the requirements for proposed developments in terms of flood risk. It states that development proposals should be avoided in areas at risk of flooding and should not increase the risk of flooding elsewhere. To achieve this, developments should be directed to areas at low flood risk, considering the suitability of their intended use for the area and demonstrating that the Sequential Test and, where required, the Exception Test, can be passed. The Environment Agency Flood Map for Planning should be used to assess flood risk to the area and a site-specific flood risk assessment should demonstrate how appropriate mitigation measures will ensure flood risk is acceptable for the site and will not be increased elsewhere. The policy states that peak surface runoff rates and annual volumes of runoff should be reduced through the effective implementation, use and maintenance of Sustainable Drainage Systems (SuDS), unless it can be demonstrated that these are not technically feasible or financially viable.

Crawley Emerging Local Plan 2021-37

3.2.5 The Crawley Borough Draft Local Plan 2021-2037 (Crawley Borough Council, 2021) was approved at the Full Council meeting on 22 February 2023 to go out to publication (Regulation 19) consultation and to the Secretary of State for Examination, on 9 May 2023. Following the consultation, the Local Plan will then be submitted for its examination. In the draft Local Plan 2021-2037 Policy EP1 and Policy GI1 refer to flood risk considerations for development applications.

Policy EP1: Development and Flood Risk

3.2.6 Policy EP1 repeats the current Policy ENV8 and includes that development is not permitted within 8 metres from a main river and or 12 metres from an ordinary watercourse without prior consent from the Environment Agency or within 3 metres of a Thames Water sewer system without their prior consent from the sewerage undertaker. Post construction council certification is required to ensure the drainage has been constructed in line with the planning application.

Policy GI1: Green Infrastructure

3.2.7 Policy GI1 requires that development proposals which cannot avoid reducing the functions of green infrastructure will be required to be mitigate and/or compensate as well as maximise the opportunity to maintain and extend green infrastructure links. For large development proposals will be required to provide new and/or create links to green infrastructure where possible, consider the use of Sustainable Drainage Systems (SuDS) and blue infrastructure, in part to reduce surface water runoff.

Crawley Borough Council Strategic Flood Risk Assessment 2020

3.2.8 Crawley Borough Council, as a local planning authority, is responsible for producing a SFRA as part of the evidence base that supports the development of its Local Plan.

3.2.9 Therefore, the Crawley SFRA (Crawley Borough Council, 2020) was published in 2020 and is a key background document to the Local Plan. It is intended to be used in conjunction with Local Plan Policy ENV8, in order to ensure that development is directed to the most sustainable location in flood risk terms. A key outcome of the SFRA process is to enable the application of the Sequential Test (see Section 3.5) and to provide an indication of the feasibility of the proposed development passing the Exception Test (see Section 3.6).

3.2.10 The SFRA document provides advice for areas of the borough that are susceptible to flood risk and outlines development management recommendations that should be considered in determining planning applications. These have been addressed within the Project and compliance is demonstrated in Section 3.3.

West Sussex County Council Local Flood Risk Management Strategy (2013-2018)

3.2.11 West Sussex County Council as Lead Local Flood Authority (LLFA) is required to set out how it will deliver local flood risk management under the Flood and Water Management Act 2010. The Local Flood Risk Management Strategy (LFRMS) (West Sussex County Council, 2014) was adopted in 2013 and summarises historical, current and future flood risk knowledge for West Sussex and defines flood risk management roles and responsibilities. It covers the period from 2013 to 2018 and its principal aim is to oversee and direct the reduction of flood risk for the Council's residents.

Draft West Sussex Local Flood Risk Management Strategy 2021-2026

3.2.12 The Draft Local Flood Risk Management Strategy (LFRMS) 2021-2026 went out to public consultation in autumn 2021 and work is currently paused.

3.2.13 The Environment Agency's National Flood and Coastal Erosion Risk Management Strategy for England was consulted on in 2019 and was published in July 2020. The Strategy provides a framework to guide the activities of Risk Management Authorities involved in Flood and coastal erosion risk management (FCERM) work. West Sussex County Council has the responsibility for developing, maintaining, applying and monitoring the implementation of a local flood risk management strategy within the county. Local flood risk management strategies produced by lead local flood authorities must be consistent with the national strategy.

Reigate and Banstead Borough Council, Mole Valley Distrct Council and Tandridge District Council Level 1 Strategic Flood Risk Assessment 2017

3.2.14 Mole Valley District Council, Reigate and Banstead Borough Council and Tandridge District Council are undertaking the preparation of individual Local Plans (LPs) for each of their areas. Given the number of watercourses that flow between the neighbouring council areas the Councils have elected to commission a joint SFRA which will provide a consistent approach to assessing flood risk across the area. The SFRA is a supporting document to Councils' LPs; flood risk policies within LPs relevant to the Project are included in Table 3.3.2.

3.2.15 Therefore the joint SFRA report has been prepared as a planning tool that will assist the Councils in their selection and development of sustainable development sites away from vulnerable flood risk areas in accordance with the NPPF (Department for Levelling Up, Housing and Communities, 2021).

3.2.16 The SFRA includes an appraisal of all potential sources of flooding, provides mapping of the location and extent of functional floodplain, reports the standard of protection provided by existing flood risk management infrastructure and considers the potential increase of flood risk due to climate change. It also provides an assessment of flood warning and emergency planning procedures and includes recommendations for future development considerations.

3.2.17 The area covered within this SFRA does not encroach on Gatwick itself but includes part of the study area as defined for this FRA. Therefore, if there are any residual effects within these neighbouring districts, the SFRA requirements and recommendations should be considered.

3.3 Compliance with National and Local Planning Policy

National Planning Requirements

Table 3.3.1 National Planning Requirements and Project Compliance

NPS Paragraph	Summary of requirement	How and where this is considered in the FRA
Airports NPS		
5.154	Considering the risk of all forms of flooding to the Project or arising from the Project and demonstrating how these risks will be managed and, where relevant, mitigated, so that the Project remains safe through its lifetime.	Section 5 of this FRA considers all risk of flooding to the Project, with the exception of tidal flooding which has been scoped out (see paragraph 4.1.2). In addition, Section 6 describes how the Project would impact fluvial, surface water, groundwater and sewer/ water distribution infrastructure flood risk if no mitigation was in place. Section 7 demonstrates how these risks would be managed with appropriate flood mitigation measures and how the Project would remain safe for its lifetime without increasing flood risk elsewhere.
	Taking into account the impacts of climate change, clearly stating the Project lifetime over which the assessment is made.	The Project lifetime is defined as 40 years to 2069 for the airfield works and 100 years to 2132 for surface access elements (see Section 3.7). Climate change impacts have been assessed and included in fluvial and surface water flood risk assessment following Flood risk assessments: climate change allowances guidance (Environment Agency, 2022a) within this FRA is described in Section 7. Section 7 demonstrates how the impacts of climate change are taken into account and managed, and how the Project would remain safe for its lifetime without increasing flood risk elsewhere.

	Assessing any residual risks after risk reduction measures have been taken into account and demonstrating how these are acceptable for the Project.	Potential residual risks for fluvial and surface water flooding are discussed in paragraphs 7.2.30 and 7.3.22 respectively, where it is demonstrated that following the proposed mitigation measures outlined in paragraphs 7.2.5 to 7.2.11, these will be managed and will not increase flood risk to the Project or third parties.
	Providing evidence for the Secretary of State to apply the Sequential Test and Exception Test, via a suitable flood risk assessment	Evidence to apply the Sequential Test have been included in paragraphs 5.10.3 to 5.10.6. Application of the Exception Test is included in paragraphs 5.10.8 to 5.10.12 and Section 7.6.
5.163	The surface water drainage arrangements for any project should be such that the volumes and peak flow rates of surface water leaving the site are no greater than the rates prior to the proposed project, taking into account climate change, unless specific off-site arrangements are made and result in the same net effect.	The pre- and post- development discharge volumes and peak runoff rates are included and discussed in paragraphs 7.3.24 to 7.3.30. These are based on Flood risk assessments: climate change allowances guidance (Environment Agency, 2022a) and the 1 per cent (1 in 100) AEP event, plus a 25 per cent climate change allowance. For the surface access elements, the highways drainage design has been based on a 1 per cent (1 in 100) AEP event plus 40 per cent climate change allowance for rainfall intensity, as per Flood risk assessments: climate change allowances guidance (Environment Agency, 2022a), given its longer lifetime than the airfield elements. Increases in discharge due to increases carriageway impermeable areas have been attenuated within the drainage design to ensure no increase in peak outflow and no increase in flood risk.

NPS for National Networks		
5.94	Requirements of the Airports NPS mentioned above are also included in the NPS for National Networks.	As above
5.104	Where linear infrastructure has been proposed in a flood risk area, the Secretary of State should expect reasonable mitigation measures to have been made to ensure that the infrastructure remains functional in the event of predicted flooding.	Where surface access improvements are proposed, these are accompanied by a proposed drainage strategy (see **ES Appendix 11.9.6: Annex 2** (Doc Ref. 5.3)) that includes the introduction of carrier drains, filter drains, ditches and attenuation ponds, along with flow control arrangements. Therefore, surface water runoff would be safely managed and restricted to pre-development or greenfield values, subject to detailed design. Moreover, the Project and proposed mitigation measures as discussed in Section 7, would decrease flood depths in the vicinity of the area where surface access improvements are proposed. Therefore, these are expected to remain functional during the 1 per cent (1 in 100) AEP event, plus a 40 per cent allowance for climate change.

Local Planning Requirements

Table 3.3.2 Local Planning Requirements and Project Compliance

Policy	Summary of requirement	How and where this is considered in the FRA
Crawley 2030: Crawley Borough Local Plan 2030		
Policy ENV8	Developments should be directed to areas at low flood risk, considering the suitability of their intended use for the area and demonstrating that the Sequential Test and, where required, the Exception Test can be passed.	Evidence to apply the Sequential Test have been included in paragraphs 5.10.3 to 5.10.6. Application of the Exception Test is included in paragraphs 5.10.8 to 5.10.12 and Section 7.6.
	The Environment Agency Flood Map for Planning should be used to assess flood risk to the area and a site-specific flood risk assessment should demonstrate how appropriate mitigation measures will ensure flood risk is acceptable for the site and will not be increased elsewhere.	Environment Agency Flood Zones (FebrSuary 2023) have been mapped in **ES Appendix 11.9.6 Figure 5.2.2** (Doc Ref. 5.3) and used for the assessment of fluvial flood risk. The proposed fluvial flood mitigation strategy is described in Section 7.2.
	Peak surface runoff rates and annual volumes of runoff should be reduced through the effective implementation, use and maintenance of SuDS, unless it can be demonstrated that these are not technically feasible or	The proposed surface water drainage strategy and associated discharge volumes and rates have been described in Section 7.3 and **ES Appendix 11.9.6: Annex 2** (Doc Ref. 5.3).

	financially viable.	
Reigate and Banstead Borough Local Plan 2005		
Policy UT4: Flooding	Development (including redevelopment) in floodplains should be avoided and appropriate flood protection and mitigation measures should be considered as part of development in areas at risk of flooding.	Section 7 demonstrates where development in floodplains is proposed as part of the Project, this would be compensated for via the introduction of new floodplain compensation areas, providing, where possible, level-to-level compensation.
Reigate and Banstead Borough Development Management Plan 2019		
Policy CCF2: Flood Risk	Development proposals must not increase the existing and future flood risk elsewhere. Proposals should seek to secure opportunities to reduce both the cause and impact of flooding for existing and proposed development.	The proposed flood mitigation measures as secured as a requirement in Schedule 2 of the **Draft Development Consent Order** (Doc Ref. 2.1) is described in Section 7, demonstrating that the Project would not increase flood risk elsewhere and, where possible, decrease overall fluvial flood risk, as assessed in section 7.2 and surface water flood risk in section 7.3.
	Where SuDS are proposed, schemes should include appropriate arrangements for the ongoing maintenance for the lifetime of the development.	A detailed maintenance strategy will be developed in conjunction with the detailed design of the Project. However, guidance from the SuDS Manual, CIRIA C753 (CIRIA, 2015) is to be followed for the effective maintenance of the proposed surface water drainage systems. Maintenance activities would be dependent on the final drainage strategy, subject to detailed design and manufacturer's recommendations. It is anticipated that maintenance activities would be the responsibilities of Gatwick and would be included within general airport

		maintenance arrangements.
Horsham District Planning Framework 2015		
Strategic Policy 38: Flooding	Where there is the potential to increase flood risk, proposals must incorporate the use of SuDS where technically feasible or incorporate water management measures that reduce the risk of flooding and ensure that flood risk is not increased elsewhere. New developments should undertake detailed assessments to consider the most appropriate SuDS methods for each site. Drainage techniques that mimic natural drainage patterns and manage surface water as close to its source as possible are required, where technically feasible.	As above.
Tandridge District Council Local Plan Part 2 – Detailed Policies		
Policy DP21: Sustainable Water Management	Development proposals should seek opportunities to reduce both the cause and the impact of flooding, ensuring the discharge of surface water runoff is restricted to pre-development values.	As above.

SFRA Recommendations

3.3.1 The Crawley SFRA (Crawley Borough Council, 2020) states that all development falling within Flood Zone 3 should be conditioned in accordance with the development management considerations included in Table 3.3.3.

Table 3.3.3 Crawley Borough Council Strategic Flood Risk Assessment Development Management Recommendations and Project Compliance

Crawley Borough Council SFRA Recommendation	How and where this is considered in the FRA
All proposed future development within Zone 3a High probability will require a detailed Flood Risk Assessment (FRA).	Appendix 11.9.6 Flood Risk Assessment has been produced (this document).
Floor levels must be situated above the 1% (100 year) predicted maximum flood level plus climate change, incorporating an allowance for freeboard.	**ES Appendix 11.9.6 Figure 7.2.2** (Doc Ref. 5.3) shows that for the 1 per cent (1 in 100) AEP event, plus a 20 per cent allowance for climate change, proposed runways, taxiways and associated infrastructure are not at significant risk of fluvial flooding. Existing taxiways, stands and buildings would experience flood depths equivalent to current situation (less than 10mm decrease in flood risk). For new taxiways, consideration has been given to elevating taxiway levels above the peak floodplain levels of the baseline event, including an allowance for uncertainty of 300 mm.
Dry access is to be provided (above flood level) to enable the safe evacuation of residents and/or employees in case of flooding. In exceptional circumstances where this is not achievable, safe access must be provided at all locations, defined in accordance with the Defra/EA research project FD2320[1]. It is essential to ensure that the nominated evacuation	For terminal buildings, dry access and egress routes from above flood levels are in place, via high-link bridges and multi-storey car parks seen in the **Flood Resilience Statement** (**ES Appendix 11.9.6: Annex 6** (Doc Ref. 5.3)).

route does not divert evacuees onto a 'dry island' upon which essential supplies (ie food, shelter and medical treatment) will not be available for the duration of the flood event.	
Basements are not to be utilised for habitable purposes. All basements must provide a safe evacuation route in time of flood, providing an access point that is situated above the 1% AEP peak design plus climate change flood level.	The Project does not include basements that are intended for habitable purposes. Several new pumping stations and substations are proposed as part of the Project that may include elements up to 10 m below ground level and may need to be accessed for maintenance purposes. Dry access and exit points would be provided. However, these pumping stations would not be accessed frequently. The proposed waste management, motor transport maintenance and surface transport facilities would also include elements below ground level (up to 5 m). However, flood extents for the design event mentioned above do not encroach on these facilities.
Implement SuDS to ensure that runoff from the site (post redevelopment) is not increased and is where possible reduced. Any SuDS design must take due account of groundwater and geological conditions.	Proposed designs have been produced at a high-level and have qualitatively considered groundwater and geological conditions. Further design development will be based on site-specific conditions and survey results.
Ensure that the proposed development does not result in an increase in maximum flood levels within adjoining properties. This may be achieved by ensuring (for example) that the existing building footprint is not increased, and/or compensatory flood storage is provided	Where the Project would encroach on existing floodplain, floodplain compensation is provided as close to the where it has been lost. It is shown in **ES Appendix 11.9.6 Figure 7.2.3** (Doc Ref. 5.3), that there are no flood impacts to third parties due to the Project for the

within the site (or upstream)[2].	design event. In several areas inside and outside of the Project site boundary, betterment is provided as a result of the Project.
A minimum 8 m buffer zone must be provided to 'top of bank' within sites immediately adjoining the main river corridor. This requirement may be negotiated with the Environment Agency in heavily constrained locations.	This Project and its associated flood mitigation strategy propose works being undertaken within Main River channels, including the realignment of the River Mole. Discussions with the Environment Agency are underway and will be ongoing.

1 FD2320 "Flood Risk Assessment Guidance for New Development" (Defra/EA, 2005)

2 Compensatory flood storage should be located as close as practically possible to the proposed development.

3.4 Vulnerability Classification

3.4.1 Annex 3 of the NPPF: Flood risk vulnerability classification of the NPPF (Department for Levelling Up, Housing and Communities, 2021) classifies the flood risk vulnerability of all land uses. In Table 2 of the NPPG (Department for Levelling Up, Housing and Communities and Ministry of Housing, Communities and Local Government, 2021), Flood Risk and Coastal Change (2022) section (reproduced here as Table 3.4.1) these vulnerability classes are aligned against Flood Zones to indicate where a development is 'compatible' with the degree of risk, where it should only be permitted if the Exception Test is passed and where it should not be permitted. The flood risk compatibility of the Project for its proposed location is considered in Table 3.4.1.

3.4.2 The NPPG Flood Risk and Coastal Change guidance (Department for Levelling Up, Housing and Communities and Ministry of Housing, Communities & Local Government, 2022) states:

"The Exception Test is not a tool to justify development in flood risk areas when the Sequential Test has already shown that there are reasonably available, lower risk sites, appropriate for the proposed development. It would only be appropriate to move onto the Exception Test in these cases where, accounting for wider sustainable development objectives, application of relevant local and national policies would provide a clear reason for refusing development in any

alternative locations identified. Table 2 sets out the circumstances when the Exception Test will be required.“

Table 3.4.1 Flood risk vulnerability and flood zone ‘incompatibility’ (NPPG, Table 2)

Flood Zone	Flood Risk Vulnerability Classification				
	Essential Infrastructure	Highly Vulnerable	More Vulnerable	Less Vulnerable	Water Compatible
1	✓	✓	✓	✓	✓
2	✓	Exception Test required	✓	✓	✓
3a †	Exception Test required †	×	Exception Test required	✓	✓
3b*	Exception Test required*	×	×	×	✓*

✓= "Exception test not required” ×= "Development should not be permitted”

“†” In Flood Zone 3a essential infrastructure should be designed and constructed to remain operational and safe in times of flood.

“*” In Flood Zone 3b (functional floodplain) essential infrastructure that has passed the Exception Test, and water-compatible uses, should be designed and constructed to:

- remain operational and safe for users in times of flood;
- result in no net loss of floodplain storage;
- not impede water flows and not increase flood risk elsewhere.

3.5 The Sequential Test

3.5.1 The Sequential Test is defined in paragraphs 162-163 of the NPPF (Department for Levelling Up, Housing and Communities, 2021) as follows:

“The aim of the sequential test is to steer new development to areas with the lowest risk of flooding from any source. Development should not be allocated or permitted if there are reasonably available sites appropriate for the proposed development in areas with a lower risk of flooding. The strategic flood risk assessment will provide the basis for applying this test. The sequential approach should be used in areas known to be at risk now or in the future from any form of flooding.

If it is not possible for development to be located in areas with a lower risk of flooding (taking into account wider sustainable development objectives), the exception test may have to be applied. The need for the exception test will depend on the potential vulnerability of the site and of the development proposed, in line with the Flood Risk Vulnerability Classification. "

3.5.2 The Sequential Test has been applied to the Project, refer to paragraphs 5.10.3 to 5.10.6.

3.6 The Exception Test

3.6.1 The Exception Test is used to demonstrate and ensure that flood risk to people and property will be managed satisfactorily, while allowing necessary development to go ahead in situations where suitable sites at lower risk of flooding are not available.

3.6.2 Paragraphs 164 of the NPPF (Department for Levelling Up, Housing and Communities, 2021) sets out the two elements that need to be satisfied for the Exception Test to be passed:

'The application of the exception test should be informed by a strategic or site-specific flood risk assessment, depending on whether it is being applied during plan production or at the application stage. To pass the exception test it should be demonstrated that:

a) the development would provide wider sustainability benefits to the community that outweigh the flood risk; and

b) the development will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall.'

3.6.3 Compliance with the Exception Test is addressed in paragraphs 5.10.8 to 5.10.12 and Section 7.6.

3.7 Climate Change

3.7.1 Increases in rainfall depth or fluvial flows due to climate change will increase the probability of a given magnitude of flood event. This means that a site currently located within a lower risk zone (Flood Zone 1 or 2) could in the future be re-classified as lying within a high-risk zone (Flood Zone 3a or 3b). This in turn

could have implications for the type of development that is appropriate according to its vulnerability to flooding.

3.7.2 Therefore, any increase in surface water runoff or fluvial flooding as a result of the Project should be attenuated on-site and the capacity should be provided for the design flood event, including an appropriate allowance for climate change. According to the NPPG (Department for Levelling Up, Housing and Communities and Ministry of Housing, Communities and Local Government, 2021), the design event is generally taken as the 1 per cent (1 in 100) annual exceedance probability (AEP[12]) event.

3.7.3 The Airports NPS (Department for Transport, 2018) refers to the NPPF (Department for Levelling Up, Housing and Communities, 2021) and its supporting guidance as the key source of policies regarding climate change impacts on flood risk. Paragraph 5.168 also states that:

'The applicant should take into account the potential impacts of climate change using the latest Climate Change Risk Assessment, the latest UK Climate Projections, and other relevant sources of climate change evidence.'

3.7.4 It should be noted that the climate change allowances have been updated since the PEIR stage. The UK Climate Projections 2019 (UKCP18), (Met Office et. al., 2018) are a set of climate change projections that update and replace the previous set: UKCP09. This FRA has been written to support the ES and adopts the latest climate change allowances by management catchment. The new projections that have informed the current Flood Risk Assessments: Climate Change Allowances guidance published in February 2016, last updated in May 2022 (Environment Agency, 2022a) are as listed below:

- Peak River Flow Climate Change Allowances by Management Catchment published in July 2021 and updated in February 2022 (Environment Agency, 2022b).
- Peak Rainfall Climate Change Allowances by Management Catchment published in May 2022 (Environment Agency, 2022c).

3.7.5 The uplift factor to be applied is determined by the location, rainfall event, design life and vulnerability classification of the proposed development.

[12] Annual Exceedance Probability (AEP) refers to the chance that a flood event of a particular magnitude is experienced or exceeded during any one year.

3.7.6 For this Project the design life and therefore the allowance for climate change varies. For the surface access works, as listed in paragraph 2.2.3, the adopted lifetime for the Project is 100 years (up to 2132). For the airfield and associated works described in paragraph 2.2.2, the adopted lifetime for the Project is 40 years (up to 2069). It is considered that a longer design life for the airfield works would not be realistic given it is likely there will be further significant changes to the airport and its operations in that timescale. The aviation industry has changed considerably during the past 40 years and this rate of change is anticipated to continue. Assessment of climate change allowances over a longer design life is therefore considered disproportionate.

Fluvial Flood Risk

3.7.7 The allowance to be made for the predicted impact of climate change on peak river flows is subject to the river basin district, in this case identified as the Mole Management Catchment. Table 3.7.1 includes the uplift factors that apply for the Mole catchment, in line with the current Environment Agency climate change allowances.

Table 3.7.1 Climate change allowance for peak river flow extracted from the Peak River Flow Climate Change Allowances by Management Catchment (Environment Agency, 2022)

Allowance	Total potential uplift anticipated		
	2020s (up to 2039)	2050s (2040-2069)	2080s (2070-2125)
Upper End	27%	26%	**40%**
Higher Central	**16%**	**12%**	**20%**
Central	11%	6%	12%

3.7.8 According to Flood Risk Assessments: Climate Change Allowances guidance (Environment Agency, 2022a), the Higher Central allowance should be adopted for Essential Infrastructure in Flood Zone 2 and 3. For the purposes of this assessment, the impact of the Project airfield works on fluvial flood risk have been assessed against the 12 per cent increase for the 2050s epoch in peak river flow for the one per cent (1 in 100) AEP event.

3.7.9 Again, given their longer lifetime the surface access elements, as listed in paragraph 2.2.3, have been assessed against a 20 per cent increase for the 2080s epoch.

3.7.10 The use of the 12 per cent and 20 per cent climate change allowances for the design event(s) peak river flow has been confirmed in discussions between GAL and the Environment Agency at a meeting on 28 January 2021.

Credible Maximum Scenario

3.7.11 As the Project is classified as a Nationally Significant Infrastructure Project (NSIP), an assessment of the impact of a more extreme increase in predicted peak river flow due to climate change is required. A sensitivity test has therefore been undertaken on the Project assessing the impact of the upper end allowance for peak river flow of 40 per cent.

Construction Scenario

3.7.12 To assess the fluvial flood risk during construction using the higher central climate change allowance, a 16 per cent uplift was adopted. This follows Flood Risk Assessments: Climate Change Allowances guidance (Environment Agency, 2022a) predicted increase in peak river flows to 2039 (see Table 3.7.1) when all construction is projected to be completed by 2038.

Rainfall Intensity

3.7.13 The current uplift factors to be applied for peak rainfall intensity (to inform surface water drainage design) for the Mole Management Catchment are indicated in Table 3.7.2.

Table 3.7.2 Predicted potential change of peak rainfall intensity extracted from the Peak Rainfall Climate Change Allowances by Management Catchment (Environment Agency, 2022)

Rainfall Event	Allowance	Total potential uplift anticipated	
		2050s (up to 2060)	2070s (2061 – 2125)
3.3% AEP	Upper End	35%	35%
	Central	20%	20%
1% AEP	Upper End	40%	**40%**
	Central	20%	**25%**

3.7.14 As the adopted lifetime of the surface access works is 100 years (up to 2132), the Flood Risk Assessments: Climate Change Allowances guidance (Environment Agency, 2022a) states the Upper End allowance of plus 40 per cent for the 2070s epoch (2061 to 2125) should be adopted for the highways surface water drainage design for the 1 per cent (1 in 100) AEP event.

3.7.15 Given the adopted lifetime for the airfield works of 40 years (up to 2069), the airfield surface water drainage design has adopted the Central allowance of plus 25 per cent for the 2070s epoch (2061 to 2125) in accordance with Flood Risk Assessments: Climate Change Allowances guidance (Environment Agency, 2022a) for the 1 per cent (1 in 100) AEP event.

3.7.16 The 40 per cent intensity has also been tested as a credible maximum scenario (as a sensitivity analysis) for the airfield drainage, in order to test the impact of a larger potential change as a result of climate change.

Conclusion

3.7.17 Fluvial flood risk has been assessed against the following climate change allowances:

- 12 per cent (higher central) increase for airfield works (2050s epoch);
- 20 per cent (higher central) increase for the access works (2080s epoch);
- 40 per cent (upper end) increase tested as a credible maximum scenario; and
- 16 per cent (higher central) increase for construction scenarios (2020s epoch).

3.7.18 Surface water flood risk has been assessed against the following climate change allowances:

- 25 per cent (central) increase for airfield surface water drainage design (2070s epoch); and
- 40 per cent (upper end) increase for the access works (2070s epoch) and tested as a credible maximum scenario for airfield drainage.

4 Assessment Methodology

4.1 Scope of the Assessment

4.1.1 This FRA considers all sources of flooding to the Project and impacts elsewhere due to the development of the Project. The assessment of residual risk arising from credible maximum events has been considered through the application of higher climate change uplift factors. This approach allows the assessment of a larger potential increase in flood risk due to climate change and provides insight on the risk of flooding to, and as a result of, the Project after 2069 and 2125.

4.1.2 Tidal flooding has been scoped out of this assessment. The watercourses that flow through the study area are the River Mole and its tributaries and are ultimately a tributary of the River Thames. The River Mole confluence with the River Thames is upstream of the tidal extent of the Thames at Teddington Lock. The airport is approximately 35 km north of the nearest coastline and ground levels are generally above 55 metres AOD and therefore are not at tidal/coastal flood risk. No impact pathway has therefore been identified that could lead to an effect on flood risk.

4.2 Assumptions and Limitations

4.2.1 Determination of flood risk from all sources to the Project is based on published flood risk mapping as well as detailed hydraulic modelling results produced specifically for GAL as detailed in Section 5.

4.2.2 The Upper Mole Hydraulic Model has been produced in partnership with the Environment Agency to allow for assessment of fluvial flood risk in the study area. The model has been further developed since its original approval by the Environment Agency in order to incorporate recent changes to the airport infrastructure (including Larkins Road and Boeing Hangar) and refinements made upstream in Crawley by the Environment Agency. The model has also been updated since the PEIR to fully reflect the operation of the Gatwick Stream Flood Storage Area (FSA) upstream of the airport. The 1D-2D model, which applies current best practice and makes use of quality reviewed local data, is considered to produce reliable model results. The model has been calibrated

based on three historic events (between 2000 and 2002) and an additional 2013 event has been used as the verification event.

4.2.3 This FRA is based upon the design summarised in ES Chapter 5: Project Description (Doc Ref. 5.1).

4.2.4 As no detailed design has been carried out at this stage, any proposed changes to ground levels due to Project car parks (except those used as FCAs) have not been incorporated in the model at this stage. However, the design of the Project car parks is intended to ensure that no loss of floodplain occurs for each site.

4.2.5 The assessment of surface water flood risk was undertaken using a drainage and surface model built with the InfoWorks™ ICM software.

4.2.6 In order to validate the model for its surface water flooding performance, an existing model was rebuilt and revalidated against an extensive flow survey of 32 monitors.

4.2.7 A hydraulic model was constructed to test the sensitivity of the airfield surface water drainage network to fluvial flooding from local watercourses. This 'integrated' model was based on the fluvial and surface water drainage models.

4.2.8 Overall, the fluvial, surface water and integrated hydraulic modelling results successfully allow consideration of the effectiveness of the Project flood mitigation strategy.

4.2.9 Where a new surface water discharge to a Main River is proposed (eg the River Mole) or where existing discharge arrangements are altered, this would be subject to discussions with the Environment Agency and any necessary consents.

4.2.10 GAL has developed a model of the wastewater network within its estate to assess the impact of the Project. This model has also been utilised to determine the risk of wastewater flooding.

4.2.11 Groundwater and water supply flood risk have been assessed based on existing available information and previous known flooding incidents within the study area. A qualitative assessment has been undertaken to identify areas that are maybe vulnerable to groundwater flooding.

4.2.12 Retaining walls and other subsurface structures associated with the surface access works are assumed to laterally extend less than 250m and to a depth that that does not penetrate the Tunbridge Wells Sands.

4.2.13 Unless otherwise specified, all other temporary or permanent subsurface structures associated with the Project such as piling foundations, sheet pile walls, etc. are assumed of length less than 150m and to extend to a depth that that does not penetrate the Tunbridge Wells Sands.

5 Existing Flood Risk

5.1 Basis of the Assessment

5.1.1 In accordance with the NPPG (Department for Levelling Up, Housing and Communities and Ministry of Housing, Communities & Local Government, 2021), an assessment of flood risk within the Project site boundary has been undertaken based on the following sources of information:

- Flood risk information available from the Environment Agency website (Flood Map for Planning, Risk of Flooding from Surface Water, Reservoir Flood Risk Map, Historic Flood Map);
- Crawley Borough Council Strategic Flood Risk Assessment, 2020;
- West Sussex County Council Local Flood Risk Management Strategy, 2013; and
- Groundwater Flooding Susceptibility Areas and Groundwater Flooding Confidence Areas mapping (British Geological Survey).

5.1.2 The Upper River Mole fluvial hydraulic model recently completed by GAL and the surface water drainage model have also been used to confirm existing flood risk to the site.

5.1.3 Overall, the risk of flooding from all relevant sources has been considered, covering:

- fluvial;
- surface water;
- sewer and water distribution infrastructure flooding;
- groundwater flooding;
- reservoirs failure; and
- flood defence failure.

5.2 Fluvial Flood Risk

5.2.1 Gatwick is located in the Thames River Basin District (RBD) and within the Upper Mole catchment. The River Mole flows through the airport, passing under the main and existing northern runways in a culvert. Tributaries of the River Mole,

including Crawter's Brook, the Gatwick Stream, Man's Brook and Westfield Stream all run through or adjacent to the Project site boundary.

5.2.2 Therefore, fluvial flood risk is one of the main sources of flood risk to the Project.

5.2.3 This section provides an assessment of existing fluvial flood risk within the Project site boundary. The assessment is based on several data sources including:

- Environment Agency Flood Zones; and
- Gatwick Upper Mole Hydraulic Model.

Environment Agency Flood Zones

Overview

5.2.4 The classification of Flood Zones is used as the basis on which the Sequential Test is applied. It identifies the probability of flooding in each Flood Zone. Flood Zones 1, 2 and 3a are defined by the Environment Agency, ignoring the presence of flood defences and without taking account of the possible impacts of climate change to the future probability of flooding. Flood Zone 3b should be defined by local planning authorities in agreement with the Environment Agency and should consider the presence of defences.

5.2.5 Table 5.2.1 sets out the classification of Flood Zones in accordance with the NPPG (Department for Levelling Up, Housing and Communities and Ministry of Housing, Communities and Local Government, 2021).

Table 5.2.1 Environment Agency Flood Zones Definition

Flood Zone	Probability of Flooding	Definition
1	Low	Land having a less than 0.1 per cent (1 in 1,000) AEP of river or sea flooding.
2	Medium	Land having between a 1 per cent (1 in 100) and 0.1 per cent (1 in 1,000) AEP of river flooding; or land having between a 0.5 per cent (1 in 200) and 0.1 per cent (1 in 1,000) AEP of sea flooding.
3a	High	Land having a 1 per cent (1 in 100) or greater AEP of river flooding; or land having a 0.5 per cent (1 in 200) or greater AEP of sea flooding.
3b	Functional Floodplain	This zone comprises land where water from rivers or the sea has to flow or be stored in times of flood. Functional floodplain will normally comprise of land having a 3.3 per cent (1 in 30) or greater AEP of flooding or land that is designed to flood, even if it would only flood in more extreme events (such as and 0.1 per cent (1 in 1,000) AEP). Local planning authorities should identify in their SFRAs, areas of functional floodplain and its boundaries accordingly, in agreement with the Environment Agency.

5.2.6 In this case, the Crawley SFRA (Crawley Borough Council, 2020) includes the following approach regarding Flood Zone 3b:

"Flood Zone 3b, unlike other Zones, does show flood risk that takes account of the presence of existing flood risk management features and flood defences, as land afforded this standard of protection is not appropriately included as functional flood plain".

This includes land subject to flooding in the 5 per cent (1 in 20) AEP flood event.

5.2.7 It should be noted that the NPPG (Department for Levelling Up, Housing and Communities and Ministry of Housing, Communities and Local Government, 2021) allowances have been updated since the PEIR stage. The definition of Flood Zone 3b has been updated to land having a 3.3 per cent (1 in 30) or greater AEP of flooding.

5.2.8 As the NPPG is the most up to date, the Project has defined Flood Zone 3b as land where water from rivers or the sea has to flow or be stored in times of flood in a 3.33 per cent (1 in 30) or greater AEP event.

Upper Mole Hydraulic Model

Overview

5.2.9 The Upper Mole Fluvial Modelling study was undertaken as a partnership between GAL and the Environment Agency. The purpose of the study was to develop a better understanding of flood risk in the catchment area, particularly to Gatwick, and provide updated flood risk information for the catchment. The objectives of the study were to develop an updated model which reflects the urban nature of the catchment, including Crawter's Brook and Gatwick Stream and the more rural nature of Man's Brook and the Upper Mole, and to calibrate this model against at least three historic high flow events.

5.2.10 The model was run for a number of design events between 10 per cent (1 in 10) AEP and 0.1 per cent (1 in 1000) AEP, plus climate change scenarios for the 1 per cent (1 in 100) AEP event of plus 12 per cent, plus 20 per cent and plus 40 per cent. All modelled extents can be seen on **ES Appendix 11.9.6 Figure 5.2.1** (Doc Ref. 5.3). The 3.33 per cent (1 in 30) AEP flood event would often be adopted to determine the extents of Flood Zone 3b).

5.2.11 The study focuses on the Upper Mole catchment, up to its downstream extent to the west of Horley, in West Sussex. The main watercourses considered are the Upper Mole, Gatwick Steam, Crawter's Brook and Man's Brook.

5.2.12 Two model scenarios have been created. The first represents the catchment without any formal defences as per the situation before the Upper Mole Flood Alleviation Scheme (FAS). This is the undefended scenario and was used as a validation model. The second represents the situation once the Upper Mole FAS had been completed. The Upper Mole FAS is an Environment Agency project, in partnership with GAL, designed to reduce flooding at Gatwick and to nearby areas including Horley and Crawley. According to the Crawley Infrastructure Plan (Crawley Borough Council, 2021), the Upper Mole FAS has now been completed and comprises the following items:

- Raising of Tilgate Dam;
- Worth Farm storage area;
- Grattons Park stream enhancements; and
- Clay's Lake storage reservoir.

5.2.13 The study built a new 1D-2D hydrodynamic model of the catchment using Flood Modeller 1D and TUFLOW 2D software. This combined 1D-2D model was selected as the most suitable approach on the basis of the following.

- Using a single 1D model in combination with linked 2D domains on the floodplain allows for interactions between individual watercourses and structures to be accurately modelled and mapped. This approach therefore represents an effective way to describe the complex flow routes expected through urbanised parts of the study area.
- The use of a 1D-2D linked model provides an accurate simulation of in-channel hydraulics, coupled with detailed out-of-bank representation of flood routes, depths, flows and velocities. The combined model therefore enables robust simulation of the effect of key hydraulic features (such as bridges, culverts, flood relief areas and flood defences) both in-bank and out-of-bank.
- A combined 1D-2D approach enables robust estimation of hazards in the floodplain, including the combined impact of coincident velocities and depths.

5.2.14 The existing Gatwick Stream FSA is represented within the new 1D-2D hydraulic model, however since the PEIR the control rules used by the FSA have been re-assessed and updated in the latest version of the Upper Mole Hydraulic Model.

Assessment

5.2.15 According to **ES Appendix 11.9.6 Figure 5.2.1** (Doc Ref. 5.3), all areas within the Project site boundary falling within flood extents for the 3.33 per cent (1 in 30) AEP event are directly related to watercourses and do not encroach in areas that would be developed for the Project except for a small area at the western end of the airport, where parts of the Project Taxiway Juliet West Spur and along the edge of Taxiway Juliet fall into the 3.33 per cent (1 in 30) flood extent and the surface access works to the A23 at the northern terminal access roundabout and at the Longbridge roundabout.

5.2.16 The requirements for considering the potential future impacts of climate change on fluvial flooding are described in Section 3.7. Suitable climate change allowances are chosen based on the management catchment, the vulnerability of the development and the lifetime of the Project. For this project, the management catchment is Mole catchment within the Thames River Basin. Based on that information, both the 12 and 20 per cent allowances for climate change have been applied within the baseline scenario of the Upper Mole Hydraulic Model. A 40 per cent climate change allowance has also been tested, as a credible maximum scenario (as a sensitivity analysis). Results are illustrated in **ES Appendix 11.9.6 Figure 5.2.1** (Doc Ref. 5.3).

5.2.17 For the 12 per cent allowance, extents are increased compared to the 1 per cent (1 in 100) event along the edge of the southern runway. There is also evidence of the south terminal stands beginning to be inundated in this event.

5.2.18 For the 20 per cent allowance, extents are increased in areas south of the main runway extending east. The inundation extent at the South Terminal has been extended further into the adjacent infrastructure.

5.2.19 For the credible maximum scenario of plus 40 per cent, flooding extends within the airport facilities, from the south terminal to the north terminal. Flood extents also encroach on the southern taxiways, and the runway edge. As well to the north at the River Mole floodplain upstream of the crossings; London Road and A217.

Conclusion

5.2.20 Overall, results from the baseline scenario of the Upper Mole Fluvial Model show that, the risk of fluvial flooding within the Project site boundary is considered to be high.

Differences Between the Environment Agency Published Flood Zones and Gatwick Model

5.2.21 This section compares the Environment Agency Flood Map for Planning flood zones, updated in November 2022, with the Upper Mole Hydraulic Model baseline scenario results, as shown in **ES Appendix 11.9.6 Figure 5.2.2** (Doc Ref. 5.3), in order to identify the differences that should be considered within this assessment.

5.2.22 The Environment Agency Flood Zones demonstrate that there are areas of Flood Zone 3 (areas at risk of flooding in a 1 per cent (1 in 100) AEP event) and Flood Zone 2 (area at risk of flooding in between a 1 per cent (1 in 100) and 0.1 per cent (1 in 1000) AEP event) within the Project site boundary. These are associated with the River Mole, Westfield Stream, Man's Brook and Crawter's Brook on the western and southern sides of the airport and with the Gatwick Stream on the eastern side.

5.2.23 Outside of the airport, there are extensive areas of Flood Zones 2 and 3 in which are situated a number of third party receptors for the Project, including residential areas and transport infrastructure that serves both Gatwick and the wider area. These flood extents are generally associated with the River Mole and/or Gatwick Stream and, therefore could potentially be affected by the Project.

5.2.24 The overall pattern of flooding is significantly different for the Upper Mole model and the Environment Agency Flood Zones, with the former indicating flood extents that are more confined, most notably in the Gatwick terminals.

5.2.25 The updated Upper Mole model also better reflects the urban nature of the catchment, including Crawter's Brook and Gatwick Stream and the more rural nature of Man's Brook and the Upper Mole, and has been calibrated against historic high flow events. Therefore, it is considered that it provides a more realistic understanding of flood extents and depths within the catchment.

5.2.26 In summary, it is considered that the Upper Mole Hydraulic Model outputs offer a more realistic and informative approach to assessing fluvial flood risk to the Project. However, in most cases, the Environment Agency Flood Zones would offer the worst-case scenario for the assessment. Therefore, the assessment undertaken has been based on a combination of both models, bearing in mind that the Upper Mole model offers the most up-to-date approach where the undefended scenario has also been considered.

5.3 Surface Water Flood Risk

Existing Surface Water Management Strategy

5.3.1 There are currently eight surface water drainage catchments within the airport that directly receive runoff, four of these serve the main airfield, discharging to Pond A, Pond M, the Dog Kennel Pond and Pond D as shown in **ES Appendix 11.9.6 Figure 5.3.1** (Doc Ref. 5.3). During cold weather, de-icer is regularly used, which, together with other pollutants, enters the surface water drainage system. When there is sufficient storage capacity in the system, the four attenuation ponds provide a degree of treatment through aeration and settlement. Pond E, Pond F, and Pond G provide attenuation for car parks east of the Railway line, and discharge to the Gatwick Stream. The clean side of Dog Kennel Pond provides attenuation for the car parks north of Larkins Road and is pumped into the River Mole. **ES Appendix 11.9.6 Figure 2.1.1** (Doc Ref. 5.3) includes the main attenuation features of the existing surface water drainage network.

5.3.2 Pond D receives the majority of runoff from Gatwick including that transferred from Pond A, Pond M, and the dirty side of Dog Kennel Pond. Runoff from the Pond D catchment drains to Pond D (lower) and is then raised by three Archimedes screws to Pond D (upper). In general, when runoff meets the required water quality standard of a biochemical oxygen demand (BOD) below 10 mg/l, water is discharged to the River Mole, via the attenuation ponds at a

consented rate controlled by a series of vortex flow control devices and pumps. When water quality falls below the required standard, the ponds discharge to the polluted water pumped main which conveys runoff for further treatment and temporary storage at two Long Term Storage Lagoons (Old and New Lagoons) with storage capacities of 220,000 m^3 and 100,000 m^3 respectively and then ultimately to Crawley Sewage Treatment Works (STW), which is operated by Thames Water. There are restrictions placed on the peak flow that can be transferred to the STW under a trade effluent consent agreed with Thames Water. In very heavy rainfall events, contaminated water diluted by rainfall may be pumped directly to the River Mole from Pond D if the incoming runoff is greater than the capacity of Pond D and there is insufficient capacity in the pumping system that transfers it to the pollution storage lagoons.

5.3.3 The assessment of existing surface water flood risk within the Project site boundary has been based on the Environment Agency Risk of Flooding from Surface Water mapping as well as surface water drainage modelling produced by GAL to inform the Project.

Environment Agency Risk of Flooding from Surface Water Mapping

5.3.4 The Environment Agency Risk of Flooding from Surface Water (RoFSW) mapping has been used to make an overarching assessment of the existing surface water flood risk to the Project. It has been used to determine overall patterns of surface water flooding and therefore to steer the assessment of risks, impacts and mitigation measures that follow.

5.3.5 According to the Environment Agency RoFSW flood extents mapping, illustrated in **ES Appendix 11.9.6 Figure 5.3.2** (Doc Ref. 5.3), surface water flooding occurs in several areas of the airport. Areas at high risk (greater that 3.3 per cent (1 in 30) AEP of flooding) are predominately associated with areas around existing watercourses or drainage features, although there are isolated pockets of high risk likely to be the result of rainfall filling local depressions rather than overland flow paths. Areas at medium risk (between 3.33 per cent (1 in 30) and 1 per cent (1 in 100) AEP of flooding) are generally small and adjacent to the areas at high risk. A large area at medium risk is located near the River Mole and south of the existing main runway. This flooding is likely to occur due to the existing River Mole culvert's capacity being exceeded. There are larger areas predicted to be at low risk (between 1 per cent (1 in 100) and 0.1 per cent (1 in 1000) AEP of flooding) within the airport, particularly to the south of the main runway and in proximity to existing terminal buildings.

Gatwick Surface Water Hydraulic Model

5.3.6 The assessment of surface water flood risk was undertaken using a drainage and surface model built with the InfoWorks™ ICM software. An existing model was rebuilt and revalidated against an extensive flow survey of 32 monitors.

5.3.7 Therefore, the mapped surface water flood extents and depths that are included in supporting figures of this FRA should only be used as an indication of the scale of the change in surface water flooding. In particular, the alterations in ground levels within the airfield due to the Project would only be resolved by detailed design, therefore, the exact locations of flooding cannot be verified. The surface water flood extents and depths will be updated following the during detailed design to inform the final surface water drainage design.

5.3.8 The baseline scenario was updated to develop a future baseline for the Project as modifications would be made to Rapid Exit Taxiway Echo Romeo (RET-ER) in advance of the Project. The model has been run for the future baseline scenario as well as the with-Project scenario, including the Project surface water mitigation measures. The baseline scenario is based on current land use, asset location and ground model data.

5.3.9 There are two critical storm durations for the surface water drainage system at Gatwick. The first is a 30-minute summer event, which generates the maximum flood volume and extent from a convective type storm event across the entire airfield. Typically, a 60-minute or 30-minute storm event would be expected to be the critical event for a land area of hardstanding such as Gatwick. However, because Gatwick has a controlled outlet at Pond D, influencing flood risk in the North Terminal and apron during longer, higher volume, less intense rainfall events, a second 1440-minute winter event has also been considered.

5.3.10 The results of the future baseline scenario for the 1 per cent (1 in 100) AEP event, plus a 25 per cent climate change allowance have been mapped in **ES Appendix 11.9.6 Figure 5.3.3** and **Figure 5.3.4** (Doc Ref. 5.3) for the 30-minute and 1440-minute storm durations respectively.

5.3.11 It is apparent that the 30-minute duration is the worst-case scenario in terms of flood extent. This is likely to be due to flow control measures and attenuation ponds that would restrain flow paths for longer events. Therefore, the 30-minute event with a 1 per cent (1 in 100) AEP plus 25 per cent climate change can be used to provide a comparison with the patterns illustrated in Environment Agency RoFSW extents. Generally, both extents seem to follow a similar pattern, with

ponding mainly forming between taxiways, around runways and towards the South Terminal.

5.3.12 An area of surface water flooding included in the RoFSW mapping is located south of the existing main runway, around the River Mole. This area is not included in the surface water modelling results. However, it is included in the Upper Mole Hydraulic Model extents as being at risk of fluvial flooding for the 1 per cent (1 in 100) AEP event.

5.3.13 Flood extents for the 1440-minute event with a 1 per cent (1 in 100) AEP plus 25 per cent climate change are much more confined and mainly located at the North Terminal.

5.3.14 The model has also been run for the 1 per cent (1 in 100) AEP event, plus a 40 per cent climate change allowance, as shown in **ES Appendix 11.9.6 Figure 5.3.3** and **Figure 5.3.4** (Doc Ref. 5.3), to examine a potentially larger impact of climate change to existing conditions. The extents of surface water flow paths and ponding areas are wider in some areas, but mostly follow the same pattern as the lower climate change allowance. This is due to topographical conditions and existing drainage infrastructure directing surface water flows within the airport.

Conclusion

5.3.15 Overall, the assessment of surface water drainage flood risk was found that the existing flood risk of surface water flooding within the Project site boundary is considered to be high.

5.4 Integrated Flood Risk

5.4.1 The purpose of the integrated catchment model is to undertake a sensitivity test to identify if there are any additional flood risks to the Project as a result of the interaction between the airfield surface water drainage network and principal watercourses. For this, both the surface water drainage model and the River Mole fluvial model were combined to build the integrated catchment model. Further details of the integrated model build are included in **ES Appendix 11.9.6: Annex 4** (Doc Ref. 5.3).

5.4.2 The existing scenario was simulated for the 5 per cent (1 in 20), 1 per cent (1 in 100) plus an allowance for climate change of plus 25 per cent rainfall intensity with plus 20 per cent peak river flow and 0.5 per cent (1 in 200) Annual Exceedance Probability (AEP) events. This incorporates the predicted impact of climate change based on Environment Agency guidance (Environment Agency,

2022) as discussed in Section 3.7. Additionally, a 40 per cent uplift for both rainfall intensity and peak river flow was adopted as a sensitivity test for a Credible Maximum Scenario (exceedance) event.

Assessment

5.4.3 For the 1 per cent (1 in 100) AEP event plus design climate change allowances (20 per cent increase for river flow and 25 per cent increase in rainfall intensity), flood extents were seen to of increased in the following locations:

- the South Terminal culvert due to overtopping of Gatwick Stream left bank;
- flood extents generally greater around the airfield near to Racecourse Road;
- flooding to the North Terminal and Gatwick Cargo Centre as a result of outfalls not being able to discharge from Pond D, leading to localised surface water flooding;
- within the car park on the right bank of River Mole at the Gatwick Stream confluence; and
- General increases to the flooding at the South Terminal culvert, as well as the North Terminal.

5.4.4 For larger events, no additional flooding mechanisms were observed. For detailed description of baseline ICM model results, refer to **ES Appendix 11.9.6: Annex 4** (Doc Ref. 5.3).

Conclusion

5.4.5 Overall, the risk of combined fluvial and surface water flooding within the Project site boundary is considered to be high.

5.5 Groundwater Flood Risk

5.5.1 Groundwater is present in the superficial deposits beneath the site. This may occur in relatively small discreet and discontinuous bodies, channelised water bodies within the alluvium or locally more continuous groundwater bodies adjacent to existing watercourses.

5.5.2 Groundwater levels respond to direct recharge from rainfall and to changes in water levels in watercourses. Groundwater levels in superficial deposits adjacent to watercourses are likely to respond to the water level in those surface waters, although there may be a lag in, and attenuation of, the water level response.

5.5.3 There are relatively sparse data for groundwater levels, but where these are available, they suggest groundwater levels are close to the surface at shallow depths within the superficial deposits (between around 0.8 and 3 mbgl) and

within the weathered layers of the Weald Clay Formation (between shallow depths of 1-2 mbgl up to 8 mbgl). Annual groundwater level fluctuation may be of the order 0.7 – 1.2 metres, but this is based on a very limited dataset, mostly away from the influence of surface watercourses.

5.5.4 Groundwater flooding may be defined as the emergence of groundwater at the ground surface or the rising of groundwater into underground infrastructure (such as basements) under conditions where the normal range of groundwater level and flow is exceeded.

5.5.5 Groundwater flooding may either be associated with shallow unconsolidated sedimentary aquifers which overlie unproductive aquifers (superficial deposits flooding), or with unconfined aquifers ("clearwater" flooding).

5.5.6 Mapping developed by the British Geological Survey (BGS 2022) identifies areas of groundwater flooding susceptibility, with associated mapping identifying the confidence level in the data used to develop the susceptibility mapping. The groundwater flooding susceptibility mapping correlates geological data and water level data held by BGS and has been included in **ES Appendix 11.9.6 Figure 5.4.1** (Doc Ref. 5.3).

5.5.7 The BGS mapping identifies that there is susceptibility to groundwater flooding throughout the areas underlain by superficial deposits (ie superficial deposits flooding), with a moderate level of confidence. There is also identified susceptibility to groundwater flooding from the Tunbridge Wells Sand (clearwater flooding), but with a low level of confidence.

5.5.8 However, the Crawley SFRA (2020) indicates there has only been two occurrences of groundwater flooding recorded in the Crawley Borough Council administrative area, neither of which are located near the airport. The SFRA identifies that groundwater flood risk is mostly negligible in the vicinity of Gatwick with some localised areas with low to moderate risk depending on the subsurface geology.

5.5.9 Reports of flooding of basements and other buried infrastructure in parts of the airport which may be the result of the inundation of shallow groundwater has been observed by GAL staff. Additionally, there is anecdotal evidence of surcharging of sewers (eg in pipework to Crawley STW) discharging by infiltrating to groundwater. However, these events if they have occurred, do not necessarily constitute groundwater flooding.

Conclusion

5.5.10 Overall, the risk of groundwater flooding within the Project site boundary is considered to be low.

5.6 Flood Risk from Reservoir Failure

5.6.1 Environment Agency Reservoir Flood Extents, last updated in March 2023, show two reservoir failure flooding scenarios, “dry day” and a “wet day”. The “dry day” scenario predicts the flooding extent if a reservoir fails when rivers are at normal level while a “wet day” shows how much worse flooding would be if a river is already experiencing extreme natural flood. The reservoir flood risk flood extents are illustrated in **ES Appendix 11.9.6 Figure 5.5.1** (Doc Ref. 5.3).

5.6.2 For the dry day scenario, the western side of the airport, including Taxiways Uniform and Lima and north to the Gatwick fuel farm, would be at risk of flooding. While on the eastern side, localised would impact the South Terminal and nearby stands.

5.6.3 For the wet day scenario, impacts can be seen across much of the eastern side of the airport, including both terminals, as well as the main runway to the west and large commercial areas on the River Mole floodplain. Similarly, the extent of wet day failure extends across much of the airport structures, including terminals, stands and taxiways.

5.6.4 Gatwick operates the two long term storage lagoons adjacent to Crawley STW that receive contaminated runoff. The consequences of a potential failure from these structures have been mapped by GAL and can be seen on **ES Appendix 11.9.6 Figure 5.5.1** (Doc Ref. 5.3) as Gatwick Breach Flood Extents. In the event of a failure, flows would travel northwards primarily through the airport car parks to the east of the London to Brighton mainline railway. The flow path does not cross the railway and would pass under the M23 spur via the B0236 bridge and then towards the residential areas to the north of the motorway. The A23 and M23 would not be flooded. In the unlikely event of a breach of the lagoons, the Project elements that would be affected would be those that are east of the railway line, principally the surface access works to the South Terminal, works to the car parks located in this area and the hotel and office provision after 2032.

5.6.5 In conjunction with the Environment Agency, GAL constructed the Gatwick Stream Flood Alleviation Scheme which included a flood storage area (FSA) on the Gatwick Stream to the south of Crawley STW. This includes an embankment to retain flood water which could theoretically fail. The FSA falls under the auspices of the Reservoirs Act 1975 and as with the lagoons is subject to a

monitoring inspection regime and therefore the risk of failure is considered to be very low. The Environment Agency has confirmed that the predicted flood extent of such a failure is included in the flood risk from reservoirs mapping and is similar to that of the reservoir flooding extent downstream (northwards) of the FSA.

Conclusion

5.6.6 Overall, the risk of flooding from reservoir failure within the Project site boundary is considered to be very low.

5.6.7 As large reservoirs, these structures are maintained and operated in accordance with the Reservoirs Act 1975 and therefore the risk of failure is considered very low due to their monitoring and inspection regime.

5.7 Sewer/Water Distribution Infrastructure Flooding

5.7.1 Gatwick has a complex water distribution and sewerage network that should be considered as a potential source of flood risk.

5.7.2 The failure of sewerage or water distribution infrastructure within or upstream of the Project could result in flooding, although the risk of this is likely to be low given the maintenance and monitoring activities undertaken by GAL to avoid this.

5.7.3 The hydraulic model built by GAL to assess the impact of the Project on the wastewater network has not identified any locations predicted to flood based on current and future flows as a result of the Project.

5.7.4 It understood through conversations with GAL operations staff that part of the Thames Water wastewater network, located in Horley, periodically reaches its capacity, causing flows to back up to the airport.

5.7.5 The Crawley SFRA (2020) includes a specific section on recorded sewer or water distribution infrastructure flooding events based on the Thames Water Sewer Flooding History Database. This records that there have been 102 instances of flooding in postcodes covered by the Crawley SFRA although some may be outside the boundary as the postcodes cover a wider area. For the Postcode area covering Gatwick (RH6 0), only one incident is recorded and this may be outside the area of the airport as the postcode area covers a much larger area of land.

Conclusion

5.7.6 Overall, the risk of sewer/ water distribution infrastructure flooding within the Project site boundary is considered to be low.

5.8 Risk of Flood Defence Failure

5.8.1 According to the Environment Agency Flood Map for Planning, the Project is partly located in an area benefiting from flood defences. As described in Section 5.2, the Upper Mole Fluvial Model has considered local flood defence schemes that were being constructed or had recently been built within the catchment. Both the defended (**ES Appendix 11.9.6 Figure 5.2.1** (Doc Ref. 5.3)) and undefended scenarios (**ES Appendix 11.9.6 Figure 5.2.2** (Doc Ref. 5.3)) have been assessed to understand the risk associated with flood defence failure.

Conclusion

5.8.2 Overall, the risk of flood defence failure within the Project site boundary is considered to be low, when taking into account flood defence asset management, monitoring and maintenance practices.

5.9 Historical Flooding

5.9.1 There is a history of flooding from different sources at the airport, most notably the December 2013 flood event, which led to major disruption. **ES Appendix 11.9.6 Figure 5.8.1** (Doc Ref. 5.3) illustrates the Environment Agency Historic Flood Map for the Project study area.

5.9.2 According to the West Sussex LFRMS (West Sussex County Council, 2013):

‘Historically the River Mole and its tributary the Gatwick Stream have come out of bank and flooded, and there *are a number of recorded incidents that have damaged property.’*

5.9.3 In September 1968, the airport was closed for several days due to flooding of the main runway. According to the Crawley SFRA (Crawley Borough Council, 2020), in 2000 over 70 properties in Crawley and Maidenbower were flooded during the reported 6.67 per cent (1 in 15) AEP event. Gatwick was also affected by this fluvial event, as Gatwick Stream exceeded the capacity of the culvert alongside the South Terminal building. This caused flooding along the A23 and into the South Terminal. The most recent fluvial flood within the catchment occurred in December 2013 when high river levels caused the loss of three airfield electrical substations and led to significant disruption, particularly to Gatwick North Terminal (McMillan, 2014). The flooding event was the culmination of unprecedented levels of rainfall over proceeding weeks and months. River flows in three waterways in the immediate vicinity of the airport were at record levels.

5.9.4 There are limited reports of surface water flooding within the catchment, however given the level of urbanisation in parts of the catchment it seems likely that some localised surface water flooding would occur. Part of the cause of the December 2013 flooding is classed as surface water, as rainfall caused the North Terminal basement to be flooded, damaging a number of systems and causing disruption to the airport (McMillan, 2014).

5.10 Flood Risk Compatibility of the Project

5.10.1 Table 5.10.1 categorises the different types of land uses of the Project elements, as described in the ES Chapter 5: Project Description (Doc Ref. 5.1), according to their vulnerability to flood risk. It then aligns these vulnerability classes against Flood Zones (based on Table 2 of the NPPG (Department for Levelling Up, Housing and Communities and Ministry of Housing, Communities and Local Government, 2021 and replicated here in Table 5.10.1 Project Elements Vulnerability and Flood Zone Compatibility to determine where development requires the Exception Test to be met before it is permitted and where development should not be permitted. For Flood Zones 3a and 3b, compatibility has been assessed based on the Gatwick Upper Mole model for the 3.33 per cent (1 in 30) event, as it offers the most up to date basis for the assessment and due to the fact that the Environment Agency Flood Zones do not specifically delineate Flood Zone 3b. Similarly, for Flood Zone 2, compatibility has been assessed on the Gatwick Upper Mole for the 0.1 per cent (1 in 1000) event.

5.10.2 Table 5.10.1 indicates the flood zone compatibility of the Project elements based on their vulnerability classification, and whether they are subject to application of the Exception Test.

Table 5.10.1 Project Elements Vulnerability and Flood Zone Compatibility

Project Elements	Vulnerability Classification	Flood Zone Compatibility			
		FZ1	FZ2	FZ3a†	FZ3b*
Runways Taxiways Terminals Piers and Stands Internal Access Routes and Surface Access	Essential Infrastructure	✓	✓	Exception Test required†	Exception Test required*
Waste Management Facilities	Highly Vulnerable	✓	Exception Test required	✓	✓
Hotel and Commercial Facilities	More Vulnerable	✓	✓	Exception Test required	✓
Fire Training Ground Hangars Maintenance Facilities Car Parking	Less Vulnerable	✓	✓	✓	✓
Flood Control Infrastructure Flood Storage Areas	Water Compatible	✓	✓	✓	✓

✓= "Exception test not required" ×= "Development should not be permitted"

"†" In Flood Zone 3a essential infrastructure should be designed and constructed to remain operational and safe in times of flood.

"*" In Flood Zone 3b (functional floodplain) essential infrastructure that has passed the Exception Test, and water-compatible uses, should be designed and constructed to:

- remain operational and safe for users in times of flood;
- result in no net loss of floodplain storage;
- not impede water flows and not increase flood risk elsewhere.

The Sequential Test

5.10.3 The Sequential Test, as described in Section 3.5, ensures that a sequential approach is followed to steer new development to areas with the lowest probability of flooding. The flood zones, as defined by the Environment Agency

Flood Map for Planning, provide the basis for the test to be applied. The aim is to steer new development to Flood Zone 1 (areas with a low probability of river or sea flooding). Where there are no reasonably available sites in Flood Zone 1, local planning authorities in their decision-making should take into account the flood risk vulnerability of land uses and consider reasonably available sites in Flood Zone 2 (areas with a medium probability of river or sea flooding), applying the Exception Test if required. Only where there are no reasonably available sites in Flood Zones 1 or 2 should the suitability of sites in Flood Zone 3 (areas at high probability of river and sea flooding) be considered, taking into account the flood risk vulnerability of land uses and applying the Exception Test if required.

5.10.4 According to the Environment Agency Flood Zones (**ES Appendix 11.9.6 Figure 5.2.2** (Doc Ref. 5.3)), the majority of the altered northern runway and Project taxiways located in the western part of the airport fall within Flood Zone 2. Existing infrastructure, including runways and taxiways as well as the South and North Terminals also fall within Flood Zone 2 and partly, Flood Zone 3. Both the existing main runway and the Project altered northern runway are located outside of Flood Zone 3, but there are small strips of taxiways, both existing and proposed, around the western end of the airfield that fall within Flood Zone 3.

5.10.5 When applying the Sequential Test the adopted approach has been to make best use of existing infrastructure. This accords with Government's policy statement: 'Beyond the Horizon - The Future of UK Aviation: Making Best Use of Existing Runways' (HM Government, 2018a), but also represents an approach by GAL to minimise wider environmental impacts.

5.10.6 A number of alternative options for the runway and other Project elements have been considered (see **ES Chapter 3: Alternatives Considered** (Doc Ref. 5.1)). The final selection for the location of these options has taken account of various factors, including flood risk. There is no more efficient way that Gatwick can make best use of its existing infrastructure other than by undertaking the Project.

5.10.7 Therefore alternative locations for the Project, outside of Flood Zone 2 and 3, are not available and the Sequential Test for the Project as a whole is considered to be satisfied.

The Exception Test

5.10.8 The Exception Test is described in Section 3.6. There are two parts to the Exception Test

- the applicant must demonstrate that a proposed development will provide wider sustainability benefits to the community that outweigh flood risk; and

- that it will be safe for its lifetime, without increasing flood risk elsewhere and where possible reducing flood risk overall.

5.10.9 The first part of the Exception Test is considered through the planning and EIA processes and within the **Planning Statement** (Doc Ref. 7.1) that accompanies the application for development consent. GAL's sustainability policy goals and objectives as set out in their Second Decade of Change lie at the heart of the Project sustainability framework.

5.10.10 In summary, the **Planning Statement** (Doc Ref. 7.1) states that some of the project economic and socio-economic benefits are:

- addresses unmet aviation demands in the South East;
- creation of 14,000 additional jobs (and employ at its peak 1,400 during construction) and productivity benefits;
- contribution of £1.75bn in GVA across the UK;
- Just over £1bn in taxes;
- increased and improved aviation connectivity;
- highways and surface access improvements (including improvements to public transport accessibility); and
- environmental enhancements including new landscaping/open space areas; creation of new ecological habitats; improved flood mitigation measures.

5.10.11 In addition, the framework reflects both the objectives used by the Government in the Airports NPS (Department for Transport, 2018) and the sustainability priorities relevant to the host local authorities within the context of local aspects. More information on wider aspects of sustainability can be found within the ES, with a brief description of GAL's ongoing sustainability objectives included in **ES Chapter 5: Project Description** (Doc Ref. 5.1).

5.10.12 The second part of the Exception Test is addressed in Section 7, where it is demonstrated that the flood mitigation strategy would ensure the Project remains safe throughout its lifetime and does not increase flood risk elsewhere.

Conclusion

5.10.13 The wider sustainability benefits that the Project would provide to the local community as set out above and in section 7.6, combined with the demonstration in this FRA that it would not increase flood risk elsewhere and that it would be safe for users for its lifetime mean that the requirements of the Exception Test have been met.

5.11 Limits of Deviation

5.11.1 The assessment has been carried out on the Project as described in **ES Chapter 5: Project Description** (Doc Ref. 5.1). Any changes to the design, as a result of the limits of deviation, would only occur if they do not lead to any materially new or materially different environmental effects in comparison to those reported in the ES.

6 Flood Risk due to the Project

6.1 Introduction

6.1.1 The Project could itself affect flood risk within the wider study area if no mitigation was in place. This section describes how and where flood risk would increase due to the Project, with regards to types of flooding that have the potential to be affected by new development. These include fluvial, surface water, groundwater and sewer/ water distribution infrastructure flood risk. The Project would not increase the likelihood of reservoir and/ or flood defence failure, or change the magnitude of impact, if these occurred. Therefore, these sources of flooding have been scoped out of this assessment.

6.2 Fluvial Flood Risk

6.2.1 According to the Environment Agency published Flood Zones and the Upper Mole Hydraulic Model results, areas downstream and upstream of Gatwick are also at risk of fluvial flooding and hence, further development within the airport has the potential to influence flood risk upstream and downstream.

6.2.2 This section provides an assessment of the Project's effect on fluvial flood risk, assuming no mitigation would be in place. This assessment is based on the comparison of flood extents and depths between the baseline 1 per cent (1 in 100) AEP event plus a 20 per cent climate change allowance and the with-Project with-mitigation results for the same event, shown in **ES Appendix 11.9.6 Figure 6.2.1** (Doc Ref. 5.3).

6.2.3 With reference to **ES Appendix 11.9.6 Figure 6.2.1** (Doc Ref. 5.3), the with-Project without mitigation scenario would result in flood depths increasing in the western area of the Project site boundary surrounding the relocated fire training ground and noise mitigation feature. This would be due to the truncation by the new noise mitigation feature of an overland floodwater flow path that flows southwards from the Man's Brook, flood depths would increase by up 500 mm at the northern boundary of the fire training ground, with depths of 200mm

extending in to Brockley Wood. The displacement of floodwaters due to taxiway modifications to the east would increase the depth of water abutting the higher main runway (greater than 10 mm and up to 50 mm increase).

6.2.4 The surface access improvements would result in the loss of floodplain at Longbridge Roundabout and to the south of the A23, north-east of North Terminal as a result of the construction of an embankment for the A23 flyover and widening of London and Brighton Road bridges. These works would result in an area of increased flood risk immediately downstream of Brighton Road and London Road bridges, Riverside Gardens and extend into third party properties if no mitigation was provided by the Project.

6.2.5 As a result of these predicted increases in flood risk without mitigation a flood mitigation strategy was developed as part of the Project which is described in Section 7.1.

Conclusion

6.2.6 The Project would result in floodplain losses and displacement of floodwaters on the River Mole due to the Taxiway Juliet West Spur works, as well as at access works encroaching into the floodplain at Longbridge roundabout and North Terminal, there a flood mitigation strategy was developed as part of the Project which is described in Section 7.2.

6.3 Surface Water Drainage Flood Risk

6.3.1 This section provides an assessment of the Project's impact on local surface water flood risk. At this stage, detailed design of the drainage system has not been undertaken and finished ground levels of the development would require that detailed design. Therefore, conceptual modelling has been undertaken to examine the impact the Project would have on surface water flows and an evaluation of the storage required to prevent any increase in discharge rates from the development has been undertaken.

6.3.2 The Project would increase the hardstanding and roof areas within the airport, resulting in an increase in the volume of surface water runoff. Furthermore, the introduction of new infrastructure has the potential to block or divert existing surface water flow paths through landform changes, potentially increasing flood risk elsewhere.

6.3.3 Existing surface water flow paths and ponding areas show the patterns of surface water flooding within the airport. Assuming no changes to the drainage system and no mitigation strategy, the addition of impermeable area would exacerbate

flood risk within areas already at risk and flooding would be expected to extend to adjacent low-lying areas.

6.3.4 Project surface access improvement works would include widening of the existing Airport Way embankment southwards. This would encroach onto the footprint of Pond F by approximately 1400m^2. A conservative approach of reducing the total volume by 9 per cent (approximate 5,000m^3 reduction in volume) has been tested using the surface water drainage model and found to have no impact on the surface water drainage network as the pond is not at capacity (less than 50 per cent full) within in the 1 per cent (1 in 100) AEP plus 25 per cent climate change allowance event and this portion of the pond is not active, therefore no specific mitigation is proposed.

Conclusion

6.3.5 The Project would increase airfield impermeable area resulting in a corresponding increase in the overall volume of runoff to receiving watercourses and potentially flood risk without mitigation. This assessment therefore highlights the need for the development of a flood mitigation strategy that would mitigate surface water flood risk within the airport (refer to Section 7.3).

6.4 Groundwater Flood Risk

6.4.1 The Project includes structures or other elements that are likely to penetrate into shallow groundwater. These may have a local impact on groundwater flow paths and levels in their immediate vicinity, especially if they act as a barrier or partial barrier to groundwater flow.

6.4.2 Furthermore, some buried services (such as cabling ducts) may be susceptible to inundation from high groundwater levels (whether or not these are due to groundwater levels higher than normal).

6.4.3 Where Project elements coincide with areas of existing groundwater flood risk as shown in **ES Appendix 11.9.6 Figure 5.4.1** (Doc Ref. 5.3), these may lead to an increased risk of groundwater flood susceptibility and a loss of flood attenuation. Where subsurface activities are within the alluvial or RTD channel areas and could create barriers to groundwater flow, there is the potential for groundwater mounding up hydraulic gradient which could give rise to groundwater flooding if no mitigation is provided.

6.4.4 Due to the localised nature and extent of the groundwater flooding risks, it is considered that the groundwater flooding risks may be addressed through normal good practice design measures which take into account additional information

obtained from ground investigation at the detailed design stage. These measures may be passive (using sealing materials to exclude the entry of groundwater) or active (by building in sumps and pumping arrangements). All foundations at or below structures expected to intercept high groundwater levels and which could form a barrier to groundwater flow would be designed to allow existing groundwater flow paths to function. This would prevent an increase in groundwater flood risk and would protect flood-sensitive receptors elsewhere.

6.4.5 It is anticipated that there is a low increased risk of groundwater flooding due to an increase in infiltration. This is due to the underlying clay geology having a low infiltration rate, and no recorded history of groundwater flooding. The large impermeable surface area of the airfield prevents infiltration during the existing flood risk conditions and the increase in impermeable area as a result of the Project would not encourage further infiltration.

6.4.6 The **ES Appendix 5.3.2: CoCP Annex 4 – Soil Management Strategy** (Doc Ref. 5.3) includes appropriate design controls to prevent the exacerbation of groundwater flooding.

Conclusion

6.4.7 Assuming appropriate design controls, which include embedding groundwater conditions into the detailed design development and ensuring adequate drainage strategies are place, it is considered that the risk from groundwater flooding would not be exacerbated by the Project.

6.5 Sewer/ Water Distribution Infrastructure Flooding

6.5.1 During the operational period of the Project, peak daily passenger numbers would increase, introducing additional loading to the foul sewerage system of the airport. This could have a potential long- term impact on sewer flood risk. However, modelling of the foul sewerage system undertaken for the **ES Chapter 11: Water Environment** (Doc Ref. 5.1), indicates that with mitigation measures the network would have adequate capacity to accommodate the increase in flows anticipated as a result of the Project.

6.5.2 Additional water distribution infrastructure would be installed as part of the Project in order to accommodate new buildings and infrastructure. However, this would be new infrastructure and would be considered to be at low risk of failure and subsequently flooding elsewhere.

6.5.3 In the case that parts of the existing water distribution network are replaced as part of the Project, this could provide an overall betterment in terms of flood risk.

Conclusion

6.5.4 In all scenarios the impact on the Gatwick wastewater infrastructure network would be negligible as the wastewater network has adequate capacity to accommodate the increase in flows resulting from additional passengers and the demand from construction workers, taking account of the additional water distribution infrastructure to be implemented as part of the Project.

7 Flood Mitigation Strategy

7.1 Introduction

7.1.1 As described in Section 6.2, the Project would encroach on existing floodplain areas resulting in a net reduction in flood storage and an increase in existing levels of flood risk that would require mitigation. There are also additional areas of pavement and other changes that alter surface water runoff. Therefore, this flood mitigation strategy has been developed to ensure the Project meets national planning policy requirements.

7.1.2 The overall approach for fluvial flood risk mitigation has been to maximise the compensatory flood storage capacity within the airport. For surface water flood risk, the approach is focused on providing additional attenuation storage and flow control measures where required.

7.2 Fluvial Flood Mitigation Strategy

Project Fluvial Flood Mitigation Measures

7.2.1 A number of flood mitigation measures have been proposed as part of the Project, to ensure it would remain safe from flooding throughout its lifetime and would not increase flood risk elsewhere. All mitigation measures proposed for inclusion within the Project, as secured as a requirement in Schedule 2 of the **Draft Development Consent Order** (Doc Ref. 2.1), have been mapped in **ES Appendix 11.9.6 Figure 7.2.1** (Doc Ref. 5.3) and are described in this section.

7.2.2 All the embedded fluvial mitigation measures of the Project are represented in the Upper Mole Hydraulic Model for the with-Project, with-mitigation scenario, which provides the basis for assessment of the mitigation strategy.

7.2.3 All of the Project flood mitigation measures are planned to be constructed during the initial construction period (2024-2028) (as defined in **ES Chapter 5: Project Description** (Doc Ref. 5.1)) of the Project to ensure that mitigation is provided in

advance of the associated encroachment and loss of floodplain, including the temporary construction compounds (see Section 7.5).

7.2.4 Preliminary designs for the two FCAs are included Annex 1. These are likely to evolve as the Project design progresses, but they do provide an indication of the intended features.

Floodplain Compensation Areas

7.2.5 The Project would encroach on existing floodplain areas of the River Mole, Gatwick Stream and Crawter's Brook and therefore result in a net reduction in flood storage that would need to be replaced. The overall approach has been to maximise the compensatory flood storage capacity of the airport as close to the location of loss as practicable. This would be achieved with the development of new FCAs to ensure there is no increase in flood risk to other parties arising from the Project.

7.2.6 There are two Project FCAs as identified below and in **ES Appendix 11.9.6 Figure 7.2.1** (Doc Ref. 5.3). Further details of the Project FCAs are included in **ES Appendix 11.9.6: Annex 5** (Doc Ref. 5.3):

- the Museum Field FCA, approximately square storage area, 165m by 185m, which is located north of the Project relocated fire training ground and west of the River Mole; and
- Car Park X (CPX) FCA, approximately 300m in length and 90m wide rectangular storage basin, located south of the main runway and adjacent to Crawter's Brook.

Museum Field FCA, shown in Annex 1

7.2.7 Figure 10.1.1 to Figure 10.1.2 , fills via a spillway when River Mole levels are above 56.6m AOD. When water levels within the River Mole drop, the basin is then drained via the same spillway back into the River Mole. The Museum Field FCA is engaged in all modelled events (beginning at the 50 per cent (1 in 2) AEP Event). As seen in Table 7.2.1, the basin has a peak water depth of 1.0m in the 1 per cent (1 in 100) AEP event plus 20 per cent allowance for climate change, and stores approximately 30,000m3.

7.2.8 CPX FCA does not operate for events of less severity than the 5 per cent (1 in 20) AEP event. The FCA fills via overland flood flows from the River Mole upstream of Charlwood Road and flowing north-east and spilling into the FCA from ground level. The FCA would be drained via a 1m diameter outfall pipe into River Mole. In the 1 per cent (1 in 100) AEP event plus 20 per cent allowance for

climate change, the CPX FCA stores approximately 41,000m3, for a peak water depth of 1.6m, as seen in Table 7.2.1. There is a slight overtopping seen to the east of the site, however it remains contained within the car park and Project site boundary. Preliminary design drawings for CPX FCA are shown in Figure 10.1.3.

Table 7.2.1 Project FCAs maximum values summary

Proposed FCA	Parameter	AEP Event				
		50%	20%	5%	1.33%	1% + 20%CC
Car Park X	Water Depth (m)	0	0	0.2	1.0	1.6
	Volume stored (m^3)	0	0	4,500	24,500	41,000
	Time wet (hr)	0	0	32	31	43
Museum Field	Water Depth (m)	0.1	0.3	0.6	0.8	1.0
	Volume stored (m^3)	1,500	8,000	18,500	24,500	30,000
	Time wet (hr)	2	33	42	44	54

Syphons

7.2.9 The new taxiway levels are governed by the need to tie into existing taxiway or runway levels, potentially impacting on areas of floodplain. Areas of lost floodplain storage would result not only from the new taxiways, but also by hydraulically isolating part of a floodplain where the taxiway crosses it. This would be addressed by connecting both sides of the floodplain with syphon structures under the taxiways. This approach has been adopted because the potential to provide compensatory floodplain storage in close proximity to the location of loss is constrained by existing airfield infrastructure and airfield operation safety requirements. The Project would include two syphons beneath Taxiway Yankee and the western end-around taxiway as shown in **ES Appendix 11.9.6 Figure 7.2.1** (Doc Ref. 5.3) to provide floodplain connectivity which are considered to be less environmentally impactful than the construction of further FCA. Further details of the outline drainage design are included in Figure 4.1 and 4.2 of **ES Appendix 11.9.6: Annex 3** (Doc Ref. 5.3).

7.2.10 A noise bund is proposed to the north-west of taxiway Juliet and to the west of the fire training ground. This will truncate a fluvial flow path that flows southwards from the Man's Brook. The noise mitigation feature would be formed of a combination of noise wall and earthen embankment and would block the flow path and otherwise increase flood risk off-site without mitigation. The intention would be to install syphons beneath the noise mitigation feature to maintain

floodplain connectivity, as shown in **ES Appendix 11.9.6 Figure 7.2.1** (Doc Ref. 5.3).

7.2.11 The Project's active travel path for pedestrian and cyclists connects Longbridge roundabout to Car Park Y on the southern side of the highways improvement works. This however includes a raised embankment on the right bank of the River Mole. In order to maintain floodplain connectivity, culverts are proposed beneath the travel path, as shown in **ES Appendix 11.9.6 Figure 7.2.1** (Doc Ref. 5.3).

Environmental Enhancement features

7.2.12 A 300mm high weir would be constructed on the eastern box of the River Mole runway culvert to concentrate flows and enhance conditions for fish passage during periods of low flow. The Upper Mole Hydraulic Model was used to assess the weir's impact on flood risk. For the 50 per cent (1 in 2) to 3.33 per cent (1 in 30) AEP events, the weir would result in raised water levels in the left box, while resulting in no adverse impacts outside the Project boundary. At more extreme events such as the 1 per cent (1 in 100) plus 20 per cent climate change, the weir would be overtopped and would not affect flood risk outside the Project site boundary.

7.2.13 Low flow calculations for August 2022 mean flow (690l/s) show flow depths would be 280mm and 175mm in the west and east boxes respectively, resulting in an increase of approximately 0.1m. Similarly, for the Q95 flow of 57l/s, the depth of flow in the west and east box would be 58mm and 38mm respectively.

7.2.14 Additionally, the creation of a fish pass to improve fish passage is particularly during low flow conditions is proposed on the existing weir located 13m upstream of the River Mole runway culvert.

Assessment of Project Fluvial Mitigation

7.2.15 The Gatwick Upper Mole Hydraulic Model has been run for the Project with-mitigation scenario in order to determine the effectiveness of the Project mitigation strategy in keeping all Project elements safe for their lifetime and in mitigating all flooding to third parties due to the Project. This assessment allows for a judgement to be made on whether the second part of the Exception Test can be passed (refer to paragraphs 5.10.8 to 5.10.12).

7.2.16 **ES Appendix 11.9.6 Figure 7.2.2** (Doc Ref. 5.3) illustrates flood extents within Gatwick, for the mitigated, with Project scenario, for the 10 per cent (1 in 10) and

30 per cent (1 in 30) AEP fluvial event, as well as the 1 per cent (1 in 100) AEP event plus 12 per cent, 20 per cent and 40 per cent climate change allowances.

7.2.17 This illustrates that the Project runways and new taxiways would not be at risk of flooding during the design events up to the 1 per cent (1 in 100) AEP event, plus a 20 per cent climate change allowance).

7.2.18 For the Credible Maximum Scenario, the 1 per cent (1 in 100) AEP event plus 40 per cent for climate change, some Project elements, including the edge of the reconfigured Taxiway Whiskey-Victor-Zulu, the edge of the relocated fire training ground, and the east of the Central Area Recycling Enclosure (CARE), would additionally be at risk of flooding. These areas of flooding are not expected to affect the ability of the airport to remain operational and safe. The planned response to an event (including the management flow chart during such an event) of this magnitude is set out in GAL's **Flood Resilience Statement** (**ES Appendix 11.9.6: Annex 6** (Doc Ref. 5.3)) that would ensure the safety of staff and passengers in such circumstances.

7.2.19 At the fire training ground, flood depths would be less than 200 mm for the design event (1 per cent (1 in 100) AEP event plus a 20 per cent climate change allowance) and the flood extents are very localised to the northern boundary and would not block any access and egress routes. The facility would not be expected to be used during extreme flooding events. Therefore, the facility would remain safe for its lifetime.

7.2.20 **ES Appendix 11.9.6 Figure 7.2.3** (Doc Ref. 5.3) illustrates the difference in fluvial flood depths between the baseline and with- Project, with-mitigation scenarios, for the 1 per cent (1 in 100) AEP event, plus a 12 per cent allowance for climate change, allowing for a more detailed assessment of potential impacts within the airfield. Overall, there would be no increase to flood risk outside the Project site boundary, and there would be large areas with reduced fluvial flood risk both inside and outside of the airport after the development of the Project with the mitigation measures proposed.

7.2.21 It shows that there are much greater areas benefiting from the development of the Project compared to the areas where flood risk is increased. The most obvious new areas of flooding are intentional and are associated with the Project FCAs at Museum Field and CPX (see **ES Appendix 11.9.6 Figure 7.2.1** (Doc Ref. 5.3)). Another area of flood depth increase is located at the north-west edge of the Project's relocated fire training ground. However, the fire training ground facility would not be classified as 'Essential Infrastructure' and would not have to remain fully operational during such an extreme event. In any case, the flood

extents are located on the edge of the facility and are not expected to affect its ability to remain safely operational, and therefore, this meets the requirements of the Exception Test.

7.2.22 Directly south of the fire training ground there is a narrow strip of increased flood depth between the Taxiway Juliet Spur and the Noise Bund. However, this area remains unused and does not encroach on any infrastructure and therefore, the change is not considered to result in a significant effect.

7.2.23 The South Terminal building would be at risk of flooding during the 1 per cent (1 in 100) AEP event plus a 12 per cent climate change allowance, as for the baseline scenario. There has been an average betterment of less than 10 mm. However, dry access and egress routes above flood levels, via high-link bridges and multi-storey car parks are in place for the terminal buildings.

7.2.24 For the airfield design event (1 per cent (1 in 100) AEP event, plus a 12 per cent allowance for climate change), there is one small area of increased flood depths at the eastern End Around Taxiway, however this would not affect its ability to remain operational during times of flood, or to operate safely. The runways would remain operational for the design event. For the terminal buildings, flooding would be less than or equivalent to existing. For taxiways and supporting airport infrastructure, flood risk would be reduced or equivalent to existing, with the exception of small areas of locally increased flood risk been described in paragraphs 7.2.18 to 7.2.22 where it is shown that these would not result in safety or operational risks. There would be no increase in flooding to third parties due to the Project.

7.2.25 The mitigation measures included to address changes in fluvial flood risk on the airfield would also provide mitigation for the surface access elements of the Project. Given its longer lifetime the impact of the surface access proposals on fluvial flood risk have considered the design event to be the 1 per cent (1 in 100) AEP event, plus a 20 per cent allowance for climate change. **ES Appendix 11.9.6 Figure 7.2.4** (Doc Ref. 5.3) demonstrates that the fluvial mitigation measures would also ensure that there would be no increase in fluvial flood risk beyond the airport boundary for this event (other than the FCA that would be deliberately designed to flood safely).

7.2.26 For the 1 per cent (1 in 100) AEP event, plus a 20 per cent allowance for climate change, **ES Appendix 11.9.6 Figure 7.2.4** (Doc Ref. 5.3) shows an increase in flood levels due to South Terminal International Departure Lounge extensions. This ground level extension acts to redirect an existing flow path around the building, resulting in localised depths of 250mm at the eastern edge of the

building. Similar to paragraph 7.2.21, this area of flooding is not expected to affect the ability of the airport to remain operational and safe and GAL's **Flood Resilience Statement** (**ES Appendix 11.9.6: Annex 6** (Doc Ref. 5.3)) would ensure the safety of staff and passengers in such circumstances.

7.2.27 **ES Appendix 11.9.6 Figure 7.2.5** (Doc Ref. 5.3) illustrates the 3.33 per cent (1 in 30) AEP event difference in fluvial flood depths compared to the baseline scenario. The only areas where flood depths would be increased are associated with the Project FCAs, the area on the edges of the fire training ground and the undeveloped area directly south of the noise bund. For all other areas flood depths would be reduced.

Credible Maximum (Exceedance) Scenario

7.2.28 As detailed in paragraph 3.7.16, the 1 per cent (1 in 100) AEP event, plus a 40 per cent climate change allowance, has been tested as an exceedance scenario for the airfield (as a sensitivity analysis) and results are mapped in **ES Appendix 11.9.6 Figure 7.2.6** (Doc Ref. 5.3).

7.2.29 It is shown that flood risk is not increased by the Project outside the Project site boundary and that there is betterment to third parties (flood depths decreased by up to 100 mm in some areas).

7.2.30 Flooding within Gatwick is locally increased compared to the design event (1 per cent (1 in 100) AEP event plus a 20 per cent climate change allowance), affecting some taxiways and stands but not the existing and Project runways. Additionally, the ground level extensions to the International Departure Lounges in both North and South Terminals re-direct flow paths causing local increases to flood risk surrounding the terminals. Safe access and egress routes as described in paragraph 7.2.23 would not be affected by flooding and available for use as set out in GAL's **Flood Resilience Statement** (**ES Appendix 11.9.6: Annex 6** (Doc Ref. 5.3)).

Fluvial waterbody crossings

7.2.31 The Project highway access works cross three waterbodies which have been hydraulically modelled by the Upper Mole hydraulic model namely:

- A23 Airport Way crossing Gatwick Stream (Culvert)
- A23 London Road Bridge crossing River Mole
- Brighton Road Bridge crossing River Mole

7.2.32 Table 7.2.2 presents the peak water levels at the listed waterbody crossings against road carriageway levels for both the access route design event and

credible maximum scenario to ensure the residual risk of fluvial flooding to the highways from waterbodies is addressed. At all three locations the carriageways are not inundated in these two events, and freeboard is greater than 400mm therefore the likelihood of an exceedance event or blockage causing flooding to the Project is considered extremely small and therefore is not considered further in this assessment.

Table 7.2.2 Peak water levels at waterbody crossings

Location	Road Level (m AOD)	Peak Water Level (m AOD)	
		1%AEP+ 20%CC	1%AEP+ 40%CC
A23 Airport Way crossing Gatwick Stream (Culvert)	65.5	56.5	56.5
A23 London Road Bridge crossing River Mole	56.2	55.6	55.7
Brighton Road Bridge crossing River Mole	56.0	55.4	55.5

7.2.33 Airfield residual risks are addressed within the GAL's **Flood Resilience Statement** (**ES Appendix 11.9.6: Annex 6** (Doc Ref. 5.3)).

Changes to Function Floodplain

7.2.34 The NPS for National Networks (Department for Transport, 2014) paragraph 5.109 states that:

"…any project in Zone 3b should result in no net loss of floodplain storage and not impede water flows."

7.2.35 **ES Appendix 11.9.6 Figure 7.2.7** (Doc Ref. 5.3) compares the functional floodplain / Flood Zone 3b (typically defined as the 3.33 per cent (1 in 30) AEP event flood extent plus formal flood storage areas), with the Upper Mole Hydraulic Model with-Project with-mitigation scenario results.

7.2.36 There is a 2 hectares reduction in flood extent resulting from the Project for the 3.3 per cent (1 in 30) AEP event in the with-Project with-mitigation scenario, compared to the baseline. The two fluvial mitigation strategies: CPX and Museum Field FCAs, however, provide an additional 6 hectares function floodplain to the catchment.

7.2.37 The areas where the functional floodplain has been lost due to the Project works are associated with River Mole for the Taxiway Juliet West Spur to the east of the

Project site boundary, as well as the proposed access works embankments encroaching into the floodplain at Longbridge roundabout and North Terminal.

7.2.38 It has been shown in **ES Appendix 11.9.6 Figure 7.2.7** (Doc Ref. 5.3) that adjacent to the access works at Longbridge roundabout and North Terminal, the functional floodplain would be lost due to the Project access works. No reasonably available alternative sites were found for the proposed development in areas with a lower risk of flooding. The upstream Museum Field and CPX FCAs mitigate any potential increase in flood risk posed due to this loss of floodplain, and given the requirement for the runway to remain contiguous with the existing airfield, this is the preferred fluvial mitigation strategy proposed.

Conclusion

7.2.39 Where potential impacts have been identified as a result of the Project, appropriate mitigation measures have been proposed. With this mitigation in place, fluvial flood risk to the Project is considered to be low and there is no adverse impact to the flood risk elsewhere as a result of the Project.

7.2.40 In some areas, the Project would reduce flood risk, particularly to the River Mole floodplain downstream of Gatwick, but also to some local properties and land. Where adverse impacts have been identified, these are within GAL owned land and will be addressed in GAL's **Flood Resilience Statement** (**ES Appendix 11.9.6: Annex 6** (Doc Ref. 5.3)).

Flood Defence Failure

7.2.41 Although it is envisioned that existing flood defences would continue to be maintained and operated as originally designed throughout the life of the Project, an assessment of all sources of flood risk is required. An assessment has therefore been made of the consequences to the Project should they fail. Mitigation for the Project has been developed based on the defended scenario (assuming the continued operation of existing flood defences).

7.2.42 The impact of failure of fluvial flood defences to the Project has been assessed to understand the potential impacts. **ES Appendix 11.9.6 Figure 7.2.8** (Doc Ref. 5.3) shows the Project Scenario (including mitigation), together with the Undefended with Project 1 per cent (1 in 100) AEP plus 20 per cent climate change scenario.

7.2.43 The undefended scenario extents are seen to extend much further into the North Terminal and extending further west towards Code E Hangar.

7.2.44 However, an extract from the GAL's **Flood Resilience Statement** included in **ES Appendix 11.9.6: Annex 6** (Doc Ref. 5.3) sets out the management system that would ensure the safety of airport operatives and passengers in the event of a flood defence failure.

7.2.45 The impacts of increased flood from flood defence failure are restricted to the airport for which management response procedures will be implemented. Flood extents for the 1 per cent (1 in 100) AEP plus 20 per cent climate change scenario have increased to the north and east, however it is likely that aircraft operation would be stopped in this scenario. Small areas of additional risk are on the Gatwick Stream adjacent to Riverside park and to the edge of the River Mole south of the airport.

Conclusion

7.2.46 As stated in paragraph 5.6.7, these structures are maintained and operated in accordance with the Reservoirs Act 1975 and therefore the risk of failure is considered very low due to their monitoring and inspection regime. However, a response plan is set out in GAL's **Flood Resilience Statement** (**ES Appendix 11.9.6: Annex 6** (Doc Ref. 5.3)) to ensure people on-site are safe in the event of a flood event and GAL already monitors weather forecasts and warnings to plan for potential extreme weather events.

7.3 Surface Water Drainage Mitigation Strategy

Proposed Surface Water Drainage Measures

7.3.1 A surface water drainage strategy has been developed as part of the Project. The objective of the strategy has been to make best use of the existing surface water management network, while providing additional attenuation facilities and/ or floodplain compensation where needed and reconfiguring existing infrastructure where that would provide wider flood risk benefits. Further details of the Surface Access Highways Surface Water Drainage Strategy Summary in **ES Appendix 11.9.6: Annex 2** (Doc Ref. 5.3) and the Airfield Surface Water Drainage Hydraulic Model Build Report is included in **ES Appendix 11.9.6: Annex 3** (Doc Ref. 5.3).

New southwest zone, attenuation and pumping station

7.3.2 New surface water attenuation and an associated pumping station is proposed south of the existing runway in the former Pond A catchment. The underground attenuation volume would have a storage capacity of up to 2,800m3 and the pumping station will be sized based on the final design of the Project to ensure

runoff from the new impermeable area from the runway and taxiways within the existing Pond M Catchment is controlled to greenfield runoff rates. The new southwest area Project drainage network is included in Figure 10.1.4.

Car Park Y underground storage

7.3.3 A new attenuation storage is proposed beneath Car Park Y (CPY) to increase the capacity of the surface water drainage network and reduce the risk of surface water drainage flooding in the fuel farm, cargo areas of the airfield and at North Terminal. The CPY attenuation storage would have a capacity of up to 32,000m^3.

Additional attenuation storage within the airfield

7.3.4 Additional storage is proposed within the existing airfield surface water drainage network to store and attenuate the additional runoff that would occur from the increase in impermeable area as a result of the Project. Below-ground storage would be installed to provide the necessary volume. The additional storage was assumed to comprise attenuation crates or similar structures.

7.3.5 Table 7.3.1 summarises the Project airfield surface water drainage mitigations included in the hydraulic model.

Table 7.3.1 Storage Provided by the Airfield Drainage Mitigation Strategy

Storage Reference (Pond Sub-Catchment)	Modelled. Volume (m^3)	Storage type
B (Dog Kennel Pond)	754	Underground
J (Pond D)	635	Underground
K (Pond D)	166	Underground
L (Pond D)	1,102	Underground
N (Dog Kennel Pond)	1,102	Underground
O (Pond M)	1,387	Underground
P (Pond D)	574	Underground
Q (Pond M)	496	Underground
E (Pond M)	2,800	Underground
Car Park Y	32,000	Underground

7.3.6 Pond A would be entirely removed as part of the Project to accommodate the northerly realignment of the northern runway and Taxiway Juliet. It has not been proposed to relocate Pond A but instead to provide additional storage to

attenuate the additional runoff from the new paved areas within that sub-catchment and the new attenuation beneath CPY.

7.3.7 The new Storage E receives flows from the new hardstanding for the end around Taxiway West has been proposed, this storage facility holds up to 2,800m^3 of runoff and would be pumped directly into the upstream end of Pond M.

Surface Access Highways Improvements Drainage Strategy

7.3.8 The surface access (highways) improvements as part of the Project works would include North Terminal and South Terminal roundabout works, works to improve capacity at the Longbridge roundabout and modifications to improve integration with the North Terminal roundabout. As part of these works, it is proposed that a drainage network is installed, consisting of carrier drains, filter drains, ditches, swales and attenuation ponds, along with flow control arrangements to limit discharges to watercourses. Therefore, surface water drainage runoff from new areas of highway would be restricted to pre-development rates, and where possible, greenfield runoff rates. This would ensure no increase in flood risk as a result of these works. Further details of the outline drainage design are included in **ES Appendix 11.9.6:Annex 2** (Doc Ref. 5.3).

Pentagon Field

7.3.9 The Project spoil/ecological habitat on Pentagon Field (as detailed in **ES Chapter 8: Landscape, Townscape and Visual Resources** (Doc Ref. 5.1) would involve using imported “clean” spoil material to level/landscape the field and improve ecological habitat and biodiversity. Spoil will be graded out to the highest point in the south of Pentagon Field. The RoFSW mapping indicates an area at risk of flooding from surface water in the northern area of the Field. Consequently spoil would be placed to avoid the extent of the 1 per cent (1 in 100) AEP area to avoid the displacement of flood water.

Assessment of Proposed Surface Water Mitigation

7.3.10 **ES Appendix 11.9.6 Figure 7.3.1** and **Figure 7.3.2** (Doc Ref. 5.3) illustrate the surface water flood extents for the 1 per cent (1 in 100) AEP event, plus a 25 per cent and a 40 per cent climate change allowance, applied to both a short duration (30 minutes) and a long duration (1440 minutes) event for the with mitigation scenario. The 25 per cent allowance defines the design event for the Project, while the 40 per cent allowance has been tested as an exceedance scenario.

7.3.11 Similar to the future baseline scenario, discussed in section 5.3, the short duration presents the worst case in terms of flood extents as several areas of local ponding are encroaching on the Project as well as existing runways and taxiways.

7.3.12 **ES Appendix 11.9.6 Figure 7.3.3** and **Figure 7.3.4** (Doc Ref. 5.3) illustrate the difference in surface water flood depths between the baseline and with-Project with-mitigation scenarios and for the 1 per cent (1 in 100) AEP event, plus a 25 per cent climate change allowance, for the 30-minute duration event and the 1440-minute duration event.

7.3.13 As presented in **ES Appendix 11.9.6 Figure 7.3.3** (Doc Ref. 5.3), overall surface water flow paths would not significantly change or be interrupted by the Project and the level of risk would remain similar to existing. There are areas of local betterment (10 mm to 50 mm flood depth decrease) on existing taxiways around the terminal buildings. However, surface water flood depths are shown to increase in some localised areas for the short duration (30 minutes) 1 per cent (1 in 100) AEP event, plus a 25 per cent allowance for climate change. Areas affected include some adjacent to the runways, taxiways and stands. In most cases the increase of flood depths would be between 10 to 50 mm in the following:

- operational taxiways: Uniform, Tango, Lima, Sierra and Juliet West (Spur);
- within grassed area between runways adjacent to the main runway, end around Taxiway Yankee and Exit Taxiways 1 and Hotel.

7.3.14 For the longer duration event (1440 minutes), as presented in **ES Appendix 11.9.6 Figure 7.3.4** (Doc Ref. 5.3), beneficial impacts to surface water flood depths are predicted around North Terminal after the development of the Project (up to 250mm betterment).

7.3.15 As mentioned in paragraphs 5.3.7 and 6.3.1, the finished ground levels within the airfield due to the Project are to be resolved by detailed design, therefore, conceptual modelling has been undertaken and the exact locations of flooding cannot be verified until detailed design.

7.3.16 As presented in **ES Appendix 11.9.6 Figure 7.3.4** (Doc Ref. 5.3), the concentrated area of increased risk to flooding is seen around Exit Taxiway 2 for the longer duration event (1440 minutes). It is not expected to impact the raised and cambered proposed taxiways but disburse into the lower surrounding grassed areas. However, GAL's **Flood Resilience Statement** (**ES Appendix**

11.9.6: Annex 6 (Doc Ref. 5.3)) will be used to prove the airfield is resilient to flooding and maintain operation.

7.3.17 Further areas of adverse impacts (greater than 10mm) are seen in **ES Appendix 11.9.6 Figure 7.3.4** (Doc Ref. 5.3) that are within airfield operational areas such as the stands at Taxiway Sierra, Taxiway Lima extension works and at the new exit/entrance taxiways 2. The non-operational grassed area between the main runway and Taxiway Yankee also shows an increase to flood depths, up to 650mm. Where critical infrastructure (such as Instrument Landing System Glide Path) is located within this grassed area, surrounding peak water levels are less than 150mm. However, as described above, the exact locations of flooding cannot be verified until detailed design.

7.3.18 At all locations, flooding on airfield operational areas would be managed safely by GAL within the airport and no adverse impacts are seen outside the Project site boundary.

7.3.19 Overall, considering the localised nature of these effects as well as the uncertainties of the surface water model, it is not anticipated that surface water flooding would affect the ability of the airport to remain functional during such an event.

Credible Maximum Scenario

7.3.20 For the exceedance scenario, the 1 per cent (1 in 100) AEP event plus a 40 per cent allowance for climate change, the model shows that there would be betterment or negligible change at all locations that previously experienced flooding, for both durations modelled (see **ES Appendix 11.9.6 Figure 7.3.5** and **Figure 7.3.6** (Doc Ref. 5.3)), except for a very localised area of increase near Taxiway Juliet West that would not be expected to impact airport operations (**ES Appendix 11.9.6 Figure 7.3.6** (Doc Ref. 5.3)).

7.3.21 At this stage and given the assessment of effects for the 1 per cent (1 in 100) AEP event, plus a 40 per cent climate change allowance, after taking into account the Project mitigation measures, it is considered that the Project would not adversely impact surface water flood risk or increase surface water flooding elsewhere. However, during detailed design, areas within the airport that are highlighted here as potentially flooded should be further investigated. The risk of potential pipe/ culvert blockages has not been considered within this assessment and would be taken into account when the detailed surface water drainage design is developed. The risk of blockage is considered to be very low due to the lack of material (trees, leaves, rubbish etc) on the airfield that typically could be

expected to block gullies, sewers etc plus the maintenance activities regularly undertaken by GAL.

7.3.22 While the Project surface water drainage measures have been designed to ensure that it would not increase flood risk elsewhere and is not at risk of flooding during the design flood event, a residual risk remains that it could flood from a more extreme event or as a result of blockages to watercourse crossings.

7.3.23 The Project surface water drainage measures have been designed to ensure that it would not increase flood risk elsewhere and is not at risk of flooding during the design flood event, a residual risk remains that it could flood from a more extreme event which exceed the design capacity of the culverts or as a result of blockages of culverts that reduce capacity to convey flows. The blockage risk has been assessed, and appropriate mitigation in the form of trash screens may be provided depending on the risk level to reduce residual risk. However, flooding may still occur.

Pre- and Post-development Discharge Rates and Volumes

7.3.24 The Crawley SFRA (Crawley Borough Council, 2015) states that surface water runoff from the site should not be increased due to proposed developments and should be reduced where possible. Similarly, the Airports NPS (Department for Transport, 2018) includes in paragraph 5.163 the requirement that:

'The surface water drainage arrangements for any project should be such that the volumes and peak flow rates of surface water leaving the site are no greater than the rates prior to the project, taking into account climate change, unless specific off-site arrangements are made and result in the same net effect.'

The proposed and existing runoff volumes and maximum discharge rates are included in Table 7.3.2 and Table 7.3.3 for the 1 per cent (1 in 100) AEP event, plus a 25 per cent allowance for climate change and for the 30-minutes duration. These rates assume free discharge at all locations. For the same event and for the longer, 1440-minutes, duration, results are included in Table 7.3.4 and Table 7.3.5.

7.3.25 The runoff rates and volumes have been calculated for five discharge locations; Pond M, Dog Kennel, Pond D, Pond E and Pond A. As the Boeing hangar and Pond A discharge to the same location on the River Mole, the runoff rates and volumes for the Boeing Hangar are included within the "Pond A" discharge location in the following tables. However, in order to pass the Exception Test and

comply with the above-mentioned Airports NPS requirement, total discharge volumes and runoff rates should not be increased.

7.3.26 Table 7.3.2 and Table 7.3.3 illustrate that for the short duration (30 minutes), the removal of Pond A and the additional attenuation storage within the Project is shown to not change discharge volumes and reduce the total peak runoff rates by 2 per cent to receiving watercourses due to the provision of additional attenuation storage measures

Table 7.3.2 Pre- and post- development volume of discharge for the 1% AEP event, plus a 25 per cent climate change allowance, for a 30-minute storm duration

Volume of discharge for 30min duration (m^3)	Discharge Locations					
	Pond M	Dog Kennel	Pond D	Pond E	Pond A	Total
Pre-development	13,770	30,949	142,415	2,633	1,079	190,845
Post-development	13,528	30,826	142,038	2,647	1,122	190,162
Difference	-242	-123	-376	14	44	-684
Difference (%)	-2%	0%	0%	1%	4%	0%

Table 7.3.3 Pre- and post-development runoff rate for the 1% AEP event, plus a 25 per cent climate change allowance, for the 30-minutes duration

Peak runoff rate for 30min duration (m^3)	Discharge Locations					
	Pond M	Dog Kennel	Pond D	Pond E	Pond A	Total
Pre-development	0.22	0	2	1	1	4
Post-development	0.24	0	2	1	1	4
Difference	0.02	0.00	0.00	0.01	-0.11	-0.07
Difference (%)	10%	0%	0%	1%	-12%	-2%

7.3.27 Table 7.3.4 and Table 7.3.5 show that for the long storm duration considered (1440 minutes) it is shown that total discharge volumes would reduce by 7 per cent and peak runoff rates to decrease by 31 per cent.

Table 7.3.4 Pre- and post- development volume of discharge for the 1% AEP event, plus a 25 per cent climate change allowance, for a 1440-minute storm duration

Volume of discharge for 1440min duration (m^3)	Discharge Locations					
	Pond M	Dog Kennel	Pond D	Pond E	Pond A	Total
Pre-development	35,065	36,697	371,792	11,634	30,740	485,929
Post-development	38,828	35,867	362,030	11,203	4,054	451,982
Difference	3,763	-830	-9,762	-431	-26,686	-33,947
Difference (%)	10%	-2%	-3%	-4%	-153%	-7%

Table 7.3.5 Pre- and post-development runoff rate for the 1% AEP event, plus a 25 per cent climate change allowance, for the 1440-minutes duration

Peak runoff rate for 1440min duration (m^3)	Discharge Locations					
	Pond M	Dog Kennel	Pond D	Pond E	Pond A	Total
Pre-development	0.47	0.07	1.72	0.32	1.19	3.76
Post-development	0.54	0.07	1.72	0.30	0.11	2.75
Difference	0.07	0.00	0.00	-0.01	-1.08	-1.02
Difference (%)	14%	0%	0%	-4%	-165%	-31%

7.3.28 The total discharge volume has decreased when compared to the baseline scenario for both the climate change allowances scenarios run (see Table 7.3.2 and Table 7.3.4). This is due to the Project's new effective long term storage to mitigate the increase in total rainfall runoff from the increase in impermeable area. **ES Appendix 11.9.6: Annex 3** (Doc Ref. 5.3) provides further details to show that during the rainfall event, the Project's surface water drainage mitigation strategy acts to better utilise the new storages created, therefore reducing the total volume discharged.

Conclusion

7.3.29 The Project would increase airfield impermeable area that would result in a corresponding increase in the overall volume of runoff to receiving watercourses, section 6.3 indicates that mitigation would be required to ensure no increase in

flood risk to other parties. Consequently, a surface water drainage mitigation strategy encompassing a series of below ground storage and attenuation locations within the existing drainage network plus storage beneath CPY has been developed for the Project.

7.3.30 The Project mitigation strategy would ensure the Project would not increase peak rates of runoff to receiving watercourses for all events up to and including the 1 per cent (1 in 100) AEP event plus an allowance for climate change of 25 per cent, which would ensure no increase in flood risk to other parties.

7.4 Integrated Mitigation Strategy

7.4.1 The existing integrated model was updated to represent the new Project highways improvements and the airfield modifications. All fluvial and surface water drainage mitigation measures were included within the ICM with-Project scenario, as described in sections 7.2 and 7.3.

7.4.2 The integrated catchment model was simulated for the 5 per cent (1 in 20), 1 per cent (1 in 100) plus an allowance for climate change, and 0.5 per cent (1 in 200) AEP events with critical storm durations of 30 minutes and 24 hours rainfall events. This incorporates the predicted impact of climate change based on Environment Agency guidance (Environment Agency, 2022) as discussed in Section 3.7.

Assessment of Project combined Fluvial and Surface Water Mitigation

7.4.3 With the inclusion of the Project and mitigation measures, flooding remains at the same locations as in the baseline model, however flooding from fluvial sources is reduced.

7.4.4 Localised increases in flood depths are seen within the airfield due to surface water, ultimately the discharge at the pond outfalls into the watercourses is less than that of the future baseline scenario. This is due to the influence of the Project mitigation measures which are found to reduce inflow to Pond M. The impact of these mitigation measures on the surface water flooding is described in detail within **ES Appendix 11.9.6: Annex 3** (Doc Ref. 5.3).

7.4.5 When comparing the integrated model to the fluvial and surface water drainage models, the integrated model has reflected the fluvial and surface water model results with additional areas of flooding shown to occur across Gatwick airfield due to the interaction between the two sources of flooding. However, due to the Project mitigations, the Project would not increase peak rates of runoff or discharge volumes to receiving watercourses for all events up to and including

the 1 per cent (1 in 100) AEP event plus an allowance for climate change of 40 per cent proving the effectiveness of the Project flood mitigation strategy.

Conclusion

7.4.6 A sensitivity test was undertaken to determine the effects of the airfield surface water drainage network to fluvial flooding from local watercourses. Overall, the integrated hydraulic modelling results successfully indicated that the mitigation strategy would ensure no increase in flood risk to other parties in such circumstances.

7.5 Flood Risk During Construction

Construction Sequencing Mitigation

7.5.1 Hydraulic modelling has been undertaken to understand the potential flood risk impacts during the construction of the Project. There are four mitigation construction periods that have been assessed as shown in Table 7.5.1 in line with the ES assessment dates. Effects for each element of the Project have been reported in Section 11.9 of the **ES Chapter 11: Water Environment** (Doc Ref. 5.1).

Table 7.5.1 Mitigation construction periods

Construction Period	Primary works impacting floodplain	Project mitigation in place
Initial Construction Period: 2024 up to 2029	Airfield works not including: ▪ Taxiway Juliet West Spur ▪ End around taxiways ▪ Taxiways Whiskey, Victor and Zulu ▪ Exit/entrance taxiways from the main runway ▪ Temporary haul bridge installed over River Mole near Museum field CPZ and CPY construction compounds installed	Museum Field FCA CPX FCA RET9 and RET10 Syphons Noise Bund Syphons River Mole diversion as seen in **Figure 10.1.5**
First Full Year of Opening: 2029 up to 2032	▪ All airfield surface works complete ▪ Surface access works including Longbridge Roundabout, North Terminal, South Terminal, London Road Bridge and Brighton Road bridges ▪ Temporary utility and pedestrian bridges installed at London Road and Brighton Road Bridge works ▪ Longbridge and CPB compounds ▪ Temporary haul bridge over River Mole near Museum field removed	As above plus culverts through pedestrian path embankment adjacent to River Mole at A23 London Road.
Interim Assessment Year: 2032 up to 2037	▪ All compounds removed ▪ Temporary utility and pedestrian bridges removed ▪ Surface access drainage pond at Longbridge roundabout	As above
Design Year: 2038 and 2047	As above	As above

Initial Construction Period: 2024 up to 2029

7.5.2 **ES Appendix 11.9.6 Figure 7.5.1** (Doc Ref. 5.3) shows the difference in flood depths (compared to the baseline scenario) during the initial construction period, for the 1 per cent (1 in 100) AEP event, plus a 16 per cent climate change allowance. This adopted climate change allowance follows Environment Agency Flood risk assessments: climate change allowances guidance (2022a) for the predicted increase in peak river flows to 2039 (see paragraph 3.7.8).

7.5.3 There are significantly larger areas of betterment (10mm-50mm and greater than 100mm), both inside the airport and off-site. However, there is a concentrated area of increased flooding (10mm-400mm) shown immediately north of the Taxiway Juliet West and does not interfere with operation of the airport.

7.5.4 Impacts seen on the site of the Taxiway West Spur, but as it is a part of the First Full Year of Opening period, this is non-operational grassed area, therefore no mitigation is proposed for these impacts shown.

7.5.5 As a part of the airfield works, there will be a temporary River Mole Crossing during the Museum Field FCA construction, during the initial construction period. This temporary River Mole crossing will be required to create an access/haul road from Museum Field to Pentagon Field to transport the excess excavated material through Gatwick Campus instead using local roads and would be in place before and during the construction of the compensatory flood storage. As there is no detail of the temporary crossings at this stage, a 1 per cent AEP plus 16 per cent uplift for climate change event standard is proposed to be used to size the crossing structure. This would ensure a low risk of the works causing an increase in flooding to receptors, particularly as the risk of an event occurring during the short construction timescales would be low. Additionally, it is assumed the crossings would be clear spans with footings set back 5m from top of bank, approach ramps set to 20m in length and 8m wide, and existing ground levels would be maintained where practicable for the haul road to prevent floodplain volume loss.

7.5.6 No additional impacts are seen in the 1 per cent (1 in 100) AEP event, plus a 16 per cent climate change allowance due to this water crossing and associated change to the floodplain. This is due to the betterment provided by the Car Park X FCA upstream. **ES Appendix 5.3.2: CoCP Annex 1 – Water Management Plan** (Doc Ref. 5.3) has been produced which maps the drainage pathways and is dependent on a temporary works design.

7.5.7 The principal construction compounds have been described and mapped in the **ES Chapter 5: Project Description** (Doc Ref. 5.1). In terms of flood risk, the location of construction compounds was compared against the 1 per cent (1 in 100) AEP event plus a 16 per cent allowance for climate change extent as the compounds would only be in place during years within the 2015-2039 period referenced in paragraph 3.7.12.

7.5.8 In the Initial Construction Period (2024 – 2029), Car Park Z compound is seen to be partly inundated.

7.5.9 The Car Park Z Staging and Laydown compound is located at the southeast corner of the airfield and the majority of the Project compound area would experience no flooding in the 1 per cent (1 in 100) AEP plus 16 per cent event flood extents. However, the access and egress route to Perimeter Road South is inundated up to 160mm in the 1 per cent (1 in 100) AEP event plus 16 per cent. No mitigation is proposed for this compound; however, it must be subject to flood warnings.

7.5.10 At this stage, other Project construction compounds installed in this period are located outside of the extent of the 1 per cent (1 in 100) AEP plus 16 per cent event.

7.5.11 A sensitivity run was undertaken in the Upper Mole Hydraulic Model to assess any potential impacts caused by the approach ramps located within the floodplain and Terminal International Departure Lounge extensions prior the construction of the compensatory flood storage basins. Only localised changes in water levels are seen where ramps and terminal extensions are located and no adverse impacts were seen outside of the Project boundary.

First Full Year of Opening: 2029 up to 2032

7.5.12 During the First Full Year of Opening period (see **ES Appendix 11.9.6 Figure 7.5.2** (Doc Ref. 5.3)), all airfield and access improvement works would be completed as detailed in Table 7.5.1, additionally, all mitigation measures discussed in section 7.2 would be completed. This would result in the further impacts detailed below:

- increased flood depths directly south of the relocated fire training ground as described in paragraph 7.2.22;
- increased betterment at the relocation of the River Mole and upstream of the main runway; and
- increased betterment surrounding the Longbridge roundabout works, Riverside Park and downstream of Brighton Road bridge crossing.

7.5.13 Temporary pedestrian and utilities footbridges crossing the River Mole will be installed to the north and south of the highway at both A23 Brighton Road and A23 London Road bridges as a part of the construction of access improvement works. Works will be carried out with clear span watercourse crossings which are set back 5m from top of bank, with remaining bridge structure placed on piers within the floodplain on either side of the river with temporary foundations installed, and bridge units craned into place to minimise floodplain storage loss. As there is no detail of the temporary crossings at this stage, a 1 per cent (1 in 100) AEP plus 16 per cent uplift for climate change event standard is proposed to be used to size the crossing structure. No widespread downstream impacts are seen due to these temporary piers within the River Mole floodplain, only localised areas of impacts are seen at pier locations.

7.5.14 The Longbridge Roundabout construction compound is located adjacent to the River Mole and falls within the 1 per cent (1 in 100) AEP plus 16 per cent event floodplain. The welfare containers would therefore be placed to the west of the site outside the flood extent within the compound boundary. The welfare facilities would be two-storey and be elevated above peak water levels to mitigate the risk of flooding to the compound and minimise temporary loss of floodplain, as the maximum depth of flooding is up to 250mm in the 1 per cent (1 in 100) AEP plus 16 per cent event. Once the compound is no longer required in 2031, construction of the highways drainage Pond-3 (as described in **ES Appendix 11.9.6: Annex 2** (Doc Ref. 5.3)) would commence.

7.5.15 Car Park B construction compound for the widening works of Airport Way bridge over the railway line is within the 3.33 per cent (1 in 30) AEP event flood extents and inundated up to 650mm in the 1 per cent (1 in 100) AEP event, plus a 16 per cent allowance for climate change. Similarly to Longbridge compound, the site welfare facilities are located in the east of the compound site, away from flood depths where possible, and would be elevated above the peak water level for the 1 per cent (1 in 100) AEP event plus 16 per cent.

7.5.16 As discussed in paragraphs 7.5.8 to 7.5.10, Car Park Z compound's access and egress route remains partly inundated. By implementing signing up for flood warnings, the compound would remain safe for its temporary lifetime without increasing flood risk elsewhere.

7.5.17 While the existing A23 Brighton Road is being demolished, a floating protective barge will be placed underneath the bridge to capture debris. A barge is able to be moved away from the bridge and tethered to be able to float on the flood waters away in a large flood event. Additionally, for the 1%AEP plus 16% climate

change uplift construction design event, there is a 1% chance every year that design storm will occur. Therefore, using joint probability, over the 10 days that the demolition barge will be in place as a part of the access works (up to 5 days per side), there is a less than 0.03% chance of this construction event occurring during the time where the barge will be in place. Therefore, following these recommended actions and being subject to flood warnings, no mitigation is proposed for these works.

7.5.18 The remaining construction compounds remain located outside of the extent of the 1 per cent (1 in 100) AEP plus 16 per cent event.

7.5.19 A Water Management Plan (WMP) has been prepared as **ES Appendix 5.3.2: CoCP Annex 1 – Water Management Plan** (Doc Ref. 5.3). An appropriate drainage strategy would be developed to ensure all flood risks related to construction activities would be mitigated or safely managed within the Project site boundary. This FRA provides information that can be used as a basis when preparing the WMP in order to ensure that people and infrastructure remain protected from identified flood risks to the Project site boundary.

Interim Assessment Year: 2032 up to 2037

7.5.20 The Interim Assessment Year results are shown in **ES Appendix 11.9.6 Figure 7.5.3** (Doc Ref. 5.3) for the 1 per cent (1 in 100) AEP event plus a 16 per cent allowance and are seen to be similar to the First Full Year of Opening periods, however the impacts seen due to the temporary water crossing piers are no longer present.

Design Year: 2038; and a further assessment year of 2047.

7.5.21 No changes to the Project works that would impact fluvial flood risk have occurred between the interim assessment year and the design year. Therefore, no further impacts on the risk of flooding are anticipated as a result of the continued operation from 2038 to 2047.

Conclusion

7.5.22 The Project construction works are not seen to impact fluvial flood risk from the initial construction periods to the interim assessment year and the design year, therefore the flood risk during construction is considered to be low due to the FCA being constructed early in the construction sequencing, resulting in small localised areas (less than $5m^2$) during the First Full Year of Opening period due to the temporary pedestrian and utilities bridges crossing the River Mole at Longbridge roundabout.

7.6 Exception Test Compliance

7.6.1 The Project proposes alterations to the existing northern runway which would enable dual runway operations as well as the development of a range of infrastructure and facilities to allow increased airport passenger numbers and aircraft operations. Additionally, the Project would enable the increased airfield capacity to be accessed by passengers through additional processing capability and improved airport access. Project land would also be provided to mitigate environmental effects (for example, for habitat creation, flood compensation or provision of recreational routes and public open space).

7.6.2 The Project is an important economic link across the South East of England. For more information please refer to the **Planning Statement** (Doc Ref. 7.1), however, a summary of the Project's economic and socio-economic benefits are as follows:

- addresses unmet aviation demands in the South East;
- creation of 14,000 additional jobs (and employ at its peak 1,400 during construction) and productivity benefits;
- new opportunities to emerge from the Gatwick Employment, Skills and Business Strategy (see ES Appendix 17.8.1: Employment, Skills and Business Strategy (Doc Ref. 5.3));
- contribution of £1.75bn in GVA across the UK;
- Just over £1bn in taxes;
- increased and improved aviation connectivity;
- highways and surface access improvements (including improvements to public transport accessibility);
- induced investment and agglomeration benefits (businesses wanting to locate next to the airport);
- increased trade and foreign direct investment (FDI) – increased expenditure;
- tourism benefits (jobs and visitor spending benefits to the economy);
- bringing operational resilience to the UK aviation system;
- increased freight capacity;
- increased competition which could result in reduced fares and increased efficiencies; and
- environmental enhancements including new landscaping/open space areas; creation of new ecological habitats; improved flood mitigation measures.

7.6.3 This FRA establishes that the Project would not exacerbate existing levels of flood risk on or offsite other than in areas where this would be deliberately achieved as part of the flood mitigation strategy. This FRA also demonstrates

that the Project would be safe for users for its lifetime, which includes consideration of the predicted impacts of climate change.

7.6.4 Therefore, the requirements to pass the Exception Test have been met.

8 Summary and Conclusions

8.1.1 This **FRA** is **Appendix 11.9.6** (Doc Ref. 5.3) to the **ES Chapter 11: Water Environment** (Doc Ref. 5.1) and is an assessment of flood risk for the Project. It includes the assessment of potential flood effects on external receptors due to the Project and describes the flood mitigation strategy as a part of the Project to mitigate these risks in order to demonstrate the Project's compliance with national planning policy.

8.1.2 Fluvial flooding is the principal source of flooding to the Project. When determining the Project location, the adopted approach has been to make best use of existing runways and airport infrastructure. Therefore, the levels of flood risk are equivalent to existing and it is considered that the Sequential Test (refer to paragraphs 5.10.3 to 5.10.6) has been passed.

8.1.3 Parts of the Project are within Flood Zone 3. With reference to Table 5.10.1, the Exception Test would have to be passed for these elements to be deemed suitable for development in Flood Zone 3. Based on the provision of wider sustainability benefits, the first part to the Exception Test has been passed (refer to paragraphs 5.10.8 to 5.10.12). The second element of the Exception Test is that the development will be *"safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible will reduce flood risk overall*" from the NPPF (Department for Levelling Up, Housing and Communities, 2021). Hydraulic modelling results show that the Project would increase the risk of flooding to other areas if no mitigation was provided. Therefore, flood mitigation measures have been proposed, primarily in the form of FCAs. These mitigation measures have been incorporated into the GAL fluvial hydraulic model and it has been shown that the Project would remain safe for its lifetime without increasing flood risk elsewhere.

8.1.4 Surface water flooding is also a key source of flooding for the Project. However, in most cases surface water flow paths and ponding areas are small in extent and do not encroach on elements of the Project. The development of the Project would introduce new impermeable areas and could also increase surface water flooding if no mitigation was in place. Therefore, a surface water management

strategy has been proposed and incorporated into the surface water hydraulic model in order to assess its effectiveness.

8.1.5 The Project would increase flood risk within its boundary on the airfield due to the truncation of existing floodplain. This would not affect other parties and it would be demonstrated that the Project will be resilient to the flooding (see the **Flood Resilience Statement** in **ES Appendix 11.9.6: Annex 6** (Doc Ref. 5.3)).

8.1.6 At this stage, based on qualitative assessment, it is considered that there is localised susceptibility to groundwater flooding in the Project areas underlain by superficial deposits. However, any groundwater flood risk to the Project, and due to the Project would be mitigated by adopting appropriate design practices. Overall, it is considered that the risk of groundwater flooding to the Project, and due to the Project would be low. A bespoke groundwater flood mitigation strategy is not considered to be required.

8.1.7 The risk of flooding from other sources, including reservoirs, water distribution infrastructure and sewers, is considered medium to low. The reference to “medium” is because whilst there is lack of recorded sewer/ water distribution infrastructure flooding events and the GAL maintenance regime would be expected mitigate any issues that could lead to flooding, there are some known problems relating to flows backing up to the airport from the Horley Thames Water network.

8.1.8 The Project is mostly located within Flood Zone 1, but there are unavoidable sections of the Project works that are located within Flood Zones 2 and 3 (see **ES Appendix 11.9.6 Figure 5.2.2** (Doc Ref. 5.3)). Minimising the impact on Flood Zones has been a key factor in the design of the Project, however, it has not been practicable to completely avoid the functional floodplain due to the ongoing operation of the airfield and the need for the Project to connect to existing taxiways, stands etc as well as the location of the existing infrastructure (ie A23 London Road main carriageway). As such, it is considered that the Sequential Test is passed.

8.1.9 In terms of flood risk vulnerability, the Runways, Taxiways, Terminals, Piers and Stands and Internal Access Routes and Surface Access have been classified as ‘essential infrastructure’ (see Table 5.10.1). As such, the development is deemed appropriate in Flood Zones 1 and 2, but the Exception Test is required for works that are proposed to be within Flood Zone 3.

8.1.10 The Exception Test has been applied in section 7.6, and paragraphs 5.10.8 to 5.10.12 shows that the Project would provide wider sustainability benefits to the

community that outweigh the flood risk impacts. The Project would be safe for its lifetime and would ensure safe operation through the provision of mitigation measures and the GAL's **Flood Resilience Statement** (**ES Appendix 11.9.6: Annex 6** (Doc Ref. 5.3)). Additionally, there would be no increase in flood risk to third parties. Consequently, it is considered that the Project passes both elements of the Exception Test and the Project is considered to comply with national planning policy.

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10 Glossary

10.1 Glossary of Terms

Table 10.1.1 Glossary of Terms and List of Acronyms

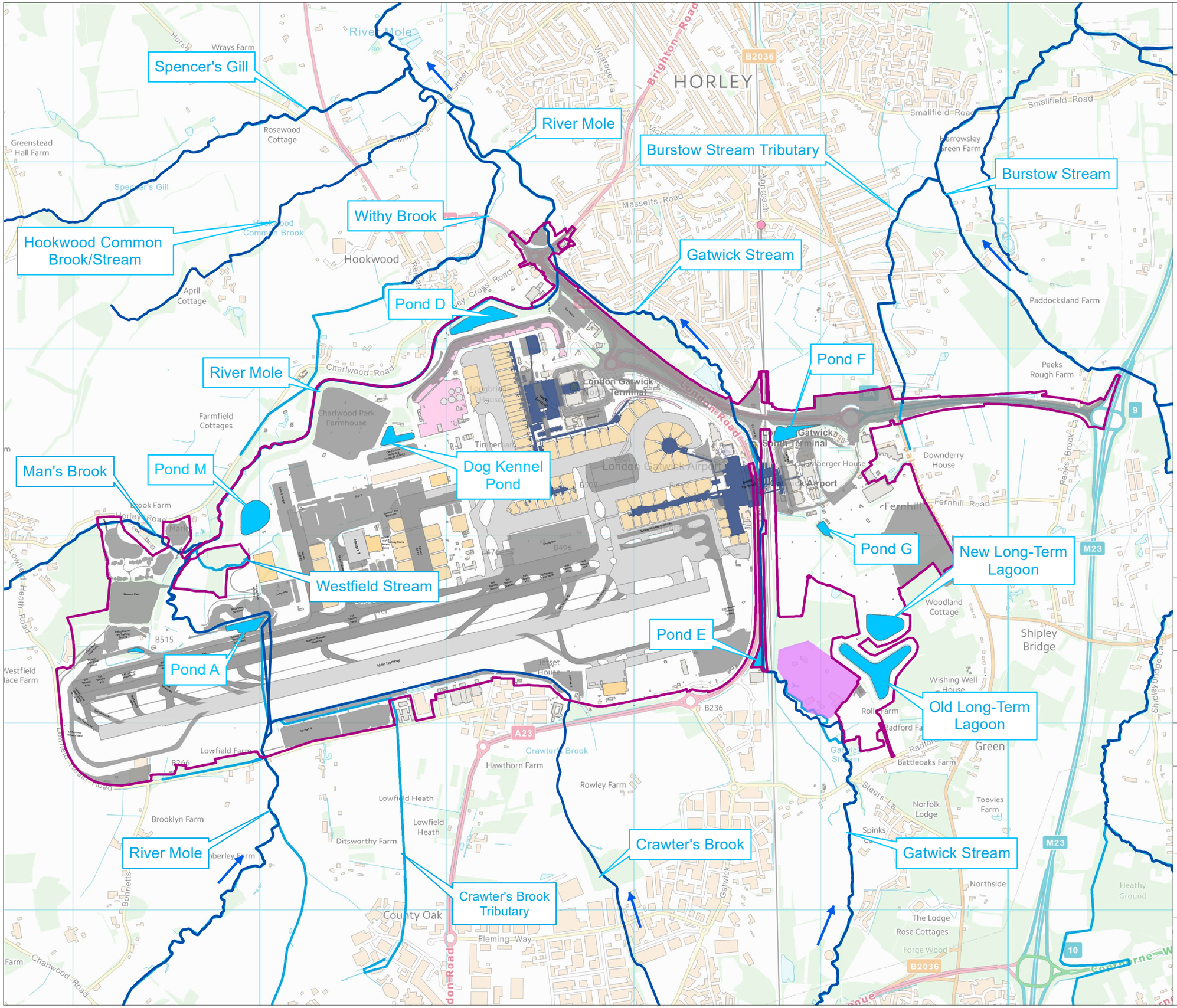
Term	Description
AEP	Annual Exceedance Probability, eg 1 per cent AEP is equivalent to 1 in 100 probability of flooding occurring in any one year (or, on average, once in every 100 years).
AOD	Above Ordnance Datum
BGS	British Geological Survey
BOD	Biochemical Oxygen Demand
CIRIA	Construction Industry Research and Information Association
CKD	Combined Kerb Drainage
CoCP	Code of Construction Practice
DCO	Development Consent Order

Defra	Department for Environment, Food and Rural Affairs. The government department responsible for environmental protection, food production and standards, agriculture, fisheries and rural communities in the UK. Among its responsibilities, Defra publishes guidance on, for example, flood modelling approaches and approaches to accounting for climate change in flood studies.
Development	The carrying out of building, engineering, mining or other operations, in, on, over or under land, or the making of any material change in the use of a building or other land.
DMRB	Design Manual For Roads And Bridges
EIA	Environmental Impact Assessment
Environment Agency (EA)	The Environment Agency is a non-departmental public body, established in 1995 and sponsored by DEFRA. Its responsibilities relate to the protection and enhancement of the environment in England. Environment Agency
EQS	Environmental Quality Standards
ES	Environmental Statement
Exception Test	The Exception Test should be applied if, following application of the Sequential Test, it is not possible for the development to be located in Flood Zones with a lower probability of flooding. For the Exception Test to be passed it must be demonstrated that: ▪ The development provides wider sustainability benefits to the community that outweigh flood risk; and ▪ That the development will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible will reduce flood risk overall.
FCA	Flood Compensation Area. Land which provides a volume of floodplain that compensates for the loss of floodplain elsewhere, where practicable to an equal volume as that lost and on a level-to-level basis.
FCERM	Flood and coastal erosion risk management
Flood Map for Planning (Rivers and Sea)	Nationally consistent delineation of ‘high’, ‘medium’ and ‘low’ probability of fluvial and tidal flooding, published on a quarterly basis by the Environment Agency.
Flood Zone 1 Low	NPPG Flood Zone, defined as areas outside Zone 2 Medium Probability. This zone comprises land assessed as having a less than 1

Probability (FZ1)	in 1,000 annual exceedance probability of river or sea flooding (less than 0.1 per cent) in any year.
Flood Zone 2 Medium Probability (FZ2)	NPPG Flood Zone which comprises land assessed as having between a 1 in 100 and 1 in 1,000 annual exceedance probability of river flooding (1 per cent – 0.1 per cent) or between a 1 in 200 and 1 in 1,000 annual exceedance probability of sea flooding (0.5 per cent – 0.1 per cent) in any year.
Flood Zone 3a High Probability (FZ3a)	NPPG Flood Zone which comprises land assessed as having a 1 in 100 or greater annual exceedance probability of river flooding (greater than 1 per cent) or a 1 in 200 or greater annual exceedance probability of sea flooding (greater than 0.5 per cent) in any year.
FMP	Flood Management Plan
FRA	Flood Risk Assessment. A site-specific assessment of flood risk. This is a statutory report for submission with planning applications in England.
FRS	Flood Resilience Statement
FSA	Flood Storage Area. An area designed to deliberately fill with floodwater and retain it until river levels have reduced with the aim of reducing peak water levels and consequently flood risk downstream.
Functional Floodplain (Flood Zone 3b) (FZ3b)	NPPG Flood Zone, defined as areas in which water from rivers or the sea has to flow or be stored in times of flood. Functional floodplain will normally comprise of land having a 3.3 per cent (1 in 30) or greater AEP or land that is designed to flood, even if it would only flood in more extreme events (such as and 0.1 per cent (1 in 1,000) AEP).
FWMA	Flood & Water Management Act. Part of the UK Government response to Sir Michael Pitt's Review on the Summer 2007 floods, the aim of which (partly) is to clarify the legislative framework for managing surface water flood risk in England.
GAL	Gatwick Airport Limited
Gatwick	London Gatwick Airport
Groundwater Flooding	Emergence of groundwater at the ground surface or the rising of groundwater into underground infrastructure (such as basements) under conditions where the normal range of groundwater level and flows is exceeded.

GRR	Greenfield Runoff Rates
HEWRAT	Highways England Water Risk Assessment Tool
LFRMS	Local Flood Risk Management Strategy. LLFAs produce Local Flood Risk Management Strategies as part of their duty to manage local flood risk under the Flood and Water Management Act 2010.
LLFA	Lead Local Flood Authority. Unitary Authorities or County Councils responsible for developing, maintaining and applying a strategy for local flood risk management in their areas and for maintaining a register of flood risk assets. Also, responsible for managing local flood risk (flooding from surface water, groundwater and ordinary watercourses).
LPA	Local Planning Authority. A local planning authority is the local authority or council that is empowered by law to exercise statutory town planning functions for a particular area of the UK.
Main River	A watercourse shown as such on the Main River Map, and for which the Environment Agency has responsibilities and powers. N.B. Main River designation is not necessarily an indication of size, although it is often the case that they are larger than Ordinary Watercourses.
NH	National Highways
NPPF	National Planning Policy Framework. National planning policy published by the Government, most recently in July 2021. It replaces most of the previous Planning Policy Statements, including that regarding flood risk (PPS25).
NPPG	National Planning Practice Guidance. Supporting guidance to the NPPF, published by the Government in March 2014 and updated since as an online resource, available at: (http://planningguidance.planningportal.gov.uk/). It replaces previously published Government guidance, including that regarding flood risk.
NPS	National Policy Statement
Ordinary Watercourse	All watercourses that are not designated Main Rivers, and which are the responsibility of Local Authorities or, where they exist, Internal Drainage Boards. Note that Ordinary Watercourse does not imply a “small” river, although it is often the case that Ordinary Watercourses are smaller than Main Rivers.

OS	Ordnance Survey
PEIR	Preliminary Environmental Investigation Report
RBD	River Basin District
Residual Risk	A measure of the outstanding flood risks and uncertainties that have not been explicitly quantified and/or accounted for as part of the design process.
RoFSW	Risk of Flooding from Surface Water
RST	Runoff Specific Thresholds
RTD	River Terrance Deposits
SCC	Surrey County Council
Sequential Test	A national planning policy requirement that seeks to steer new development to areas with the lowest probability of flooding. In demonstrating that the requirements of the sequential test have been met, proposals should refer to the NPPF and Planning Practice Guidance, and the Environment Agency Flood Zones.
SES	Safety, Engineering And Standards
SFRA	Strategic Flood Risk Assessment. There are two levels of SFRA. All local planning authorities need to carry out a Level 1 assessment at least and it may be necessary to expand the scope of this assessment to a more detailed Level 2 assessment. A Level 1 SFRA should provide sufficient detail to apply the Sequential Test. A Level 2 SFRA should build on the information in the Level 1 assessment and include sufficient information for the Exception Test to be applied. Where a Level 2 SFRA is produced, the Sequential Test should also be applied to identify sites with the lowest risk of flooding within Flood Zones 2 and 3.
STW	Sewage (waste/foul water) treatment works
SuDS	Sustainable Drainage System. Term covering the whole range of sustainable approaches to surface drainage management. These are designed to control surface water runoff close to where it falls and mimic natural drainage as closely as possible.
SWCs	Surface Water Channels
SWMP	Surface Water Management Plan
WMP	Water Management Plan
WSCC	West Sussex County Council



LONDON GATWICK

KEY

- Project Boundary (DCO)
- Existing Surface Water Drainage Ponds
- Crawley Sewage Treatment Works
- Main Rivers
- Ordinary Watercourses
- Flow direction

Existing Elements

- Terminal
- Runway/Taxiway
- Hangar
- Stands
- Environmental Mitigation
- Other existing airport infrastructure

Proposed Project Elements

- Proposed Project Elements

DOCUMENT

Environmental Statement
Appendix 11.9.6

DRAWING TITLE

General Water Features

DATE

June 2023

ORIENTATION	DRAWING NO.	REVISION
N	FIGURE 2.1.1	For ES
	DRAWN BY: KE	PM / CHECKED BY: MS

SCALE @ A3 1:19,363

0 120 240 480 720 960 m

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LONDON GATWICK

KEY

Project Boundary (DCO)

Main Rivers

Ordinary Watercourses

Proposed Project Elements

- Aircraft Holding Area
- Car Park
- CARE
- Compound
- End Around Taxiway
- Environmental Mitigation
- Existing taxiway to be replaced with grass
- Exit/Entrance Taxiway
- Flood Compensation Areas
- Hangar
- Noise Mitigation
- Northern Runway 08L/26R
- Overnight parking/remote stands
- Relocation of Fire Training Ground
- Satellite Airport Fire Service Facility provision south of main runway
- Stands
- Surface Access works
- Taxiway
- Terminal Works

Existing Elements

- Terminal
- Runway/Taxiway
- Hangar
- Stands
- Environmental Mitigation
- Other existing airport infrastructure

DOCUMENT

Environmental Statement
Appendix 11.9.6

DRAWING TITLE

Project Elements

DATE

June 2023

ORIENTATION	DRAWING NO.	REVISION
N	FIGURE 2.2.1	For ES
	DRAWN BY: KE	PM / CHECKED BY: MS

SCALE @ A3 1:19,363

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LONDON GATWICK

KEY

- Project Boundary (DCO)
- Main Rivers
- Ordinary Watercourses
- Upper Mole Model 10% AEP event
- Upper Mole Model 3.33% AEP event
- Upper Mole Model 1% + 12%CC AEP event
- Upper Mole Model 1% + 20%CC AEP event
- Upper Mole Model 1% + 40%CC AEP event

Existing Elements

- Terminal
- Runway/Taxiway
- Hangar
- Stands
- Environmental Mitigation
- Other existing airport infrastructure

Proposed Project Elements

- Proposed Project Elements

DOCUMENT

Environmental Statement
Appendix 11.9.6

DRAWING TITLE

Upper Mole Model 10%, 3.33%, 1%+12%CC, 1%+20%CC and 1%+40%CC AEP Event Extents (Baseline Scenario)

DATE

June 2023

ORIENTATION	DRAWING NO.	REVISION
N	FIGURE 5.2.1	For ES
	DRAWN BY: KE	PM / CHECKED BY: MS

SCALE @ A3 1:19,363

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LONDON GATWICK

KEY

- Project Boundary (DCO)
- Main Rivers
- Ordinary Watercourses
- Upper Mole Model 1% AEP event
- Upper Mole Model 0.1% AEP event
- Flood Zone 3
- Flood Zone 2

Existing Elements

- Terminal
- Runway/Taxiway
- Hangar
- Stands
- Environmental Mitigation
- Other existing airport infrastructure

Proposed Project Elements

- Proposed Project Elements

DOCUMENT

Environmental Statement
Appendix 11.9.6

DRAWING TITLE

Environment Agency Published Flood Zones
Upper Mole Model 1% and 0.1% AEP Event
Extents (Baseline Undefended Scenario)

DATE

June 2023

ORIENTATION	DRAWING NO.	REVISION
N	FIGURE 5.2.1	For ES
	DRAWN BY: KE	PM / CHECKED BY: MS

SCALE @ A3 1:19,363

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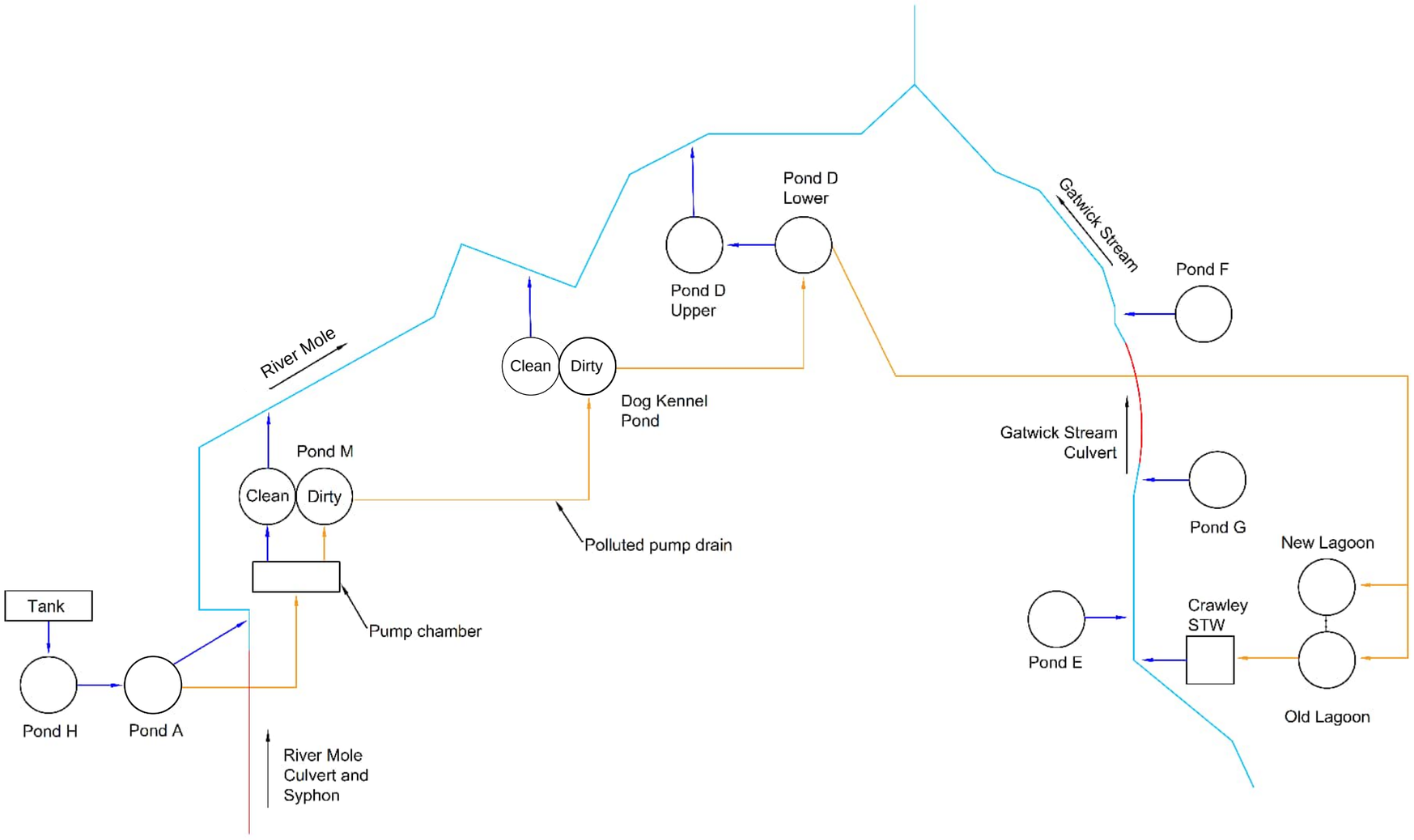

YOUR LONDON AIRPORT Gatwick

KEY

- River
- Culvert
- Drain

DOCUMENT

Environmental Statement
Appendix 11.9.6

DRAWING TITLE

Drainage Schematic
Existing

DATE

January 2023

DRAWING NO.	REVISION
FIGURE 5.3.1	For ES
DRAWN BY	PM / CHECKED BY
KE	MS

\\Uk-lon-fas02\projects\SSBU\GADD001A-Gatwick-EMR\@Projects\GALCTC25-Northern-Runway-Water\500 GIS\Figures\MXDs\ES\FRA\ES Drainage Scheme.mxd

LONDON GATWICK

KEY

- Project Boundary (DCO)
- Main Rivers
- Ordinary Watercourses
- EA RoFSW 3.3% (1 in 30) Flood Extent (High Risk)
- EA RoFSW 1% (1 in 100) Flood Extent (Medium Risk)
- EA RoFSW 0.1% (1 in 1000) Flood Extent (Low Risk)

Existing Elements

- Terminal
- Runway/Taxiway
- Hangar
- Stands
- Environmental Mitigation
- Other existing airport infrastructure

Proposed Project Elements

- Proposed Project Elements

DOCUMENT

Environmental Statement
Appendix 11.9.6

DRAWING TITLE

Risk of Flooding from Surface Water Flooding Extents

DATE

June 2023

ORIENTATION	DRAWING NO.	REVISION
N	FIGURE 5.3.2	For ES
	DRAWN BY: KE	PM / CHECKED BY: MS

SCALE @ A3 1:19,363

0 120 240 480 720 960 m

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LONDON GATWICK

KEY

- Project Boundary (DCO)
- Main Rivers
- Ordinary Watercourses
- 1% (1 in 100) AEP event + 25% climate change (30-mins)
- 1% (1 in 100) AEP event + 40% climate change (30-mins)

Existing Elements

- Terminal
- Runway/Taxiway
- Hangar
- Stands
- Environmental Mitigation
- Other existing airport infrastructure

Proposed Project Elements

- Proposed Project Elements

DOCUMENT

Environmental Statement
Appendix 11.9.6

DRAWING TITLE

Gatwick Surface Water Model 1%+25%CC, 1% + 40%CC Extents (Baseline Scenario) for the 30 mins duration

DATE

June 2023

ORIENTATION	DRAWING NO.	REVISION
N	FIGURE 5.3.3	For ES
	DRAWN BY: KE	PM / CHECKED BY: MS

SCALE @ A3 1:19,363

0 120 240 480 720 960 m

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LONDON GATWICK

KEY

- Project Boundary (DCO)
- Main Rivers
- Ordinary Watercourses
- 1% (1 in 100) AEP event + 25% climate change (1440-mins)
- 1% (1 in 100) AEP event + 40% climate change (1440-mins)

Existing Elements

- Terminal
- Runway/Taxiway
- Hangar
- Stands
- Environmental Mitigation
- Other existing airport infrastructure

Proposed Project Elements

- Proposed Project Elements

DOCUMENT

Environmental Statement
Appendix 11.9.6

DRAWING TITLE

Gatwick Surface Water Model 1%+25%CC, 1% + 40%CC Extents (Baseline Scenario) for the 1440 mins duration

DATE

June 2023

ORIENTATION	DRAWING NO.	REVISION
N	FIGURE 5.3.4	For ES
	DRAWN BY: KE	PM / CHECKED BY: MS

SCALE @ A3 1:19,363

0 120 240 480 720 960 m

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LONDON GATWICK

KEY

- Project Boundary (DCO)
- Main Rivers
- Ordinary Watercourses

Areas Susceptible to Groundwater Flooding

- Limited potential for groundwater flooding to occur
- Potential for groundwater flooding of property situated below ground level
- Potential for groundwater flooding to occur at surface

Existing Elements

- Terminal
- Runway/Taxiway
- Hangar
- Stands
- Environmental Mitigation
- Other existing airport infrastructure

Proposed Project Elements

- Proposed Project Elements

DOCUMENT

Environmental Statement
Appendix 11.9.6

DRAWING TITLE

Areas Susceptible to Groundwater Flooding

DATE

June 2023

ORIENTATION	DRAWING NO.	REVISION
N	FIGURE 5.4.1	For ES
	DRAWN BY: KE	PM / CHECKED BY: MS

SCALE @ A3 1:19,363

0 120 240 480 720 960 m

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LONDON GATWICK

KEY

- Project Boundary (DCO)
- Main Rivers
- Ordinary Watercourses
- Maximum Reservoir Flood Extent - when river levels are normal
- Maximum Reservoir Flood Extent - when there is also flooding from rivers
- Gatwick Breach Flood Extents

Existing Elements

- Terminal
- Runway/Taxiway
- Hangar
- Stands
- Environmental Mitigation
- Other existing airport infrastructure

Proposed Project Elements

- Proposed Project Elements

DOCUMENT

Environmental Statement
Appendix 11.9.6

DRAWING TITLE

Risk of Reservoir Failure
Flood Extents

DATE

June 2023

ORIENTATION	DRAWING NO.	REVISION
N	FIGURE 5.5.1	For ES
	DRAWN BY: KE	PM / CHECKED BY: MS

SCALE @ A3 1:19,363

0 120 240 480 720 960 m

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LONDON GATWICK

KEY

- Project Boundary (DCO)
- Main Rivers
- Ordinary Watercourses
- EA Historic Flood Map

Existing Elements

- Terminal
- Runway/Taxiway
- Hangar
- Stands
- Environmental Mitigation
- Other existing airport infrastructure

Proposed Project Elements

- Proposed Project Elements

DOCUMENT

Environmental Statement
Appendix 11.9.6

DRAWING TITLE

Environment Agency Published
Historic Flooding

DATE

June 2023

ORIENTATION	DRAWING NO.	REVISION
N	FIGURE 5.8.1	For ES
	DRAWN BY: KE	PM / CHECKED BY: MS

SCALE @ A3 1:19,363

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LONDON GATWICK

KEY

Project Boundary (DCO)

Main Rivers

Ordinary Watercourses

1% (1 in 100) + 20%CC AEP Event Depth Difference

Depth (m)

- -10 to -0.1
- -0.1 to -0.05
- -0.05 to -0.01
- -0.01 to 0.01 Negligible
- 0.01 to 0.05
- 0.05 to 0.1
- >=0.1

Existing Elements

- Terminal
- Runway/Taxiway
- Hangar
- Stands
- Environmental Mitigation
- Other existing airport infrastructure

Proposed Project Elements

- Proposed Project Elements

DOCUMENT

Environmental Statement
Appendix 11.9.6

DRAWING TITLE

Upper Mole Hydraulic Model 1% + 20%CC AEP Event Depth Difference to Baseline (With-Project, No-Mitigation Scenario)

DATE

June 2023

ORIENTATION	DRAWING NO.	REVISION
N	FIGURE 6.2.1	For ES
	DRAWN BY: KE	PM / CHECKED BY: MS

SCALE @ A3 1:19,363

0 120 240 480 720 960 m

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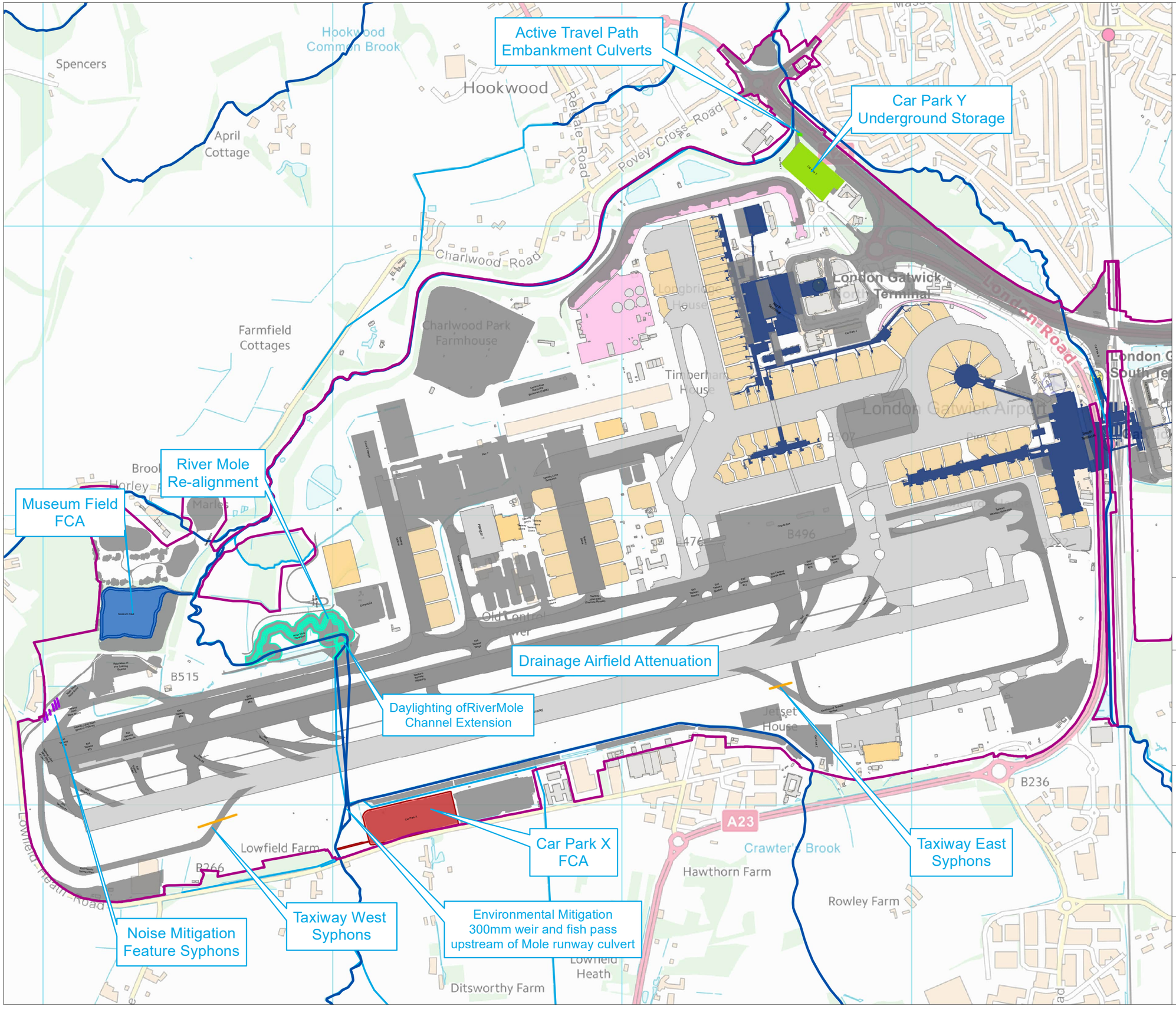

LONDON GATWICK

KEY

- Project Boundary (DCO)
- Main Rivers
- Ordinary Watercourses

Flood Mitigation Measures

- Museum Field FCA
- Car Park X FCA
- Car Park Y Underground Storage
- River Mole Realignment
- Airfield Syphons
- Noise Mitigation Feature Syphons
- Travel Path Embankment Culverts

Existing Elements

- Terminal
- Runway/Taxiway
- Hangar
- Stands
- Environmental Mitigation
- Other existing airport infrastructure

Proposed Project Elements

- Proposed Project Elements

DOCUMENT

Environmental Statement Appendix 11.9.6

DRAWING TITLE

Proposed Flood Mitigation Measures

DATE

May 2023

ORIENTATION	DRAWING NO.	REVISION
N	FIGURE 7.2.1	For ES
	DRAWN BY: KE	PM / CHECKED BY: MS

SCALE @ A3 1:12,500

0 80 160 320 480 640 m

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LONDON GATWICK

KEY

- Project Boundary (DCO)
- Main Rivers
- Ordinary Watercourses
- Upper Mole Model 10% AEP event
- Upper Mole Model 3.33% AEP event
- Upper Mole Model 1% + 12%CC AEP event
- Upper Mole Model 1% + 20%CC AEP event
- Upper Mole Model 1% + 40%CC AEP event

Existing Elements

- Terminal
- Runway/Taxiway
- Hangar
- Stands
- Environmental Mitigation
- Other existing airport infrastructure

Proposed Project Elements

- Proposed Project Elements

DOCUMENT

Environmental Statement
Appendix 11.9.6

DRAWING TITLE

Upper Mole Model 10%, 3.33%, 1%+ 12%CC, 1%+20%CC and 1%+40%CC AEP Event Extents (With-Project, With-Mitigation Scenario)

DATE

June 2023

ORIENTATION	DRAWING NO.	REVISION
N	FIGURE 7.2.2	For ES
	DRAWN BY: KE	PM / CHECKED BY: MS

SCALE @ A3 1:19,363

0 120 240 480 720 960 m

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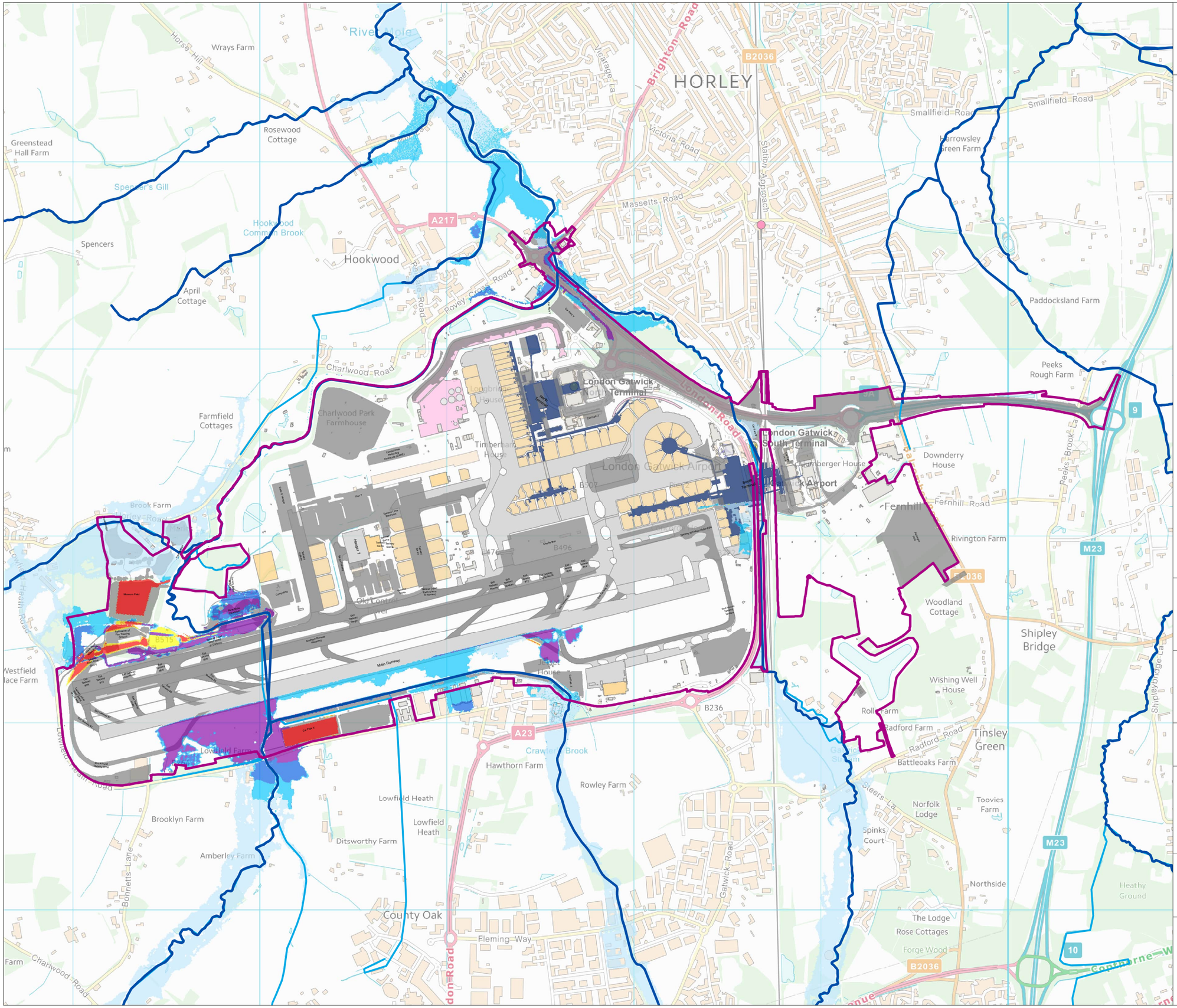

LONDON GATWICK

KEY

Project Boundary (DCO)

Main Rivers

Ordinary Watercourses

1% (1 in 100) + 12%CC AEP Event Depth Difference

Depth (m)

- -10 to -0.1
- -0.1 to -0.05
- -0.05 to -0.01
- -0.01 to 0.01 Negligible
- 0.01 to 0.05
- 0.05 to 0.1
- >=0.1

Existing Elements

- Terminal
- Runway/Taxiway
- Hangar
- Stands
- Environmental Mitigation
- Other existing airport infrastructure

Proposed Project Elements

- Proposed Project Elements

DOCUMENT

Environmental Statement
Appendix 11.9.6

DRAWING TITLE

Upper Mole Hydraulic Model 1% + 12%CC AEP Event Depth Difference to Baseline (With-Project, With-Mitigation Scenario)

DATE

June 2023

ORIENTATION	DRAWING NO.	REVISION
N	FIGURE 7.2.3	For ES
	DRAWN BY: KE	PM / CHECKED BY: MS

SCALE @ A3 1:19,363

0 120 240 480 720 960 m

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LONDON GATWICK

KEY

Project Boundary (DCO)

Main Rivers

Ordinary Watercourses

1% (1 in 100) + 20%CC AEP Event Depth Difference

Depth (m)

-10 to -0.1

-0.1 to -0.05

-0.05 to -0.01

-0.01 to 0.01 Negligible

0.01 to 0.05

0.05 to 0.1

>=0.1

Existing Elements

Terminal

Runway/Taxiway

Hangar

Stands

Environmental Mitigation

Other existing airport infrastructure

Proposed Project Elements

Proposed Project Elements

DOCUMENT

Environmental Statement
Appendix 11.9.6

DRAWING TITLE

Upper Mole Hydraulic Model 1% + 20%CC AEP Event Depth Difference to Baseline (With-Project, With-Mitigation Scenario)

DATE

June 2023

ORIENTATION	DRAWING NO.	REVISION
N	FIGURE 7.2.4	For ES
	DRAWN BY: KE	PM / CHECKED BY: MS

SCALE @ A3 1:19,363

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LONDON GATWICK

KEY

Project Boundary (DCO)

Main Rivers

Ordinary Watercourses

3.33% (1 in 30) AEP event Depth Difference

Depth (m)

-10 to -0.1

-0.1 to -0.05

-0.05 to -0.01

-0.01 to 0.01 Negligible

0.01 to 0.05

0.05 to 0.1

>=0.1

Existing Elements

Terminal

Runway/Taxiway

Hangar

Stands

Environmental Mitigation

Other existing airport infrastructure

Proposed Project Elements

Proposed Project Elements

DOCUMENT

Environmental Statement
Appendix 11.9.6

DRAWING TITLE

Upper Mole Hydraulic Model 3.33% AEP Event Depth Difference to Baseline (With-Project, With-Mitigation Scenario)

DATE

June 2023

ORIENTATION	DRAWING NO.	REVISION
N	FIGURE 7.2.5	For ES
	DRAWN BY: KE	PM / CHECKED BY: MS

SCALE @ A3 1:19,363

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LONDON GATWICK

KEY

Project Boundary (DCO)

Main Rivers

Ordinary Watercourses

1% (1 in 100) + 40%CC AEP Event Depth Difference

Depth (m)

-10 to -0.1

-0.1 to -0.05

-0.05 to -0.01

-0.01 to 0.01 Negligible

0.01 to 0.05

0.05 to 0.1

>=0.1

Existing Elements

Terminal

Runway/Taxiway

Hangar

Stands

Environmental Mitigation

Other existing airport infrastructure

Proposed Project Elements

Proposed Project Elements

DOCUMENT

Environmental Statement
Appendix 11.9.6

DRAWING TITLE

Upper Mole Hydraulic Model 1% + 40%CC AEP Event Depth Difference to Baseline (With-Project, With-Mitigation Scenario)

DATE

June 2023

ORIENTATION	DRAWING NO.	REVISION
N	FIGURE 7.2.6	For ES
	DRAWN BY: KE	PM / CHECKED BY: MS

SCALE @ A3 1:19,363

0 120 240 480 720 960 m

\\Uk-lon-fas02\projects\SSBU\GADD001A-Gatwick-EMR\@Projects\GALCTC25-Northern-Runway-Water\500 GIS\Figures\MXDs\ES\FRA\ES_FRA_Figure 7.2.3.mxd

LONDON GATWICK

KEY

- Project Boundary (DCO)
- Main Rivers
- Ordinary Watercourses
- Upper Mole Model 3.33% AEP event (Baseline)
- Upper Mole Model 3.33% AEP event (With-Scheme, With-Mitigation)

Existing Elements

- Terminal
- Runway/Taxiway
- Hangar
- Stands
- Environmental Mitigation
- Other existing airport infrastructure

Proposed Project Elements

- Proposed Project Elements

DOCUMENT

Environmental Statement
Appendix 11.9.6

DRAWING TITLE

Upper Mole Model 3.33% AEP Event
Extent Difference to Baseline
(With-Project,With-Mitigation)

DATE

June 2023

ORIENTATION	DRAWING NO.	REVISION
N	FIGURE 7.2.7	For ES
	DRAWN BY: KE	PM / CHECKED BY: MS

SCALE @ A3 1:19,363

0 120 240 480 720 960 m

\\Uk-lon-fas02\projects\SSBU\GADD001A-Gatwick-EMR\@Projects\GALCTC25-Northern-Runway-Water\500 GIS\Figures\MXDs\ES\FRA\ES_FRA_Figure 7.2.7.mxd

LONDON GATWICK

KEY

- Project Boundary (DCO)
- Main Rivers
- Ordinary Watercourses
- Upper Mole Model 1% + 20%CC AEP event (With-Scheme, With-Mitigation)
- Upper Mole Model 1% + 20%CC AEP event (Undefended With-Scheme, With-Mitigation)

Existing Elements

- Terminal
- Runway/Taxiway
- Hangar
- Stands
- Environmental Mitigation
- Other existing airport infrastructure

Proposed Project Elements

- Proposed Project Elements

DOCUMENT

Environmental Statement
Appendix 11.9.6

DRAWING TITLE

Upper Mole Model 1%+20%CC AEP (With-Project,With-Mitigation) and 1%+20%CC AEP Event Extents (With-Project,Undefended)

DATE

June 2023

ORIENTATION	DRAWING NO.	REVISION
N	FIGURE 7.2.8	For ES
	DRAWN BY: KE	PM / CHECKED BY: MS

SCALE @ A3 1:19,363

0 120 240 480 720 960 m

\\Uk-lon-fas02\projects\SSBU\GADD001A-Gatwick-EMR\@Projects\GALCTC25-Northern-Runway-Water\500 GIS\Figures\MXDs\ES\FRA\ES_FRA_Figure 7.2.8.mxd

LONDON GATWICK

KEY

- Project Boundary (DCO)
- Main Rivers
- Ordinary Watercourses
- 1% (1 in 100) AEP event + 25% climate change (30-mins)
- 1% (1 in 100) AEP event + 40% climate change (30-mins)

Existing Elements

- Terminal
- Runway/Taxiway
- Hangar
- Stands
- Environmental Mitigation
- Other existing airport infrastructure

Proposed Project Elements

- Proposed Project Elements

DOCUMENT

Environmental Statement
Appendix 11.9.6

DRAWING TITLE

Gatwick Surface Water Model 1%+25%CC, 1% + 40%CC Extents (With-Project, With-Mitigation Scenario) for the 30min duration

DATE

June 2023

ORIENTATION	DRAWING NO.	REVISION
N	FIGURE 7.3.1	For ES
	DRAWN BY: KE	PM / CHECKED BY: MS

SCALE @ A3 1:19,363

0 120 240 480 720 960 m

\\Uk-lon-fas02\projects\SSBU\GADD001A-Gatwick-EMR\@Projects\GALCTC25-Northern-Runway-Water\500 GIS\Figures\MXDs\ES\FRA\ES_FRA_Figure 7.3.2.mxd

LONDON GATWICK

KEY

- Project Boundary (DCO)
- Main Rivers
- Ordinary Watercourses
- 1% (1 in 100) AEP event + 25% climate change (1440-mins)
- 1% (1 in 100) AEP event + 40% climate change (1440-mins)

Existing Elements

- Terminal
- Runway/Taxiway
- Hangar
- Stands
- Environmental Mitigation
- Other existing airport infrastructure

Proposed Project Elements

- Proposed Project Elements

DOCUMENT

Environmental Statement
Appendix 11.9.6

DRAWING TITLE

Gatwick Surface Water Model 1%+25%CC, 1% + 40%CC Extents (With-Project, With-Mitigation Scenario) for the 1440min duration

DATE

June 2023

ORIENTATION	DRAWING NO.	REVISION
N	FIGURE 7.3.2	For ES
	DRAWN BY: KE	PM / CHECKED BY: MS

SCALE @ A3 1:19,363

0 120 240 480 720 960 m

\\Uk-lon-fas02\projects\SSBU\GADD001A-Gatwick-EMR\@Projects\GALCTC25-Northern-Runway-Water\500 GIS\Figures\MXDs\ES\FRA\ES_FRA_Figure 7.3.2.mxd

LONDON GATWICK

KEY

Project Boundary (DCO)

Main Rivers

Ordinary Watercourses

1% (1 in 100) + 25%CC AEP Event Depth Difference (30 min)

Depth (m)

-10 to -0.1

-0.1 to -0.05

-0.05 to -0.01

-0.01 to 0.01 Negligible

0.01 to 0.05

0.05 to 0.1

>=0.1

Existing Elements

Terminal

Runway/Taxiway

Hangar

Stands

Environmental Mitigation

Other existing airport infrastructure

Proposed Project Elements

Proposed Project Elements

DOCUMENT

Environmental Statement
Appendix 11.9.6

DRAWING TITLE

Gatwick Surface Water Model 1%+25%CC AEP Event Depth Difference to Baseline (With-Project,With-Mitigation Scenario) for the 30 min duration

DATE

June 2023

ORIENTATION	DRAWING NO.	REVISION
N	FIGURE 7.3.3	For ES
	DRAWN BY: KE	PM / CHECKED BY: MS

SCALE @ A3 1:19,363

0 120 240 480 720 960 m

\\Uk-lon-fas02\projects\SSBU\GADD001A-Gatwick-EMR\@Projects\GALCTC25-Northern-Runway-Water\500 GIS\Figures\MXDs\ES\FRA\ES_FRA_Figure 7.3.3.mxd

LONDON GATWICK

KEY

- Project Boundary (DCO)
- Main Rivers
- Ordinary Watercourses

1% (1 in 100) + 25%CC AEP Event Depth Difference (1440 min)

Depth (m)

- -10 to -0.1
- -0.1 to -0.05
- -0.05 to -0.01
- -0.01 to 0.01 Negligible
- 0.01 to 0.05
- 0.05 to 0.1
- >=0.1

Existing Elements

- Terminal
- Runway/Taxiway
- Hangar
- Stands
- Environmental Mitigation
- Other existing airport infrastructure

Proposed Project Elements

- Proposed Project Elements

DOCUMENT

Environmental Statement
Appendix 11.9.6

DRAWING TITLE

Gatwick Surface Water Model 1%+25%CC AEP Event Depth Difference to Baseline (With-Project,With-Mitigation Scenario) for the 1440 min duration

DATE

June 2023

ORIENTATION	DRAWING NO.	REVISION
N	FIGURE 7.3.4	For ES
	DRAWN BY: KE	PM / CHECKED BY: MS

SCALE @ A3 1:19,363

0 120 240 480 720 960 m

\\Uk-lon-fas02\projects\SSBU\GADD001A-Gatwick-EMR\@Projects\GALCTC25-Northern-Runway-Water\500 GIS\Figures\MXDs\ES\FRA\ES_FRA_Figure 7.3.3.mxd

LONDON GATWICK

KEY

Project Boundary (DCO)

Main Rivers

Ordinary Watercourses

1% (1 in 100) + 40%CC AEP Event Depth Difference (30 min)

Depth (m)

-10 to -0.1

-0.1 to -0.05

-0.05 to -0.01

-0.01 to 0.01 Negligible

0.01 to 0.05

0.05 to 0.1

>=0.1

Existing Elements

Terminal

Runway/Taxiway

Hangar

Stands

Environmental Mitigation

Other existing airport infrastructure

Proposed Project Elements

Proposed Project Elements

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Environmental Statement
Appendix 11.9.6

DRAWING TITLE

Gatwick Surface Water Model 1%+40%CC AEP Event Depth Difference to Baseline (With-Project,With-Mitigation Scenario) for the 30 min duration

DATE

June 2023

ORIENTATION	DRAWING NO.	REVISION
N	FIGURE 7.3.5	For ES
	DRAWN BY: KE	PM / CHECKED BY: MS

SCALE @ A3 1:19,363

0 120 240 480 720 960 m

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LONDON GATWICK

KEY

Project Boundary (DCO)

Main Rivers

Ordinary Watercourses

1% (1 in 100) + 40%CC AEP Event Depth Difference (1440 min)

Depth (m)

-10 to -0.1

-0.1 to -0.05

-0.05 to -0.01

-0.01 to 0.01 Negligible

0.01 to 0.05

0.05 to 0.1

>=0.1

Existing Elements

Terminal

Runway/Taxiway

Hangar

Stands

Environmental Mitigation

Other existing airport infrastructure

Proposed Project Elements

Proposed Project Elements

DOCUMENT

Environmental Statement
Appendix 11.9.6

DRAWING TITLE

Gatwick Surface Water Model 1%+40%CC AEP Event Depth Difference to Baseline (With-Project,With-Mitigation Scenario) for the 1440 min duration

DATE

June 2023

ORIENTATION	DRAWING NO.	REVISION
N	FIGURE 7.3.6	For ES
	DRAWN BY: KE	PM / CHECKED BY: MS

SCALE @ A3 1:19,363

0 120 240 480 720 960 m

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Temporary Pedestrain/Utilities Bridges crossing River Mole

Temporary Haul Road crossing River Mole

LONDON GATWICK

KEY

Project Boundary (DCO)

Main Rivers

Ordinary Watercourses

Initial Construction Period (1%+16%CC AEP Event) Depth Difference

Depth (m)

-10 to -0.1

-0.1 to -0.05

-0.05 to -0.01

-0.01 to 0.01 Negligible

0.01 to 0.05

0.05 to 0.1

>=0.1

Existing Elements

Terminal

Runway/Taxiway

Hangar

Stands

Environmental Mitigation

Other existing airport infrastructure

Proposed Project Elements

Proposed Project Elements

Temporary Construction Bridge

DOCUMENT

Environmental Statement
Appendix 11.9.6

DRAWING TITLE

Initial Construction Period (2024 - 2029)
1% + 16%CC AEP Event
Depth Difference to Baseline

DATE

June 2023

ORIENTATION	DRAWING NO.	REVISION
N	FIGURE 7.5.1	For ES
	DRAWN BY: KE	PM / CHECKED BY: MS

SCALE @ A3 1:19,363

0 120 240 480 720 960 m

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Temporary Pedestrain/Utilities Bridges crossing River Mole

Temporary Haul Road crossing River Mole

LONDON GATWICK

KEY

Project Boundary (DCO)

Main Rivers

Ordinary Watercourses

First Full Year of Opening (1%+16%CC AEP Event) Depth Difference

Depth (m)

-10 to -0.1

-0.1 to -0.05

-0.05 to -0.01

-0.01 to 0.01 Negligible

0.01 to 0.05

0.05 to 0.1

>=0.1

Existing Elements

Terminal

Runway/Taxiway

Hangar

Stands

Environmental Mitigation

Other existing airport infrastructure

Proposed Project Elements

Proposed Project Elements

Temporary Construction Bridge

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Environmental Statement
Appendix 11.9.6

DRAWING TITLE

First Full Year of Opening (2029 - 2032)
1% + 16%CC AEP Event
Depth Difference to Baseline

DATE

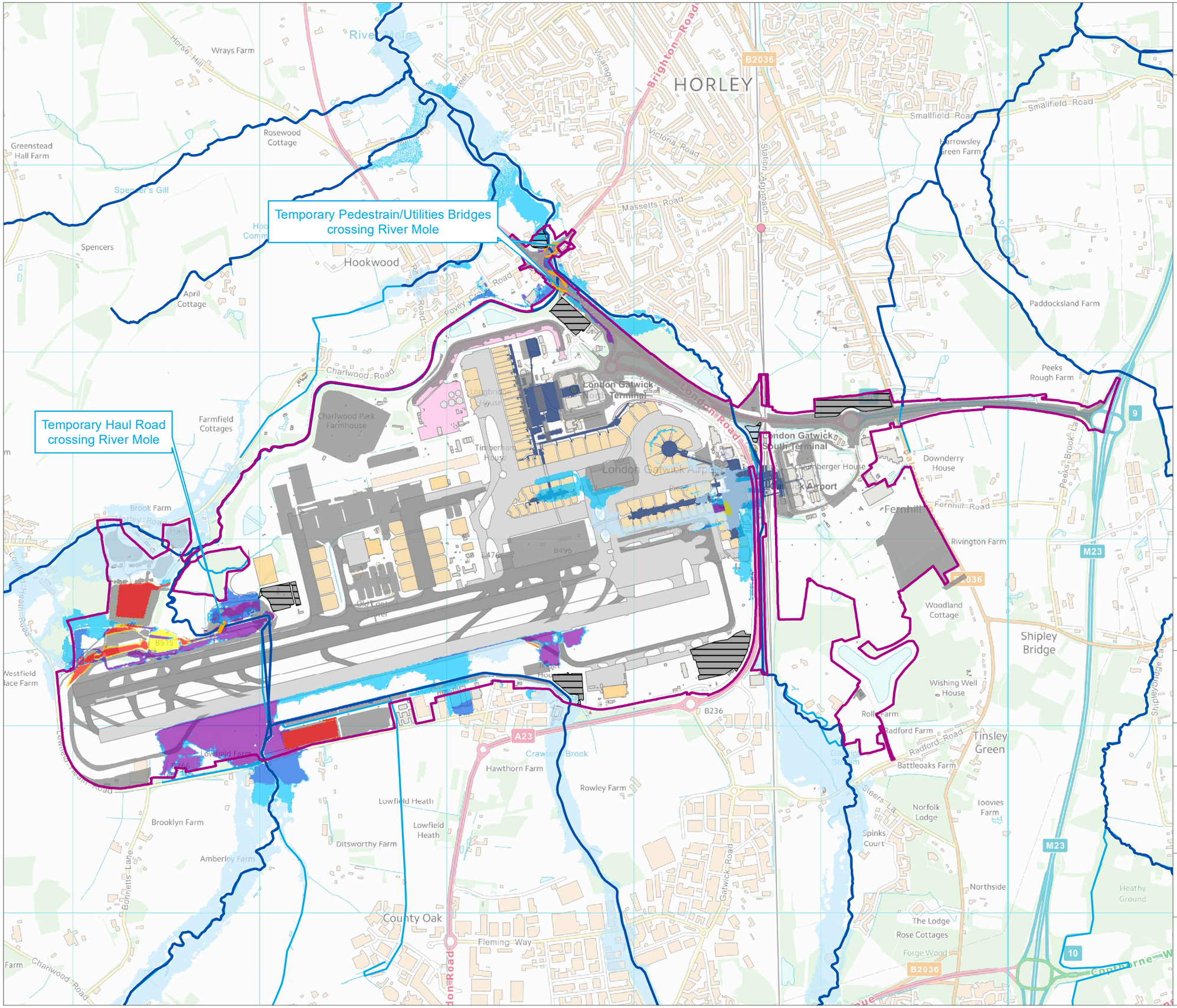
June 2023

ORIENTATION	DRAWING NO.	REVISION
N	FIGURE 7.5.2	For ES
	DRAWN BY: KE	PM / CHECKED BY: MS

SCALE @ A3 1:19,363

0 120 240 480 720 960 m

\\Uk-lon-fas02\projects\SSBU\GADD001A-Gatwick-EMR\@Projects\GALCTC25-Northern-Runway-Water\500 GIS\Figures\MXDs\ES\FRA\ES_FRA_Figure 7.5.1.mxd



LONDON GATWICK

KEY

- Project Boundary (DCO)
- Main Rivers
- Ordinary Watercourses

Interim Assessment Year (1%+16%CC AEP Event) Depth Difference

Depth (m)

- -10 to -0.1
- -0.1 to -0.05
- -0.05 to -0.01
- -0.01 to 0.01 Negligible
- 0.01 to 0.05
- 0.05 to 0.1
- >=0.1

Existing Elements

- Terminal
- Runway/Taxiway
- Hangar
- Stands
- Environmental Mitigation
- Other existing airport infrastructure

Proposed Project Elements

- Proposed Project Elements
- Temporary Construction Bridge

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Environmental Statement
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DRAWING TITLE

Interim Assessment Year (2032 - 2037)
1% + 16%CC AEP Event
Depth Difference to Baseline

DATE

June 2023

ORIENTATION	DRAWING NO.	REVISION
N	FIGURE 7.5.3	For ES
	DRAWN BY: KE	PM / CHECKED BY: MS

SCALE @ A3 1:19,363

0 120 240 480 720 960 m

\\Uk-lon-fas02\projects\SSBU\GADD001A-Gatwick-EMR\@Projects\GALCTC25-Northern-Runway-Water\500 GIS\Figures\MXDs\ES\FRA\ES_FRA_Figure 7.5.1.mxd