Preliminary Environmental Information Report
Chapter 11: Water Environment

September 2021

Table of Contents

11 Water Environment

11.1 Introduction

11.1.1 This chapter of the Preliminary Environmental Information Report (PEIR) presents the findings of the Environmental Impact Assessment (EIA) work undertaken to date concerning the potential effects of the proposal to make best use of Gatwick's existing runways (referred to within this report as 'the Project') on the water environment. For the purposes of this assessment, the water environment constitutes:

- flood risk;
- surface water drainage;
- geomorphology;
- water environment regulations;
- water quality;
- groundwater resources;
- wastewater infrastructure; and
- water supply infrastructure.

11.1.2 This chapter considers the existing (current baseline) conditions, and the impact of the Project on the water cycle including: flood risk, surface water drainage, geomorphology, water quality, groundwater resources, water supply and wastewater. The water environment also interfaces with other environmental disciplines, whose chapters should be read in conjunction with this, eg Chapter 9: Ecology and Nature Conservation (which includes aquatic habitats and ecology) and Chapter 10 Geology and Ground Conditions (which includes groundwater quality).

11.1.3 In particular, this PEIR chapter:

- sets out the existing and future environmental baseline conditions, established from desk studies, surveys and consultation to date;
- presents the potential environmental effects on the water environment arising from the Project, based on the information gathered and the analysis and assessments undertaken to date;
- identifies any assumptions and limitations encountered in compiling the environmental information; and
- highlights any necessary monitoring and/or mitigation measures that could prevent, minimise, reduce or offset the possible environmental effects identified in the EIA process.

11.1.4 This chapter is accompanied by a summary of relevant local policy (Appendix 11.2.1), a summary of stakeholder scoping responses (Appendix 11.3.1), a Flood Risk Assessment (Appendix 11.9.1), Water Environment Regulations Assessment (Appendix 11.9.2), Geomorphology Assessment (Appendix 11.9.3), Water Supply Assessment (Appendix 11.9.4) and the following figures:

- Figure 11.4.1: Water Environment Study Area;
- Figure 11.6.1: General Water Features;
- Figure 11.6.2: Environment Agency Published Flood Zones;
- Figure 11.6.3: Upper Mole Model 1% (1 in 100) AEP Event Extent;
- Figure 11.6.4: Environment Agency Risk of Flooding from Surface Water Extents;

- Figure 11.6.5: Areas Susceptible to Groundwater Flooding;
- Figure 11.6.6: Flood Risk from Reservoirs;
- Figure 11.6.7: Contaminated Water Path – Existing Route;
- Figure 11.6.8: Groundwater Levels and Aquifer Designation;
- Figure 11.6.9: Wastewater Infrastructure 2019;
- Figure 11.8.1: Contaminated Water Path – Project Option Route;
- Figure 11.8.2: Project Wastewater Infrastructure;
- Figure 11.9.1: Upper Mole Model 1% (1 in 100) AEP event + 35% Climate Change Depth Difference to Baseline (with-Project, with-Mitigation); and
- Figure 11.9.2: Upper Mole Model 1% (1 in 100) AEP event + 70% Climate Change Depth Difference to Baseline (with-Project, with-Mitigation).

11.1.5 The PEIR will inform pre-application consultation. Following consultation, comments on the PEIR will be reviewed and taken into account, where appropriate, in preparation of the Environmental Statement (ES) that will accompany the application to the Planning Inspectorate for development consent.

11.2 Legislation and Policy

Legislation

11.2.1 A summary of key legislation of relevance to the water environment is included in Table 11.2.1.

Table 11.2.1: Summary of Legislation Relevant to the Water Environment

Legislation	Description and Relevance
The Water Environment (Water Framework Directive) (England and Wales) Regulations (2017)	The Water Environment Regulations (WER) 2017 have been transposed from the Water Framework Directive (2000/60/EC) and adopted more widely post January 2021 transitional arrangements. The provisions of WER require that environmental objectives are set for all surface and groundwater bodies to have regard for water quality standards and betterment wherever possible. The Water Environment Regulation assessment needs to be taken into account in the planning of all new activities in the water environment. The Environment Agency, as competent authority in England and Wales is responsible for delivering the objectives through the Water Environment (Water Framework Directive) (England and Wales) Regulations 2017.
Urban Wastewater Treatment Directive (91/271/EEC)	The objective of the Urban Wastewater Treatment Directive (UWWTD) is to protect the environment from the adverse effects of urban waste water discharges and discharges from certain industrial sectors, and concerns the collection, treatment and discharge of domestic waste water; mixture of waste water and waste water from certain industrial sectors. It aims to protect the environment from the adverse effects of the collection, treatment and discharge of urban wastewater.
Groundwater Directive (2006/118/EC)	The Water Environment Regulations, require specific measures to be proposed to prevent and control groundwater pollution and achieve good

Legislation	Description and Relevance
	groundwater chemical status. These measures include criteria for assessing the chemical status of groundwater and for identifying trends in pollution of groundwater bodies. Hazardous substances must be prevented from entering groundwater.
Floods Directive (2007/60/EC)	The objective of the Floods Directive is to establish a framework for the assessment and management of flood risk to reduce the negative consequences of flooding on human health, economic activities, the environment and cultural heritage. The Directive which applies to all kinds of floods (river, lakes, flash floods, urban floods, coastal floods, including storm surges and tsunamis), on all of the European Union (EU) territory requires Member States to approach flood risk management in a three stage process, including preliminary flood risk assessment; develop flood risk maps and produce flood risk management plans. The Environment Agency has delivered the requirements of the Floods Directive through its flood hazard and risk maps, and Flood Risk Management Plans.
Drinking Water Directive (2015/1787/EU)	This directive requires that drinking water be free of any microorganisms, parasites or substances that could potentially endanger human health. It sets standards for the most common, potentially harmful organisms and substances that can be found in drinking water.
Reservoirs Act 1975	This legislation was enacted to protect against escapes of water from large reservoirs or from artificially created or enlarged lakes. The Reservoirs Act has been amended by the Flood and Water Management Act 2010. It essentially provides regulation for assessing risk of escape of water and ensuring that reservoirs are regularly monitored and their asset status (integrity) is regularly assessed.
Environmental Protection Act 1990	This defines the fundamental structure for waste management and control of emissions, including contaminated land.
Land Drainage Act 1991 (as amended)	This requires that a watercourse be maintained by its owner in such a condition that the free flow of water is not impeded. The riparian owner must accept the natural flow from upstream but need not carry out work to cater for increased flows resulting from some types of works carried out upstream.
Water Resources Act 1991 (as amended)	This legislation regulates water resources, water quality, water pollution, flood defence, and provides for the general management of water resources, the standards expected for controlled waters, and mitigation through flood defence.
Environment Act 1995	This legislation set the standard for environmental management and made provision for the establishment of the Environment Agency. The Environment Agency are a key consultee for water environment elements of the Project.

Legislation	Description and Relevance
Control of Pollution (Oil Storage) (England) Regulations 2001 (SI 2954)	Statutory Instrument 2954 provides legislation to prevent pollution of the water environment, by minimising and/or preventing future contamination of controlled water by oil. It supports the Groundwater Directive and the EU Directive on Dangerous Substances (76/464 EEC).
Climate Change Act 2008	This legislation requires that emissions of carbon dioxide and other greenhouse gases are reduced and that climate change risks are prepared for. The Project is expected to consider the impact of climate change when assessing future effects.
Flood Risk Regulations 2009	This legislation was enacted to support the delivery of the Floods Directive requirements and outlines the requirements for flood protection and flood risk management, subsequently reflected in the Flood and Water Management Act, 2010.
Flood and Water Management Act 2010	This Act established Lead Local Flood Authorities (LLFA) with responsibilities to manage local sources of flooding. East Sussex and Surrey County Councils are statutory consultees for the Project as LLFAs.
Water Act 2014	This legislation governs public water supply, water companies and provides greater protection to consumers. It sets out the main powers for water companies and provides a framework for licensing and permitting.
The Private Water Supplies (England) Regulations 2016, as amended	This legislation sets out standards for private water supplies including wells and boreholes. It establishes a framework for monitoring and ensuring water quality standards.
The Water Supply (Water Quality) Regulations 2016	These regulations consolidated legislation concerning the quality of water supplies for human consumption in England. They aim to prevent contamination of water supply and ensure standards for water quality are met.
The Environmental Permitting (England and Wales) Regulations 2016 (as amended)	The regulations set out the guidelines for environmental permitting, the circumstances in which environmental permits are required, and compliance obligations. It is relevant to, for example, any works in rivers, dewatering, and any discharges to water bodies.

Planning Policy Context

National Policy Statements

11.2.2 The Airports National Policy Statement (NPS) (Department for Transport, 2018a), 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.

11.2.3 The NPS for National Networks (Department for Transport, 2015)[1] sets out the need for development of road, rail and strategic rail freight interchange projects on the national networks

[1] It is noted that the Transport Decarbonisation Plan published by Department for Transport (DfT) on 14 July 2021 announced DfT's intention to review the NPS for National Networks in due course once demand patterns post-pandemic become clearer. It is understood DfT intends to commence the review by the end of 2021 and complete it by Spring 2023. In the interim and whilst the review is

and the policy against which decisions on major road and rail projects will be made. This NPS would cover the highways improvements elements of the Project. This has been taken into account in relation to the highways improvements proposed as part of the Project.

11.2.4 The Draft National Policy Statement for Water Resources Infrastructure (Department for Environment and Rural Affairs, 2018) has been consulted on and responses are currently being considered by the UK government. Any implications for the Project will be considered when the NPS is issued.

11.2.5 Table 11.2.2 provides a summary of the relevant requirements of these NPSs and how these are addressed within the PEIR.

Table 11.2.2: Summary of NPS Information Relevant to this Chapter

Summary of NPS requirement	How and where considered in the PEIR
Airports NPS	
4.7: Where the applicant's proposals in relation to surface access meet the thresholds to qualify as nationally significant infrastructure projects under the Planning Act 2008, or is associated development under section 115 of the Planning Act 2008, the Secretary of State will consider those aspects by reference to both the National Networks NPS and the Airports NPS, as appropriate.	The consideration of the impacts and effects of the Project on the water environment as a result of highways improvement proposals would need to address the requirements of the National Policy Statement for National Networks. The impacts of surface access are addressed in Appendix 11.9.1 for flood risk, and in Appendix 11.9.2 for water quality.
4.46 and 4.49: Detailed consideration must be given to the range of potential impacts of climate change using the latest UK Climate Projections available at the time, and to ensuring any environmental statement that is prepared identifies appropriate mitigation or adaptation measures.	Reference is made to the influence of climate change on the assessment in Sections 11.6 and 11.10.
4.47: Where transport infrastructure has safety-critical elements, and the design life of the asset is 60 years or greater, the applicant should apply the latest available UK Climate Projections, considering at least a scenario that reflects a high level of greenhouse gas emissions at the 10%, 50% and 90% probability levels.	While the existing and northern runways would be considered as safety-critical infrastructure, the design life of the Project as a whole has been assumed to be 40 years having had consideration for the past history of development of airport and roads infrastructure at Gatwick. The proposed road junction improvements have been assessed separately (but in the context of the wider airport development having occurred) assuming a 100 year lifetime. A sensitivity test would be included in the ES of a greater predicted change to rainfall and river flows due

undertaken, DfT has confirmed the NPS for National Networks remains relevant government policy and has full force and effect for the purposes of the Planning Act 2008.

Summary of NPS requirement	How and where considered in the PEIR
	to climate change in accordance with Environment Agency guidance.
5.153: The applicant should consider the risk of all forms of flooding to the Project or arising from the Project and demonstrate how these risks will be managed and, where relevant, mitigated, so that the Project remains safe through its lifetime.	A flood risk assessment (FRA) (included here as Appendix 11.9.1) has been produced for the Project, which considers all forms of flood risk from and due to the Project and describes the proposed flood mitigation strategy that forms part of the Project. This PEIR chapter summarises the key findings of the FRA.
5.154: Take into account the impacts of climate change, clearly stating the Project lifetime over which the assessment is made.	Climate change impacts have been considered in Appendix 11.9.1 and in Section 11.10 of this chapter.
5.154: 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 are discussed in Section 11.9 where it is demonstrated how these would be managed appropriately, ensuring that flood risk to the Project, or third parties within the study area, would not be increased.
5.154: Consider if there is a need to remain operational during a worst-case flood event during the Project's lifetime and the need for safe access and exit arrangements.	For this assessment, the design event for the Project is the 1 per cent (1 in 100) Annual Exceedance Probability (AEP2) event, including a 35 per cent allowance for climate change. It has been demonstrated within the FRA (Appendix 11.9.1) that the runways would not be flooded and would remain operational for such an event, if required. In terms of the terminal buildings and their surrounding areas, existing flood risk would potentially have an operational impact, however, flood risk is not adversely impacted from the Project. Dry access and egress routes above peak flood water levels are available via high-link bridges and multi-storey car parks from the terminal buildings.
5.154: Provide evidence for the Secretary of State to apply the Sequential Test and Exception Test, via a suitable flood risk assessment.	Evidence for the application of the Sequential and Exception Tests is included in the FRA (Appendix 11.9.1).
5.183: The Secretary of State will generally need to give more weight to impacts on the water environment where a project would have adverse effects on the achievement of the environmental objectives established under the Water Framework Directive compliance assessment.	The impacts are identified in the Water Environment Regulations compliance assessment in Appendix 11.9.2.

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

Summary of NPS requirement	How and where considered in the PEIR
NPS for National Networks	
Sections 5.90 – 5.115 sets out the requirements in relation to flood risk. Where flood risk is a factor the application must be supported by a Flood Risk Assessment and that the Sequential and Exception Tests have been applied in accordance with the National Planning Policy Framework (NPPF).	A FRA has been included as Appendix 11.9.1 that informs the assessment of the impact of the Project. The FRA also demonstrates the Project's compliance with the Sequential and Exception Tests.
Sections 5.216 to 5.231 set out the requirements in relation to water quality and resources. An applicant should ascertain the existing status of, and carry out an assessment of the impacts on, water quality water resources and physical characteristics (geomorphology) as part of the environmental statement.	The existing status of water resources in the study area is summarised in Section 11.6 (baseline environment) and the impacts are assessed and summarised in Section 11.9.

National Planning Policy Framework

11.2.6 The National Planning Policy Framework (NPPF) (Ministry of Housing, Community and Local Government, 2021) sets out the planning policies for England. It describes how these should be applied and aims to contribute towards sustainable development.

11.2.7 The NPPF does not include specific policies for nationally significant infrastructure but states that:

'these are determined in accordance with the decision-making framework in the Planning Act 2008 (as amended) and relevant national policy statements for major infrastructure, as well as any other matters that are relevant (which may include the National Planning Policy Framework)'

11.2.8 Section 14 of the NPPF: 'Meeting the challenge of climate change, flooding and coastal change' is relevant to the water environment and considers the impact of climate change to flood risk, coastal change and water supply.

11.2.9 Paragraphs 159 to 169 set out flood risk policies to be followed by all proposed developments. These policies set strict tests to protect people and property from flooding. 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 for its lifetime, ensuring flood risk is not increased elsewhere, it should not be permitted.

11.2.10 Section 15 of the NPPF: 'Conserving and enhancing the natural environment' is relevant to water quality and sets out the requirement of:

'e) preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution…'

11.2.11 It also states that development should, wherever possible, help to improve local environmental conditions including water quality.

11.2.12 The National Planning Practice Guidance (NPPG) (Ministry of Housing, Communities and Local Government, 2019) supports the NPPF and provides guidance across a range of topic areas. These include climate change, EIA, flood risk and coastal change, the natural environment, water supply, wastewater and water quality.

11.2.13 Guidance on climate change 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.

11.2.14 Guidance on flood risk and coastal change 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.

11.2.15 Guidance on water supply, wastewater and water quality includes advice on how planning can ensure water quality and the delivery of adequate water and wastewater infrastructure.

Other Relevant National Planning Policy

11.2.16 Other national aviation planning policy documents considered include:

- Aviation Policy Framework (Department for Transport, 2013);
- The Future of UK Aviation - Making Best Use of Existing Runways (HM Government, 2018); and
- Aviation 2050 - The Future of UK Aviation (Department for Transport, 2018b).

11.2.17 The Aviation Policy Framework sets out that it is essential to better understand and manage the risks associated with climate change for the long-term resilience of the aviation sector, although this pre-dated the Airports NPS.

11.2.18 The Future of UK Aviation Strategy sets out the UK government's framework for sustainable airport growth, making the case for more efficient use of the infrastructure available. The Aviation Strategy requires that the applicant will need to demonstrate how the Project would mitigate against local environmental issues. In December 2018, the Government published a Green Paper: Aviation 2050 - The Future of UK Aviation. The consultation ran from 17 December 2018 to 20 June 2019.

Local Planning Policy

11.2.19 Gatwick Airport 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 Airport, while Mid Sussex District Council lies approximately 2 km to the south east. Gatwick Airport is located in West Sussex, immediately adjacent to the bordering county of Surrey.

11.2.20 The relevant local planning policies applicable to the water environment based on the extent of the study area for this assessment are set out in Table 11.2.3. Further details are provided at Appendix 11.2.1.

Table 11.2.3: Local Planning Policy

Administrative Area	Plan	Policy
Adopted Policy		
Crawley	Crawley 2030: Crawley Borough Local Plan 2015-2030	ENV8: Development & Flood Risk ENV9: Tackling Water Stress ENV10: Pollution Management & Land Contamination
Horsham	Horsham District Planning Framework 2015	Policy 38: Flooding
Reigate and Banstead	Reigate and Banstead Local Plan: Core Strategy 2014	CS10: Sustainable Development
	Reigate and Banstead Local Plan Development Management Plan 2018-2027	CCF2: Flood Risk
Mole Valley	Mole Valley Core Strategy 2009	CS20: Flood Risk Management
	Mole Valley Local Plan 2000	ENV65: Drainage and Run Off ENV67: Groundwater Quality
Tandridge	Tandridge District Core Strategy 2008	CSP15: Environmental Quality
	Tandridge Local Plan Part 2: Detailed Policies 2014-2029	DP21: Sustainable Water Management
Emerging Policy		
Crawley	Draft Crawley Borough Local Plan 2021-2037	EP1: Development and Flood Risk EP3: Land and Water Quality GI1: Green infrastructure SDC1: Sustainable Design and Construction SDC3: Tackling Water Stress GAT1: Development of the Airport with a Single Runway
Mole Valley	Future Mole Valley 2018-2033 Consultation Draft Local Plan	EN10: Regionally Important Geological and Geomorphological Sites EN13: Promoting Environmental Quality EN14: Responding to the Climate Emergency INF2: Managing Flood Risk

Administrative Area	Plan	Policy
Horsham	Draft Horsham District Local Plan 2019-36	Policy 25: Environmental Protection Policy 27: The Natural Environment and Landscape Character Policy 37: Climate Change Policy 39: Sustainable Design and Construction Policy 40: Flooding
Tandridge	Our Local Plan 2033 (Regulation 22 Submission) 2019	TLP47: Sustainable Urban Drainage and Reducing Flood Risk

11.3 Consultation and Engagement

11.3.1 In September 2019, Gatwick Airport Limited (GAL) submitted a Scoping Report to the Planning Inspectorate, which described the scope and methodology for the technical studies being undertaken to provide an assessment of any likely significant effects and, where necessary, to determine suitable mitigation measures for the construction and operational phases of the Project. It also described those topics or sub-topics which are proposed to be scoped out of the EIA process and provided justification as to why the Project would not have the potential to give rise to significant environmental effects in these areas.

11.3.2 Following consultation with the statutory bodies, the Planning Inspectorate (on behalf of the Secretary of State) provided a Scoping Opinion on 11 October 2019.

11.3.3 Key issues raised during the scoping process specific to the water environment are listed in Table 11.3.1, together with details of how these issues have been addressed within the PEIR. Further details of individual consultee scoping responses are provided in Appendix 11.3.1.

Table 11.3.1: Summary of Scoping Responses

Details	How/where addressed in PEIR
The ES should assess impacts to the Baldhorns Brook, Ifield Brook and Stanford Brook and Mole (Hersham to River Thames confluence at East Molesey) where significant effects are likely to occur (ID 4.5.1)	The PEIR has scoped out these watercourses as no significant effects are likely to occur. Justification is provided in Table 11.4.2.
The ES should include an assessment of the potential impacts from increased flows on watercourses due to an increase in hardstanding/impermeable areas and consider water quality (ID 4.5.2)	The potential impacts from increased flows due to an increase in hardstanding/impermeable areas are considered in the Flood Risk Assessment in Appendix 11.9.1 and summarised in this chapter. An assessment of the impact on water quality is provided in Section 11.9.
The ES should quantify the baseline of such inputs/outputs of the balancing ponds in order to account for any changes and subsequent impacts and effects (ID 4.5.3)	Baseline surface water flows and discharge volumes from the balancing ponds are reported in the Flood Risk Assessment in Appendix 11.9.1. These are compared to

Details	How/where addressed in PEIR
	the equivalent with-Project values to identify any impacts and effects.
Ecology and geology and ground conditions should be cross-referenced where applicable (ID 4.5.4)	Cross references are provided where necessary. In addition, inter-relationships between topics are considered in Section 11.11 and in Chapter 19: Cumulative Effects and Inter-relationships.
The ES should include sufficient detail regarding mitigation measures during construction and operation and explain how this will be secured (ID 4.5.5)	Mitigation measures are set out in Section 11.8.
The ES should address the apparent contradiction regarding the capacity of the wastewater network in paragraphs 7.5.46 and 7.5.14 of the Scoping report. The ES should assess impacts to the existing drainage regime and its associated infrastructure (ID 4.5.6)	Paragraph 7.5.46 of the Scoping Report is referring to the current condition of the wastewater network where there are three pumping stations which have long running times during peak periods indicating stress on the system, namely PS03, PS07 and PS08. PS08 is currently being refurbished and fitted with higher capacity pumps which will accommodate future growth. PS03 and PS07 are both proposed to be replaced by new installations as part of the Project, and these would be sized to accommodate the projected growth. Paragraph 7.5.14 of the scoping report is true for the future situation (with Project). This PEIR considers the impact on the existing drainage regime and infrastructure where this is to be retained as part of the Project. Where new or replacement infrastructure is included in the Project, the assessment has been performed on this rather than the existing infrastructure.
The ES must describe how pluvial and fluvial flows will be managed during the construction phase and assess any significant effects of the proposed development (ID 4.5.7)	Fluvial and surface water/pluvial flood risk during the construction phase is considered within the Flood Risk Assessment at Appendix 11.9.1 and in Section 11.9.
Mitigation beyond what is proposed in the Scoping Report should be considered, specifically, to reduce consumption and to increase water recycling (ID 4.5.8)	Appropriate mitigation measures in terms of re-use, behaviours and new technologies have been examined, and applied to demand forecasts where appropriate to update future demand requirements. All considered efficiencies are detailed in Appendices 11.9.4.
The assessment of flood risk in the ES should take into account the potential impacts of climate change using the latest UK Climate Projections (UKCP) available at the time of preparation (ID 4.5.9)	The potential impacts of climate change have been taken into account within the Flood Risk Assessment provided in Appendix 11.9.1. The assessment follows the guidance published by the Environment Agency based on UKCP09. In July 2021 the published guidance for considering the future changes to peak river flow was updated to reflect UKCP18 data. The current assessment will be updated to

Details	How/where addressed in PEIR
	reflect the latest guidance to inform the Environmental Statement. However a review of the updated guidance indicates allowances for peak river flow have reduced and therefore the current fluvial flood risk mitigation strategy is considered to be conservative and would be able to incorporate the new allowances and meet the necessary regulatory requirements.
The assessment in the ES should, as appropriate, have regard to information being prepared by, Crawley Borough Council, Reigate and Banstead Borough Council and Mid Sussex District Council for their water cycle study (ID 4.5.10)	In the 'Gatwick Sub-region' Water Cycle Study (2020), Sutton and East Surrey Water (SESW) stated that there was sufficient capacity at their treatment works to meet projected demand. Additionally, at a meeting with GAL on 3/10/19, SESW stated that capacity issues at the treatment works would be unlikely as a result of the proposed works at the airport. Proposed future works at the treatment works will allow for additional demand, and Gatwick airport has two additional sources of supply which would allow alternate sources to be implemented, should the current source be deemed at risk.
The Applicant is advised to review the Inspectorate's Advice Note 18 when determining the scope and methodology of the Water Framework Directive assessment and consultation with the Environment Agency and LLFA (ID 4.5.11)	The Water Environment Regulations assessment (the relevant assessment to be undertaken following the UK's exit from the EU) is included as Appendix 11.9.2 and follows Advice Note 18.

11.3.4 Key issues raised during consultation and engagement with interested parties specific to the water environment are listed in Table 11.3.2, together with details of how these issues have been addressed within the PEIR.

Table 11.3.2: Summary of Consultation to Date

Consultee/issue	Date	Details	How/where addressed in PEIR
Environment Agency			
Flood risk, geomorphology, water quality and groundwater	15 August 2019	Introductory presentation to the Project and site visit. It is understood that the Environment Agency intends to update published flood zones with those developed from the new Upper Mole Hydraulic model (refer to	Sections 11.4 and 11.9.

Consultee/issue	Date	Details	How/where addressed in PEIR
		paragraph 11.6.55 and Figure 11.6.3).	
De-icer contamination and water quality	24 September 2019	Discussion and agreement of methodology and approach.	The methodology agreed for the impact assessment is outlined in Section 11.4 (paragraphs 11.4.28 to 11.4.30).
Flood Risk	25 November 2019	Presentation of emerging fluvial impacts and mitigation.	FRA in Appendix 11.9.1.
Flood risk, geomorphology, water quality and groundwater	28 January 2021	Reintroduction to the Northern Runway Project.	N/A
Flood risk	17 February 2021	Review of hydraulic modelling updates.	FRA in Appendix 11.9.1.
Water	29 April 2021	Review of draft PEIR and scoping review comments.	Throughout
West Sussex County Council as the Lead Local Flood Authority			
Flood Risk	September and October 2019	All primary flood risk related documentation is publicly available and has been sourced and reviewed. It is considered by GAL that this information sufficient to inform the PEIR.	Sections 11.4 and 11.9. FRA in Appendix 11.9.1.
Crawley Borough Council			
Groundwater	23 September 2019	Request for information to Crawley Borough Council on groundwater flooding and unlicensed abstractions.	Information has been requested and currently awaited.
Thames Water			
Wastewater	3 October 2019	Introductory presentation to the Project, hydraulic model construction and impact assessment methodology.	The PEIR includes an assessment of the impacts using the methodology outlined in the meeting. Thames Water will be undertaking their own assessment of impact upon their network.

Consultee/issue	Date	Details	How/where addressed in PEIR
Sutton and East Surrey Water (Water Supply)			
Water supply	24 October 2019	Introductory presentation to the Project, and water supply methodology for demand forecasting.	Sections 11.4 and 11.9, and SESW will be undertaking their own impact assessment.
Water supply	13 January 2020	SESW stated that their network and sources would be able to meet the increase in demand of the Project.	Throughout Section 11.9.

11.4 Assessment Methodology

Relevant Guidance

11.4.1 The assessment of the effects of the Project on the water environment has been undertaken in accordance with the legislation summarised in Section 11.1 and the guidance in the Design Manual for Roads and Bridges (DMRB) LA113 – Road Drainage and the Water Environment (Highways England *et al*, 2020). Where appropriate, informed professional judgement has been used, primarily in relation to geomorphology, where there is a lack of published guidance to date. Flood risk has been assessed in accordance with the requirements of the NPPF (Ministry for Housing, Communities and Local Government, 2021) and the accompanying online flood risk guidance. For the purposes of this assessment, the Project has been classed as 'Essential Infrastructure'. The NPPG (Ministry for Housing, Communities and Local Government, 2019) includes 'Essential transport infrastructure which has to cross the area at risk' within this category.

Scope of the Assessment

11.4.2 The scope of this chapter has been developed in consultation with relevant statutory and non-statutory consultees as detailed in Table 11.3.1 and Table 11.3.2.

11.4.3 Taking into account the scoping and consultation process, Table 11.4.1 summarises the issues considered as part of this assessment.

Table 11.4.1: Issues Considered within the Assessment

Issue	Potential Effects
Construction Phase (including Demolition): Water Environment	
Geomorphology	Sediment from construction areas washed off into watercourses increasing turbidity and impacting on morphology.
	Damage and loss of riparian vegetation.
	Damage and loss of natural bed and banks.
	Changes in flow (discharge and velocity) in channel and on floodplain.
	Changes in river continuity.
	Change in drainage strategy altering flows to receiving watercourses affecting flood risk, geomorphology and water quality.
	Modifications to groundwater recharge or flow paths could affect surface water flows due to connection via river terrace deposits.
Groundwater Resources	Construction dewatering affecting groundwater levels flows, creating potential settlement and mobilisation of contaminants.
	Piling introducing contaminants and creating contaminant pathways.
	Modifications to groundwater recharge or flow paths could affect surface water flows due to connection via river terrace deposits.
	Spillage at surface impacting the quality of groundwater resources.
Water Quality	Contaminated runoff or spillage from construction areas impacting surface water.
	Dewatering for foundations/sub-surface structures resulting in changes to surface water quality.
	Change in drainage strategy altering flows to receiving watercourses affecting flood risk, geomorphology and water quality.
	Dewatering for foundations, basement and other sub-surface structures resulting in changes to groundwater flow and quality of groundwater resources (including any private water supplies, if present).
Flood Risk	Temporary storage of materials reduces the volume of floodplain storage increasing flood risk.
	Increased flood risk due to existing surface water flow paths being interrupted, diverted or created by construction works, or due to increased compaction of ground or increase in impermeable area.
	Failure of temporary over-pumping arrangements of the surface water drainage and foul networks resulting in flooding.
	Dewatering for foundations, basement and other sub-surface structures resulting in changes to groundwater levels and flow routes and altering flood risk, exacerbated due to potential hydraulic connectivity between groundwater and surface water resources.
	Temporary works for outfalls etc. within river channels leading to increase in flood risk.
	Change in drainage strategy altering flows to receiving watercourses affecting flood risk, geomorphology and water quality.

Issue	Potential Effects
Surface Water Drainage	Discharges from construction activities leading to increased flows to the surface water network increasing the risk of flooding from the surface water drainage. Sediment from construction areas washed off into surface water drainage causing blockage and flooding. Construction activity leading to physical damage surface water drainage assets and causing flooding.
Wastewater	Increased flows during construction due to additional workers at the airport discharging to the wastewater network.
Water Supply	Increased demand on existing water supply/water resources to support construction activities.
Operational Phase: Water Environment	
Geomorphology	Narrowing of channel width with new/replacement concrete floodwalls. Potential increase in stream energies locally and damage to channel bed form and substrate.
	Homogeneity of channel cross-section with new culverts and new/replacement concrete floodwalls. Potential for loss of natural variance in velocities and secondary flows cells, leading to changes in velocity and geomorphological processes.
	Disruption of quantity and dynamics of flow and sediment supply, due to changes in bed and bank form, channel planform, cross-section and gradients. Potential effects due to new/replacement floodwalls, culverts, river realignment and creation of flood compensation areas.
	Increased sediment supply. Damage to channel bank form.
	Change in sediment dynamics due to changes in runoff.
	Change in physicochemical quality due to changes to natural bed and banks.
	Loss and damage to riparian zone due to new structures and/or additional access requirements for maintenance.
	Loss of natural bank form and material.
	Reduction in channel – floodplain coupling due to new/replacement floodwalls and culverts.
Water Quality	Additional de-icer being used to address increase in air traffic movements, with potential impact on surface water quality if not appropriately stored and if contaminated runoff is not treated effectively.
	Runoff from increased impermeable areas increasing sediment loading in watercourses.
	Potential for air quality effects on surface water quality, ie airborne contaminants being deposited on the ground, ultimately ending up in surface water.
	Runoff from upgraded junctions – DMRB assessment water quality (eg long-term use of herbicides/chemicals on hardstanding).
Groundwater Resources	Discharges to ground, eg from road drainage impacting groundwater flows or levels.
	Foundation/box structures, piling or cuttings/underpasses intercepting/diverting groundwater flow leading to impacts on groundwater levels and/or flow.
	Increased impermeable areas (such as car parks) leading to a reduction in recharge to shallow groundwater, impacting both groundwater levels and quality and associated

Issue	Potential Effects
	increased surface water flood risk. The assessment to consider effects on flow of any private water supplies, if present.
	Change in groundwater flow paths from sub-surface structures affecting groundwater fed ecological features (such as wetlands).
Flood Risk	Increased runoff due to additional impermeable areas increases flood risk.
	Changes to channel structures (eg culverts) reduces capacity and increases flood risk.
	Changes in drainage strategy – increased runoff leading to an increase in flood risk.
	Increased fluvial flood risk due to loss of floodplain storage arising from elements of Project within the floodplain.
	Increased flood risk due to existing surface water flow paths being interrupted, diverted or created by the Project, or due to increased impermeable area.
	New development placing more people (working and using the airport) or assets in path of potential reservoir failure flow path.
	Foundation/box structures intercepting/diverting groundwater flow leading to waterlogging and/or groundwater flooding.
Surface Water Drainage	Increased runoff due to additional impermeable areas increases flood risk.
	Changes to the A23 resulting in increased surface water runoff increasing flood risk.
Wastewater	Additional treated effluent from an increase in passenger and staff numbers impacting surface water quality if appropriate wastewater collection and treatment is not provided.
	Increased discharges to the existing foul sewerage system leading to flooding if insufficient capacity is available.
	The provision of new pumping stations creating a risk of flooding within the airport, both landside and airside (in event of failure).
Water Supply	Increase in potable water demand, requiring new infrastructure and affecting sustainability of supply from local water resource zone.

11.4.4 A summary of the effects scoped out of the assessment are presented in Table 11.4.2.

Table 11.4.2: Issues Scoped Out of the Assessment

Issue	Justification
Tidal/coastal flood risk	The airport is approximately 35 km north of the nearest coastline and ground levels are generally above 55 m above ordnance datum (AOD) and therefore are not at tidal/coastal flood risk. Accepted in the scoping response by PINS.
Groundwater impact on public water supply	There are no public water supply boreholes in the study area and the nearest Source Protection Zone for public supply boreholes is over 8 km away. Accepted in the scoping response by PINS.
Geomorphological impacts on Withy Brook and Man's Brook	The geomorphology of the watercourses is not considered to be impacted by the Project on Withy Brook and Man's Brook as they are upstream of the proposed works. No change would be expected on these watercourses. These

Issue	Justification
	watercourses are therefore scoped out given the distance and location of the watercourses and their surrounds from the proposed works.
Geomorphological impacts on Ifield Brook, Stanford Brook, Baldhorns Brook and the Mole (Hersham to River Thames confluence at East Molesey)	The geomorphology of the watercourses is not considered to be impacted by the Project on Ifield Brook, Stanford Brook and Baldhorns Brook as they are all >3 km upstream of any proposed works, and no change would be expected on these watercourses. The Mole (Hersham to River Thames confluence at East Molesey) has also been scoped out. Whilst it is an adjacent water body to the Project, it is over 60 km downstream of any proposed works. It has therefore been assumed that any impacts that the works may have on the Mole would not be significant this far downstream.

Study Area

11.4.5 The water environment study area is identified in Figure 11.4.1.

11.4.6 The study area is generally defined by a 2 km radius beyond the Project site boundary. Taking into account the nature of the Project, impacts are predicted to occur in close proximity to the Project site and it is considered that a 2 km study area would be sufficient to identify significant effects. This study area has been extended where a hydrological pathway is identified as part of the assessment phase once further data have been collected, the Project design evolves, site surveys have been undertaken and/or in response to consultation with stakeholders.

11.4.7 For geomorphological effects, a catchment study area has been defined that covers the catchments of the receptors identified and a smaller site study area has been defined based on the channels that would be directly impacted (Figure 11.2.1 in Appendix 11.9.3). The catchments of the receptors cover a combined extent of 237 km2, including the catchments of the River Mole upstream of Horley, River Mole (Horley to Hersham), Tilgate Brook and Gatwick Stream at Crawley, and Burstow Stream, which intersect the Project site. A smaller multi-reach scale study area was initially defined based on the extent of the Project site boundary. This has been further refined following the scoping stage based on a high-level review of velocity information taken from the new Upper Mole hydraulic model. The smaller study area encompasses sections of watercourses River Mole, Gatwick Stream, Crawter's Brook, Burstow Stream and Burstow Stream Tributary.

11.4.8 For flood risk and water quality, the study area cannot necessarily be defined by distance but rather the hydraulic and morphological characteristics and connectivity of water receptors. Consequently, the flood risk study area has been extended where necessary to fully assess the Project's impact upon watercourses, surface water and groundwater.

11.4.9 For wastewater the assessment of potential effects is limited to the supporting infrastructure at Gatwick. It is understood Thames Water will undertake an impact assessment of the Project on the downstream public sewerage conveyance and treatment system which will inform the ES.

11.4.10 For water supply the assessment of potential effects is limited to the water source, and does not currently cover deficiencies in water infrastructure, either internal or managed by SESW. It is understood that SESW will undertake an impact assessment of the Project on their water network infrastructure to identify any sections requiring upgrade as a result of projected increases in water demand that would inform the ES.

Methodology for Baseline Studies

Desk Study

11.4.11 The data sources that have informed the assessment of impact are summarised in Table 11.4.3:

Table 11.4.3: Data Sources

Source	Dataset
gov.uk Open Data	Source Protection Zones* Consented discharges* Thames River Basin Management Plan
Environment Agency	Licensed abstractions and consented discharges* Water quality monitoring locations* Abstraction licence strategy (Catchment Abstraction Management Strategy) (CAMS) Pollution incidents Groundwater vulnerability and soil leaching potential* Catchment Data explorer
British Geological Survey	1:50,000 digital geology mapping (superficial and bedrock)* Groundwater flood susceptibility mapping* Web based information from GeoIndex Onshore (British Geological Survey)
Hydraulic Models	Hydraulic models are available for the fluvial network, surface water network and wastewater network. Other models will become available to inform the ES for water quality.
National Library of Scotland	Historical Ordnance Survey maps
MAGIC Website	Designated sites* Aquifer designations* Nitrate vulnerable zones*
Lead Local Flood Authorities / Local Authorities	Unlicensed groundwater and surface water abstraction (awaited) Surface water flood management plans (SWMPs) Records of local flood history (awaited) Crawley Borough Council Strategic Flood Risk Assessment 2020
Gatwick Airport Limited	Historic ground investigation data Historical water consumption data Previous water demand forecast studies Wastewater network historical operational data Pollution control system monitoring data De-icer use records Historic weather records

Note: Items marked * accessed from Geosure reports

Geomorphology

11.4.12 The watercourse catchment extents have been used to undertake a desk-based review of geomorphological conditions (Figure 11.2.1 in Appendix 11.9.3). This provides an overview of the catchments, how they currently function and a summary of information on historical changes. This information has been augmented with information gained via a walkover survey in September 2019 (see Paragraph 11.4.24).

Water Environment Regulations

11.4.13 A Preliminary Water Environment Regulation compliance assessment has been undertaken using desk study methods. The Environment Agency's Catchment Data Explorer database (2018) was used to assess water bodies present within the Project's study area as part of a desk study review. The water body information provided as part of this includes their ID numbers, designation and classification details. The Water Environment Regulation compliance mapping for groundwater risk and status assessment was also reviewed along with any other supporting data.

11.4.14 The Water Environment Regulation compliance assessment includes:

- an assessment of the existing status of the main river bodies;
- an impact assessment, which considers the potential impacts of the activities associated with the Project;
- identification of ways to avoid or minimise impacts; and
- identification of whether an activity may cause deterioration or jeopardise the water body achieving Good Ecological Status or Potential (GES or GEP). Impacts are assessed largely through qualitative methods as the further survey work will be undertaken to inform the ES.

Water Quality

11.4.15 In 2013 GAL commissioned a study to hydraulically model the surface water pollution control system, calibrate it and use it as a tool for assessing system performance and water quality in the River Mole. The model was based on the records held by GAL which are largely the result of a comprehensive survey of the network undertaken and supplemented by drawings from recent works. The calibration was undertaken against winter rainfall and de-icer use for the winters of 2011/12 and 2012/13.

11.4.16 The model was used between 2015 and 2016 to develop a new operating manual for the pollution control system, which formed the basis for a new Environment Permit (issued by the Environment Agency) for the discharge from Pond D (upper) to the River Mole.

11.4.17 Baseline de-icer use has been taken from the worst day in 2017/18 which is the coldest year since the de-icer model was validated in 2013. The winter of 2017/18 was a particularly long and cold winter, and therefore both aircraft and pavement de-icer use was above average. A de-icer use forecast model generated during the 2013/14 modelling was validated against the 2017/18 de-icer use and air traffic movements. The worst day is defined as the day in which Gatwick de-icer records show the highest load of de-icer was applied. The day on which the greatest load was applied to pavement differed to the day on which the greatest load was applied to aircraft. Therefore, the greatest pavement de-icer load was combined with the greatest aircraft de-icer load to form a theoretical worst-case day. This forms the baseline load against which development impacts were assessed as set out in Table 11.4.4.

Table 11.4.4: Baseline Pavement and Aircraft De-icer Use (Winter 2017-18)

	Date	Volume (l)	Load (kg BOD)	Concentration (BOD mg/l)
Pavement de-icer - worst day in 2017/18	27/02/2018	135,336	62,534	462,064
Aircraft de-icer - worst day in 2017/18	02/03/2018	70,040	26,265	375,000

Groundwater

11.4.18 The development of the baseline groundwater conditions has been undertaken by reference to existing information. No Project-specific ground investigation (GI) has been undertaken at this stage, although data available from existing relevant GIs have been reviewed where available. No groundwater numerical modelling has been undertaken as this was not considered proportionate to the potential impacts on or from groundwater. Data sources used in the assessment are summarised in Table 11.4.3.

Flood Risk and Surface Water Drainage

11.4.19 A baseline assessment of all sources of flood risk and surface water drainage has been undertaken. The findings are reported in a FRA for the Project (see Appendix 11.9.1). The FRA has been undertaken in accordance with the planning practice guidance (Ministry of Housing, Community and Local Government, 2019) and NPPF (Ministry of Housing, Community and Local Government, 2021). It considers baseline flood risk to the Project site from all sources, including fluvial, surface water, groundwater, flooding from reservoirs and sewer/ water supply flooding.

11.4.20 The FRA has incorporated the findings of a desk study using publicly available information and of detailed hydraulic modelling. GAL, in partnership with the Environment Agency, has recently completed the development of a fluvial hydraulic model for the Upper River Mole catchment. This includes other watercourses in the vicinity of the airport that may be impacted by the Project. This model has been used to confirm the baseline fluvial flood risk conditions. Further detail on the model is provided in the FRA (Appendix 11.9.1).

11.4.21 The assessment of surface water flood risk was undertaken using a drainage and surface model built with the InfoWorks™ ICM software. 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. Further detail on the model is provided in the FRA (Appendix 11.9.1).

Wastewater

11.4.22 A computer hydraulic model of the wastewater system was built and calibrated in early 2019. It comprises a digital twin of the network serving the airport and is based mainly on asset survey data and calibrated against periods of dry and wet weather. The model was updated with peak 2018 daily passenger numbers, and the future base case scenario loading has been applied, allowing the impacts to be assessed.

Water Supply

11.4.23 Baseline consumption data have been completed through the analysis of previous forecasted demands as detailed in report 'London Gatwick – Water Masterplan 2020 & 2028 Forecast – Full backing report' (Gatwick Airport, 2018) and comparing predicted forecast demands with actual consumption values for 2017 and 2018, adjusting the demand curve accordingly and extrapolating out to 2038. This has been adjusted to account for any previously proposed water efficiencies which have yet to be implemented to the current facilities.

Site-Specific Surveys

11.4.24 A geomorphological walkover survey was undertaken of publicly accessible areas within the smaller study area to develop a detailed baseline of channel characteristics on the watercourses which are potentially impacted by the Project. The survey took place in September 2019 and water levels were higher than average following a prolonged period of heavy rainfall. As a result, the bed and much of the banks were not visible. However, some information on the banks, processes and existing pressures was recorded, supplemented by photographs taken on site.

11.4.25 Manhole and sewer flow surveys have been undertaken by GAL to inform the development of the surface water drainage and water quality hydraulic model of the airport. This model is in development so has not informed the PEIR but is anticipated to be completed in time to inform the ES.

Methodology for Impact Assessment

Geomorphology

11.4.26 The potential geomorphological impacts of the Project and flood risk mitigation components have been identified for each watercourse. The baseline assessment is taken to be indicative of the current morphological condition of the watercourses. Descriptions of the potential effects of construction and operational activities have been outlined using expert judgment of fluvial geomorphological processes. A qualitative assessment of the magnitude of the impacts, both spatially and temporally, has been established with reference to GIS information, baseline conditions (including existing morphological pressures) and the Project design. The sensitivity of each watercourse to impacts is based on the water body status published on the EA's Catchment data explorer website for Water Environment (Water Framework Directive) (England and Wales) Regulations 2017. This publishes data on the status of each water body, as required by the River Basin Management Plan. For water bodies not designated under the Directive, sensitivity is assigned based on diversity of morphological features and processes, state of natural equilibrium, and extent of artificial modification or anthropogenic influence.

Water Environment Regulations

11.4.27 The Water Environment Regulation compliance assessment is a detailed assessment comprising identification of baseline parameters for each water body potentially affected by the Project; impacts to relevant water bodies as a result of Project elements, incorporation of Environment Agency mitigation measures, and a cumulative assessment of other Projects. Impacts are assessed largely through qualitative methods as survey work is ongoing at this PEIR stage.

Water Quality

11.4.28 Projected future contamination from de-icer use has been calculated from a forecast model developed in 2013 and recalibrated against 2017/18 winter de-icer use. The model has been subjected to the potential increase in de-icer use associated with forecast winter air traffic movements and increase in airfield pavement areas for the maximum design scenario in 2038. The impacts have been assessed in terms of exceedance of available capacity and potential discharge to the water environment, compared to the baseline case taking account of the proposed mitigation works to be implemented by the Project.

11.4.29 Future de-icer use has been calculated for the 'worst winter day' described in paragraph 11.4.15. An uplift factor for pavement de-icer has been calculated assuming that 100% of any additional impermeable area generated within the airside boundary will be de-iced at the same application rate (litres per hectare) as reported in the baseline year worst day. An uplift for aircraft de-icer has been calculated based on projected increase in winter departures against the 2017-18 baseline year as summarised in Table 11.4.5.

Table 11.4.5: Estimated Future De-icer Requirements

Year	2017-18	2029	2032	2038
Winter departures	75,571	82,956	83,490	101,895
Planes de-iced	5,789	6,355	6,396	7,806
Aircraft de-icer uplift factor %	0	1.10	1.11	1.35
Airside impermeable area (ha)	265.4	Not calculated. Maximum design scenario (2038) assumed	Not calculated. Maximum design scenario (2038) assumed	271.5
Pavement deicer uplift factor (%)	0	Not calculated. Maximum design scenario (2038) assumed	Not calculated. Maximum design scenario (2038) assumed	2.31
Winter departures	75,571	82,956	83,490	101,895

11.4.30 The assessment assumes that the proportion of aircraft de-iced remains the same as the baseline, and therefore no allowance has been made for the impact of climate change potentially reducing the number of ATMs that will be de-iced due to predicted warmer winters.

Table 11.4.6: Estimated Future De-icer Use

	Date	Volume (l)	Load (kg BOD)	Concentration (BOD mg/l)	Deicer
Pavement de-icer - Worst day in 2017/18	27/02/2018	135,336	62,534	462,064	Mix of Konsin and Safegrip ECO2 used in 2017/18
Aircraft deicer - worst day in 2017/18	02/03/2018	70,040	26,265	375,000	Ethylene Glycol
Additional Northern Runway 2038 pavement de-icer - worst day in 2017/18	27/02/2018	24,315	5,349	220,000	Operational changes mean that only Safegrip ECO2 is used on pavements

	Date	Volume (l)	Load (kg BOD)	Concentration (BOD mg/l)	Deicer
Additional Northern Runway 2038 aircraft de-icer - worst day in 2017/18	02/03/2018	24,514	9,193	375,000	Ethylene Glycol
Total Northern Runway 2038 pavement de-icer - worst day in 2017/18	27/02/2018	159,651	35,123	220,000	Operational changes mean that only Safegrip ECO2 is used on pavements
Total Northern Runway 2038 aircraft de-icer - worst day in 2017/18	02/03/2018	94,554	35,458	375,000	Ethylene Glycol
Pavement de-icer - Worst day in 2017/18	27/02/2018	135,336	62,534	462,064	Mix of Konsin and Safegrip ECO2 used in 2017/18

11.4.31 Therefore the total volume of de-icer on the worst winter day increases by 24 m^3, and the total load decreases by 27,076kg BOD.

11.4.32 A detailed water quality model, based on the verified surface water model, is in development, and will be used to inform the assessment of impacts in the ES. The model has been revalidated against a flow survey that was completed in October 2019, and is currently being validated against observed water quality data.

Groundwater

11.4.33 Groundwater impacts have been evaluated based on desk study information, including historic GI surveys. Information on private water supplies and historic groundwater flooding events has been requested and is awaited from Crawley Borough Council. However, based on the Strategic Flood Risk Assessment (SFRA) for Crawley Borough (Crawley Borough Council, 2020) it is understood that there have been no groundwater flooding events recorded in the study area.

11.4.34 To develop an overview of the groundwater regime a summary (qualitative) conceptual site model has been developed to set the context of groundwater within the overall water environment and to support the groundwater impact assessment. The conceptual site model has been used to inform the sensitivity of groundwater as a resource and determine the significance of the effects.

11.4.35 The risk from groundwater flooding has been included in the FRA in Appendix 11.9.1 and summarised in Section 11.9.

Flood Risk and Surface Water Drainage

11.4.36 An assessment of Project's impact on flood risk has been undertaken and the findings have been reported in the FRA (Appendix 11.9.1). The assessment is primarily based on site-specific fluvial hydraulic modelling that has been developed by GAL, in partnership with the Environment Agency. The Project has been modelled by adding it to the baseline version of the hydraulic model and re-running the model. The modelling results have been used to assess the magnitude of impact of the Project on fluvial flood risk.

11.4.37 Results from the validated surface water drainage model have been utilised in combination with Environment Agency mapping to provide an assessment of the impact of the Project on surface water drainage flood risk.

11.4.38 At this stage, there is no modelling data available for joint fluvial and surface water flooding events. However, fluvial hydraulic modelling assumes that watercourses receive all catchment flows (including surface water runoff). Similarly, the location of watercourses has been considered within the surface water drainage model.

11.4.39 It has not been possible to quantify potential Project effects on groundwater and water infrastructure flood risk, consequently these assessments are qualitative in nature. Further details are included in Appendix 11.9.1.

Wastewater

11.4.40 The assessment of impacts has been undertaken using a calibrated computer hydraulic model of the wastewater sewerage system. The model has been subject to the projected increases in discharges during the various stages of the Project and the impacts assessed in terms of exceedance of available capacity and consequent flooding compared to the baseline case, taking account of the proposed mitigation works to be implemented as part of the Project.

Water Supply

11.4.41 An assessment of the impact on water supply infrastructure has been undertaken by assessing the Project elements that will increase water consumption through increased passengers and temporary construction workforce combined with potential efficiencies to be implemented during construction. This has been combined with updated baseline consumption information, as detailed in paragraph 11.4.23. The updated consumption values have been supplied to SESW to confirm the water source contains sufficient capacity for the required water consumption.

Assessment Criteria and Assignment of Significance

11.4.42 The water environment encompasses a number of disciplines covering all aspects of the water cycle. For each of these the sensitivity of receptors and magnitude of impact of the Project have been defined. These have then been combined to determine the significance of the effect of the Project (based on the elements identified in Chapter 5: Project Description) on each water element. The criteria for each of these assessments are included in Table 11.4.7, Table 11.4.8 and Table 11.4.9. The following sections explain the information utilised and approach to determine the significance of the effect.

11.4.43 The definition of effect and impact in terms of the EIA process are drawn from the glossary of the Highways Agency DMRB (Highways Agency *et al*, 2008), which provides general guidance:

- Impact: Change that is caused by an action; for example, land clearing (action) during construction which results in habitat loss (impact).
- Effect: Term used to express the consequence of an impact (expressed as the ‘significance of the effect’), which is determined by correlating the magnitude of the impact to the importance, or sensitivity, of the receptor or resource in accordance with defined significance

criteria. For example, land clearing during construction results in habitat loss (impact), the effect of which is the significance of the habitat loss on the ecological resource.

11.4.44 Impact magnitude takes into account the impact duration. The following definitions have been adopted for the PEIR:

- short term: A period of months, up to one year;
- medium term: A period of more than one year, up to five years; and
- long term: A period of greater than five years.

11.4.45 The significance of an effect is determined based on the sensitivity of a receptor and the magnitude of an impact. This section describes the criteria applied to characterise the sensitivity of receptors and magnitude of potential impacts. The terms used to define magnitude and sensitivity are based on and have been adapted from those used in DMRB LA113 (Highways England *et. al.,* 2020), which is described in further detail in Chapter 6: Approach to Environmental Assessment. The significance, sensitivity and magnitude have been assessed for each water discipline (see paragraph 11.1.1) and then combined into a single classification for the following water receptors:

- surface water;
- groundwater;
- flood risk; and
- water infrastructure.

11.4.46 These receptors, collectively, cover the potential impacts related to each topic area considered. The assessment of significance of the effect has been undertaken for the Project with embedded mitigation taken into consideration.

Receptor Sensitivity/Value

11.4.47 The sensitivity of receptors has been classified for each water environment discipline in accordance with the criteria set out in Table 11.4.7. As part of the assessment there are a number of potential effects which would arise from the risk of an impact rather than a certain consequence of the Project. An example of this is the risk of a pollution incident. The methodology takes account of the fact that in the worst case the consequence of these types of risk on relevant receptors could be high but the likelihood of the impact occurring would be expected to be low.

Table 11.4.7: Sensitivity Criteria

Sensitivity	Water Environment Receptor	Criteria
Very High	Surface water	Watercourse having a high (or potential to achieve high) Water Environment Regulations classification shown in a River Basin Management Plan (RBMP) and/or international designation related to wet features (eg a riverine Special Area of Conservation (SAC) or Special Protection Area (SPA)). Non Water Environment Regulations classified watercourses may be applicable if they demonstrate qualities such as: a channel in stable equilibrium and exhibiting a range of natural morphological features (such as pools, riffles and bars); diversity in morphological processes reflects unconstrained natural function; free from artificial modification or anthropogenic influence.
	Groundwater	Principal aquifer providing a strategic and regionally important resource of high quality and/or provides primary support to a watercourse or site, including groundwater dependent terrestrial ecosystems (GWDTE), protected under international legislation. Source Protection Zone (SPZ)1 of a public water supply.
	Flood risk	Essential infrastructure or highly vulnerable development (as defined in the NPPF flood risk vulnerability classification); essential transport infrastructure, essential utility infrastructure, wind turbines, emergency services stations and dispersal points required to be operational during a flood, basement dwelling, caravans and mobile homes, and installations requiring hazardous substances consent.
	Water infrastructure	Water use or infrastructure supporting human health, economic activity or environmental protection at a regional scale. For example, an integrated water resources system that serves the whole of the South East of England.
High	Surface water	Watercourse having a good (or potential to achieve good) Water Environment Regulations classification shown in a RBMP and/or national designation related to wet features (eg a riverine Site of Special Scientific Interest (SSSI)). Non Water Environment Regulations classified watercourses may be applicable if they demonstrate qualities such as: a channel achieving near-stable equilibrium and exhibiting a range of natural morphological features (such as pools, riffles and bars); diversity in morphological processes reflects relatively unconstrained natural function, with minor artificial modification or anthropogenic influence.
	Groundwater	Principal aquifer providing locally important resource or supporting a river ecosystem. Groundwater supports a GWDTE with a national conservation designation. SPZ2/SPZ3 of a public water supply.

Sensitivity	Water Environment Receptor	Criteria
	Flood risk	More vulnerable development (as defined in the NPPF); hospitals, residential institutions, dwellings, non-residential uses for health services, landfill sites and sites used for holiday or short-let caravans/camping.
	Water infrastructure	Water use or infrastructure supporting human health, economic activity or environmental protection at a regional scale at a nationally significant city scale.
Medium	Surface water	Watercourse having a less than good (or potential to achieve less than good) Water Environment Regulations classification shown in a RBMP and/or local designation related to wet features (eg a riverine Local Nature Reserve (LNR)). Non Water Environment Regulations classified watercourses may be applicable if they include channels currently showing signs of historical or existing modification and artificial constraints, and/or attempting to recover to a natural equilibrium and exhibiting a limited range of natural morphological features (such as pools, riffles and bars).
	Groundwater	A secondary aquifer providing water for agricultural or industrial use with limited connection to surface water and/or which provides support to a GWDTE of regional importance.
	Flood risk	Less vulnerable development (as defined in the NPPF); emergency services stations, commercial units, agricultural land, other waste treatment, minerals working, water treatment works and Sewage Treatment Works (if adequate pollution control is in place).
	Water infrastructure	Water use or infrastructure supporting human health, economic activity or environmental protection at a regional scale. For example, Crawley Sewage Treatment Works.
Low	Surface water	Minor local watercourses not having a Water Environment Regulations classification shown in a RBMP and no designated features. A channel currently showing signs of extensive historical or existing modification and artificial constraints. There is no evidence of diverse fluvial processes and morphology and active recovery to a natural equilibrium.
	Groundwater	A secondary aquifer of poor water quality and/or very low permeability that make exploitation of the aquifer for supply unfeasible, or which provides support to a GWDTE of local importance.
	Flood risk	Water compatible development (as defined in the NPPF); flood control infrastructure, marine facilities (docks, marinas etc), amenity

Sensitivity	Water Environment Receptor	Criteria
		open space and recreation facilities, and lifeguard/coastguard stations.
	Water infrastructure	Water use or infrastructure supporting human health, economic activity or environmental protection at a regional scale at a local or individual business or property scale. For example, a drinking water pumping station serving a hamlet or village.
Negligible	Surface water	Minor ephemeral drains and channels.
	Groundwater	Unproductive strata. No groundwater connection to local ecosystems or where changes to the groundwater regime are not expected to have an impact on local ecology.
	Flood risk	Water compatible development (as defined in the NPPF).
	Water infrastructure	Water use or infrastructure not supporting human health, economic activity or environmental protection.

Magnitude of Impact

11.4.48 The magnitude of impact on the water environment has been assessed based on the degree of change created by the Project and the impact this will cause on the receptor. Table 11.4.8 summarises the assessment criteria.

Table 11.4.8: Impact Magnitude Criteria

Magnitude of Impact	Water Environment Receptor	Criteria
High Adverse	Surface water	Loss or extensive change to a fishery. Loss of regionally important public water supply. Loss or extensive change to an internationally designated nature conservation site. Works would adversely impact the geomorphology on a waterbody scale. Reduction in water body Water Environment Regulations status.
	Groundwater	Loss of, or extensive change to, an aquifer. Loss of regionally important water supply. Loss of, or extensive change to GWDTE or baseflow contribution to protected surface water bodies. Reduction in water body Water Environment Regulations classification. Loss or significant damage to major structures through subsidence or similar effects.
	Flood risk	Increase in peak flood level (>100 mm).
	Water infrastructure	Loss of regionally important water supply. High risk of flooding from foul sewerage system (>5 incidents per annum).

Magnitude of Impact	Water Environment Receptor	Criteria
		Total failure of asset. Major outage. Major regulatory risk (eg significant risk of failure of Upper Tier permits, or of failing to achieve water supply quality standards). Likely to cause CAT1 pollution (see 11.4.49). Exceeds installed capacity of asset.
Medium Adverse	Surface water	Partial loss in productivity of a fishery. Degradation of regionally important public water supply or loss of major commercial/industrial/agricultural supplies. Works would adversely impact geomorphology of the waterbody at a multi-reach scale. Contribution to reduction in water body Water Environment Regulations status.
	Groundwater	Partial loss or change to an aquifer. Degradation of regionally important public water supply or loss of significant commercial/ industrial/agricultural supplies. Partial loss of the integrity of GWDTE. Contribution to reduction in water body Water Environment Regulations classification. Damage to major structures through subsidence or similar effects or loss of minor structures.
	Flood risk	Increase in peak flood level (50-100 mm).
	Water infrastructure	Degradation of regionally important public water supply. High risk of flooding from foul sewerage system (>5 incidents per annum). Temporary outage of asset. Moderate regulatory risk (eg moderate risk of failing). Reduced ability to achieve agreed performance standards (eg Water pressure requirements). Potential to cause CAT2 pollution.
Low Adverse	Surface water	Minor effects on water supplies and/or river quality. Works would adversely impact the geomorphology of the waterbody on a reach scale.
	Groundwater	Minor effects on an aquifer (flow, levels or quality), GWDTEs, abstractions and structures.
	Flood risk	Increase in peak flood level (10-50 mm).
	Water infrastructure	Minor effects on regional water supply. Low risk of flooding from foul sewerage system (<2 incidents per annum). Reduction in performance of asset, marginal regulatory compliance. Reduced ability to achieve level of service standards (eg Water pressure requirements).

Magnitude of Impact	Water Environment Receptor	Criteria
		Potential to cause CAT3 pollution.
Negligible Adverse	Surface water	Measurable but insignificant adverse effects on flow, supplies or quality. Works would adversely impact the geomorphology of the waterbody on a local scale.
	Groundwater	No measurable impact upon an aquifer and/or groundwater receptors.
	Flood risk	Negligible increase to peak flood level (≤10 mm).
	Water infrastructure	No measurable impact on regional water supply. Negligible risk of flooding from wastewater system (<1 incident per annum). Minor reduction in performance of asset, but still achieves regulatory standards.
No Change	Surface water	No loss or alteration of characteristics, features or elements; no observable impact in either direction.
	Groundwater	No loss or alteration of characteristics, features or elements; no observable impact in either direction.
	Flood risk	Due to the tolerance of hydraulic models used to assess flood risk impacts, it is often not possible to distinguish between No Change and Negligible impacts. Therefore, where model results are used to assess change in flood risk, negligible is used where the model is predicting No Change.
	Water infrastructure	No loss or alteration of characteristics, features or elements; no observable impact in either direction.
Negligible Beneficial	Surface water	Measurable but insignificant benefits on flow, supplies or quality. Works would beneficially impact the geomorphology of the waterbody on a local scale.
	Groundwater	Slight measurable positive effect (eg increased recharge) upon an aquifer and/or groundwater receptors.
	Flood risk	Negligible reduction in peak flood level (≤10mm).
	Water infrastructure	Slight measurable positive effect on regional water supply. Small decrease in demand on foul sewerage system. Minor improvement in performance of asset, but still achieves regulatory standards.
Low Beneficial	Surface water	Minor improvements in surface water quality (eg through removal/mitigation of a poor-quality discharge). Works would beneficially impact the geomorphology of the waterbody on a reach scale.
	Groundwater	Reduction of groundwater hazards to existing structures. Reductions in waterlogging and groundwater flooding.
	Flood risk	Reduction in peak flood level (10-50 mm).
	Water infrastructure	Minor measurable positive effect on regional water supply. Medium decrease in demand on foul sewerage system.

Magnitude of Impact	Water Environment Receptor	Criteria
		Increase in performance of asset; bring non-compliant asset into compliance. Improved ability to achieve LOS standards (eg water pressure requirements). Reduced risk of CAT3 pollution
Medium Beneficial	Surface water	Works would beneficially impact the geomorphology of the waterbody on a multi-reach scale. Contribution to improvement in water body Water Environment Regulations classification.
	Groundwater	Contribution to improvement in water body Water Environment Regulations classification. Improvement in water body CAMS (or equivalent) classification. Support to significant improvements in damaged GWDTE.
	Flood risk	Reduction in peak flood level (50-100 mm).
	Water infrastructure	Measurable positive effect on regional water supply. Significant decrease in demand on foul sewerage system. Reduced risk of outage of asset. Brings marginally compliant asset into regulatory compliance. Improved ability to achieve agreed performance standards (eg water pressure requirements). Reduced risk of CAT2 pollution.
High Beneficial	Surface water	Removal of existing polluting discharge or removing the likelihood of polluting discharges occurring to a watercourse. Works would beneficially impact the geomorphology of the waterbody on a waterbody scale. Improvement in water body Water Environment Regulations classification.
	Groundwater	Removal of existing polluting discharge to an aquifer or removing the likelihood of polluting discharges occurring. Recharge of an aquifer. Improvement in water body Water Environment Regulations classification.
	Flood risk	Reduction in peak flood level (>100 mm).
	Water infrastructure	Significant positive effect on regional water supply. Significant decrease in demand on foul sewerage system and sewage treatment facilities. Significantly reduced risk of outage of asset. Brings non-compliant asset into regulatory compliance. Significantly improved ability to achieve agreed performance standards (eg water pressure requirements). Significantly reduced risk of CAT1/2 pollution.

11.4.49 Pollution categories described above are based on the Ofwat / Environment Agency Common Classification Scheme (Incidents and their Classification: the Common Incident Classification Scheme, Environment Agency 2016):

- CAT1 – major, serious, persistent and/or extensive impact or effect on the environment, people and/or property.
- CAT2 – significant impact or effect on the environment, people and/or property.
- CAT3 – minor or minimal impact or effect on the environment, people and/or property.
- CAT4 – substantiated incident with no impact.

Significance of Effect

11.4.50 The significance of the effect upon the water environment has been determined by taking into account the sensitivity of the receptor and the magnitude of the impact. The method employed for this assessment is presented in Table 11.4.9. Where a range of significance levels are presented, the final assessment for each effect is based upon expert judgement.

11.4.51 In all cases, the evaluation of receptor sensitivity, impact magnitude and significance of the effect has been informed by professional judgement and is underpinned by narrative to explain the conclusions reached. The significance of the effect is assessed after consideration of proposed mitigation that would be in place.

11.4.52 For the purpose of this assessment, any effects with a significance level of minor or less are not considered to be significant in terms of the Infrastructure Planning Environmental Impact Assessment (EIA) Regulations 2017, as amended (referred to as the 'EIA Regulations').

11.4.53 However, specifically for flood risk, national planning policy requires that no increase in flood risk occurs elsewhere due to the Project. Therefore, any increase in flood risk to third parties due to the Project that is not of 'negligible' magnitude would be considered to require mitigation.

Table 11.4.9: Assessment Matrix for Assigning Significance of Effect

Sensitivity	Magnitude of Impact (Adverse or Beneficial)				
	No Change	Negligible	Low	Medium	High
Negligible	No change	Negligible	Negligible or Minor	Negligible or Minor	Minor
Low	No change	Negligible or Minor	Negligible or Minor	Minor	Minor or Moderate
Medium	No change	Negligible or Minor	Minor	Moderate	Moderate or Major
High	No change	Minor	Minor or Moderate	Moderate or Major	Major or Substantial
Very High	No change	Minor	Moderate or Major	Major or Substantial	Substantial

11.4.54 A description of the significance levels, assigned taking account of proposed mitigation, is as follows:

- Substantial: Only adverse effects are normally assigned this level of significance. They represent key factors in the decision-making process. These effects are generally, but not exclusively, associated with sites or features of international, national or regional importance that are likely to suffer a most damaging impact and loss of resource integrity. However, a major change in a site or feature of local importance may also enter this category.
- Major: These beneficial or adverse effects are considered to be very important considerations and are likely to be material in the decision-making process.
- Moderate: These beneficial or adverse effects may be important but are not likely to be key decision-making factors. The cumulative effects of such factors may influence decision-making if they lead to an increase in the overall adverse effect on a particular resource or receptor.
- Minor: These beneficial or adverse effects may be raised as local factors. They are unlikely to be critical in the decision-making process but are important in enhancing the subsequent design of the Project.
- Negligible: No effects or those that are beneath levels of perception, within normal bounds of variation or within the margin of forecasting error.

11.5 Assumptions and Limitations of the Assessment

11.5.1 The PEIR includes the following key limitations as part of the assessment for the water environment:

- A preliminary Water Environment Regulations compliance assessment has been undertaken at this stage of the Project and will be updated to a full assessment to inform the ES.
- The potential influence of groundwater flooding on flood risk from other sources (for example sewer flooding) has been considered qualitatively within the FRA.
- No site visit has been undertaken to inform the groundwater impact assessment as it was considered there were no observations of value that could be made at this time.
- No GI specific to the groundwater assessment has been undertaken.
- The Project design development is ongoing at the time of writing this assessment. Further design development is likely through the EIA process and the assessment will be updated for the ES.
- At this stage, the finished elevations of the development are not finalised, and therefore it is not possible to develop a full post development drainage model which is conceptual in nature. A more detailed assessment will be undertaken at a later design stage to inform the ES. Therefore, the mapped surface water flood extents and depths that are included in supporting figures of the 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 have not been assessed as the model is still being prepared. Therefore, the exact locations of flooding cannot be verified. The surface water flood extents and depths will be updated following the revalidation against the flow survey and will be taken into account within the FRA accompanying the application for development consent.
- At this stage, the design of proposed flood mitigation measures is subject to discussion with the LLFA and/or the Environment Agency. Therefore, details regarding their location and arrangements are subject to change.
- High water levels during the geomorphology walkover survey meant the banks and bed were not visible in most areas, however sufficient information was obtained to fully assess effects of relevance to this study.

- No geomorphological walkover has been undertaken on Burstow Stream as it was originally scoped out of the assessment. A further site visit to collect detailed baseline information will be undertaken for the ES stage.
- The detailed de-icer water quality is being validated. The assessment is based on what mitigation is needed to prevent any increase in volume or load of de-icer being discharged to the environment. The detailed modelling may indicate that there are other operational solutions to de-icer water quality management than the structural measures proposed in this report.

11.5.2 Key assumptions made at this stage of assessment include:

- New discharges during the operational phase to watercourses will be at or better than greenfield runoff rates.
- Scour protection will be designed for the outfalls using soft engineering where possible.
- Where there may be potential impacts on groundwater (for example by constraining or limiting groundwater flow, or the effects of dewatering) there are engineering solutions that can be embedded within the development and its construction to mitigate these impacts.
- Although much of the evidence for the groundwater assessment is based on historic information, it is assumed, given the relatively slow rate of long-term change in groundwater conditions, that this data may be used to represent the current (present day) baseline.
- The amount of pavement de-icer used per unit of airfield, and per air traffic movements (broken down by aerodrome reference code) during the operational phase will remain the same.
- Where there may be potential impacts to Water Environment Regulation water bodies, there are engineering and/or design solutions that can be implemented to reduce the potential deterioration to classification status.
- Thames Water will complete an assessment of the impact of an increase in passenger numbers as a result of the Project on water treatment capacity at Crawley and Horley that would inform the ES. GAL has identified a potential location for a new treatment works adjacent to the existing Crawley Sewage Treatment Works, should there be insufficient capacity for the Project at the two existing works that receive flows from Gatwick. The impact of these works has not been assessed as part of this chapter, however the Sewage Treatment Works is considered as part of the cumulative assessment. This PEIR includes an assessment on the Gatwick wastewater sewerage network capacity, not the treatment works.
- Winter 2017/18 is adopted as a good baseline for a cold winter year and climate change does not impact the volume of pavement or aircraft de-icer used.
- The airfield de-icer strategy does not change (eg there are no specific de-icing pads, the application rate of de-icer per aircraft and per impermeable area do not change and the rate of recovery of aircraft de-icer at stands does not change).
- Where surface access improvements are proposed, these would be accompanied by drainage ensuring that surface water runoff would be safely managed and restricted to pre-development or, where possible, greenfield runoff rates.
- Mapping of the consequences of the failure of the Gatwick Stream Flood Storage Area embankment will be modelled to inform the ES. It is anticipated that the inspection and maintenance regime would result in a very low likelihood of failure.

11.5.3 Despite the limitations listed in 11.5.1 and the requirement to adopt the assumptions listed, it is considered that sufficient information was available to provide a preliminary assessment of environmental effect of the Project. The assessment will be updated with additional information to inform the assessment presented in the ES.

11.6 Baseline Environment

Current Baseline

11.6.1 Key water environment features relevant to the Project are identified in Figure 11.6.1.

Geomorphology

11.6.2 A geomorphological baseline was established for the Mole, Gatwick Stream, Crawter's Brook and Burstow Stream Tributary and Burstow Stream (Figure 11.6.1). These watercourses were deemed to have the potential to be directly or indirectly impacted by the Project. Design changes in terms of proposed flood mitigation measures between the scoping stage and the PEIR stage have resulted in the following being scoped out of the assessment, given that they are no longer considered to be impacted by the Project: Mole (Horley to Hersham), Withy Brook and Man's Brook.

11.6.3 The catchment terrain of the scoped in watercourses is dominated by the Low Weald topography of the Wealden Basin, and underlain by clay of the Wealden Group. Surface geology mainly comprises alluvium and river terrace sands and gravels.

11.6.4 The Mole (upstream of Horley) catchment area is approximately 30 km2 and includes the urban areas of Crawley and Three Bridges, and Gatwick Airport (Environment Agency, 2018). The Mole forms at the confluence of the tributaries of Ifield Brook and Baldhorns Brook, north of Crawley, where it flows north eastwards through mainly rural land, receiving field drain runoff. This section of the watercourse has a naturally meandering planform and wide channel of 5 metres. At the southern perimeter of Gatwick Airport, the Mole is joined by Crawter's Brook. Crawter's Brook is a narrow stream of 2 metres which rises in Tilgate Forest in the south and flows northwards through Crawley via a network of culverts and open channels towards the southern perimeter of the airport. Crawter's Brook was realigned westwards along a straightened channel to meet the Mole. The Mole is then culverted under the existing main and northern runways. North of these, the Mole re-emerges from the culvert and is joined from the west by Man's Brook, a small 2-4 metre wide stream which rises at Tilgate and flows eastwards through agricultural land. The Mole is also joined by Westfield Stream, a small realigned and heavily modified channel which rises northwest of the runway, connecting to the Mole via a balancing pond. The Mole has been realigned around the northern perimeter of the airport, confined in a low valley between the airport infrastructure and urban residential areas. The Mole is culverted under the A23, at which point it meets the confluence with Gatwick Stream, forming the Mole (Horley to Hersham).

11.6.5 Gatwick Stream is a tributary of the Mole. It rises in Worth Forest below Clays Lake in West Sussex and flows northwards through Tilgate Forest, through Maidenbower, Three Bridges and Tinsley Green to the confluence with the Mole. Tilgate Brook is a tributary of Gatwick Stream, about 300 metres in length. Crawley sewage treatment works is located adjacent to the Gatwick Stream, downstream of Crawley. Gatwick Stream is approximately 8 km in length, with a catchment area of 14 km2 (Environment Agency, 2018). The river planform is sinuous as it flows through Tinsley Green: a mixture of wooded area and parkland. The width of the channel typically measures 4-5 metres along this section. Downstream of the sewage treatment works, the watercourse passes through a culvert under the London to Brighton mainline railway and flows northwards along an engineered straightened course adjacent the eastern airport perimeter. The watercourse is narrower at this point with an approximate width of 3 metres. The watercourse is culverted under the South Terminal building and under Airport Way, where it re-emerges into Riverside Garden Park, to the north of the A23, as a 900 metre long section of natural meandering channel. Downstream, the watercourse is straightened as it flows between the A23 and residential areas, before joining the Mole to the east of the A23.

11.6.6 Burstow Stream is a tributary of the Mole. It rises at Crawley Down in Sussex, flowing through mostly rural areas and the urban area of Copthorne, joining the Mole at Horley. Burstow Stream is approximately 2 km away from the airport, however, a small section which flows under the M23 motorway and a tributary is within the study area. Burstow Stream Tributary is a tributary of the Burstow Stream. It is a small channel fed by several drains from agricultural land and road drains. The stream is typically less than 2 metres in width. Current OS mapping indicates the stream originates south of Horley as a drain along Balcombe Road and is culverted under the M23 motorway. The stream flows mostly over ground through the residential area south of Horley.

11.6.7 Further details of the watercourses' evolution and detailed channel characteristics ascertained from the walkover survey are included in Appendix 11.9.3.

Water Environment Regulations

11.6.8 The baseline for Water Environment Regulations is set as the present day using data from 2019, as supplied by Environment Agency's Catchment Data Explorer database (2018). The water bodies assessed in the Water Environment Regulations compliance assessment are:

- Mole upstream of Horley (water body ID number GB106039017481);
- Tilgate Brook and Gatwick Stream at Crawley (GB106039017500);
- Burstow Stream (GB106039017520);
- Mole (Horley to Hersham) (ID: GB 106039017621); and
- Groundwater water body Copthorne Tunbridge Wells Sands (GB40602G602400).

11.6.9 These are identified in Figure 11.2.1 and Appendix 11.9.2 (Water Environment Regulations rivers with river labels).

11.6.10 The Mole upstream of Horley is classed as Heavily Modified with a current potential status of Moderate, and overall objective of Good. As stated in the Water Environment Regulations compliance assessment and on the Environment Agency's Catchment Data Explorer database (2018), there are no protected areas within Mole upstream of Horley. The Mole is considered to be of high sensitivity.

11.6.11 Tilgate Brook and Gatwick Stream at Crawley is Heavily Modified with a current potential status of Moderate, and an overall objective of Moderate. As stated in the Water Environment Regulations compliance assessment, and on Environment Agency's Catchment Data Explorer (2018), River Mole Urban Wastewater Treatment Directive is a linked protected area within the water body. This water body is considered to be of high sensitivity.

11.6.12 Burstow Stream is a river not designated as artificial or Heavily Modified. Its current status is Bad with an overall objective of Poor by 2027. There are two Nitrates Regulations sites within the water body. This water body is considered to be of medium sensitivity.

11.6.13 The River Mole (Horley to Hersham) is a river not designated as artificial or Heavily Modified. Its current status is Moderate, with an overall objective of Moderate. As stated in the Water Environment Regulations compliance assessment, and on Environment Agency's Catchment Data Explorer (2018), there are three Nitrates Regulations sites, River Mole Urban Wastewater Treatment Directive, and Mole Gap to Reigate Escarpment Habitats Regulations site within the water body. This water body is considered to be of high sensitivity.

11.6.14 The groundwater body is Copthorne Tunbridge Wells sands. Its current status is Good with an overall objective of achieving Good. This is considered to be of high sensitivity.

11.6.15 A summary of the surface waterbody Water Environment Regulations information is presented in Table 11.6.1.

Table 11.6.1: Surface Waterbody Water Environment Regulations Summary Information

Water Environment Regulations Waterbody	Mole (upstream of Horley)	Tilgate Brook and Gatwick Stream	Burstow Stream	Mole (Horley to Hersham)
River Basin Management Plan (RBMP)	Thames River Basin District RBMP: 2015	Thames River Basin District RBMP: 2015	Thames River Basin District RBMP: 2015	Thames River Basin District RBMP: 2015
Operational Catchment	Mole Upper Trib	Mole Upper Trib	Mole Upper Trib	Lower Mole and Rythe
Waterbody ID	GB106039017481	GB106039017500	GB106039017520	GB106039017621
Classed as Heavily Modified Waterbody	Yes	Yes	No	No
Water Environment Regulations Overall Status (2019)	Moderate	Moderate	Bad	Moderate
Physicochemical Status	Moderate	Good	Moderate	Moderate
Chemical Status	Fail	Fail	Fail	Fail
Hydromorphological Quality Elements	Supports Good	Supports Good	Supports Good	Supports Good

Water Quality

11.6.16 The baseline for water quality is based on the baseline for Water Environment Regulations status, using the same water bodies as receptors. Water Environment Regulations data are used as the baseline from which to assess future changes.

11.6.17 The airfield surface water drainage and pollution control system is included in Figure 11.6.7.

11.6.18 The western extent of the airfield drains to Pond A. During non de-icer contamination periods, surface water discharges through Pond A to the River Mole with no attenuation. When de-icer is in use (either pavement or aircraft), a penstock on the discharge point is closed, and the contaminated runoff is routed to Pond M.

11.6.19 Pond M receives flows from the Pond M Drainage catchment, including pumped flows from Pond A. If the water quality is better than a specific biochemical oxygen demand (BOD) and pH threshold, the runoff is pumped into the western ‘clean’ compartment of Pond M, attenuated, and discharged at greenfield runoff rates to the River Mole. If the water quality is worse than the threshold, it is retained in the eastern ‘dirty’ compartment of Pond M, before being pumped onwards and then drained under gravity towards Pond D.

11.6.20 Pond D is the key drainage pond receiving the majority of runoff from Gatwick. Runoff from the Pond D catchment drains under gravity to Pond D (lower) and is then raised by three Archimedes Screws. If the water quality meets the required standard, runoff enters Pond D (upper) via a series of separator channels and discharges to the River Mole. Discharge to the River Mole is at a consented rate, controlled by a series of hydrobrakes and pumps. The actual rate of discharge is determined by the volume of flow in the River Mole. Higher flow rates in the River Mole permit a higher discharge rate from Pond D (upper).

11.6.21 When the runoff meets the minimum required water quality standard of less than 10 mg/l BOD, Pond D discharges to the River Mole. When water quality is worse than the required standard, the pond discharges to the ‘dirty’ water pumped main which conveys runoff for further treatment and temporary storage at two long term storage lagoons with storage capacities of 220,000 m3 and 100,000 m3 and then ultimately to Crawley sewage treatment works operated by Thames Water. There are restrictions placed on the peak flow that can be transferred to the sewage treatment works under a trade effluent consent agreed with Thames Water.

11.6.22 There are two permitted environmental conditions where there may be a discharge of worse than the 10 mg/l BOD standard from Pond D (upper) to the River Mole. The first is if the total capacity of the two long term storage lagoons has been exceeded. The second long term storage lagoon was constructed in 2011 with a design to ensure that capacity was never exceeded even in a particularly cold and wet winter. The capacity has never been exceeded since the lagoon was constructed, and that period includes the very cold winter of 2017/18. Secondly, if the capacity of the conveyance system between Pond D (lower) and the long term storage lagoons is exceeded and Pond D lower was full, there will be a discharge to the Mole that could exceed the 10 mg/l BOD threshold. This type of discharge is classed as an Emergency Discharge by Gatwick and is needed to protect North Terminal / Apron, the fuel farm and the cargo and waste centre facilities from flooding.

11.6.23 The River Mole at the point of discharge is classified as Good Potential Status therefore the existing discharge arrangement does not impact on water quality.

Groundwater

11.6.24 The geology and hydrogeology of the site are set out in Chapter 10: Geology and Ground Conditions, although key information is repeated here to provide the context for the assessment of impact for groundwater resources. Mapping of both superficial deposits and bedrock strata is provided in Figure 11.6.8.

Geology and Hydrogeology

11.6.25 Groundwater occurs beneath the site in both superficial deposits of Alluvium and River Terrace Deposits (RTD) and in the Upper Tunbridge Wells Sand Formation, at depth beneath the site. Groundwater is also present in upper weathered layers of the Weald Clay Formation.

11.6.26 Alluvium is recorded across several parts of the study area, and comprises a heterogeneous mixture of clay, silt, sand and gravel. RTD are recorded beneath parts of the study area and comprise sand and gravel. The deposits are likely to continue beneath the mapped Alluvium, giving them an area of subcrop. Both Alluvium and RTD are largely associated with existing or historic watercourses. These associations are summarised in Table 11.6.2.

Table 11.6.2: Association between Superficial Deposits and Watercourses

Watercourse	Geological Association
South River Mole	Alluvium, River Terrace Deposits 1, River Terrace Deposits 2
North River Mole	Alluvium, River Terrace Deposits (Undifferentiated)
Historic River Mole north	Alluvium, River Terrace Deposits 1
Historic River Mole east	River Terrace Deposits 1, River Terrace Deposits 2
Diverted River Mole	Alluvium, None
South Crawter's Brook	Alluvium
Channelised Crawter's Brook	None
Historic Crawter's Brook	Alluvium, River Terrace Deposits 1
Gatwick Stream	Alluvium, River Terrace Deposits 1, River Terrace Deposits (Undifferentiated)
Burstow Stream	Alluvium, River Terrace Deposits (Undifferentiated)

11.6.27 The majority of the study area is underlain by bedrock of the Weald Clay Formation, principally a mudstone but with layers of clay and ironstone recorded to the west and south of the airport. Outcrop of the underlying Upper Tunbridge Wells Sand Formation occurs in the south east of the study area, comprising of interbedded sandstone and siltstone, and a single thick band of mudstone. The Upper Tunbridge Wells Sand Formation extends beneath the Weald Clay Formation in subcrop.

11.6.28 The Environment Agency aquifer designations for each of the different identified geological units are summarised in Table 11.6.3.

Table 11.6.3: Aquifer Designations and Lithological Description

Geological Unit	Lithology	Aquifer Designation
Alluvium	Clay, silt, sand and gravel	Secondary A Aquifer
Head	Clay, silt, sand and gravel	Secondary Undifferentiated Aquifer
River Terrace Deposits	Sand and gravel	Secondary A Aquifer
Weald Clay	Mudstone	Unproductive Strata
Upper Tunbridge Wells Sand	Interbedded sandstone and siltstone	Secondary A Aquifer
Upper Tunbridge Wells Sand	Mudstone	Unproductive Strata

11.6.29 Secondary A aquifers are described by the Environment Agency as: '*Permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers*' (What's In Your Backyard, Environment Agency, 2019)

11.6.30 Unproductive strata are described by the Environment Agency as: '*…rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow*'.. (What's In Your Backyard, Environment Agency, 2019)

11.6.31 The lateral extent of the aquifers is defined by their mapped outcrops. The alluvium and head aquifers are likely to be thin, no more than 2 metres at their thickest and become thinner towards the margins of the outcrop. The RTD are likely to be slightly thicker than the alluvium and head deposits, up to around 5 metres, but will similarly thin towards their margins. The more clay-rich alluvium may provide a degree of confinement where the RTD are present beneath, as well as containing perched water.

11.6.32 Groundwater is contained in the top of the Weald Clay Formation where this has been weathered to produce fractures. The Upper Tunbridge Wells Sand aquifer continues in subcrop beneath the Weald Clay Formation. The mudstone of the Weald Clay is generally considered to be an aquiclude (ie limiting the passage of groundwater) and is therefore likely to provide a high degree of confinement and limits the connectivity between groundwater in the upper aquifer of the superficial deposits and the lower aquifer of the Tunbridge Wells Sand. However, where the mudstone is thinnest, there may be some connection to the lower aquifer, if the mudstone is sufficiently weathered.

Groundwater Flow and Levels

11.6.33 The permeability of the alluvium and head is likely to be relatively low, dependent on the proportion of clay content; a higher clay content will result in lower permeability. The RTD have a relatively high permeability and storage. Normal values for such a formation are of the order of 100 m^2/day (Freeze and Cherry, 1979).

11.6.34 The Upper Tunbridge Wells Sand Formation has a moderate to low permeability (around 22 m^2/day), dependent on the proportion of siltstone (Jones *et al*, 2000). The layers of siltstone can also reduce the vertical connectivity within the formation, creating a stratified aquifer with perched groundwater. Faults within the Tunbridge Wells Sand formation can act as local conduits to groundwater flow, depending on fault throw and the juxtaposition of adjacent strata. However, they generally form barriers to regional flow, "compartmentalising" the aquifer (Jones *et al*, 2000).

11.6.35 Groundwater levels have been observed in historic GI at shallow depths within the superficial deposits, between around 0.8 and 3 mbgl (metres below ground level). Groundwater was also encountered within the weathered layers of the Weald Clay Formation, often at similar depths but in some locations at greater depths, up to 8 mbgl.

11.6.36 Groundwater monitoring is available from data loggers fitted to six boreholes associated with the existing runways for a period of over one year from March 2017, with an hourly data record. Depth to the water table was observed to vary through the year by over 1.2 metres in some locations, and as little as 0.7 metres in others. Only one of the boreholes shows a substantial seasonal fluctuation, with the variation in the others mostly relating to shorter term rainfall events, with very rapid increase in water levels and quick recessions. This is indicative of a small and low storage aquifer, possibly the weathered clay.

11.6.37 Where there is sufficient data, minimum recorded groundwater depths have been plotted and depth to groundwater contours generated. These are shown on Figure 11.6.8, although the paucity of data (in terms of its geographic spread) is such that these should be considered indicative only. Groundwater elevation data (ie metres above ordnance datum (mAOD)) level data was rarely available and not therefore recorded.

11.6.38 Despite the lack of elevation data, based on the topography of the airfield the water table in the superficial deposits is relatively flat, with little or very sluggish groundwater flow. Further, a lot of the superficial deposits are found in isolated areas, without any connection to others. What groundwater flow there is will follow the local topography, and as such deflect towards the local or historic watercourses (see Table 11.6.2:). The nature of the weathering of the Weald Clay means that the groundwater may be found in relatively isolated pockets without complete hydraulic connectivity across the study area.

Recharge and Surface Water Interaction

11.6.39 Groundwater recharge primarily occurs from infiltrating rainfall through exposed soils. The large swathes of impermeable surfaces (runways, taxiways, aprons etc) across the airport will locally limit this recharge rainfall.

11.6.40 Based on the geological mapping, the surface watercourses are all likely to be lined by superficial deposits, primarily Alluvium. Perched groundwater contained within layers of the superficial deposits is likely to be in hydraulic continuity with the water level in the watercourse. When river levels are high these may locally recharge groundwater in the superficial deposits. Conversely, when river levels are low, there may be a small contribution to river baseflow from the superficial deposits. However, the clay layers within the Alluvium may restrict the connection to the water contained within the underlying RTD.

11.6.41 Due to the generally low permeability of the bedrock, there is not expected to be any significant connection with the surface water. Overall baseflow contribution to the watercourses may therefore be relatively low.

11.6.42 There may be some regional contribution to baseflow from the Upper Tunbridge Wells Sand Formation, but this is only partially exposed to the extreme south east of the study area and is not likely to be significant in this location. However, south and east of Crawley (in excess of 5 km to the south east of the airport boundary) the Upper Tunbridge Wells Sand Formation provides spring flow to the headwaters of the Gatwick and Burstow streams (Environment Agency, 2013).

11.6.43 Overall baseflow contribution to the watercourses (from both superficial deposits and underlying bedrock) in the vicinity of the airport may therefore be relatively low.

Groundwater Abstractions and Discharges to Groundwater

11.6.44 There are no SPZs for public water supplies within the groundwater study area, and no drinking water safeguard zones. One licenced groundwater abstraction for general use has been identified approximately 1 km south of the airport boundary. It is considered that this most likely abstracts from the Tunbridge Wells Sand Formation, but this is still subject to confirmation. It is not clear if this source is used for drinking water, but if so, it would, by default, have an associated SPZ1 of 50 metre radius. The Mole abstraction licensing strategy (Environment Agency, 2013) identifies that the Tunbridge Wells Sands currently receives little pressure from groundwater abstraction (ie it is little utilised). Crawley Borough Council has been contacted to establish the presence of any registered, unlicensed abstractions. At the time of writing, no response has been received.

Table 11.6.4: Licensed Groundwater Abstractions

Licence no.	NGR	Annual license Quantity	Daily Max	Source	Start (Expiry)
TH/039/0032/016	526681 138924	47,450 m^3	130 m^3	Groundwater (Borehole)	17/10/12 (31/03/2029)

11.6.45 No active licenced discharges to groundwater have been identified in the study area.

Groundwater Dependent Features

11.6.46 No potential GWDTEs have been identified within the study area. No potentially groundwater dependent lakes or ponds have been identified within the study area. There may be a baseflow component from groundwater to the surface watercourses, but it is considered likely to be secondary, and the watercourses are therefore not substantially groundwater dependent.

Conceptual Site Model and Groundwater Baseline Summary

11.6.47 Groundwater occurs in relatively thin, shallow superficial deposits of Alluvium and River Terrace Deposits (classified together as a Secondary A aquifer) that underlie the airport in a number of discontinuous bands. These groundwater bodies may be discrete and isolated, although there may be more continuous shallow groundwater bodies close to or adjacent to existing and/or historic watercourses. Groundwater occurs near the surface, typically between 1 - 3 mbgl, although because of the flat gradient, groundwater flow is sluggish, particularly in those areas dominated by low permeability Alluvium. The shallow groundwater is primarily recharged by rainfall. There may be some hydraulic continuity between shallow groundwater and the surface watercourses, and locally groundwater may be recharged by, or discharge to, these watercourses, albeit that this is likely to be at low rates. There are no sites of ecological importance supported by shallow groundwater and there are no consented discharges to groundwater. Despite its designation as a Secondary A aquifer, due to its limited depth, extent and connectivity as well as expected low permeability and potential for poor water quality, this shallow upper alluvium aquifer overall has a low importance and the River Terrace Deposits a medium importance.

11.6.48 Beneath the superficial deposits lies the Weald Clay Formation, primarily comprising mudstones. This is a thick sequence of bedrock strata, classified as an unproductive aquifer. Although there may be groundwater in weathered zones near the surface, it generally acts as an aquiclude thereby largely precluding the passage of groundwater. This prevents any downward migration of groundwater from the overlying upper, shallow aquifer, although there may be some very limited downward connectivity where the mudstone this and is extensively weathered. Groundwater within the Weald Formation strata is of negligible importance.

11.6.49 Also classified as a secondary A aquifer, the Upper Tunbridge Wells Sand Formation lies, mostly at depth, beneath the Weald Clay. 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. There is one licensed abstraction assumed to be from the lower aquifer, about 1 km south of the airport perimeter. Although with a similar classification to the upper aquifer, this lower aquifer has a greater regional importance as an aquifer, and overall is of medium importance by reference to its aquifer designation and its local industrial/general use.

11.6.50 The sensitivity of groundwater aquifers is presented in Table 11.6.5.

Table 11.6.5: Sensitivity of Aquifers

Aquifer Unit	Importance/Sensitivity
Alluvium	Low
Head	Low
River Terrace Deposits	Medium
Weald Clay	Negligible
Upper Tunbridge Wells Sand (sandstone and siltstone)	Medium
Upper Tunbridge Wells Sand (mudstone)	Negligible

Flood Risk

11.6.51 The Project FRA (included here as Appendix 11.9.1) provides a preliminary assessment of all potential sources of flood risk, including fluvial, surface water, groundwater, sewer flooding and flooding from reservoirs, that would be updated to inform the ES. It addresses the key requirements of the Airports NPS and NPPF. Key findings regarding baseline flood risk conditions are summarised below.

Fluvial Flood Risk

11.6.52 Gatwick Airport is located in the Thames River Basin District and within the Upper Mole catchment. The River Mole flows through the airport, passing under the main and existing northern runways in culvert. Tributaries of the River Mole, including the Crawter's Brook, the Gatwick Stream and Westfield Stream all run through or adjacent to the Project site. Therefore, fluvial flood risk is the primary risk of flooding to the Project. The Environment Agency Flood Zones classification is used as the basis on which the Sequential Test is applied. It identifies the probability of flood risk 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 predicted impact 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, taking into account the presence of flood defences.

11.6.53 Flood Zones 2 and 3 are identified in Figure 11.6.2. 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 and 0.1 per cent (1 in 100 to 1 in 1000) AEP event) within the Project site. 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. Beyond the Project site boundary, the Flood Zones are quite extensive and include a number of potential receptors for the Project, including residential areas and transport infrastructure that serves both Gatwick and the wider region.

11.6.54 There are areas of the airport at risk of fluvial flooding in the existing scenario from a 1 per cent (1 in 100) AEP event. Should such predicted flooding occur it would be managed to ensure the safety of passengers and staff by the Gatwick Airport Flood Threat Plan.

Upper Mole Hydraulic Model

11.6.55 The Upper Mole Hydraulic Model was updated by GAL in partnership with the Environment Agency. The objective was to improve the understanding of flood risk in the area, particularly to Gatwick Airport. The model was completed in 2018 and further updated in 2021 to mirror small modifications made by the Environment Agency to flow distribution and structural elements in the model upstream of the airport in Crawley. It is understood that the Environment Agency used this version of the model to update their published flood zones in February 2021. Further information is included in the FRA (Appendix 11.9.1).

11.6.56 Based on the model results flooding occurs within the Project site boundary for the 1 per cent (1 in 100) AEP event. The flooding extents for the 1 per cent (1 in 100) AEP event based on the Upper Mole Hydraulic model have been compared to the published Flood Zone 3 in Figure 11.6.3. Similar to the published Flood Zones, flooding is primarily associated with the River Mole and Crawter's Brook on the western and southern sides of the airport, and with the Gatwick Stream on the eastern side, around the South Terminal building. However, the actual flooding extents are different from published Flood Zones. The differences between the two models and extents are discussed in more detail in the FRA (Appendix 11.9.1). These variances have been raised with the Environment Agency. The Gatwick upper mole model has been adopted for this PEIR and the future ES.

11.6.57 The information included in the Project FRA and summarised above provides the basis to apply the Sequential and, where necessary, Exception Test for the Project (refer to Appendix 11.9.1).

Surface Water Flood Risk

11.6.58 The assessment of existing surface water flood risk to the Project site has been based on the Environment Agency Risk of Flooding from Surface Water mapping (RoFSW) as well as surface water modelling produced specifically by GAL.

11.6.59 The Environment Agency RoFSW mapping was used to make an overarching assessment of the existing surface water flood risk to the Project. It was used to determine overall patterns of surface water flooding and therefore, to steer the assessment of risks, impacts and mitigation measures that follow.

11.6.60 According to the RoFSW extents identified in Figure 11.6.4, surface water flooding occurs in several areas of the airport. Areas at high risk (greater than 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 and 1 per cent (1 in 30 and 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. There are larger areas predicted to be at low risk (between 1 per cent and 0.1 per cent (1 in 100 and 1 in 1000) AEP of flooding) within the airport, particularly to the south of the main runway and in proximity to existing terminal buildings.

11.6.61 The surface water model currently being developed by GAL has also been used to provide an understanding of the existing level of surface water flood risk from the Project. The assessment of modelling results has been included in the Project FRA (Appendix 11.9.1). Overall, it is considered that the Environment Agency RoFSW mapping provides an informative assessment of existing surface water flood extents, while the GAL surface water model provides an understanding of the current runoff volume and rates, as well as an indication of how climate change would affect surface water flooding.

Groundwater Flood Risk

11.6.62 Groundwater is present in the superficial deposits, particularly the RTD, beneath the study area. This may occur in relatively small, discrete and discontinuous bodies, or, particularly adjacent to current and historic watercourses, may form more continuous groundwater bodies. Further information on the geological strata underlying the site is presented in Chapter 10: Geology and Ground Conditions.

11.6.63 Groundwater levels respond to direct recharge from rainfall but also, adjacent to water bodies, may respond to changes in river and stream levels. The rate of this response and the "outward" propagation of these levels from surface waters, may vary considerably across the site, depending upon the transmissivity and storage properties of the aquifer.

11.6.64 There are relatively sparse data for groundwater levels, but where these are available, they suggest groundwater levels are close to the surface (and may be less than 1 metre depth). Annual groundwater level fluctuation may be of the order 0.5 – 1.5 metres, but this is based on a very limited data set, mostly away from the influence of surface watercourses.

11.6.65 British Geological Survey (BGS) mapping identifies that there is susceptibility to groundwater flooding throughout areas of the site underlain by superficial deposits (ie superficial deposits flooding), with a moderate level of confidence. Areas susceptible to groundwater flooding are shown in Figure 11.6.5.

11.6.66 There is also identified susceptibility to groundwater flooding from the Tunbridge Wells Sand (clearwater flooding), but with a low level of confidence.

11.6.67 Based on the Crawley Borough Council SFRA there have been only two occurrences of groundwater flooding recorded in the Crawley area. These are not located near the airport. The SFRA identifies groundwater flood risk as being low for the Crawley Borough Council area as a whole and sets out that there is no conclusive evidence of elevated susceptibility to groundwater flooding within the borough.

Flood Risk from Reservoir Failure

11.6.68 Environment Agency Risk of Flooding from Reservoirs Maximum Outline data show that much of the western side of the airport would be at risk of flooding in the event of failure of the Ifield Mill Pond, while the eastern side, including sections of both terminal buildings, would be at risk from a failure of the long term storage lagoons adjacent to Crawley Sewage Treatment Works. Gatwick operates the two storage lagoons that receive contaminated runoff. The consequences of a potential failure from these structures has been mapped by GAL. In the event of a failure, flows would flood northwards, constrained from flowing westwards towards the airport by the London to Brighton railway. 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. The flood extent mapping does differ slightly between the two sources, which is considered to be due to differences in the level of detail included in the two models. However in general terms the models' prediction of risk is broadly similar The reservoir flood risk flood extents are illustrated in Figure 11.6.6.

Sewer/Water Supply Flood Risk

11.6.69 Gatwick has a complex water distribution and sewerage network that should be considered as a potential source of flood risk. The failure of sewer or water supply infrastructure within or upstream of the Project site could result in flooding, although the risk of this is likely to be low given the maintenance and monitoring activities undertaken by Gatwick to avoid this.

11.6.70 At the time of writing, it was reported by GAL personnel that part of the Thames Water network, located in Horley, periodically reaches its capacity, causing flows to back up to the airport, as was observed during the June 2019 flow survey. This is not thought to pose a risk of flooding to the airport as flooding from the Thames Water network (beyond the airport) would occur first due to the topography, and this would limit the potential for surcharging within the network at the airport upstream. However, it could have an operational impact on the GAL sewers as the surcharging would reduce velocities in the pipes and sediment deposition is more likely to occur although this should be dealt with under the normal maintenance of the network.

11.6.71 The Crawley Borough Council SFRA (Crawley Borough Council, 2020) does not include a specific section on recorded sewer flooding events. However, given the reported capacity issues on the Thames Water network despite the lack of evidence of any historical flooding to the airfield as a result of these, there is considered to be a medium risk of sewer flooding at the airport.

Wastewater

11.6.72 The airport foul wastewater network comprises two discrete systems: one serving the North Terminal and discharging to Thames Water's Crawley sewage treatment works, and a second network serving the South Terminal and a hotel development on the North Terminal site discharging to Thames Water's Horley sewage treatment works approximately 6 km to the north of the airport via the trunk sewerage system.

11.6.73 The North Terminal system is characterised by a combination of gravity networks discharging to pumping stations. The main terminal area is served by Pumping Station 8 (PS8), which in turn receives flows from two pumping stations draining the old Premier Inn site and part of the southern quadrant of the terminal building respectively. PS8 discharges flows to the west into a gravity sewer which also serves the fuel farm and the sanitation block (where waste from aircraft is discharged), plus other ancillary buildings: this gravity sewer routes south towards the cargo terminal and discharges into Pumping Station 7 (PS7). The west side of the cargo terminal and the Boeing hangar are served by Pumping Station 6 (PS6), which discharges into the PS7 gravity system. PS7 is a terminal pumping station which discharges flows directly to the Thames Water trunk sewer on London Road on the south boundary of the airport conveying flows to Crawley STW approximately 1 km to the east.

11.6.74 The central parts of the airport comprising Pier 6, the fire station and control tower areas are served by Pumping Station 2 (PS2) with the Pier 6 flows discharging via Pumping Station 44 (PS44) at the pier. PS2 pumps flows forward to a gravity network discharging to Pumping Station 3 (PS3). This system also receives flows from the Virgin hangar, the Central Area Recycling Enclosure (CARE) facility, old control tower/Estates Utilities and Environment (EUE) facilities (via Pumping Stations 4 and 5) and the fire training ground via Pumping Station 45 (PS45). All flows from PS3 are injected into one of the twin pumping mains from PS7 so also discharge to the trunk sewer on London Road.

11.6.75 The South Terminal system on the west side of the railway is a predominantly gravity network although there are two small pumping stations serving Pier 2 and a larger facility Pumping Station 40 (PS40) serving part of the International Departure Lounge, which also receives the pumped flows from Pier 2. Gravity flows from the main terminal building, offices and service facilities discharge into a gravity sewer running north along Perimeter Road East to which PS40 discharges. The system on the east side of the railway is served by two gravity networks discharging to Pumping Station 19 (PS19 serving the car hire and car parking facilities) or Pumping Station 23 (PS23 serving the hotel, office and fast food facilities). These both pump across the railway using pipes fixed to bridges to discharge into the East Perimeter Road gravity sewer. North of the terminal building, this gravity sewer receives flows from Pier 3, the police station and the new Premier Inn before routing north across the A23 dual carriageway to discharge to Thames Water's Horley STW sewer network. The current configuration of the wastewater system is shown on Figure 11.6.9.

11.6.76 In 2019 GAL commissioned a study to model the foul water system, calibrate it and use it as a tool for assessing the current performance (Jacobs, 2019). The computer model was based on the records held by GAL which are largely the result of a comprehensive survey of the network undertaken supplemented by drawings from recent works. The calibration was based on a short-term flow survey performed in February and March 2019 for which flow and depth monitors captured the performance of the network at ten strategic locations: the survey was fortunate to record the end of a particularly dry period and a severe storm, so the operation of the network in fairly extreme conditions was observed. Although the network is nominally for foul discharges only, the observed flows confirm that there were small pockets of the estate that discharged storm flows.

11.6.77 The model was used to evaluate the performance of the foul sewerage system against the busiest day of 2018 for passenger numbers. This evaluation was conducted for both dry weather and wet weather conditions equivalent to a 3.3 per cent (1 in 30) AEP storm (a typical return period for testing flood risk from sewerage systems). The assessment of performance found that the network was adequate for the foul flows discharged in dry weather, but in wet weather PS7 had long running times during peak periods indicating stress on the system and the upstream network was at risk of flooding in extreme storm events. The report recommended replacing the existing pumps with models of increased capacity. In addition, the flow survey observed a possible constraint in the capacity of the Thames Water sewerage network discharging to Horley sewage treatment works downstream of the airport connection.

11.6.78 Since the PS7 pump upgrade is likely to be implemented in the short term, it has been incorporated in the current baseline model. Also, included this model is an upgrade to PS40 and associated pumping main which GAL is implementing to address problems with low velocities in the existing main.

Water Supply

11.6.79 Potable water is supplied to Gatwick via a single interconnected network, supplied via a 300 mm main. This supply includes fire flow. There are two additional potential supply points to the internal Gatwick Network, but these are normally closed.

11.6.80 As previously described baseline consumption data was taken from the 'London Gatwick – Water Masterplan 2020 & 2028 Forecast – Full backing report, 2018' report (Gatwick Airport, 2018). This report details a previous study into the water consumption at the site and forecasts demand through to 2028 and has been included as an annex in Appendix 11.9.4 Water Supply. This report assumes that with no additional development consumption will increase to 749 Megalitres per year. This assumes no new water efficiency measures will be implemented.

Summary

11.6.81 Table 11.6.6 summarises the sensitivity of the identified receptors.

Table 11.6.6: Summary of Receptor Sensitivity

Receptor	Sensitivity
Surface Water	
River Mole	High
Tilgate Brook	High
Gatwick Stream	High
Water Infrastructure	Medium
Crawter's Brook	High
Burstow Stream	Medium
Burstow Stream Tributary	Low
Surface Water (airfield) ponds	High
Groundwater	
Secondary A superficial aquifer (alluvium)	Low
Secondary A superficial aquifer (RTD)	Medium
Secondary A Upper Tunbridge Wells Sand aquifer	Medium - High (latter based on Water Environment Regulations good status)
Flood Risk	
Residential properties	High
Industrial properties	Medium
Transport infrastructure	Very High
Airport Infrastructure	Very High
Airfield grassed areas	Low
Water Infrastructure – Wastewater	
Gatwick wastewater network	Medium
Water Infrastructure – Water Supply	
Gatwick potable water supply network	Low

Future Baseline Conditions

11.6.82 The assessment of likely environmental effects needs to consider any potential changes in the baseline that would alter the conclusions of the assessment. The primary source of future change with respect to the water environment baseline is considered to be climate change. A number of developments (see Chapter 4: Existing Site and Operation for a full description) have been included in the future baseline that are consented and would progress in the absence of the Project. They are summarised below with a description of their potential influence on the future baseline:

- Western Pier 6 extension – limited change to the water environment (undertaken on existing impermeable areas).
- Runway resurfacing – limited change to the water environment.
- Additional car parking – potential reduction in peak runoff due to local planning requirements for betterment.
- Local widening of North and South roundabout junctions – potential changes to impermeable area.
- Increased hotel capacity – increased water demand and wastewater flows.
- Potential efficiency savings in water consumption in line with Decade of Change (GAL, 2021).

11.6.83 Commentary on Wastewater infrastructure in the text relate to Gatwick's private wastewater network. The Thames Water public sewerage network to which the airport discharges may undergo some changes in response to the increase in flows subject to the outcome of the forthcoming Thames Water Development Impact Assessment (see paragraph 11.9.2).

Initial Construction Phase: 2024-2029

Surface Water, Groundwater, Flood Risk and Water Infrastructure (Wastewater and Water Supply)

11.6.84 For flood risk and surface water drainage, the main source of future change to the baseline conditions is climate change. For the initial construction phase, and as a conservative approach (see Table 11.6.8), a 25 per cent allowance on peak river flows has been applied to consider the impact of climate change on fluvial flood risk.

11.6.85 For geomorphology, evolution due to natural adjustment of the watercourses is expected. The River Mole and Gatwick Stream are currently exhibiting some evidence of channel adjustment. These channels have been assessed as having a low to moderate energy, with limited ability to actively move the course of the planform. It is anticipated that if left undisturbed, the watercourses would continue to adjust slowly laterally and potentially through incision within the defined wider corridor. The remaining watercourses in the study area exhibited less evidence of adjustment, with lower energies, and are considered unlikely to adjust significantly. No change to the baseline is therefore considered for the initial construction phase.

11.6.86 The Water Environment Regulations future baseline will be affected by climate change and the impacts caused to habitat because of water levels, higher probability of severe storms, and potential changes in species preference. These changes are difficult to predict and potentially extraneous to the changes in the water bodies as a result of construction and operation. Overall, there will be no significant effect as the water bodies respond to changes and attempt to reach a new equilibrium. However, notwithstanding this, within the context of the timeframe for the initial construction phase (2024-29), no climate change impacts are identified, and therefore no changes to the baseline are expected.

11.6.87 The increase in impermeable area associated with consented developments are very minor. Discharge is understood to be to surface water features and not to ground. As such for groundwater, no significant changes to the current baseline are expected.

11.6.88 For water supply, based on the programme of proposed works, the increase in water consumption has been calculated and combined with the updated forecast to give total water demand. Water demand for construction activities has also been estimated and added to get a net change in water demand. Based on the programme of works, no works undertaken will directly impact on water demand, and therefore the baseline remains unchanged.

11.6.89 There are two consented projects that are expected to increase hotel capacity by an additional 250 rooms before the project commences. These would have a very slight increase on wastewater loading and water supply but that increase is not anticipated to be significant.

Water Quality

11.6.90 Winter peak day ATMs will continue to increase and the amount of aircraft de-icer used will increase, assuming environmental weather conditions are the same as the baseline year (the cold winter of 2017/18). However, the impact of climate change and weather variability on de-icer use and discharges to the environment are challenging to predict. The latest projections of future climate change (UKCP18[3]) indicate that winters will become wetter and warmer on average which will reduce the amount of both pavement and de-icer applied. However, whilst winters are anticipated to become warmer on average, cold weather spells will still occur. The total amount of winter rainfall is expected to increase, and winter storminess might also increase.

11.6.91 As the impact of de-icer on the environment from Pond D is a complex relationship between de-icer application during cold weather and the impact of rainfall washing off, diluting and transporting the de-icer, a detailed assessment of the future baseline will only be possible when the new pollution control model is fully verified for use, which will be used to inform the ES in 2021.

11.6.92 Anecdotally, there is little available capacity for future development within the existing treatment systems. Therefore, the future baseline may need to include additional infrastructure or operational changes to mitigate the impact of additional ATMs and/or climate change. These mitigations cannot be planned until the pollution control model is validated, but the types of mitigations required would be similar to the type of mitigation required for the Project: Additional retention or additional treatment at a new car park Y facility and/or extension of Dog Kennel Pond.

11.6.93 Therefore, for the purposes of this assessment, the assessment of impact against baseline uses the worst-case scenario of assuming winter 2017/18 weather conditions, with de-icer load predictions based on peak winter ATMs in 2038.

11.6.94 Pond A is used to retain de-icer contaminated runoff after a rainfall event and will be reduced in capacity during construction. When Pond A reaches capacity, it discharges to the River Mole. To mitigate any potential impact of the reduced volume of storage available, a permanent overpumping facility will be installed to increase the rate at which this pond is emptied into the much larger Pond M. The rate of overpumping has not yet been determined but the detailed

[3] https://www.metoffice.gov.uk/binaries/content/assets/metofficegovuk/pdf/research/ukcp/ukcp-headline-findings-v2.pdf

water quality model will be used to ensure that there is no increase in discharge from the pond into the River Mole. The Project is also increasing the amount of attenuation storage in the Pond M catchment to ensure that the rate of discharge into Pond M does not increase. Further storage would also be provided by upsizing Dog Kennel Pond to mitigate the loss of storage at A Pond.

First Full Year of Opening: 2029

Surface Water, Groundwater and Water Infrastructure (Wastewater and Water Supply)

11.6.95 It is anticipated that airport growth and any effects from climate change would not have a significant effect on surface water drainage, geomorphology, the Water Environment Regulations assessment, groundwater, and water infrastructure, when compared to the baseline assessment, for the same reasons outlined above for the initial construction phase (2024-29). Therefore, changes to the baseline are not expected for the first year of opening (2029) for any of these aspects.

Flood Risk

11.6.96 For the first full year of opening, and as a conservative approach (see Table 11.6.8), a 25 per cent allowance on peak flows has been applied to consider the impact of climate change on fluvial flood risk.

Water Quality

11.6.97 Winter peak day aircraft movements will continue to increase and the amount of aircraft de-icer used will also increase, assuming environmental weather conditions are the same as the baseline year (the cold winter of 2017/18). As stated in paragraph 11.4.28 for the purposes of the PEIR, the assessment of impact against baseline adopts the worst case scenario of assuming winter 2017/18 weather conditions, with de-icer load predictions based on peak winter ATMs in 2029.

Interim Assessment Year: 2032

Surface Water, Groundwater and Water Infrastructure (Wastewater and Water Supply)

11.6.98 It is anticipated that airport growth and any effects from climate change would not have a significant effect on surface water drainage, geomorphology, the Water Environment Regulations assessment, groundwater and wastewater, when compared to the baseline assessment, for the same reasons outlined above for the initial construction phase (2024-29) and the opening year (2029). Therefore, changes to the baseline are not expected in 2032 for any of these aspects.

Water Quality

11.6.99 Winter peak day ATMs will continue to increase and the amount of aircraft de-icer used will increase, assuming environmental weather conditions are the same as the baseline year (the cold winter of 2017/18). As stated in paragraph 11.4.28 for the purposes of the PEIR, the assessment of impact against baseline uses the worst case scenario of assuming winter 2017/18 weather conditions, with de-icer load predictions based on peak winter ATMs in 2038.

Flood Risk

11.6.100 For the interim assessment year, and as a conservative approach (see Table 11.6.8), a 25 per cent allowance on peak flows has been applied to consider the impact of climate change on fluvial flood risk.

Water Supply

11.6.101 Based on the information supplied by GAL, improvements to the North and South Terminals are due to be completed by 2030, and hotel facilities will be completed by 2032. This will allow for projected increased in staff numbers and passenger numbers, it is estimated that in the worst-case if these facilities were full to capacity, this would generate an increase in demand of 280 Megalitres per year. In addition to the updated forecasted baseline consumption in 2038 of 749 Megalitres per year, and estimated consumption due to construction activities of 3 Megalitres per year, this gives a total demand for this period of 1,032 Megalitres per year. This calculation does not include for any water efficiencies or water recycling that would reduce consumption per passenger.

Design Year: 2038

Geomorphology

11.6.102 For geomorphology, evolution of the watercourses is expected due to the effects of climate change, natural channel adjustment, and meeting policy objectives. Over a medium to long-term time period, climate change could potentially alter the hydrological regime of the watercourses. Increased frequency/severity of droughts and floods could potentially lead to the watercourses adjusting to different patterns of erosion and deposition. However, it is likely that the adjustment would remain localised and of relatively low magnitude given the channel types. Natural channel adjustment will continue to occur on all watercourses. Left undisturbed, the watercourses would continue to adjust slowly laterally and potentially through incision within the defined wider corridor.

Water Environment Regulations

11.6.103 The Thames RBMP provides details of the anticipated ecological status (which is partly dependent on stream morphology) for the Water Environment Regulations water bodies within the study area by 2027 (Defra, 2015). The Thames RBMP outlines mitigation measures in the Mole catchment, these are listed in full in Appendix 11.9.2 Water Environment Regulations Assessment. Of note are the following which could lead to improvement in individual quality elements: tackling non-native species, removal of fish barriers, and restoration of more natural morphology where man-made modifications exist.

Water Quality

11.6.104 Winter peak day ATMs will continue to increase and the amount of aircraft de-icer used will increase, assuming environmental weather conditions are the same as the baseline year (the cold winter of 2017/18). As stated in paragraph 11.4.28 for the purposes of the PEIR, the assessment of impact against baseline uses the worst case scenario of assuming winter 2017/18 weather conditions, with de-icer load predictions based on peak winter ATMs in 2038. Therefore, this is the maximum design scenario assessed.

Groundwater

11.6.105 For groundwater, climate change predictions suggest that changes in rainfall patterns are likely to lead to overall reductions in groundwater recharge. For example, it has been suggested that there may be a 40 per cent reduction in potential groundwater recharge by the end of the 21st century (Airports Commission, 2014). However, by the design year, there may only be a limited quantum of change in recharge compared to the current baseline groundwater conditions in the vicinity of the airport. Any commensurate reduction in groundwater levels, should they occur, is likely to lessen the potential impact from the airport development.

Flood Risk and Surface Water Drainage

11.6.106 The Environment Agency's climate change allowances last updated in February 2021 (Environment Agency, 2016a) are the best national representation (from a guidance perspective) of how climate change is likely to affect flood risk for peak river flow and peak rainfall intensity available at the time of writing this chapter. The allowances for peak river flow were updated and republished by the Environment Agency in July 2021 to reflect UKCP18 data. This assessment continues to adopt the previous set of allowances based on the UKCP09, and the 2021 update will be used to inform the ES. The new set of allowances for peak river flow have reduced for the River Mole catchment, therefore the current assessment is considered to be conservative. Allowances for rainfall intensity are yet to be updated and republished. The uplift factor to be applied is determined by the location, design life and vulnerability classification of the proposed development. The uplift factors to be applied in small urban catchments are indicated in Table 11.6.7.

Table 11.6.7: Total potential change of peak rainfall intensity anticipated for 2010 to 2115

Applies to across all of England	Total potential change anticipated for 2015 to 2039	Total potential change anticipated for 2040 to 2069	Total potential change anticipated for 2070 to 2115
Upper End	10%	20%	40%
Central	5%	10%	20%

11.6.107 When determining the potential impact of climate change on rainfall, the guidance states that both the 'Upper end' and 'Central' allowances as outlined in Table 11.6.8 should be considered, to understand the potential range of the impact and that discharge rates should be restricted to the 'Upper end' allowance.

11.6.108 In this case, the assessment is undertaken based on a 40-year lifetime for the Project (up to 2069). It is considered that a longer design life would not be realistic given it is likely there will be further significant changes to the Airport in that timescale. Gatwick Airport 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. An allowance of 35 per cent has therefore been applied to incorporate the predicted impact of climate change for the design event peak river flow (see Table 11.6.8). The highways improvements are considered to have a longer lifetime of 100 years given the nature of highways design and duration, therefore a climate change allowance of 70 per cent has been adopted for peak river flow for these elements to assess the impact from and to fluvial flood risk. The twin approach has been confirmed in discussions between GAL and the Environment Agency.

11.6.109 Therefore, the 10 per cent and 20 per cent climate change allowances should be applied for peak rainfall intensity. However, as a conservative approach, the 20 per cent value has been adopted as the main climate change allowance for the assessment. The 40 per cent has also been tested as an exceedance scenario, in order to test the impact of a larger potential impact of climate change.

11.6.110 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 Thames River Basin. Table 11.6.8 indicates the recommended uplift factors for the Thames River Basin, in line with Environment Agency climate change allowances.

Table 11.6.8: Recommended climate change allowance for peak river flows

Applies to Thames River Basin	Total potential change anticipated for 2015 to 2039	Total potential change anticipated for 2040 to 2069	Total potential change anticipated for 2070 to 2115
Upper End	25%	35%	70%
Higher Central	15%	25%	35%
Central	10%	15%	25%

11.6.111 According to relevant guidance (Environment Agency, 2016), the Higher Central and Upper End allowances should be used for 'Essential Infrastructure' in Flood Zone 2. In this case, as a conservative approach, the assessment has been based on the 35 per cent climate change allowance, while the 70 per cent value has also been tested as an exceedance scenario.

11.6.112 It should be noted that the climate change guidance (Environment Agency, 2016a) is based on the UKCP09 climate projections. The Environment Agency published updated guidance for the consideration of future peak river slow in July 2021 to reflect UKCP18 data. This assessment adopts the previous set of guidance, however the 2021 guidance will be adopted for the ES. The new set of peak river flow allowances have reduced compared to those based on UKCP09 and therefore the current assessment is considered to be robust and conservative. The assessment of potential climate change impacts will be revisited for the ES, assuming that new guidance will be issued by the Environment Agency for climate change factors related to river flows and rainfall intensity, based on UKCP18 data.

Wastewater

11.6.113 No changes to the baseline are expected: the airport foul sewerage network itself is not expected to change. However, regional growth and climate change pressures on the downstream public wastewater collection and conveyance facilities may result in changes implemented by Thames Water. This will be considered by Thames Water in their Development Impact Assessment.

Water Supply

11.6.114 During the period to 2038, Pier 7 works will be completed, increasing water consumption by an additional 369 Megalitres per year. This increased total on-site consumption to a total demand for this period of 1,401 Megalitres per year. This calculation does not include for any water efficiencies or water recycling that would reduce consumption per passenger.

11.7 Key Project Parameters

11.7.1 The assessment has been based on the parameters identified within Chapter 5: Project Description.

11.7.2 Table 11.7.1 identifies the key parameters relevant to this assessment. Where options exist, the maximum design scenario selected is the one having the potential to result in the greatest effect on an identified receptor or receptor group. Effects of greater adverse significance are not predicted to arise should any other option identified in Chapter 5: Project Description be taken forward in the final design of the Project. The selection of the preferred option for other Project elements (eg CARE and Inter Terminal Transit System (ITTS) are less significant for this assessment.

11.7.3 The following sections place a high-level overview of the proposed works in a water environment context.

Alterations to the Existing Northern Runway, Taxiways and Holding Areas

11.7.4 The existing northern runway would be adjusted to reposition the centreline 12 metres further north. There would be a number of associated works to taxiways that would require the construction of new areas of hardstanding. Redundant areas would be broken out and removed. This would result in an increase in impermeable area and consequently surface water runoff volume (including potentially polluted runoff). It would also encroach into the existing floodplain and disconnect areas that currently flood from the floodplain.

Pier and Stand Amendments

11.7.5 A new Pier 7 is proposed to the north west of Pier 6, adjacent to the existing cargo facility covering approximately 10.1 hectares. It is not anticipated this would have a significant impact on the water environment as it would be constructed on existing impermeable areas and would not therefore affect existing runoff and drainage patterns.

11.7.6 There would be a series of modifications to existing stand provision across the airfield that would have the potential to alter the distribution of runoff and the use of de-icer which could affect water quality if unmitigated. However all runoff would continue to drain to the existing airfield ponds.

Reconfiguration of Existing Airport Facilities

11.1.1 A number of existing facilities would require reconfiguration, relocation or additional facilities to be provided, to accommodate the proposed changes to the airport, including CARE, cargo, the fire training ground, hangers, noise mitigation (eg walls and bunding) and internal access routes and forecourts. These elements have the potential to redistribute runoff across the airfield however runoff would continue to drain to existing ponds. The noise mitigation measures could sever or remove existing floodplain.

Hotel and Commercial Facilities

11.7.7 An increase in passenger and aircraft operations would require additional office and hotel provision to meet the needs of airport companies and passengers. Provision of new office space could provide for up to three new office blocks, each office building having a footprint of approximately 1,024 m^2. Three new hotels are proposed as part of the Project. The office and hotel elements could affect water infrastructure requiring the provision of additional water supply and an increase in wastewater flows. These developments would be undertaken on existing impermeable areas and would therefore not affect flood risk and drainage.

Main Contractor Compound (MA1)

11.7.8 This would be a securely fenced compound in an area west of the perimeter road on an area of hardstanding currently occupied by car parking. This could increase runoff to the drainage system and increase the risk of pollution to the water environment.

Airfield Satellite Contractor Compound

11.7.9 This would be a securely fenced compound anticipated to be to the west of Taxiway Uniform and south of the Boeing hangar currently comprising a construction compound for the Boeing hangar, grassland, a reed bed and a hedgerow. Parts of this compound would be within the existing River Mole floodplain.

Surface Access Satellite Contractor Compound, South Terminal

11.7.10 This would be a securely fenced compound of approximately 2 hectares of greenfield land located to the north of the South Terminal roundabout and Airport Way. The compound could increase runoff compared to the baseline situation that would need to be managed to prevent an increase to flood risk. It could also introduce the risk of pollution to the receiving watercourse(s) or sewers.

Car Parking

11.7.11 New car parking would be required on site in order to meet additional demand generated by the proposed increase in passengers, and to replace existing parking spaces that would be lost due to development associated with the Project. New car parking would be provided at North Terminal Long Stay, Multi-storey car parks J, Y and H and Pentagon Field. Excavations for new car parks could affect groundwater resources. The new Pentagon field parking is on an area of existing farmland that could affect flood risk and water quality by increasing discharges of potentially polluted runoff to watercourses.

11.7.12 For the provision of Purple parking at Crawter's Field the grassland and woodland would be cleared and used for parking, increasing the impermeable area, potentially increasing runoff rates and consequently flood risk and the risk of pollution to watercourses.

Surface Access Improvements

11.7.13 In order to accommodate the proposed increase in passenger numbers and taking into account other known and planned developments in the area, improvements are likely to be required to the South Terminal, North Terminal and Longbridge roundabouts and to add capacity and will include increasing the number of lanes on the A23 and M23 spur plus grade separated junctions. This could be detrimental to the water environment by increasing flood risk due to encroachment into the floodplain and increased runoff, it could be potentially detrimental to water quality by increasing the discharge of pollutants to receiving watercourses and the modifications to the existing Brighton Road bridge over the River Mole could affect geomorphology. Piling activities during construction could affect groundwater resources.

11.7.14 Other surface access improvements: rail and Inter-Terminal Transit System (ITTS), are not anticipated to affect the water environment.

Wastewater Treatment Works

11.7.15 Construction of a new wastewater treatment works would ensure capacity is maintained to meet the requirements of future passenger numbers produced by the Project. Excavations for construction could impact upon groundwater resources.

CARE Facility (Options 1 and 2) Phase 1 and 2

11.7.16 There are two options for the location of the new CARE facility. Its construction would require the breakout and removal of existing car park hardstanding, removal of existing greenfield areas of trees and potentially hedgerows. This would result in an increase in impermeable area and consequently runoff to the drainage network. Below ground works could impact on groundwater. The option and therefore location selected would not significantly alter the nature of the development or its effects.

Noise Mitigation Feature

11.7.17 Reshaping and relocation of the existing noise bund would involve the clearance of the young woodland planting which currently covers the bund. A new mitigation feature would be constructed adjacent to Lowfield Heath Road. This could cause localised changes to surface water flows and fluvial flood extents.

Fire Training Ground

11.7.18 The fire training ground would be consolidated and re-provided immediately to the north of its current location. This could change runoff characterises of potentially polluted water.

North Terminal Extension and Forecourt

11.7.19 The main improvements to the North Terminal would include an extension of the departure lounge, an extension of the baggage hall and an extension of baggage reclaim. Small amounts of hard and soft landscaping would be removed within the forecourt area and re-provided. The increase in passenger numbers that this allows would increase water supply requirements and wastewater produced. It would also increase impermeable area and consequently runoff.

South Terminal Extension and Forecourt

11.7.20 Construction and operation of a terminal building extension, including a two-storey autonomous vehicle transition space to Pier 7. This would result in increased passenger numbers and consequently water supply requirements and wastewater produced. It would also increase impermeable area and consequently runoff.

Offices at South Terminal

11.7.21 Construction and operation of two office blocks in car park H east of South Terminal and the Hilton Hotel could increase water demand and wastewater flows.

Fluvial Mitigation Measures

11.7.22 A number of mitigation measures are embedded into the Project to meet national planning policy to ensure no increase in fluvial flood risk to other parties. Details of these measures are included in Table 11.8.1 and the FRA (Appendix 11.9.1), but include:

- Museum Field floodplain compensation area;
- realignment and naturalisation of the River Mole downstream (north) of the northern runway;
- car park X floodplain compensation area (FCA); and
- Gatwick Stream floodplain compensation area.

Table 11.7.1: Maximum Design Scenarios

Element	Potential Impact	Maximum Design Scenario	Justification
Initial Construction Phase: 2024-2029			
Groundwater	Dewatering (groundwater flow, levels, settlement). Diversion of groundwater flow. Groundwater flood risk to buried structures/ services.	Approximate depths of excavations: Museum Field flood compensation area: 3.5 metres, east of Museum Field flood compensation area: 1.8 metres, car park X flood compensation area: 2.5 metres, Gatwick Stream flood compensation area: 3 metres, car park Y (drainage retention tank) 6 metres, fire training ground: 5 metres, new pumping stations: 10 metres, CARE, motor transport and surface transport facilities: 5 metres. Below ground works or surface works may impact recharge/ groundwater quality.	This scenario would result in maximum impact on groundwater flow and levels. Flood risk, surface water and geomorphology elements unaffected.
Geomorphology	Damage to River Mole banks and watercourse due to construction activities associated with River Mole diversion.		Works being undertaken within existing River Mole corridor to complete diversion.
Water Quality	Impact of additional treated de-icer contaminated runoff on river quality in the River Mole.	Worst winter day ATMs, worst winter day pavement de-icing, A Pond reduced in size, but permanent overpumping station to D Pond installed. Dog Kennel Pond increased in size to offset reduction in Pond A.	This scenario would cause additional de-icer contaminated runoff to be discharged to the River Mole if mitigation was not provided.
Flood Risk	Increased flood risk due to loss of floodplain storage.	Proposed airfield satellite contractor compound, Juliet West Taxiway and End Around Taxiways	This scenario would reduce floodplain storage, if no mitigation was in place (medium-term

Element	Potential Impact	Maximum Design Scenario	Justification
		encroaching into floodplain (refer to Chapter 5: Project Description).	impact for construction compound and long-term impact for taxiways).
Wastewater	Flooding arising from increased flows in the wastewater network exceeding capacity, potentially disrupting airport operations, particularly in and around the terminal buildings.	Peak wastewater flow discharges from passengers, construction workers and other airport related flows on the busiest day of the assessment year which constitutes the highest combined impact of normal airport flows coincident with construction activities, where this coincides with a 3.3% (1 in 30) AEP storm event.	This scenario is a common standard for urban drainage systems.
Water Supply	Increase in demand from construction activities. This could impact the water source upstream.	The maximum design scenario considered is for construction activities occurring within the construction phase by year, in addition to the future baseline forecast passenger demand increase.	Based on Project peak construction water demand.
First Full Year of Opening: 2029			
Water Quality	Discharge of diluted untreated de-icer to the River Mole from Pond D upper.	Not greater than Design Year: 2038	The worst-case design scenario has been assessed as being design year 2038. Assuming the 2017/18 weather conditions, maximum pavement area and maximum ATMs, no operational improvements in de-icer application and no change to treatment infrastructure is the maximum design scenario. No interim design scenario could have a greater impact on the environment.
Wastewater	Flooding arising from increased flows in the wastewater network	The maximum design scenario considered is for peak wastewater discharges on the busiest day of	This scenario is a common standard for urban drainage systems.

Element	Potential Impact	Maximum Design Scenario	Justification
	exceeding capacity. Potentially disrupting airport operations, particularly in and around the terminal buildings.	the assessment year for which the peak day passenger numbers are expected by GAL to increase by approximately 6 per cent from the 2029 baseline, where this coincides with a 3.3 per cent (1 in 30) AEP storm event.	
Water Supply	Ongoing construction activities will have an impact on water supply due to the increase in demand.	The maximum design scenario considered is for construction activities occurring throughout the year, in addition to the Baseline demand.	This scenario would represent the maximum demand for water supply.
Interim Assessment Year: 2032			
Groundwater	Dewatering (groundwater flow, levels, settlement). Diversion of groundwater flow. Groundwater flood risk to buried structures/ services.	Depth of excavation: East of Museum Field flood compensation area: 1.8 metres	This scenario would result in maximum impact on groundwater levels and flow.
Water Quality	Impact of additional treated de-icer contaminated runoff on river quality in the River Mole.	Not greater than Design Year: 2038	Car Park Y design has been based on worst case design scenario for year 2038. The 2017/18 weather conditions, maximum pavement area and maximum ATMs, no operational improvements in de-icer application and no change to treatment infrastructure represents the maximum design scenario. No interim design scenario could have a greater impact on the environment. Timing of provision of Car Park Y will be determined by detailed modelling supporting the ES and will

Element	Potential Impact	Maximum Design Scenario	Justification
			be in advance of any potential impact.
Wastewater	Flooding arising from increased flows in the wastewater network exceeding capacity. Potentially disrupting airport operations, particularly in and around the terminal buildings.	The maximum design scenario considered is for peak foul flow discharges on the busiest day of the assessment year for which the peak day passenger numbers are expected by GAL to increase by approximately 19 per cent from the 2032 baseline, where this coincides with a 3.3 per cent (1 in 30) AEP storm event.	This scenario is a common standard for urban drainage systems.
Water Supply	The potential impact on the water supply system is an increase in demand from ongoing construction activities and from the extensions to the North and South Terminals.	The maximum design scenario considered is for construction activities occurring throughout the assessment year, in addition to the forecast existing passenger demand increase.	This scenario would represent the maximum demand for water supply.
Design Year: 2038			
Flood Risk, Surface Water Drainage, Geomorphology, Water Environment Regulations and Groundwater	The assessment assumes the completed Project is in place.		
Water Quality – Deicer	The assessment assumes the Project is in place. De-icer forecasts are based on ATM forecasts for 2038 and assumes the whole airside pavement is de-iced. The maximum design scenario assumes worst winter day.		
Wastewater	The potential impact on the foul sewerage system is flooding arising from increased flows in the network exceeding the available capacity. This could disrupt	The maximum design scenario considered is for peak foul flow discharges on the busiest day of the assessment year for which the peak day passenger numbers are expected by GAL to increase by approximately 21 per cent, where	This scenario is a common standard for urban drainage systems.

Element	Potential Impact	Maximum Design Scenario	Justification
	airport operations, particularly in and around the terminal buildings.	this coincides with a 3.3 per cent (1 in 30) AEP storm event.	
Water Supply	The potential impact on the water supply system is an increase in demand from the predicted additional throughput of 13 million passengers per annum.	The maximum design scenario considered is for peak demand taking account of additional passenger numbers from completed improvements to the terminal.	This scenario would represent the maximum demand for water supply, driven by the increase in passenger numbers.

11.8 Mitigation and Enhancement Measures Adopted as Part of the Project

11.8.1 A number of measures have been designed into the Project to reduce the potential for impacts on the water environment. These are listed in Table 11.8.1. Also, measures to mitigate construction effects are outlined in Section 11.8.3.

Table 11.8.1: Mitigation, Monitoring and Enhancement Measures

Measures Adopted as Part of the Project	Justification
Mitigation	
Provision of compensatory flood storage	Floodplain storage would be lost due to ground raising for Project elements within the floodplain. Provision has been made to introduce new flood compensation areas (FCAs) as close as possible to areas where floodplain storage would be lost. These include: Museum Field FCA connected to the River Mole via a spillway that also connects to a new east of Museum Field FCA (between the River Mole and Museum Field); a flood compensation area at the existing car park X; and a new flood compensation area to the east of Gatwick Stream. The FCAs would include measures to reduce their own impact: ▪ Fish refuges on floodplain. For example, low points within the FCA could be connected to the watercourse by swales to encourage any fish that move with rising flood water to return to the river as flood waters recede. ▪ Design flow control structure to reduce water levels behind the embankment slowly. (If the water level receded rapidly fish are more likely to be stranded.) ▪ Any low points within the flood storage area should be connected by swales to encourage any fish that move with rising flood water to return to the beck as flood waters recede. ▪ Loss of aquatic habitat for fish should be mitigated by in-channel habitat elsewhere.

Measures Adopted as Part of the Project	Justification
Reconfiguration of impacted surface water attenuation facility (Pond A)	The storage volume of Pond A would reduce due to the proposed Taxiway Juliet and this volume needs to be compensated for elsewhere to ensure no increase in flood risk. A new below ground attenuation feature will be created south of the current runway that will mitigate for the additional impermeable area created in the A Pond and M pond catchment. A new overpumping facility at A Pond will ensure that there is no additional discharge from A Pond to the River Mole. The capacity of Dog Kennel Pond may be increased to offset the loss of volume from Pond A.
Relocation and reconfiguration of impacted surface water attenuation facility (Pond A)	A large volume of the existing Pond A storage would be lost to the proposed Taxiway Juliet and this volume needs to be compensated for elsewhere to ensure no increase in flood risk. Pond A would be relocated directly to the north of its current position. The volume of the relocated Pond A would accommodate increased runoff due to increases in impermeable area due to the Project within the catchment it drains.
Realignment of the River Mole	The proposed relocation of Pond A north of its existing location, requires the realignment of the River Mole. This would include the general enhancement of the River Mole channel area to increase its capacity. The existing River Mole culvert and syphon outfall structures would be extended as part of this work.
New culvert design	New culverts are proposed on the Burstow tributary and the extension of the existing River Mole culvert. These would include geomorphological mitigation: ▪ Design new culverts to be as short as possible to avoid tunnelling effect and light-dark barrier at threshold. ▪ Design new culverts to have rough bed/baffles to maintain water depth at low flows to allow fish passage.
Provision for new airfield syphons	Where proposed taxiways would bisect parts of floodplain areas, areas of floodplain would be disconnected. Two syphon connections are proposed to retain floodplain connection on both sides of the taxiway.
Surface access improvements drainage strategy	The surface access improvements proposed as part of the Project would result in additional surface water runoff due to the introduction of new impermeable area. As part of these works, it is proposed that a drainage network would be installed, consisting of carrier drains, filter drains, ditches and attenuation ponds, along with flow control arrangements to limit discharges to watercourses. Therefore, surface water runoff would be restricted to pre-development values, and where possible, greenfield rates. This would ensure no increase in flood risk as a result of these works.
Additional de-icer retention at Pond A	Pond A would be relocated, and a new BOD discharge control monitoring system would be implemented to ensure that discharges of diluted de-icer runoff to the environment would only happen under extreme weather conditions and would occur less frequently than the baseline situation. Improved attenuation and discharge control provided by the relocation of Pond A would ensure that all de-icer contaminated runoff would be retained within Pond A

Measures Adopted as Part of the Project	Justification
	and then pumped forward through the pollution control system for management at Pond D (lower).
Additional de-icer retention and/or retention at car park Y	A new retention and/or treatment system is proposed to be provided at car park Y to mitigate for the additional de-icer load associated with the increase in pavement area and the increase in winter ATMs. At this stage in the modelling, it is not possible to determine the most environmentally and cost-effective balance of storage and treatment. Therefore, a modular below ground system has been planned that can provide either retention only, treatment only, or an optimized combination of both, and would be of sufficient size to fully mitigate the additional de-icer load. It is currently planned that a subsurface load balancing tank and aerated gravel bed filter would offset any increased load arriving at Pond D (lower). Should an aerated gravel bed system not achieve the load reduction required, then the treatment process could be intensified to higher rate treatment processes such as moving bed bioreactor, although such a treatment system would require appropriate nutrient feed and would require to be primed at the start of winter and rundown at the end of the season. In the unlikely event that detailed modelling to support the ES shows there is insufficient land availability at car park Y for a subsurface treatment system and a load balancing tank, increased capacity could be provided to treat deicer contaminated runoff in Pond M and further reduce the load upstream of car park Y, although this is not anticipated to be required. Current deicer recovery rates are low by international standards (due to the temperate nature of our climate, the cost of maintaining a recovery fleet for intermittent recovery, and the type of deicer used). No consideration has been given to the use of deicer recovery at deicing pads, although this will be examined alongside detailed modelling to support the ES. It is possible that a deicer recovery system could offset the need for additional treatment infrastructure, and this would be a more sustainable option in terms of raw resource and energy use. The configuration of the pollution control system with the Project is shown on Figure 11.8.1.
Wastewater System Capacity Upgrades	The potential impact on the foul sewerage system is flooding arising from increased flows in the network exceeding the available capacity. This could disrupt airport operations, particularly in and around the terminal buildings. Wastewater improvements to the foul sewerage system as part of the Project would include the following: construction of new pumping station 7a to replace existing facility PS7 to provide additional capacity; replacement of pumps and pumping main at pumping station PS06 to provide additional capacity; construction of a new pumping station on the east side of the Brighton-London mainline railway to convey all foul flows from this area to Crawley STW to relieve the gravity outfall pipe discharging to Thames Water's Horley STW sewer network. The configuration of the wastewater system with the Project is shown on Figure 11.8.2.

Measures Adopted as Part of the Project	Justification
	Similar upgrades would also be required for the alternative wastewater disposal option of providing a GAL owned and operated sewage treatment works adjacent to Crawley sewage treatment works should Thames Water be unable to accommodate the future foul flows.
Geomorphological mitigation for River Mole diversion valley	Realignment of the River Mole would include geomorphological mitigation in its design. Creation of a more natural planform and a two stage channel would improve flow regime (not only for the 1:100-year flow), channel diversity and floodplain coupling. The design would include varied cross sections to mimic natural processes, bed and bank forms, and would be of a suitable river type for the bed gradient of the realignment in order to maintain sediment transport capability. Suitable substrate would be added to the diversion channel following the works.
Geomorphological mitigation for flood compensation areas	Soft/bio engineering would be used in preference to concrete where natural banks require protection at the connecting spillways to the new flood compensation areas. The bank form would also be varied where they are being altered/lowered to ensure natural variance of flow in the channel. Ecological planting would take place on the newly created floodplain compensation areas. This would restore natural vegetation to the floodplain whilst protecting the banks from erosion.
Geomorphological mitigation for culvert extensions	Culvert extensions on the River Mole and Burstow Stream Tributary would be designed with a depressed invert and a natural bed gradient in order to maintain sediment transport capability. The culvert would also be designed with splayed wing walls to reduce the light and dark barrier. There would be inclusion of baffles or a low flow channel to retain sediment in the culvert and create suitable depth of flow under a range of conditions.
Monitoring	
Water quality monitoring	GAL would continue to monitor the quality of water discharges to ensure compliance with environmental permits post Project. Given the increased de-icer loading, additional water quality monitoring within Gatwick's system would be implemented as part of the overall water quality management system.

Measures Adopted as Part of the Project	Justification
Enhancement	
All Water Environment disciplines	At this stage, no specific enhancement measures have been developed as part of the Project. However, the realignment of the River Mole and other flood mitigation measures would provide general enhancement by decreasing off-site flooding. As the Project develops, further opportunities for enhancements will be explored.

11.8.2 In addition to the measures identified above, a number of further measures are proposed in order to manage potential impacts associated with construction activities. These will be implemented through the Code of Construction Practice (CoCP). An outline CoCP is provided in Appendix 5.3.1.

11.8.3 For a Project of this scale there are a large number of measures that would be implemented to mitigate effects during construction. These would include measures such as the following.

- Constructing adequate temporary Sustainable Drainage Systems (SuDS) or conventional drainage to contain surface water and silt during the construction period.
- Identifying the location of services before any work commences to avoid any damage during construction.
- Ensuring adequate dewatering takes place during excavation activities or construction of subsurface features and foundations, in line with any permitting requirements.
- Ensuring dewatering does not mobilise existing contamination or lead to settlement or other such effects.
- Ensuring piling works do not create preferential pathways for contamination through a piling risk assessment.
- Ensuring the drainage system has adequate capacity to store any additional surface water runoff or groundwater required to be pumped out of excavations.
- Implementation of water efficiency measures to minimise additional water use, such as pressure management, grey water recycling and rainwater harvesting, and water efficient controllers on tap and urinals.
- Where river realignment is proposed, construction activities should be planned to ensure no increase in fluvial flood risk, with temporary mitigation provided if required.
- Where the construction of Project elements within the floodplain is proposed, phasing would be developed to ensure adequate mitigation is provided prior to the loss of any floodplain as a result of construction activities, where reasonably practicable. Where this is not practical, ensure temporary floodplain compensation is provided if the construction activities would increase flood risk elsewhere.
- Constructing the River Mole diversion offline and leave to vegetate over before flow is initiated down the channel. This would reduce the release of fine sediment and the likelihood of any unexpected large-scale channel change.
- Preparing an incident response plan prior to construction. This would be present on site throughout construction, informing all site workers of required actions in the event of a flooding incident.
- Using site materials free of contamination, avoiding any potential contamination of local surface water flow paths.

- Ensuring that wet cement does not come in to contact with surface water or groundwater.

11.9 Assessment of Effects

11.9.1 The assessment of effects has been undertaken for each element of the Project. The assessment takes a reasonable worst-case approach considering the completion of construction in 2038, in addition to effects during construction and an interim assessment year.

11.9.2 The capacity of the public sewerage network to which the private Gatwick wastewater system discharges and the downstream sewage treatment works is the responsibility of Thames Water under the terms of its license as the statutory authority. Discussions with Thames Water are ongoing to agree the quantity and distribution of discharges from the airport in the future. An assessment will be required to determine the impact on both the Thames Water sewerage network and treatment capacity. Thames Water will undertake a Development Impact Assessment to confirm whether there will be any impact from the Project. If capacity issues are identified, Thames Water will be responsible for reinforcing their network to support development and they will recoup their costs through infrastructure charges to GAL. The anticipated effect on the Thames Water wastewater infrastructure resulting from the Project is based on the projected increase in foul flows pending completion of any mitigation works. This, and the mitigation works required by Thames Water – if any – are to be confirmed during the EIA process and will be reported in the ES. In the event that there is not sufficient capacity or that improvements cannot be made to provide this capacity, an expansion to the existing Crawley Sewage Treatment Works may be required. This would be undertaken separately by Thames Water. However, an area of land has been identified to allow the expansion on land owned by GAL, in case this is required.

Initial Construction Phase: 2024-2029

11.9.3 This section sets out effects that could occur during the Project initial construction phase between 2024 and 2029.

11.9.4 For the purpose of this assessment, the classification of impact magnitude also takes into account impact duration. For the construction phase period, most impacts are considered to have a 'medium term' duration, defined as a period of more than one year and up to five years.

11.9.5 Mitigation would be implemented through the CoCP (an outline CoCP is provided in Appendix 5.3.1), and these measures are discussed in Section 11.8. For the construction phase, the magnitude of each impact has been determined based on professional judgement and taking account of the proposed mitigation measures, including the CoCP.

Surface Water

11.9.6 During the initial construction phase, works would generally be contained within the airfield with some additional activities taking place beyond the current operational airport boundary. The latter includes proposed surface parking at Pentagon Field (previously greenfield), construction of flood mitigation areas and the establishment of construction compounds. In addition, the works to the South Terminal roundabout would begin towards the end of this initial construction phase. Within this phase the following flood mitigation areas would be constructed:

- Modification of Pond A;
- Modifications to Dog Kennel Pond;
- River Mole channel diversion;

- Museum Field flood compensation area;
- East of Museum Field flood compensation area;
- Underground surface water storage at car park Y; and
- Car park X flood compensation area.

11.9.7 Construction of additional surface water storage and/or de-icer treatment and retention would be underway within the Pond A catchment and at car park Y. However, this/these facility/ies would be constructed offline without any potential impact on the capacity or performance of the existing system.

11.9.8 General airfield construction activities have the potential to impact on all watercourses. These impacts may include the following:

- Increase to suspended sediment loads due to channel disturbance from working in the channel, and runoff from construction areas. Impacts sediment transport and bed substrate downstream;
- Increase in potential for erosion of bed and banks due to excavation and earthworks, and removal of riparian vegetation;
- Loss of and damage to riparian vegetation due to vegetation clearance; and
- Disruption of quantity and dynamics of flow and sediment supply, due to changes in bed and bank form.

11.9.9 The airfield construction works would only have a limited impact in relation to water quality on the water bodies, predominantly because of distance away from any surface waterbodies, limited pathways, and mitigation during construction implemented through the CoCP.

11.9.10 Best practice measures to mitigate the construction impacts (implemented through the CoCP) would substantially control these impacts. The duration of these impacts would be medium term and the magnitude of the impact on Gatwick Stream (high sensitivity), River Mole (high sensitivity), Crawter's Brook (high sensitivity), Burstow Stream (medium sensitivity) and Burstow Stream Tributary (low sensitivity) would be negligible adverse. This would result in a **minor adverse** effect for Gatwick Stream, River Mole, Crawter's Brook and Burstow Stream, and a **negligible** effect for Burstow Stream tributary. This is not considered to be significant.

11.9.11 Construction of the diversion of the River Mole would begin in 2024. This would require excavation and earthworks along a 400 metre length in the floodplain adjacent to the existing channel. The existing channel would be infilled along this section, and the upstream and downstream of the diversion channel would be reconnected to the main watercourse. These activities may impact the existing watercourse through:

- destabilisation of banks due to bank top loading and ground vibration;
- damage to bank face due to modification and removal of bank material;
- destabilisation of banks due to vegetation clearance, as vegetation binds the bank material and draws water;
- disruption of quantity and dynamics of flow and sediment supply, due to changes in bed and bank form, channel planform, cross-section and gradients, as the channel adjusts; and
- loss of existing bed forms and sediment, due to infilling of the original channel.

11.9.12 Best practice measures implemented through the CoCP and the offline construction of the diversion of the River Mole channel would reduce the release of fine sediments and the likelihood of any unexpected large-scale change. Given the range of potential impacts, the length of the channel potentially impacted and the temporary nature of the impacts, the magnitude of the impact is considered low adverse on a high sensitivity receptor, resulting in a **minor adverse** effect, which is not considered significant.

11.9.13 The River Mole diversion and provision of floodplain compensation areas, which involve the lowering of ground levels are considered to provide the most detrimental impacts to the water bodies, mainly for their effects on habitat and fish during construction. During construction of the River Mole diversion, the magnitude would be considered low adverse in terms of water quality/Water Environment Regulations status elements on a receptor of high sensitivity, with potential deterioration of the Water Environment Regulations status elements, particularly biology over the short-term. This would result in a **minor adverse** effect during this phase which would not be significant

11.9.14 Construction of the culvert extension and re-provisioning of siphon to the north of the northern runway would have the permanent effect of loss of existing bed and bank form and material, and riparian vegetation. This could result in localised disruption of quantity and dynamics of flow and sediment supply. The length of the culvert extension is approximately 45 metres, covering the existing channel which has been heavily modified in the past. The mitigation outlined in the CoCP reduces the impact by re-establishment of riparian vegetation and minimising the area impacted. The area potentially impacted would also be relatively small, and part of the existing culvert would be replaced. There is the potential to increase suspended sediment loads due to channel disturbance from working in the channel. This would have a localised impact on the geomorphology of the channel due to the CoCP mitigation that will be put in place to reduce these impacts. The magnitude of the impact would be negligible resulting in a **minor adverse** effect which is not considered significant.

11.9.15 The works to create the Museum Field FCA would involve lowering the existing ground level by up to approximately 3.5 metres (this is the maximum excavation depth as existing ground levels vary). The flood compensation area would connect to the River Mole via a spillway which would involve lowering the watercourse bank. Impacts on the River Mole (high sensitivity) could include sediment pollution and a change in bed form. However, with the implementation of the best practice measures through the CoCP, the magnitude of the impact is assessed as low adverse resulting in a **minor adverse** effect on the River Mole. This is not considered to be significant.

11.9.16 The construction of a new flood compensation area is proposed East of Museum Field between the River Mole diversion and Museum Field flood compensation area . This would require lowering of the ground levels on the floodplain by up to approximately 1.8 metres below ground level. The area is expected to be returned to grassland following completion of the excavation works. These activities could have the effect of increased sediment loading within the River Mole (high sensitivity) during construction. However, with the implementation of the best practice measures through the CoCP and given that the flood compensation area is setback from the watercourse, the magnitude of the impact is assessed as negligible adverse resulting in a **minor adverse** effect on the River Mole. This would not be significant.

11.9.17 The works to provide the car park X flood compensation area, would involve lowering of the car park ground level. The flood compensation area would connect to the River Mole downstream via a concrete outfall. Construction of the concrete outfall headwall on the River Mole (high sensitivity) would have the effect of change in bank form, sediment pollution and localised changes to flow and sediment supply and could impact on hydromorphological elements of the Water Environment Regulations status for this water body. With the implementation of the best practice measures through the CoCP and given the length of channel impacted would be relatively small, the magnitude of the impact is negligible resulting in a **minor adverse** effect which would not be significant.

11.9.18 Ground lowering and increase of the depth of water in the car park X flood compensation area could have the effect of increased sediment loading within Crawter's Brook (high sensitivity) during construction. The Water Environment Regulations assessment suggests little change to water body status as a result, although there could be some negligible impacts to sediment variability, floodplain connection, and change to ecological habitat footprints. The flood compensation area also has potential to result in direct effects on biological elements of the Water Environment Regulations, including loss of habitat and fish stranding. The CoCP would mitigate for increased sediment loading to the channel, and any floodplain/watercourse exchange of physical indicators. The area impacted would be relatively small and set back from the watercourse, therefore the magnitude of the impact is considered to be negligible. This would result in a **minor adverse** effect on a high sensitivity receptor, which is not significant.

11.9.19 The effect of the increased use of de-icer due to the increase in ATMs is fully mitigated by the additional storage provided to retain de-icer contaminated runoff, therefore the significance of effect is **negligible**.

Groundwater

11.9.20 Excavation for building foundations and other infrastructure could result in dewatering of the superficial aquifers which could impact on groundwater flows, levels, and ground settlement. Dewatering activities would be minimised where possible with best practice measures, including local control on discharge volumes and drawdown. Potential impacts on changes in water levels and flow, as well as settlement, would be subject to local evaluation as impacts are likely to be localised and short term. Groundwater resource impacts on the secondary A superficial aquifers as a whole are expected to be low adverse for these low or medium sensitivity receptors. This would result in a **negligible/minor adverse** effect which would not be significant.

11.9.21 Piling for building foundations could result in the introduction of contaminants or the creation of new contaminant pathways to the secondary A superficial aquifers. Best practice and mitigation measures identified as part of the piling risk assessment would control these impacts. This would result in a low adverse impact on the secondary A superficial aquifers (low or medium sensitivity receptors). This would result in a **negligible/minor adverse** effect, which is not significant.

11.9.22 There are not likely to be impacts from dewatering or piling activities on the deeper Upper Tunbridge Wells Sand aquifer (and any water sources therein) as it is isolated beneath the impermeable Weald Clay resulting in **no change**.

11.9.23 Construction of sub-surface structures could result in the diversion of groundwater flow, mobilisation of contaminants and groundwater flood risk in the superficial aquifers. Local evaluation and best practice would be adopted via the CoCP to ensure sub-surface structures are constructed to minimise impedance to groundwater flow. This would result in a low adverse impact on receptors of low or medium sensitivity. Therefore, the effect would be **negligible/minor adverse** which would not be significant. There are unlikely to be impacts on the deeper Upper Tunbridge Wells Sand aquifer, resulting in **no change**.

11.9.24 Construction of the Museum Field flood compensation area has the potential to intercept shallow groundwater. However, the Museum Field flood compensation area is entirely located on the mapped outcrop of the Weald Clay Formation with no superficial deposits. There is therefore likely to be only minimal groundwater seepage into any excavation. This would result in a low adverse impact on receptors of low sensitivity. Therefore, the effect would be **negligible** which would not be significant.

11.9.25 Spillage of contaminants at the surface could impact the quality of groundwater. Best practice measures to mitigate the construction impacts (implemented through the CoCP) would substantially control these impacts. The duration of these impacts would be medium term and the magnitude of the impact on the secondary A superficial aquifers as a whole are expected to be low adverse for these low or medium sensitivity receptors. This would result in a **negligible/minor adverse** effect which would not be significant.

Flood Risk

Surface Water Flood Risk

11.9.26 Existing surface water flow paths may be interrupted, diverted or created by construction works, due to increased compaction of ground, increase in impermeable area, or by level changes as a result of temporary works. The discharge of groundwater as a result of dewatering of foundations, basement and other sub-surface structures could result in changes to surface water flow paths. Therefore, any increase in surface water runoff that could potentially not be conveyed by the existing drainage system would be managed on site or dealt with through temporary drainage. This could result in a negligible magnitude of impact (ie <10 mm change in flood depth) on all receptors, although no specific instances where this is likely have been identified at this stage. This would result in a **minor adverse** effect for residential properties (high sensitivity), transport infrastructure (very high sensitivity) and airport infrastructure (very high sensitivity); and a **negligible/minor adverse** effect on industrial properties (medium sensitivity) and airfield non-operational areas (low sensitivity). These effects are not considered to be significant.

11.9.27 Increased surface water flood risk could also occur as a result of changes in rates and volumes of surface water runoff being discharged into the existing drainage system. As mentioned in Section 11.8 and in accordance with the CoCP, the drainage system would be designed to ensure it has adequate capacity to store any additional surface water runoff at all stages of the construction phase. Therefore, any increase in surface water flood risk would result in **no change** to residential and industrial properties, and transport infrastructure, and a negligible adverse impact on airport infrastructure and grassed areas. The effect on airport drainage infrastructure therefore has been assessed as **minor adverse** and **negligible/minor adverse** for airfield infrastructure and grassed areas respectively. These effects are not considered to be significant.

Fluvial Flood Risk

11.9.28 Loss of floodplain storage could occur due to construction activities in floodplain areas, including the introduction of construction compounds and works in river channels (eg for outfalls), increasing fluvial flood risk. The receptors considered in the assessment of flood risk have been identified as: residential properties (high sensitivity), industrial properties (medium sensitivity), transport infrastructure (very high sensitivity), airport infrastructure (very high sensitivity) and airfield grassed areas (low sensitivity).

11.9.29 The airfield satellite contractor compound (programmed to be established in 2024) would be located adjacent to the River Mole and falls within the floodplain. It has been assumed that this compound would be flood protected with a bund. Sections of the Museum Field, car park Y and car park X solutions would be implemented within this period (in advance of loss of floodplain), mitigating the risk of flooding from the loss of floodplain from the airfield satellite contractor compound. All other proposed construction compounds are expected to be located outside of flood risk areas.

11.9.30 Hydraulic modelling has been undertaken to assess the impact of the construction compound on flood risk using the 1 per cent (1 in 100) AEP event including a 25 per cent climate change allowance. A 25 per cent allowance is in accordance with Environment Agency guidance (EA, 2016a) for the construction timeframe. It has been shown that there would be no adverse impacts to flood risk expected due to the introduction of the construction compound with mitigation in place, including suitable construction phasing applied prior and during construction (see Section 11.8). The compensation measures proposed to mitigate the loss of floodplain would also offer betterment (mainly up to 50 mm flood depth decrease) in several areas within and outside of the Project site boundary. Full details of the change in flood depth as a result of the Project are presented in the FRA (Appendix 11.9.1).

11.9.31 The diversion of the River Mole has potential to increase flood risk due to the temporary works required within the river channel and the floodplain to enable the diversion to be safely undertaken. The works would be programmed to ensure that as much of the new channel as practicable is completed prior to any loss of existing channel capacity. Any loss of channel capacity would therefore be of minimal duration and the contractor would have measures in place, such as temporary pumps, to ensure that there is no increase in flood risk should a flood event occur during this time.

11.9.32 The eastern end of the proposed car park at Crawter's Field (Purple Parking replacement) would be within the floodplain, however it is assumed that this would be located at existing ground level to avoid reducing available floodplain storage. This will also cause an increase in impermeable area, however it is assumed that this will be dealt with through provision of suitable drainage for the car park to ensure no increase in flood risk.

11.9.33 Despite the loss of existing floodplain (fluvial flooding) as a result of the Project the provision of the associated embedded mitigation measures reduces flood risk to residential and industrial properties compared to the baseline resulting in a **minor beneficial** effect (not significant). There would be no change to the risk of flooding to transport infrastructure and a negligible beneficial impact and **minor beneficial** effect (not significant) on airport infrastructure. The change in flood risk to the grassed areas of the airfield would result in a negligible beneficial impact to some areas resulting in a **negligible/minor beneficial** effect, and a high adverse impact and a **minor adverse** effect to others. These effects are not considered to be significant.

Groundwater Flood Risk

11.9.34 Increase in the risk of groundwater emergence could occur as a result of construction activities lowering ground levels or impeding groundwater flows. As stated in paragraphs 11.9.20 to 11.9.25, with appropriate mitigation the impact on groundwater is anticipated to be minor. This also applies to the impact on groundwater levels and therefore the risk of groundwater flooding. Appropriate mitigation and construction measures, as set out in the CoCP, would be anticipated to mitigate any increase in groundwater levels as a result of the construction and therefore any change would be of negligible magnitude (less than 10 mm change in depth). This would result in a **minor adverse** effect for residential properties (high sensitivity), transport infrastructure (very high sensitivity) and airport infrastructure (very high sensitivity); and a **negligible/minor adverse** effect on industrial properties (medium sensitivity) and airfield non-operational areas (low sensitivity). These effects are not considered to be significant and no specific instances where this is likely to occur have been identified at this stage.

Water Infrastructure – Wastewater

11.9.35 Discharges to the wastewater network by construction workers and construction activities are estimated to increase the peak system loading by 1 per cent. Hydraulic modelling has been undertaken to determine the impact of the additional flows, which are very small compared to the normal daily flows and demonstrated to be well below the available capacity of the network and treatment facilities. As a result, the impact of the construction on the Gatwick wastewater network (medium sensitivity) has been assessed as negligible with an effect of **negligible/minor adverse** and would not be significant.

Water Infrastructure – Water Supply

11.9.36 Increased water consumption would be expected through staff welfare facilities and construction processes, eg vehicle washes and concrete pouring. Temporary water supply points to support construction would be agreed and metered to monitor consumption. Calculations have been undertaken to determine the additional demands on water supply and these have been deemed to have a negligible impact on the Gatwick potable water supply (low sensitivity). This would result in a **negligible/minor adverse** effect which is not considered to be significant.

Further Mitigation

11.9.37 Whilst there would be temporary impacts on all aspects on the water environment during the construction phase, with the application of best practice construction practices (as set out in the draft CoCP in Appendix 5.3.1), the potential impacts would be reduced to an acceptable level. No further mitigation is proposed at this stage.

Future Monitoring

11.9.38 No additional monitoring beyond that currently undertaken by GAL (eg monitoring of outfall water quality to ensure compliance with discharge consents) is anticipated as a result of the Project for the water environment during construction.

Significance of Effects

11.9.39 The significance of the effects on the water environment during this phase of the Project would remain as set out in the assessment above as no further mitigation has been identified.

First Full Year of Opening: 2029 (up to 2032)

11.9.40 According to the proposed construction phasing programme, all of the proposed flood mitigation measures (except for the Gatwick Stream flood compensation area) would have been completed by the first full year of opening; Museum Field, east of River Mole and car park X flood compensation areas. Further details on the phasing of mitigation are provided in the Flood Risk Assessment (Appendix 11.9.1). After 2029, the main works that could impact fluvial flood risk would be the proposed surface access improvement works which would include their own mitigation measures and the satellite airfield contractor construction compound that would encroach on the floodplain would remain until 2032.

Surface Water

11.9.41 During the first full year of opening, change to the geomorphology of surface waterbodies is expected to continue as the watercourses adapt and adjust to construction works associated with various watercourses. Best practice measures to mitigate the construction impacts would continue to control the impacts. The impact on the surface water bodies would be negligible. This would result in a **minor adverse** effect for Gatwick Stream, River Mole, Crawter's Brook and Burstow Stream, and a **negligible** effect for Burstow Stream Tributary. This is not considered to be significant.

11.9.42 The North Terminal highway works are setback from Gatwick Stream (high sensitivity), however there is the potential for sediment pollution due to runoff from construction areas. Outfalls would be constructed on the River Mole (high sensitivity) and Gatwick Stream connecting to a highway drainage attenuation tank and pond, respectively. The construction of the outfall headwalls would impact the watercourse by localised disruption of quantity and dynamics of flow and sediment supply. This would occur due to localised damage to the bank face during modification and removal of bank material and riparian vegetation, and temporary release of fine sediments into the watercourse. With the implementation of best practice measures through the CoCP and given that works only require a small area of the bank for the outfall, the magnitude of the impact of these works is considered negligible adverse, resulting in **minor adverse** effect which is not significant.

11.9.43 Improvements to the South Terminal roundabout would commence towards the end of this period. The works would have adverse impacts to biological elements in Gatwick Stream during construction. Suspended sediment concentrations and runoff carrying particles and road borne contaminants have the potential to cause higher suspended sediment concentrations in the water bodies, which could directly impact on fish, macrophytes and invertebrates. Best practice measures implemented through the CoCP would aim to control this impact. Therefore, the impact on Gatwick Stream (high sensitivity) during the construction of the South Terminal roundabout would be low adverse, resulting in a **minor adverse** effect, which is not considered to be significant.

11.9.44 The South Terminal highway works include the widening of the M23 spur road and extending the culvert at Burstow Stream Tributary (low sensitivity). A highway drainage attenuation basin is also proposed, connected to Burstow Stream Tributary downstream of the culvert via an outfall drain. The works would also require modification and improvements to an existing attenuation pond, and the drains and outfalls which connect to Burstow Stream (medium sensitivity). There is potential for localised disruption of quantity and dynamics of flow and sediment supply, and release of fine sediments into the channels during construction. The impacts on the geomorphology of the watercourse would be mostly temporary with the provision of best practice measures adopted through the CoCP; therefore, the effects would be **minor adverse** which is not significant.

11.9.45 Construction of new surface access arrangements at Longbridge Roundabout would be completed in 2032. The works would include widening the existing overbridge at the River Mole by 5-6 metres, development in the floodplain to accommodate widening and modifications to the A23 and two concrete outfall headwalls connecting the highway drainage attenuation basins to the River Mole (high sensitivity). These activities may impact the watercourse by disruption of quantity and dynamics of flow and sediment supply. This would occur due to localised damage to the bank face during modification and removal of bank material and riparian vegetation, and temporary release of fine sediments into the watercourse, including runoff from construction areas. This would have a temporary and localised impact on the geomorphology of negligible magnitude on the channel of the River Mole (high sensitivity) due to the CoCP mitigation that would be put in place. The effects would be **minor adverse** which is not significant.

11.9.46 Relocation of Pond A could improve biological quality of the Water Environment Regulations status of the relevant water bodies, and improve over habitat functioning, species quality and quantity, as well as water quality indicators. Given the range of potential impacts, the length of the channel potentially impacted and the temporary nature of the impacts, the magnitude of the impact is considered low beneficial on the River Mole (a high sensitivity receptor), resulting in a **minor beneficial** effect, which is not considered significant.

11.9.47 During 2029 there is likely to be little change or improvement in Water Environment Regulations status elements as the waterbodies would be adapting to changes that have occurred during earlier construction activities. While there is inherent uncertainty as to how long it would take for the waterbodies to reach equilibrium, where this is likely to occur (site-specifically), the geomorphic systems are not highly dynamic so are unlikely to exhibit uncontrolled changes of high magnitude.

11.9.48 The effect of the increased use of de-icer due to the increase in ATMs has been assessed for the design year 2038 only. The increase in ATMs and de-iced pavement area in 2038 represents the worst case for this parameter and therefore no interim assessment has been undertaken. Until the detailed modelling has been completed, the timing of provision of mitigation through the new car park Y facility cannot be determined. However, full mitigation required for the 2038 maximum design scenario would be provided prior to 2029, and before any possible deterioration occurs. Further detail about the timing of provision of mitigation will be provided in the ES.

Flood Risk

11.9.49 No further additional effects on flood risk above those assessed in the initial construction phase would be anticipated as a result of the continued construction works in this time period.

11.9.50 Hydraulic modelling results have shown that no additional significant effects would be anticipated as a result of loss of floodplain due to surface access works commencing in 2029, for the 1 per cent (1 in 100) AEP event including a 25 per cent climate change allowance. This is due to the implementation of mitigation measures earlier in the programme which would be sufficient for this phase of the Project. Any additional construction activities required within the floodplain to enable these works may require temporary mitigation measures to prevent a loss of floodplain and therefore increase in flood risk although the increase in floodplain storage from implementing most mitigation measures in Phases 1 and 2 would provide sufficient compensation.

Groundwater

11.9.51 No additional effects on groundwater above those assessed in the initial construction phase would be anticipated as a result of the continued construction and operation commencing in 2029. Therefore, no further assessment has been undertaken for this period.

Water Infrastructure - Wastewater

11.9.52 The first full year of opening would see peak daily passenger numbers increase by approximately 6 per cent from 2029, compared to the 2029 future baseline (which would be an increase of 14 per cent on the 2018 baseline). The increase in foul water flows would add to the foul system loading throughout the network so would have a potential long-term impact on the foul drainage system. Compared to the baseline for 2029, the Project foul system flows would be a maximum of 5 per cent higher for the dry weather cases, but 8 per cent lower for the wet weather cases due to the proposed mitigation works and changes in land use associated with the Project which would divert storm flow out of the foul system. Hydraulic modelling of this increase predicts that the impact on the Gatwick Airport wastewater infrastructure network (medium sensitivity) would be negligible resulting in a **negligible** effect, that would consequently not be significant. This is due to the wastewater network having adequate capacity to accommodate the increase in flows as a result of additional passengers and the demand from construction workers.

Water Infrastructure - Water Supply

11.9.53 Existing SESW infrastructure would be able to meet the demands of increased passenger numbers during this period both from baseline increases and as a result of the Project. The demands of construction activities would be relatively small in comparison and consequently combined they would be considered to have a negligible impact on the Gatwick Airport potable water supply (low sensitivity). This would result in a **negligible/minor adverse** effect which is not considered to be significant. Through consultation, SESW has provisionally confirmed that their sources and network can meet the additional demands of the Project during construction, including the increase in passenger numbers, subject to the outcome of their full impact assessment.

Further Mitigation

11.9.54 All impacts during this phase are not considered significant and therefore no further mitigation is proposed.

Future Monitoring

11.9.55 No additional monitoring beyond that currently undertaken by GAL (eg monitoring of outfall water quality to ensure compliance with discharge consents) would be required as a result of the Project for the water environment.

Significance of Effects

11.9.56 No further mitigation has been identified, therefore the residual effect of the Project on the water environment in this assessment year would remain as outlined above.

Interim Assessment Year: 2032 (up to 2037)

Surface Water

11.9.57 In this phase of the Project, the effects of construction works on the watercourses (undertaken in earlier phases of construction) would have stabilised, and it is not anticipated that there would be any further adverse effects. The implementation of the CoCP would be expected to address construction related impacts such as increases in suspended sediment concentrations.

11.9.58 It is likely that the effects of earlier construction activity would no longer be noticeable in the water body elements under the Water Environment Regulations. Further, it would be difficult to ascertain the source of any changes occurring in the relevant water bodies – whether these are as a result of the Project or because of changes elsewhere in the water body or catchment. Therefore, no additional effects during the interim assessment year have been assessed for this reason.

11.9.59 The works to create the Gatwick Stream flood compensation area would be undertaken from 2036. The works would involve lowering the existing ground level by up to 3 metres (this is the maximum excavation depth as existing ground levels vary). The flood compensation area would connect to the watercourse by lowering the stream bank. Impacts on the Gatwick Stream (high sensitivity) could include sediment pollution and a change in bed form over time. However, with the implementation of the best practice measures through the CoCP, the magnitude of the impact is assessed as low adverse resulting in a **minor adverse** effect on Gatwick Stream. This is not considered to be significant.

11.9.60 No additional effects would be anticipated for the interim assessment year. The continued construction of some airfield works (eg Pier 7, internal access works, car park Y and the North Terminal Long Stay car park) and highways works (Longbridge roundabout) would incorporate best practice measures to reduce pollution to watercourses and the implementation of previous mitigation features (such as the tanking at car park Y) would be adequate to mitigate any effects that could occur. Therefore, no further assessment has been undertaken for this period.

11.9.61 As stated in paragraph 11.9.48 the effect of the increased use of de-icer due to the increase in ATMs has been assessed for the design year 2038 only. The increase in ATMs and de-iced pavement area in 2038 represents the worst case for this parameter and therefore no interim assessment has been undertaken. Until the detailed modelling has been completed, the timing of provision of mitigation through the car park Y facility cannot be determined. However, full mitigation required for the 2038 Maximum Design Scenario would be provided before any deterioration occurs. Further detail about the timing of provision of mitigation will be provided for the ES.

Groundwater

11.9.62 There may be additional excavation for building structures, basements, piling etc. (eg Pier 7 foundation works, and below ground works for pumping stations and substations). These could result in dewatering of the superficial aquifer which could impact on groundwater flows, levels, and ground settlement. Dewatering activities would be minimised where possible with best practice measures, including local control on discharge volumes and drawdown. Potential impacts on changes in water levels and flow, as well as settlement, would be subject to local evaluation as impacts are likely to be localised and short term. Groundwater resource impacts on the secondary A superficial aquifers as a whole are expected to be low adverse for these low or medium sensitivity receptors. This would result in a **negligible/minor adverse** effect which would not be significant.

11.9.63 Excavation of the Gatwick Stream flood compensation area appears to be away from the superficial aquifer and overlies the mapped Weald Clay outcrop, which contains little or no groundwater. In this case there would be no impacts on groundwater resources from this excavation. However, the lower aquifer (Upper Tunbridge Wells Sand) is mapped as outcropping within about 5 metres to the south / south west. If the Weald Clay is thin and shallow in this location (which may only be confirmed by local ground investigations), the excavation may locally penetrate the top of this lower aquifer. Groundwater levels (in the Upper Tunbridge Wells Sand) at this location are unknown; however, it is understood that the existing flood compensation area does not suffer from groundwater ingress and as such groundwater levels within the Upper Tunbridge Wells Sand are unlikely to be shallow. If the top of the aquifer is penetrated, appropriate construction measures and practices will need to be adopted, for example, to prevent contamination from entering the aquifer or to control groundwater seepage. Any local impacts from construction are likely to be short term only and negligible or at worst low adverse. The Upper Tunbridge Wells Sand aquifer is of medium sensitivity (though high sensitivity in terms of Water Environment Regulations) but overall (and taking into account the short term nature of the impact) the significance of the effect is considered to be **minor adverse** and would not be significant.

Flood Risk

11.9.64 According to the proposed construction phasing programme, all primary works that could affect current flood risk would have been completed by 2029. The measures implemented by this stage would be adequate to ensure no further increase in flood risk would occur. Additional mitigation in the form of the Gatwick Stream flood compensation area would be provided in 2036 in order to comply with future climate change adaptation requirements. Other construction works at this time would have potential to alter surface water flow paths or temporarily increase runoff. The impact of this would be anticipated to be as described in 11.9.26, with no significant effects anticipated once appropriate mitigation is applied in accordance with the CoCP.

Water Infrastructure - Wastewater

11.9.65 The interim assessment year 2032 would see peak daily passenger numbers increase by approximately 19 per cent compared to the 2032 future baseline. The increase in foul water flows would add to the foul system loading throughout the network so would have a potential low long-term impact on the foul drainage system. Compared to the future baseline for 2032, the Project foul system flows are a maximum of 10 per cent higher for the dry weather cases, but 6 per cent lower for the wet weather cases due to the proposed mitigation works and changes in land use associated with the Project which would divert storm flow out of the foul system. The foul sewerage system (of medium sensitivity) has adequate capacity to accommodate the increase in flows. The impact of the Project is therefore assessed as negligible adverse magnitude resulting in a **negligible** effect, that is not considered to be significant.

Water Infrastructure - Water Supply

11.9.66 This phase would see an increase in water demand due to the increase in passengers. Although unconfirmed, SESW has indicated that the projected increase in demand would likely not have an adverse impact on the water source. Therefore, there would be **no change** compared to the 2032 future baseline.

Further Mitigation

11.9.67 No additional significant effects during the interim assessment year have been assessed as part of this study and therefore no additional mitigation is proposed for the water environment.

Future Monitoring

11.9.68 No additional significant effects during the interim assessment year have been assessed as part of this study, therefore no additional monitoring beyond that currently undertaken by GAL (eg monitoring of outfall water quality to ensure compliance with discharge consents) is anticipated as a result of the Project for the water environment.

Significance of Effects

11.9.69 No significant effects have been identified once the proposed mitigation is included.

Design Year: 2038

11.9.70 This section describes the potential effects of the Project on the water environment during the operational phase.

11.9.71 In order to assess the effects due to the Project, each identified impact has been assigned a magnitude after considering the embedded mitigation designed as part of the Project. Mitigation measures adopted as part of the Project have been described in Section 11.8.

11.9.72 For the purpose of this assessment, the classification of impact magnitude also takes into account impact duration. For the operational phase of the Project, all impacts are considered to have a 'long term' duration, defined as a period of more than five years.

Surface Water

11.9.73 An increase in contaminated runoff from additional pavement area and additional de-icer use associated with the increased ATMs could affect surface water bodies if not mitigated by the Project. The additional impermeable area created as part of taxiway and runway reconfiguration would increase the area of hardstanding that is de-iced. This would increase the de-icer load in runoff arriving at Ponds A, M and D. Additional contaminated runoff storage and/or treatment is included at Dog Kennel Pond and under car park Y, which would fully mitigate any potential impact on water quality from intermittent discharges to the River Mole, or any impact on Crawley sewage treatment works. The change in pavement de-icer significantly decreases the load discharged to the River Mole.

11.9.74 By 2038 these measures would be fully in place and would ensure no deterioration of the waterbodies. Therefore, the impact on the water quality of the River Mole and Gatwick Stream (high sensitivity) as a result of runoff from the increased hardstanding would be negligible. This would result in a **minor adverse** effect which is not considered to be significant.

11.9.75 The diversion of the River Mole into a two-stage channel included the reinstatement of a more natural planform and restoration of more natural morphology. During operation, this would have a long-term effect of improving the flow regime and channel diversity. There would also be floodplain and re-meandering improvements along with improvements in floodplain coupling. Planting of natural floodplain vegetation would improve riparian habitats and improve bank stability. The duration of these impacts would be long term and the magnitude of impact on the River Mole (high sensitivity) would be medium beneficial. The effects would be considered as **moderate beneficial** and therefore considered significant.

11.9.76 There would, however, be the potential for a reduction in water velocity along the river diversion in the long term, which may cause deposition at this location, along with sediment starvation and erosion downstream. These changes would arise due to the changes in cross-sectional form and channel gradient. The potential length of the channel impacted by the effects of reduced velocity in the watercourse could be substantial, as it would include the channel diversion from the runway culvert downstream beyond the diversion. The diversion channel would be designed as a suitable river type for the bed gradient of the realignment in order to maintain sediment transport capability. The magnitude of the effect would be to low adverse and the significance of the effect on the River Mole would be **minor adverse**, and not considered significant. Further detailed design work and modelling on the diversion channel is required as the Project progresses and will be assessed within the ES.

11.9.77 The extension of the River Mole culvert and concrete lining underneath the runway would have the permanent effect of loss of existing bed and bank form, material, and riparian vegetation. The length of the culvert extension is approximately 45 metres, covering the existing channel which has been heavily modified in the past. The increased homogeneity of the new channel cross-section would create the potential for minor loss of natural variance in velocities and secondary flows cells, leading to changes in velocity and geomorphological processes. The potential length of the channel impacted by the changes in geomorphological processes would be relatively small, and part of the existing culvert would be replaced. Furthermore, provision of geomorphological mitigation to the diversion channel of the River Mole acts to more than compensate these effects. Therefore, the magnitude of the impact is assessed as negligible on the River Mole resulting in a **minor adverse** effect, which is not considered significant.

11.9.78 The River Mole diversion and culvert extension would have various effects on the watercourse, some adverse and some beneficial. The geomorphological mitigation on the River Mole diversion valley and mitigation for the adverse effects included in the construction and design of the diversion channel show that beneficial effects outweigh the adverse effects.

11.9.79 The creation of the Museum Field flood compensation area and connecting spillway as well as the East of Museum Field and east of Gatwick Stream flood compensation area would improve floodplain-channel coupling, and naturalisation of flows in the main channel during flood conditions. Lowering the banks of the River Mole and Gatwick Stream to connect these watercourses to the floodplain compensation areas would result in the loss of existing bank form. These alterations to the baseline could encourage erosion of the banks and bed along the connecting spillway during flood events. The length of bank impacted in both cases would however be relatively small and set back from the watercourses, however the banks would not be entirely natural. Furthermore, enough time would have passed since the construction phase for the river to naturally adjust and for vegetation to establish on the banks to aid bank stability. The potential for erosion along the spillways during flood events would remain which would result in a low impact of a long-term duration on both the River Mole and Gatwick Stream. This would result in a **minor adverse** significance of the effect for both receptors (of high sensitivity) which is not considered to be significant.

11.9.80 Construction of the concrete outfall headwall from the flood attenuation basin in car park X would have the effect of loss of existing bank and riparian vegetation on the River Mole and localised changes to sediment transfer and flow patterns in the channel. By 2038, sufficient time would have passed since the construction phase for the river the naturally adjust. The length of channel impacted would be relatively small, therefore the magnitude of the impact would reduce to negligible resulting in a **minor adverse** effect which is not significant.

11.9.81 Ground lowering and increase of the depth of water in the floodplain in car park X would have the effect of reduction in area of floodplain-channel coupling with Crawter's Brook (high sensitivity) in the long term. The CoCP would mitigate for increased sediment loading to the channel and any floodplain/watercourse exchange of physical indicators but cannot change the coupling effect of the floodplain which would be considered in design. The area impacted would be relatively small and set back from the watercourse, therefore the magnitude of the impact is considered to be negligible. This would result in a **minor adverse** effect on a high sensitivity receptor, which is not significant.

11.9.82 The South Terminal new surface access arrangements would result in long-term changes to the geomorphology of Burstow Stream Tributary (low sensitivity) which is currently culverted underneath the M23 spur. Extension of the existing culvert to accommodate road widening, and the new concrete outfall headwall connecting to the highway drainage attenuation basin, would result in permanent loss of natural bank form and riparian vegetation. The increased homogeneity of the channel cross-section has the potential for loss of natural variance in velocities and secondary flow cells, leading to changes in velocity and geomorphological processes in the channel. There is existing concrete lining upstream and downstream of the culvert and only a relatively small area would potentially be impacted. The long-term impact on the Burstow Stream Tributary has a **negligible adverse** effect, which is not considered to be significant.

11.9.83 The South Terminal new surface access arrangements would result in long-term changes to the geomorphology of Burstow Stream (medium sensitivity). Widening of the M23 spur, and modifications and improvements to an existing attenuation pond, drains and outfall connecting to Burstow Stream would result in the permanent loss of existing banks and localised changes to sediment transfer and flow patterns in the channel. Flow control on the outfall drain and filtering of pollutants would reduce the impact on flow and sediment transfer. Permanent change to the baseline would also include loss of floodplain and natural vegetation due to encroachment of highway footprint onto existing natural floodplain. The length of channel impacted is relatively small as existing structures will be modified and/or improved. The works on the floodplain are also setback from the watercourse. The long-term impact on the Burstow Stream has a **minor adverse** effect, which is not considered to be significant.

11.9.84 The North Terminal new surface access arrangements would result in long-term loss of floodplain and natural vegetation due to encroachment of highway footprint onto existing natural floodplain. The footprint of the highway works would however be set back from the banks of Gatwick Stream (high sensitivity). The highways works would also result in a localised reduction in floodplain-coupling. Construction of the outfall headwalls on the River Mole (high sensitivity) and Gatwick Stream connecting to the highway drainage attenuation basins results in permanent loss of natural banks and localised changes to sediment transfer and flow patterns in the channel. The length of channel impacted is relatively small. In terms of geomorphology of the watercourse the impact has been assessed as negligible resulting in a **minor adverse** effect on a high sensitivity receptor, which is not significant.

11.9.85 The Longbridge Roundabout new surface access arrangements would result in long-term loss of floodplain and natural vegetation due to encroachment of highway footprint onto existing natural floodplain of the River Mole (high sensitivity). Construction of the two new concrete outfall headwalls connecting the highway drainage attenuation basins and widening of the existing overbridge would result in permanent loss natural bed and bank form, and natural riparian vegetation. The increased homogeneity of the channel cross-section has the potential for loss of local natural variance in flow, effecting geomorphological processes in the channel. The impact on the geomorphology of the watercourse has been assessed as negligible resulting in a **minor adverse** effect on a high sensitivity receptor, which is not significant.

11.9.86 During operation there would be an improvement to hydromorphology and water quality (chemical) elements in the River Mole and the surface water attenuation and treatment ponds. The pathway between surface water runoff and the Gatwick Stream would be reduced as a result of the surface water drainage design. However, it is unlikely to be sufficient to result in a betterment. Therefore the impact has been assessed as low beneficial resulting in an effect of **minor beneficial**. This is considered to be not significant.

11.9.87 Following the construction of the South Terminal roundabout there would be an improvement to hydromorphology and water quality (chemical) elements of Gatwick Stream compared to the baseline. During operation the pathway between the road and the watercourse which existed during construction would be removed improving water quality elements at the receptor. This is due to the Project highway drainage design, leading to an overall beneficial impact. This would result in a low beneficial impact on Gatwick Stream with a **minor beneficial** effect, which is not considered to be significant.

11.9.88 The North Terminal highway works would have impacts on Burstow Stream during construction, including increased suspended sediment concentrations, disturbance to species and habitats, and potential change to water quality. During operation, however, there is potential for a change to Burstow Stream in terms of Water Environment Regulations elements. This would incorporate potential opportunity for betterment with regards to water quality and the effect this would have on biological quality elements. Overall, this would not improve the water body Water Environment Regulations status as a whole. The opportunity of recovery during operation would occur as the pathway between the road and the watercourse would be reduced. This is due to the Project highway drainage design, leading to an overall low beneficial impact. Therefore, the effect on Burstow Stream of medium sensitivity would be **minor beneficial** and not significant.

Groundwater

11.9.89 During operation of the Project, there would be a long term change in the amount of hardstanding compared to the baseline (eg additional hardstanding for runways, taxiways and aprons). However, this increase is considered to be a small proportion of the overall recharge area within the airport and is unlikely to bring about significant change in the recharge of groundwater to the shallow superficial aquifers. Therefore, the impact has been assessed as low adverse resulting in a **negligible/minor adverse** effect on the Secondary A superficial aquifers of low or medium sensitivity. This is not considered to be significant.

11.9.90 Where potential effects on groundwater flow are identified from below ground structures (eg piled foundations), these may be addressed by adopting appropriate design of permanent works to eliminate upstream mounding and flow diversion. Impacts on groundwater flow are likely to be short to medium term and groundwater levels are expected to equalise over time. The impact on the Secondary A superficial aquifers therefore has been assessed as low adverse resulting in a **negligible/minor adverse** effect on the Secondary A superficial aquifers of low or medium sensitivity. This is not considered to be significant.

11.9.91 Loss of groundwater storage within permeable superficial deposits may occur where sub-surface structures lead to the long term loss or removal of the gravel aquifer. This is likely to be only a small proportion of the available groundwater storage within the superficial aquifer and would have only very minor localised impacts (if any), resulting in negligible adverse impact on receptors of low or medium sensitivity. The resultant effect would be of **negligible/minor adverse** significance which is not considered to be significant.

11.9.92 It is not proposed to discharge from the surface water drainage to ground. However, if the attenuation ponds are unlined the superficial aquifers may receive some recharge. This recharge may be of lower quality water resulting in a reduction in the water quality within the aquifers. This would result in a low adverse effect on a receptor of medium or low sensitivity. The resultant effect would be **minor adverse** which is not considered to be significant. The Museum Field flood compensation area may intercept groundwater within the weathered Weald Clay Formation. Groundwater within the Weald Clay Formation is contained in isolated areas with minimal flow. As such, negligible seepage into the flood compensation area would be anticipated. This would result in a low adverse effect on a receptor of low sensitivity. The resultant effect would be **negligible** which is not considered to be significant.

11.9.93 Long term operational impacts on the lower superficial A Upper Tunbridge Wells Sand aquifer are unlikely to be significant overall. However, if the base of the flood compensation storage area for the Gatwick Stream penetrates the lower aquifer (refer 11.9.63) it is possible the aquifer would receive (intermittent) recharge from within the flood compensation area, when it is brought into operation. Additional recharge to the aquifer (from Gatwick Stream “waters”) could be considered beneficial, particularly if future climate scenarios result in a reduction in overall aquifer recharge. Any such benefit would be of negligible impact. No other project elements are anticipated to penetrate the full thickness of the Weald Clay Formation. The resultant overall effect on the lower aquifer (of medium sensitivity and high sensitivity with respect to Water Environment Regulations) would be **negligible.** This is considered to be not significant.

Flood Risk

Surface Water Flood Risk

Offsite Receptors

11.9.94 The introduction of new impermeable areas as part of the Project could result in increased surface water runoff in the long term, or cause alterations to existing surface water flow paths that could potentially increase flood risk.

11.9.95 It has been shown in Appendix 11.9.1, that the Project would cause a slight increase in discharge volumes and peak runoff rates (by 1.3 per cent and 4 per cent respectively) that could potentially increase flood risk elsewhere. At this stage, it has been considered that such a limited increase would be safely managed and mitigated through provision of additional mitigation in the form of underground storage. Surface water flood extents outside of the Project site boundary are not expected to be directly impacted by the Project and there would be a negligible increase in surface water flood risk. The magnitude of impact on residential properties (high sensitivity), industrial properties (medium sensitivity) and transport infrastructure (very high sensitivity) is therefore considered to be negligible. This would result in **a minor adverse, negligible/minor adverse** and **minor adverse** effect on these receptors respectively. These effects are not considered to be significant.

Airport Infrastructure

11.9.96 The FRA (Appendix 11.9.1) demonstrates that surface water flood risk would increase for the 1 per cent (1 in 100) AEP event, including a 20 per cent allowance for climate change, at some very localised areas of runways, taxiways and stands within the airport boundary. This would be safely managed through the application of Gatwick's Flood Threat Plan.

11.9.97 However, as discussed in Section 11.5, the hydraulic model has not been finalised for surface water flooding performance. In particular, the alterations in ground levels within the airfield due to the Project have not been assessed in this PEIR as the hydraulic model is incomplete. Therefore, the exact locations of flooding cannot be verified. In reality, the proposed runways and taxiways would be raised and, therefore, flooding is very unlikely to occur at the locations that the FRA plans currently indicate. Areas to be used for aircraft movement would be designed with suitable drainage to prevent such surface water flooding, and any potential increase is anticipated to be localised and restricted to grassed areas outside of general use, within the airport boundary.

11.9.98 Given the above, the magnitude of the potential impact to runways and taxiways (very high sensitivity) is considered to be negligible resulting in areas with **a minor adverse** effect and others with a **minor beneficial** effect (not significant).

11.9.99 For all other elements of airport infrastructure (terminals and piers, stands, waste management facilities, and car parking) the change in modelled surface water flood risk would result in impacts ranging from **negligible adverse** to **negligible beneficial** (see Table 11.9.1), and are therefore not considered significant.

11.9.100 For grassed areas of the airfield (low sensitivity), the magnitude of impact is expected to be medium (up to 100 mm of flood depth increase) resulting in a **minor adverse** effect which is not considered to be significant. Table 11.9.1 summarises the effects on each of these receptors.

Table 11.9.1: Summary of Surface Water Flood Risk Effects on Airport Infrastructure

Receptor	Sensitivity	Magnitude	Effect	Significant/not significant
Runways and taxiways	Very high	Negligible	**Minor adverse**	Not significant
Terminals and piers	Very high	No change	**No change**	Not significant
Stands	Very high	Negligible	**Minor adverse**	Not significant
Waste management facilities	Very High	Negligible	**Minor beneficial**	Not significant
Car parking	Medium	Negligible	**Minor beneficial**	Not significant
Grassed areas	Low	Medium	**Minor adverse**	Not significant

Fluvial Flood Risk

Offsite receptors

11.9.101 Elements of the Project that fall within the floodplain could lead to a loss of floodplain storage and increase fluvial flood risk. However, a number of floodplain compensation/storage areas have been incorporated into the design as embedded mitigation to ensure any potential impact would be reduced.

11.9.102 Fluvial hydraulic modelling results (see Figure 11.9.1), for the 1 per cent (1 in 100) AEP event, including a 35 per cent climate change allowance, show that for third party receptors, including residential and industrial properties, anticipated flood depths would decrease by up to 100 mm for those receptors adjacent to Gatwick. Therefore, the overall impact of the Project on residential properties (high sensitivity) and industrial properties (medium sensitivity) would be medium beneficial, resulting in an effect of **moderate/major beneficial** and **moderate beneficial** respectively. This is considered to be a significant beneficial effect.

11.9.103 Fluvial flood risk for major transport infrastructure is not expected to be affected by the Project in the long term therefore the impact is therefore classified as **no change**.

Airport Infrastructure

11.9.104 In terms of airport infrastructure, for the 1 per cent (1 in 100) AEP event, including a 35 per cent climate change allowance, most areas would benefit from the development of the Project. Flood depths would be decreased by up to 100 mm (medium beneficial impact) for taxiways and proposed car parking areas, and up to 50 mm (low beneficial impact) for terminals and piers.

11.9.105 There is only one area of airport infrastructure where flood depths are modelled to increase; located at the north-west edge of the proposed fire training ground. For most of the area the increase in flood risk would be less than 50 mm (low adverse impact).

11.9.106 For grassed parts of the airport, there are extended areas where flood depths decrease and some smaller areas of localised increases, including the proposed flood compensation areas. Overall, considering the area at whole, the significance of effect on grassed areas of the airport is considered to be **negligible adverse** (not significant). Table 11.9.2 summarises the effects on airport infrastructure.

Table 11.9.2: Summary of Fluvial Flood Risk Effects on Airport Infrastructure

Receptor	Sensitivity	Magnitude	Effect	Significant/not significant
Runways and taxiways	Very high	Medium	**Major beneficial**	Significant
Terminals and piers	Very high	Low	**Moderate/major beneficial**	Significant
Stands	Very high	No change	**No change**	Not significant
Fire training Ground	Medium	Low	**Minor adverse**	Not significant
Car parking	Medium	Medium	**Moderate beneficial**	Significant
Grassed areas	Low	Negligible	**Negligible/minor adverse**	Not significant

Reservoir Flooding

11.9.107 A number of airport infrastructure elements currently fall within reservoir failure flow paths (see Figure 11.6.6). However, 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. The Project proposes to make best use of existing infrastructure and therefore, no new reservoir failure flow paths are introduced to the study area. Overall, the effect is considered to be **no change**.

Groundwater Flooding

11.9.108 Foundation and/or box structures intercepting and/or diverting groundwater flows could result in an increase of flood risk elsewhere. Any such increase would be expected to have a negligible impact (ie <10 mm increase in flood depths) and would occur in low-lying areas that are already susceptible to groundwater flooding. The effect on airport infrastructure of very high sensitivity would therefore be **minor adverse,** and **negligible/minor adverse** on airfield grassed areas of low sensitivity.

Sewer/Water Supply Flooding

11.9.109 During the operational phase 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 this increase has shown that the sewerage system would not be significantly affected by the Project. The foul sewerage system (with mitigation) would have adequate capacity to accommodate the increase in flows from surface water runoff expected to be caused by the Project. The impact on all potential receptors (very high to low sensitivity) would therefore be negligible, resulting in an effect of **negligible/minor adverse** significance.

11.9.110 Additional water supply infrastructure would also have to 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 failing and causing flooding (negligible impact). In the case that parts of the existing water supply network are replaced as part of the Project, this could provide an overall betterment in terms of flood risk. Overall, the effect on all potential receptors (very high to low sensitivity) would be considered **negligible/minor beneficial**.

Water Infrastructure – Wastewater

11.9.111 2038 would see peak daily passenger numbers increase by approximately 21 per cent compared to the 2038 future baseline. Compared to the future baseline for 2038, the Project foul system flows are a maximum of 11 per cent higher for the dry weather cases, but 6 per cent lower for the wet weather cases due to the proposed mitigation works and changes in land use associated with the Project which would divert storm flow out of the foul system. Hydraulic modelling has been undertaken to determine the impact of the additional flows in the GAL wastewater network infrastructure (medium sensitivity), taking account of the proposed mitigation measures to be implemented as part of the Project. The modelling results show that the proposed infrastructure is of sufficient capacity for the projected flows, so it is considered that the impact is negligible, resulting in a **negligible/minor adverse** effect (not significant). The assessment of effects on the Thames Water network and wastewater treatment works is ongoing and will be updated in the ES.

Water Infrastructure – Water Supply

11.9.112 There is anticipated to be an increase in demand on the water supply due to the forecast increase in passenger numbers during 2038. Calculations have been undertaken to determine the extent of the increase and, through discussions with GAL and SESW, the impact on the upstream water infrastructure is considered to be low adverse, resulting in a **negligible/minor adverse** effect (not significant). Through consultation, SESW has provisionally stated that their sources and network can meet the additional demands of the Project during operation (subject to the full findings of their impact assessment).

Further Mitigation

11.9.113 It is considered that additional mitigation would be required to address the long-term effects on flood risk. The details of the further mitigation will be refined for the ES, however it is likely to include the measures set out below.

Flood Risk and Surface Water Drainage

11.9.114 Whilst from an EIA perspective the level of significance is minor (adverse) or better for all effects related to flood risk, further mitigation may be put in place in order to mitigate any residual risk of increase in downstream surface water flooding to ensure compliance with the NPS. A more detailed assessment is included in the FRA (Appendix 11.9.1). It is anticipated that further mitigation may be provided during the detailed design of the proposed drainage strategy for Gatwick and after the surface water drainage hydraulic model has been verified. This would likely take the form of oversized pipes or, where required, additional attenuation capacity for the proposed surface water attenuation facilities (eg car park Y).

Future Monitoring

11.9.115 From a geomorphological and Water Environment Regulations perspective, regular monitoring of any change to the channel bed and banks should be undertaken, particularly in the vicinity of the River Mole channel diversion, following completion of the Project. This should be undertaken using fixed point photography. If negative change occurs, appropriate mitigation should be implemented.

11.9.116 Any impacts to water quality would be identified by existing discharge monitoring undertaken by GAL (at Pond A, M and D and in the River Mole) and by Thames Water (at Crawley sewage treatment works).

11.9.117 Water demand can be further refined and updated through continuous monitoring of water consumption data and changes in passenger numbers.

11.9.118 No additional monitoring is required for other water disciplines.

Significance of Effects

11.9.119 Any effect regardless of severity could be considered significant to third parties according to the NPS. Therefore, the further mitigation measures proposed for potential residual surface water flood risk impacts would aim to ensure that no third parties are impacted by the Project. These would ensure that the Project would not increase flood risk elsewhere, and therefore the significance of the effects to third parties would be reduced to **negligible**.

11.9.120 The potential impacts on geomorphology mainly arise due to the flood risk mitigation associated with the River Mole channel diversion, creation of flood compensation areas and extension of culverts. There would be a minor to negligible effect on the watercourses with the implementation of the design recommendations proposed. The overall the long-term effect on the River Mole would be **minor beneficial**, whilst there would be a **minor adverse** effect on Gatwick Stream, Crawter's Brook and Burstow Stream. The significance of the effect on Burstow Stream Tributary would be **negligible**. Other remaining impacts on the watercourses associated to the Project, such as new access arrangements, would be offset by improvements and environmental enhancement in other areas of the catchment, as part of the embedded mitigation. Therefore, any residual effect with a significance of minor or less is not considered to be significant.

11.9.121 Based on a qualitative assessment of groundwater flood risk, it is considered that some elements of the Project may have a local impact on groundwater flow paths and levels in their immediate vicinity. These risks would easily be addressed by adopting appropriate design practices during the detailed design stage and therefore, it is considered that the residual risk from groundwater flooding will not be adversely affected by the Project. This is therefore not anticipated to change the assessment of effect.

11.10 Potential Changes to the Assessment as a Result of Climate Change

11.10.1 The impact of climate change is an integral part of the assessment for the water environment. Impacts such as increased severity and frequency of droughts and floods, changes to rainfall patterns in terms of rainfall intensity, and seasonal and annual rainfall totals, are relevant to the assessment of different water environment elements. Other aspects such as changes related to cold weather events impact on airport de-icing operations. As these climate change impacts are taken into account in the assessment, there is no anticipated change to the assessment as a result of climate change. A summary of the main climate change considerations incorporated into the assessment for each water environment element is given below.

Geomorphology

11.10.2 Climate change could potentially alter the hydrological regime of the watercourses over a medium to long-term time period. Increased frequency or severity of droughts and floods could potentially lead to the watercourses adjusting to different patterns of erosion and deposition. It is likely that the adjustment would remain localised and of relatively low magnitude given the channel types. Overall, the potential effect of climate change is unlikely to change the outcome of this assessment.

Water Environment Regulations

11.10.3 From a Water Environment Regulations perspective, climate change could impact on habitats due to an altered hydrological regime related to both floods and droughts, impacting on potential changes in species preference. Although the exact changes are difficult to predict overall, there will be no significant effect as the water bodies respond to changes and attempt to reach a new equilibrium. Therefore, the potential effect of climate change is not anticipated to change the outcome of the assessment.

Water Quality

11.10.4 Climate change impacts on water quality aspects related to geomorphology and Water Environment Regulations are not anticipated to alter the assessment, as noted above. However, the impact of climate change and weather variability on de-icer use is challenging to predict. The latest projections of future climate change (UKCP18) indicate that winters will become wetter and warmer on average which would generally reduce de-icer use. However, for a given weather event (such as the winter 2017/18 event used for the assessment) with increased air traffic movements, de-icer use would be greater. It is important to note that whilst winters are anticipated to become warmer on average, cold weather spells will still occur. This has been taken into account in the assessment, and therefore, no further change to the assessment is expected as a result of climate change.

Groundwater

11.10.5 Although impacts of climate change on groundwater are uncertain, the consensus of climate change predictions (UK Groundwater Forum, 2019) appears to suggest that changes in rainfall patterns are likely to lead to overall reductions in groundwater recharge. Conversely, other extremes, such as groundwater flooding, may also occur. The impact of potentially drier summers (increasing soil moisture deficit and reducing groundwater storage) may not be compensated for by wetter winters or higher intensity storms as these tend to generate rapid runoff instead of steady infiltration to groundwater. Changes in groundwater recharge have been taken into account in the assessment, and therefore no changes to the assessment are anticipated.

Flood Risk and Surface Water Drainage

11.10.6 The impact of climate change on flood risk will be to increase the risk of both fluvial flooding and surface water flooding. However, this has been considered as an integral part of the assessment as a worst-case scenario and in line with Environment Agency guidance (Environment Agency, 2016a). In July 2021 the Environment Agency updated their guidance for the consideration of the future impacts of climate change on peak river flow to reflect UKCP18 data. This assessment has not incorporated the updated allowances. The new allowances will be adopted to inform the ES. However an initial review indicated that the requirements have reduced and therefore the current mitigation strategy is expected to continue to meet planning policy requirements, which would be confirmed via an updated FRA that would inform the ES. As climate change has been fully integrated to the assessment, no changes to the assessment are anticipated.

Wastewater

11.10.7 Climate change has the potential to cause rainfall of increased depth, frequency and intensity to occur compared to the present rainfall patterns. As a result, storm runoff from the small contributing areas discharging to the foul sewerage system would increase the flows in the network and potentially exceed the capacity of the gravity sewers or pumping stations. The potential impact was tested using the Design Year 2038 case as this exhibits the highest normal flows in the system. The Environment Agency predicts an upper end potential increase in precipitation of 20 per cent for the year 2039 and the storm flows were increased by this percentage and the performance of the system was compared to the equivalent baseline, and also the absolute impact was assessed. The climate change increase to the storm flows increases the peak flows in the foul sewerage system by approximately 10 per cent: as a result, there are some minor increases to surcharging of the gravity pipes, and the pumps have to run for longer in order to deal with the flow, but there is no predicted flooding or significant detriment to the operation of the network. Compared to the incremental baseline with the same rainfall uplift applied, the total flows are 7 per cent lower and the predicted stress on the network is considerably less due to the proposed mitigation works and changes in land use associated with the Project which will divert storm flow out of the foul system. The impact on the foul sewerage system would be minor adverse as there is no predicted risk of flooding, but the system will experience higher degrees of surcharge. As these factors are taken into account on the assessment process, no additional changes to the assessment are anticipated as a result of climate change.

Water Supply

11.10.8 Climate change may have an impact on available water sources due to changes in annual rainfall which affect impounding reservoir catchment areas, or groundwater available for abstraction. This is not currently deemed to have a significant effect on the water source, but this should be reviewed as the Project develops. Overall, the potential effect of climate change is unlikely to change the outcome of this assessment.

11.11 Cumulative Effects

Zone of Influence

11.11.1 The zone of influence (ZoI) for the water environment has been identified based on the spatial extent of likely effects.

Screening of Other Developments and Plans

11.11.2 The Cumulative Effect Assessment (CEA) takes into account the impact associated with the Project together with other developments and plans. The projects and plans selected as relevant to the CEA presented within this chapter are based upon the results of a screening exercise undertaken as part of the 'CEA short list' of developments. Each development on the CEA long list has been considered on a case by case basis for scoping in or out of this chapter's assessment based upon data confidence, effect-receptor pathways and the spatial/temporal scales involved.

11.11.3 In undertaking the CEA for the Project, it is important to bear in mind that the likelihood of other developments and plans being constructed varies depending on how far along the planning process they are. For example, relevant developments and plans that are already under construction are likely to contribute to a cumulative impact with the Project (providing impact or spatial pathways exist), whereas developments and plans not yet approved or not yet submitted are less certain to contribute to such an impact, as some may not achieve approval or may not ultimately be built due to other factors. For this reason, all relevant development and plans considered cumulatively alongside the Project have been allocated into 'Tiers', reflecting their current stage within the planning and development process. Appropriate weight is therefore given to each Tier in the decision-making process when considering the potential cumulative impact associated with the Project (eg it may be considered that greater weight can be placed on the Tier 1 assessment relative to Tier 2). Further details of the screening process for the inclusion of other developments and plans in the short list and a description of the Tiers is provided in Chapter 19: Cumulative Effects and Inter-relationships.

11.11.4 The specific developments scoped into the CEA for the water environment and the tiers into which they have been allocated, are outlined in Table 11.11.1. The developments included as operational in this assessment have been commissioned since the baseline studies for this Project were undertaken and as such were excluded from the baseline assessment.

11.11.5 The assumption of the Project and this assessment is that the developments in Table 11.11.1 would comply with national planning policy and would therefore include mitigation not to increase flood risk off site nor detrimentally effect the water environment.

Table 11.11.1: List of Other Developments and Plans considered within CEA

Reference Number	Application Number	Description	Distance from Project (km)	Overlap with the Project?
Tier 1				
2	CR/2016/0858/ARM	Forge Wood. Application for approval for reserved matters for Phase 3 Employment Building, car parking, internal access roads, footpaths, parking and circulation areas, hard and soft landscaping and other associated infrastructure and engineering works.	1.6	Only an impact if no mitigation included – not anticipated
3	CR/2016/0083/ARM	Forge Wood. Application for approval of reserved matters for Phase 2c for the erection of 249 dwellings, car parking including garages, internal access roads, footpaths, parking and circulation area, hard and soft landscaping and other associated infrastructure and engineering works.	2.1	Only an impact if no mitigation included – not anticipated
9	CR/2016/0962/ARM	Forge Wood. Application for approval of reserved matters for Phase 3b for 151 dwellings and associated works.	2.2	Only an impact if no mitigation included – not anticipated
15	CR/2016/0114/ARM	Forge Wood. Approval of reserved matters for Phase 2d for the erection of 75 dwellings, car parking including garages, internal access roads, footpaths, parking and circulation area, hard and soft landscaping and other associated infrastructure and engineering works and noise.	2.1	Only an impact if no mitigation included – not anticipated
17	CR/2016/0780/ARM	Forge Wood. Application for approval of reserved matters for Phase 3a for 225 dwellings and associated works.	2.2	Only an impact if no mitigation included – not anticipated
46	CR/2018/0544/OUT	Application for up to 150 residential units; new site access from Birch Lea with enhanced access from Kenmara Court, demolition of the existing Oakwood Football Club.	2.1	Only an impact if no mitigation included – not anticipated
48	CR/2017/0810/FUL	Application for the temporary use (for a period of 5 years) of the site as a Park and Ride car park, comprising 892 car parking	1.2	Only an impact if no mitigation

Reference Number	Application Number	Description	Distance from Project (km)	Overlap with the Project?
		spaces (814 long stay) and associated infrastructure.		included – not anticipated
155	CR/2018/0894/OUT	Outline Application for up to 185 residential dwellings with associated vehicle and pedestrian access via steers lane, car parking, cycle storage and landscaping.	1.3	Only an impact if no mitigation included – not anticipated
158	CR/2016/0997/FUL	Demolition of 3 existing office buildings and erection of a new b1(a) office building.	2.0	Only an impact if no mitigation included – not anticipated
159	CR/2012/0134/OUT	Outline application for erection of a mixed use employment park to include use classes b1c, b2, b8 and a business hub accommodating a mix of uses, including b1a, b1c, b8, c1, a1, a3, a5 and car dealerships.	2.4	Only an impact if no mitigation included – not anticipated
162	CR/2017/0997/OUT	Hybrid application for construction of a new town hall and offices, associated car parking, 182 residential units and commercial space.	3.3	Only an impact if no mitigation included – not anticipated
52	04/02120/OUT	Comprehensive mixed use development to comprise housing (approx. 1510 dwellings), neighbourhood centre, primary school, recreation and open space uses, plus associated infrastructure and access roads linking the development to A23 and A217.	5.0	No – sufficiently downstream not to impact
64	2019/548/EIA	Request for screening opinion for the Proposed Development of circa 360 residential units and a small amount of commercial development.	1.5	Only an impact if no mitigation included – not anticipated
73	DC/17/2481	Outline planning application for the development of approximately 227 dwellings with the construction of a new access from Calvert Link, a pumping station and associated amenity space.	6.3	Only an impact if no mitigation included – not anticipated
81	13/04127/OUTES	Outline planning application for up to 500 homes, a primary school and doctors surgery, up to 15,500 sqm employment floorspace, public open space, allotments,	2.7	Only an impact if no mitigation included – not anticipated

Reference Number	Application Number	Description	Distance from Project (km)	Overlap with the Project?
		associated landscaping, infrastructure and pedestrian and cycle access.		
103	CR/2015/0552/NCC (and subsequent reserved matters and non-material amendment applications)	Allocated in Crawley Local Plan 2030 (Adopted) known as Forge Wood. Erection of up to 1900 dwellings, 5000 sqm of use class b1,b2 & b8 employment floorspace, 2500 sqm of retail floorspace, a local centre/community centre (including a community hall), a new primary school, recreational open space, landscaping, the relocation of the 132 Kv ohv power line adjacent to the m23, infrastructure and means of access. CR/1998/0039/OUT permitted through appeal on 16/02/2011. A variation of condition application, CR/2015/0552/NCC, was approved in 2016 and did not change the quantum of development, the proposed land uses or for the most part the general disposition of those land uses within the site. There have since been a number of reserved matters applications for the phased stages of development (1A,1C,2A,3A) and non-material amendments made.	1.6	Only an impact if no mitigation included – not anticipated
281	CR/2019/0542/FUL	Demolition of existing nightclub and redevelopment of site providing 152 apartments, ground floor commercial/retail space (class A1, A3, A4, B1 and/or D2 uses) split between 2 to 4 units, new publicly accessible public realm (including pocket park), new publicly accessible electric vehicle charging hub, car club and associated works	4	Only an impact if no mitigation included – not anticipated
283	CR/2015/0718/ARM	Allocation within Crawley Local Plan 2021-2037 (Regulation 19). Approval of Reserved Matters for Phase 2B for 169 dwellings and associated works pursuant to outline permission CR/2015/0552/NCC for a new mixed-use neighbourhood	1.6	Only an impact if no mitigation included – not anticipated

Reference Number	Application Number	Description	Distance from Project (km)	Overlap with the Project?
289	20/02515/SCREEN	Screening opinion for erection of a crematorium together with associated access, parking and landscaping. Screened as not EIA.	7.2	Only an impact if no mitigation included – not anticipated
292	20/02017/S73	Part demolition of existing building, conversion of upper floors of existing building to residential with additional floor, connected 5 storey new build residential building to provide total 43 apartments.	1.5	Only an impact if no mitigation included – not anticipated
149	DC/10/1612	Housing/Mixed Development site allocated in the Horsham DC Planning Framework (Adopted 2015). Outline approval for the development of approximately 2500 dwellings, new access from A264 and a secondary access from A264, neighbourhood centre, comprising retail, community building with library facility, public house, primary care centre and care home, main pumping station, land for primary school and nursery, land for employment uses, new rail station, energy centre and associated amenity space. To be constructed in phases of which most are built out.	6.7	Only an impact if no mitigation included – not anticipated
328	EIA/20/0004	EIA Scoping for West of Ifield - allocated site. The proposed development is on a site of 194 hectares in size with a minimum of 3,250 homes and up to 4,000 homes along with social infrastructure, green infrastructure and highway links.	1.5	Only an impact if no mitigation included – not anticipated
334	13/04127/OUTES	Outline planning application for up to 500 homes, a primary school and doctors surgery, up to 15,500 sqm employment floorspace (B1c light industry/B8 storage and distribution), public open space, allotments, associated landscaping, infrastructure (including substations and pumping station) and pedestrian and cycle access	2.7	Only an impact if no mitigation included – not anticipated
341	DM/20/4127	Outline application for an expansion of the existing commercial estate with up to 7,310	7.3	Only an impact if no mitigation

Reference Number	Application Number	Description	Distance from Project (km)	Overlap with the Project?
		sqm of new commercial space. There is currently 3,243 sqm of existing commercial space, of which 2,530 sqm will be retained and 713 sqm of lower-quality, temporary buildings and portacabins removed.		included – not anticipated
387	CR/2018/0273/FUL	Gatwick Station. Proposed construction of new station concourse/airport entrance area, link bridges, platform canopies, back of house staff accommodation and associated improvement works.	0	Only an impact if no mitigation included – not anticipated
Tier 2				
328	EIA/20/0004	EIA Scoping for West of Ifield - allocated site. EIA Scoping for West of Ifield - allocated site. The proposed development is on a site of 194 hectares in size with a minimum of 3,250 homes and up to 4,000 homes along with social infrastructure, green infrastructure and highway links.	1.5	Only an impact if no mitigation included – not anticipated
385	TR020003 (PINS Reference)	Expansion of Heathrow Airport to enable at least 740,000 air traffic movements per annum and including a new runway to the north-west of the existing airport; supporting airfield, terminal and transport infrastructure; works to the M25, local roads and rivers; temporary construction works, mitigation works and other associated development.	40	No hydraulic connection
Tier 3				
112	Tinsley Lane	Key Housing Site Allocation for 120 dwellings and community uses under Local Plan. Outline application CR/2018/0544/OUT for 150 units and community uses submitted in July 2018 appears to have been undetermined or withdrawn.	2.2	Only an impact if no mitigation included – not anticipated
133	Land west of Balcombe Road, Horley Strategic	Horely Employment Park - Strategic Employment Site - 83ha with 200,000 sqm office space.	0.4	Only an impact if no mitigation included – not anticipated

Reference Number	Application Number	Description	Distance from Project (km)	Overlap with the Project?
	Business Park			
134	Land off the Close and Haroldslea Drive	Residential allocation, up to 40 new homes, 2.4 hectare site.	1.2	Only an impact if no mitigation included – not anticipated
152	Land north of Rosemary Lane	Identified for a potential ca. 150 housing units, 5.12 hectare site.	1.4	Only an impact if no mitigation included – not anticipated
153	Land east of Ifield Road	Identified for a potential ca. 150 housing units, 9 hectare site with 5 hectares developable.	1.4	Only an impact if no mitigation included – not anticipated
356	Land adjacent to Desmond Anderson	Housing allocation for 150 dwellings	6.6	Only an impact if no mitigation included – not anticipated
357	Land to the southeast of Heathy Farm, Balcombe Road	Housing allocation for 150 dwellings	4.1	Only an impact if no mitigation included – not anticipated
359	Telford Place/ Haslett Avenue	Town Centre Key Opportunity Site - Housing allocation for 300 dwellings	5	Only an impact if no mitigation included – not anticipated
361	Crawley College	Town Centre Key Opportunity Site - Housing allocation for 400 dwellings	4.7	Only an impact if no mitigation included – not anticipated
368	Land east of Balcombe Road and South of the M23 Spur - 'Gatwick Green'	Allocated for an industrial-led Strategic Employment Location that will provide as a minimum 24.1 hectare new industrial land, predominantly for B8 storage and distribution use	2.5	Only an impact if no mitigation included – not anticipated

Reference Number	Application Number	Description	Distance from Project (km)	Overlap with the Project?
145	Land at Plough Road and Redehall Road, Smallfield	160 residential units, 5 hectare site under Proposed Plan	3.6	No – of sufficient distance not to interact
146	Land North of Plough Road, Smallfield	120 residential units, 9.2 hectare site under Proposed Plan	4.0	No – of sufficient distance not to interact
264	Land West of Reigate Road, Hookwood Site Allocation Policy SA42	Site identified in the Reg 18 consultation draft local plan (Feb 2020 to March 2020) for 450 dwellings and two gypsy and travellers pitches	0.3	Only an impact if no mitigation included – not anticipated
386	Gatwick Airport Sewage Treatment Works	Land within the airport available for extension to the Crawley Sewage Treatment Works if required.	0	Only an impact if no mitigation included – not anticipated

Cumulative Effects Assessment

11.11.6 A description of the significance of cumulative effects upon the water environment arising from each identified impact is given below.

Flood Risk, Surface Water Drainage, Geomorphology, Water Environment Regulations, Water Quality, Groundwater

11.11.7 It is assumed that approved developments within the ZoI would include embedded and further mitigation of any effects and residual effects respectively, in order to ensure there is no deleterious impact upon the water environment. The assessment undertaken in this chapter showcases that there will be no residual significant adverse effects to flood risk and surface water drainage, geomorphology, Water Environment Regulations, groundwater or water quality from the Project to third parties. Therefore, no cumulative effects are anticipated among the Project and other developments within the ZoI for all assessment years.

Water Infrastructure

11.11.8 With respect to the private Gatwick wastewater network, there are no cumulative effects, but there could be an impact on the public sewerage and treatment facilities. These are expected to be taken into account by Thames Water when they perform their forthcoming Development Impact Assessment (see paragraph 11.9.2).

11.11.9 In terms of water supply all of the items listed may have an impact on water supply, as all will increase demand in the surrounding area. Any hydraulic impact assessments will be carried out by SESW and it is recommended that regular contact be established during development of the Project programme with respect to any changes to levels of service.

11.12 Inter-Related Effects

11.12.1 The mitigation measures proposed as part of this assessment are embedded within the Project and any potential inter-related impacts with other topics would be assessed as part of this PEIR. One such risk is floodwater entering the wastewater sewerage system. If it did, then pumping stations could get inundated and flood themselves, adding to any water quality impact from the original flooding itself. Although the likelihood of this occurring in the baseline would be low, as the available pathways into the foul system are generally limited and it would be reduced further by the Project via the provision of new drainage infrastructure, it would still be considered.

11.12.2 Further mitigation proposed as part of other topics could potentially encroach on floodplain or interrupt existing surface water flow paths. At this stage, the specific location and arrangements of such mitigation measures have not been determined and potential inter-related effects cannot be assessed. These will be considered and, if necessary, mitigated during future design stages.

11.12.3 Water quality impacts of the Project could affect aquatic ecology receptors. This would be considered in the ES following completion of the surface water drainage hydraulic model. Although it is anticipated that the Project would include sufficient mitigation to ensure no significant impacts as a result of increased de-icer use.

11.12.4 There is an opportunity for use of the proposed flood compensation areas for other environmental mitigation and/ or recreational purposes, compatible with their currently proposed use. This should be considered during the final ES assessment and detailed design stages.

11.13 Summary

11.13.1 An assessment has been undertaken to identify the likely effects of the Project on the water environment comprising:

- flood risk and surface water drainage;
- geomorphology;
- Water Environment Regulations;
- water quality;
- groundwater resources;
- wastewater infrastructure; and
- water supply infrastructure.

11.13.2 The primary effects of the Project on the water environment, without the consideration of further mitigation, are related to flooding, surface water drainage, geomorphology and water quality. However, there are potential effects on all water environment elements.

11.13.3 For flood risk, the assessment covers all sources of flood risk to the Project, the likely effects of the Project on flood risk and the measures which are proposed as part of the Project to mitigate any potential effects.

11.13.4 The following conclusions can be made with regards to flood risk to the Project site:

- Fluvial flooding is the principal source of flood risk to the Project. Elements proposed as part of the Project, including new taxiways and stands, would be located as close to existing infrastructure as possible. Therefore, levels of fluvial flood risk to proposed airport infrastructure would be equivalent to existing or reduced.
- Surface water flooding is also a significant source of flooding to the Project. However, in most cases surface water flow paths and ponding areas are small in extent and do not encroach on proposed elements of the Project. Where they do, surface water drainage will mitigate any risk.
- At this stage, it has not been possible to fully quantify groundwater flood risk to the Project site; however, it is considered that the risk from groundwater flooding at the airport site is low.
- The risk of flooding from other sources, including reservoirs and sewers flooding, is considered low.

11.13.5 Hydraulic modelling results showed that the development of the Project would increase the risk of flooding if no mitigation was in place. Therefore, flood mitigation measures have been proposed and are embedded in the Project, such that the Project will remain safe for its lifetime without increasing flood risk elsewhere.

11.13.6 At this stage, the assessment of Project impacts on surface water flood extents is generally qualitative. A more detailed assessment will be undertaken once the Gatwick surface water model is validated for the ES. However, it has been shown that the Project would not significantly increase discharge volumes and peak runoff rates to third parties.

11.13.7 Any groundwater flood risk that could occur due to the Project would be addressed by adopting appropriate design practices. Overall, it is considered that the risk from groundwater flooding would not be adversely affected by the Project and risk from groundwater flooding would remain low.

11.13.8 Overall, the significance of flood risk effects from the Project on all sources of flood risk has been assessed to be (at worst) negligible or minor adverse and therefore not significant in terms of the EIA Regulations, assuming the appropriate embedded mitigation measures outlined above are implemented during the construction and operational phases. The development would therefore be safe for its users and would not increase flood risk elsewhere. For certain receptors, the Project improves fluvial flood risk for third parties.

11.13.9 For geomorphology, the assessment evaluates the potential impacts of the Project and the embedded flood mitigation measures on the geomorphology of watercourses in the study area, during the construction and operational phases of the Project. The assessment found that during the initial construction phase of the Project, there would be minor adverse impacts on the River Mole associated to construction of the channel diversion and creation of flood compensation areas which are part of the embedded flood mitigation. The effects would be temporary, however, and the channel diversion works would deliver an overall improvement to the geomorphology of the watercourse, supporting Water Environment Regulations objectives during operation. There would be negligible to minor adverse impacts during construction works with the provision of mitigation and best practice measures through the CoCP. During the first full year of operation, there would be a negligible to minor adverse impact on the watercourses as they adapt and adjust to associated construction works, including the new surface access arrangements at the South Terminal and North Terminal. During the interim assessment year of the Project, there would be minor adverse impacts on the watercourses associated to construction of the Gatwick Stream flood compensation area, with the provision of mitigation and best practice measures through the CoCP. During the design year, there would be minor to negligible adverse impacts associated to operational activities on the watercourses. These relate to the River Mole channel diversion, flood compensation areas and culvert extensions. There would be a moderate beneficial impact on the River Mole with the implementation of the mitigation proposed and further detailed design work. Other remaining impacts on the watercourses associated to the Project, such as new access arrangements, would be offset by improvements and environmental enhancement in other areas of the catchment, as part of the embedded mitigation.

11.13.10 Within the catchment there are several water bodies assessed in the Water Environment Regulations compliance assessment, including both surface water and groundwater features, many of which are of high importance. These could be potentially impacted by construction works, but through appropriate design and mitigation, the impact would not be significant. Following completion of construction, during operation, it is anticipated that there are benefits overall.

11.13.11 The diversion of the River Mole has been assessed to have a minor adverse effect on water quality. This would be short-term during construction, and the longer term effect is beneficial due to the naturalisation of the watercourse.

11.13.12 With regard to water quality, at this preliminary stage, the future de-icing strategy has not yet been developed. A precautionary approach has been taken assuming that de-icer load increases proportionally with the increase in air traffic movements and increase in airfield pavement area. The Project provides infrastructure to fully retain or treat this additional load and the assessment concludes that any impact on the water environment is negligible.

11.13.13 For groundwater, the hydrogeology of the area shows that the underlying strata are largely either secondary aquifers or unproductive strata. Potential impacts in construction and operation include the risk of pollution, diversion of groundwater flow, the introduction of new flow pathways, and alterations to recharge. All of the impacts identified can be mitigated to an acceptable level through good practices as embedded mitigation.

11.13.14 The impacts on the private airport wastewater system will be negligible, as upgrading works to accommodate the forecast increased inflows are to be constructed as part of the Project. Any impacts on the public sewerage conveyance and treatment facilities will be addressed by Thames Water in their forthcoming Development Impact Analysis and appropriate mitigation works will be provided if and as required.

11.13.15 For water supply the assessment shows that water demand will increase due to increase in passenger numbers through the existing site, during construction, and following completion of the terminal improvements and additional hotel and commercial facilities. This can be partially mitigated through introduction of water efficiencies during construction of new facilities. Following conversations with SESW it has been provisionally stated that forecast demands are unlikely to negatively impact the water source.

11.13.16 From the assessment undertaken of the potential impacts on all elements of the water environment, suitable mitigation has been proposed and it is concluded that there are no significant residual effects.

Next Steps

11.13.17 This PEIR Chapter has presented a preliminary assessment of the likely effects of the Project on the water environment. The assessment at the final ES stage will develop key subjects discussed within this chapter with further quantitative and qualitative detail and supported by more site-specific information and design detail.

11.13.18 The design of the highways improvement elements of the Project will be progressed further, and the assessment of impact will be updated to inform the ES.

11.13.19 Further development of a detailed surface water flood model and a combined surface water and fluvial model will be undertaken. This will allow for further quantitative assessment of impact on flood risk and water quality to be undertaken when the model is validated.

11.13.20 In terms of geomorphology, further information from comparison of changes in river energy and sediment transport would provide quantitative detail on the downstream impacts of the embedded flood mitigation.

11.13.21 In terms of Water Environment Regulations, further information from ecological surveys is required in order to fully complete the assessment. This should include fish, conclusions from the Habitats Regulations Non Significant Effects Report, macrophytes and invertebrates. Ground investigations, including aquifer depth will inform the ES. Finally, further information on the highway drainage design will be provided in order to support the conclusions in the assessment that there will be betterment.

11.13.22 In terms of groundwater flooding, the effects to and arising from the Project would be assessed in more detail once site-specific surveys and investigation provide information on the exact ground conditions, such as the extent of superficial deposits and thickness of the Weald Clay Formation and groundwater levels at the areas where works are proposed as part of the Project, including the Museum Field and Gatwick Stream flood compensation areas, which would inform the ES.

11.13.23 In terms of groundwater, further assessment of the potential effects of infiltration from the surface water drainage and unlined attenuation ponds will be undertaken to inform the final ES assessment.

11.13.24 In terms of water supply SESW have provisionally stated that current water sources are sufficient to maintain supply to Gatwick even with forecast increases and proposed external development. Further changes to demand forecasts through design refinement and/or change should be communicated to SESW for re-evaluation.

11.13.25 Overall, the information included in this chapter provides the basis for the production of the relevant ES chapter. However, aspects of the highways improvements will be further developed or refined and will be incorporated into the final ES assessment.

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Table 11.13.1: Summary of Effects

Receptor	Receptor Sensitivity	Description of Impact	Short / Medium / Long Term / Permanent	Magnitude of Impact	Significance of Effect	Significant / Not significant	Notes
Initial Construction Phase: 2024-2029							
Surface Water	High to Low	Impacts the River Mole, Gatwick Stream, Crawter's Brook, Burstow Stream, Burstow Stream tributary and surface water drainage ponds include: ▪ Destabilisation of banks due to vegetation clearance and bank top loading ▪ Disruption to quantity and dynamics of flow and sediment supply due to changes to bed and bank form ▪ Increase to suspended sediment loads due to channel disturbance and runoff from construction areas	Medium-term	Negligible Adverse	Negligible – Burstow Stream Tributary, Minor Adverse other watercourses	Not significant	

Receptor	Receptor Sensitivity	Description of Impact	Short / Medium / Long Term / Permanent	Magnitude of Impact	Significance of Effect	Significant / Not significant	Notes
Surface Water – River Mole Geomorphology and Water Quality	High	River Mole diversion geomorphology	Medium-term	Low Adverse	Minor Adverse	Not significant	
Surface Water – River Mole Geomorphology and Water Quality	High	Construction of culvert extension and re-provisioning of siphon north of runway could affect quantity and dynamics of flow and increase suspended sediment	Medium-term	Negligible Adverse	Minor Adverse	Not significant	
Surface Water – River Mole Geomorphology and Water Quality	High	Museum Field, East of Museum Field and car park X flood compensation areas	Medium-term	Negligible to Low Adverse	Minor Adverse	Not significant	
Surface Water – Crawter's Brook Geomorphology and Water Quality	High	Car park X flood compensation areas	Medium-term	Negligible Adverse	Minor Adverse	Not significant	

Receptor	Receptor Sensitivity	Description of Impact	Short / Medium / Long Term / Permanent	Magnitude of Impact	Significance of Effect	Significant / Not significant	Notes
Surface Water – Water Quality (Water Environment Regulations)	High	River Mole diversion water quality	Short-term	Low Adverse	Minor Adverse	Not significant	Considered a short-term impact during works and in long-term would be beneficial
Groundwater (Secondary A aquifer)	Low to Medium	Groundwater levels and flow	Short-term	Low Adverse	Negligible/ Minor Adverse	Not significant	
Groundwater (Secondary A aquifer)	Low to Medium	Diversion of flow and mobilisation of contaminants	Short-term	Low Adverse	Negligible/ Minor Adverse	Not significant	
Groundwater (Secondary A aquifer)	Low to Medium	Spillage of contaminants at the surface	Medium-term	Low Adverse	Negligible/ Minor Adverse	Not significant	
Flood Risk - Fluvial	Very High to Low	Loss of floodplain	Medium-term	Negligible to Minor Beneficial	Negligible to Minor Beneficial	Not significant	Mitigation measures address Project effects and reduce baseline flood risk
Flood Risk - Groundwater	Very High to Low	Lowering of ground levels or impediment of groundwater flows	Medium-term	Negligible	Negligible to Minor Adverse	Not significant	

Receptor	Receptor Sensitivity	Description of Impact	Short / Medium / Long Term / Permanent	Magnitude of Impact	Significance of Effect	Significant / Not significant	Notes
Flood Risk-Surface Water	Very High to Low	Increased flood risk due to: ▪ alteration of surface water flow paths ▪ changes in groundwater levels ▪ changes in surface water discharge rates and volumes	Medium-term	Negligible	Negligible to Minor Adverse	Not significant	
Water Infrastructure – Wastewater	Medium	Increased discharges to wastewater network due to construction activities and increased passengers	Medium-term	Negligible	Negligible to Minor Adverse	Not significant	
Water Infrastructure – Water Supply	Low	Increased water consumption due to construction activities	Medium-term	Negligible	Negligible to Minor Adverse	Not significant	
First full year of operation: 2029 (to 2032)							
Surface Water – Water Quality, Geomorphology and Water Environment Regulations	High to Low	Ongoing impacts the River Mole, Gatwick Stream, Crawter's Brook, Burstow Stream, Burstow Stream tributary and surface water drainage ponds from construction	Medium-term	Negligible Adverse	Minor Adverse - Gatwick Stream, River Mole and Crawter's Brook,	Not significant	

Receptor	Receptor Sensitivity	Description of Impact	Short / Medium / Long Term / Permanent	Magnitude of Impact	Significance of Effect	Significant / Not significant	Notes
					Burstow Stream, Negligible – Burstow Stream tributary		
Surface Water – Gatwick Stream Geomorphology, Water Quality	High	North Terminal highways works	Short-term	Negligible Adverse	Minor Adverse	Not significant	
Surface Water – Burstow Stream, Burstow Stream Tributary Geomorphology	Medium to Low	South Terminal highways works	Short-term	Negligible Adverse	Minor Adverse	Not significant	
Surface Water – River Mole Geomorphology	High	Longbridge Roundabout new surface access arrangements construction works	Short-term	Negligible Adverse	Minor Adverse	Not significant	
Surface Water - Gatwick Stream	High	Works at South Terminal roundabout could affect Gatwick Stream biological	Short-term	Low Adverse	Minor Adverse	Not significant	

Receptor	Receptor Sensitivity	Description of Impact	Short / Medium / Long Term / Permanent	Magnitude of Impact	Significance of Effect	Significant / Not significant	Notes
		elements from suspended sediment					
Surface Water – Water Quality	Low	Relocation of Pond A	Short-term	Low	Minor Beneficial	Not significant	
Groundwater and Flood Risk				No additional significant effects beyond those in the initial construction phase			
Water Infrastructure - Wastewater	Medium	Increased demand on wastewater network due to passenger growth	Long-term	Negligible	Negligible	Not significant	
Water Infrastructure - Water Supply	Low	Increased demand due to ongoing construction works and passenger growth	Long-term	Negligible	Negligible to Minor Adverse	Not significant	
Interim Assessment Year: 2032 (to 2037)							
Surface Water – Water Quality, Geomorphology and Water Environment Regulations	High to Low	Ongoing impacts the River Mole, Gatwick Stream, Crawter's Brook, Burstow Stream, Burstow Stream tributary and surface water drainage ponds from construction	Medium-term	Negligible Adverse	Minor Adverse - Gatwick Stream, River Mole and Crawter's Brook, Burstow Stream	Not significant	

Receptor	Receptor Sensitivity	Description of Impact	Short / Medium / Long Term / Permanent	Magnitude of Impact	Significance of Effect	Significant / Not significant	Notes
					Negligible – Burstow Stream tributary		
Surface Water – Water quality, Geomorphology and Water Environment Regulations	High	Construction of Gatwick Stream flood compensation area introducing sediment and changing bed form	Medium-term	Low Adverse	Minor Adverse	Not significant	
Groundwater - Secondary A aquifer	Low	Below ground works, eg car park Y, Pier 7 etc resulting in dewatering	Short-term	Low	Negligible to Minor Adverse	Not significant	Localised impacts
Groundwater - Upper Tunbridge Wells Sand Aquifer	Medium	Excavation of Gatwick Stream flood compensation areas may penetrate top of aquifer	Short-term	Low	Minor Adverse	Not significant	
Flood Risk				No additional significant effects beyond those in the initial construction phase			
Water Infrastructure - Wastewater	Medium	Increased demand on wastewater network due to passenger growth	Long-term	Negligible	Negligible	Not significant	

Receptor	Receptor Sensitivity	Description of Impact	Short / Medium / Long Term / Permanent	Magnitude of Impact	Significance of Effect	Significant / Not significant	Notes
Water Infrastructure - Water Supply	Low	Increased demand due to ongoing construction works and passenger growth	Long-term	No Change	No Change	Not significant	
Design Year: 2038							
Surface Water – Water Quality	High	Increase deicer use, potentially discharging to River Mole and Gatwick Stream	Long-term	Negligible	Minor Adverse	Not significant	Quality of discharges controlled by existing consents
Surface Water - Water Quality and Geomorphology	High	River Mole diversion, including re-meandering and restoration of natural channel morphology, improved floodplain coupling	Long-term	Medium Beneficial	Moderate Beneficial	Significant	
Surface Water - Geomorphology	High	River Mole diversion: changes to channel velocity and sediment transport modifications	Long-term	Low Adverse	Minor Adverse	Not significant	Further Project design work required to ensure a suitable river type for the bed gradient of the realignment in order to maintain

Receptor	Receptor Sensitivity	Description of Impact	Short / Medium / Long Term / Permanent	Magnitude of Impact	Significance of Effect	Significant / Not significant	Notes
							sediment transport capability.
Surface Water - Geomorphology	High	Extension of River Mole culvert results in removal of natural bed and banks	Long-term	Negligible Adverse	Minor Adverse	Not significant	Short length of channel affected, offset by enhancements downstream
Surface Water - Geomorphology	High	Creation of flood compensation areas: Museum Field, east of Museum Field and Gatwick Stream resulting in loss of natural bank	Long-term	Negligible to Low Adverse	Minor Adverse	Not significant	Small length of bank affected
Surface Water - Geomorphology	High	Car park X flood compensation area reduction in channel-floodplain coupling, car park X outfall loss of natural bank	Long-term	Negligible Adverse	Minor Adverse	Not significant	Small area impacted and set back from watercourse
Surface Water – Geomorphology	Medium to Low	South Terminal new surface access arrangements loss of banks due to extension of existing	Long-term	Negligible Adverse	Minor Adverse – Burstow Stream,	Not significant	Small length of bank affected

Receptor	Receptor Sensitivity	Description of Impact	Short / Medium / Long Term / Permanent	Magnitude of Impact	Significance of Effect	Significant / Not significant	Notes
		culvert at Burstow Stream Tributary, and modifications/creation of outfall to connect attenuation ponds			Negligible – Burstow Stream tributary		
Surface Water – Geomorphology	High	North Terminal new surface access arrangements encroachment onto floodplain and loss of banks due to new outfall headwalls on River Mole and Gatwick Stream	Long-term	Negligible Adverse	Minor Adverse	Not significant	Small area impacted and set back from watercourse
Surface Water – Geomorphology	High	Longbridge Roundabout new surface access arrangements encroachment onto floodplain and loss of banks due to new outfall headwalls on River Mole	Long-term	Negligible Adverse	Minor Adverse	Not significant	Small area impacted
Surface Water – Water Quality	High	Impacts to biological and chemical elements of River Mole	Medium-term	Low Beneficial	Minor Beneficial	Not significant	

Receptor	Receptor Sensitivity	Description of Impact	Short / Medium / Long Term / Permanent	Magnitude of Impact	Significance of Effect	Significant / Not significant	Notes
Surface Water – Water Quality	High	Construction of South Terminal roundabout improving chemical elements of Gatwick Stream	Long-term	Low Beneficial	Minor Beneficial	Not significant	
Surface Water – Water Quality	Medium	Construction of North Terminal roundabout improving chemical elements of Gatwick Stream	Long-term	Low Beneficial	Minor Beneficial	Not significant	
Groundwater – Superficial Secondary A aquifer	Low	Change in recharge, groundwater flow and storage	Long-term	Low Adverse	Negligible to Minor Adverse	Not significant	
Groundwater - Upper Tunbridge Wells Sand Secondary A aquifer	Medium	Change in recharge, groundwater levels and flow	Long-term	Negligible	Negligible	Not significant	Potential for aquifer recharge via flood plain compensation area
Flood Risk - Surface Water (Offsite)	Very High to High	Increased flood risk due to increased impermeable area	Long-term	Negligible	Negligible to Minor Adverse	Not significant	Potential impact on flood risk is long-term, however, if the

Receptor	Receptor Sensitivity	Description of Impact	Short / Medium / Long Term / Permanent	Magnitude of Impact	Significance of Effect	Significant / Not significant	Notes
							risk is realised, the flooding would be a short-term event.
Flood Risk – Surface Water (on Airport)	Very High to Low	Increased surface runoff due to increased impermeable area	Long-term	Medium to No Change	Minor Beneficial to Minor Adverse	Not significant	Potential impact on flood risk is long-term, however, if the risk is realised, the flooding would be a short-term event.
Flood Risk – Fluvial (offsite)	Very High (Transport Infrastructure) to Medium (Industrial)	Change in flood risk due to encroachment into floodplain	Long-term	Medium to No Change	Major Beneficial to No Change	Significant (beneficial)	Potential impact on flood risk is long-term, however, if the risk is realised, the flooding would be a short-term event. Third party receptors would experience lower

Receptor	Receptor Sensitivity	Description of Impact	Short / Medium / Long Term / Permanent	Magnitude of Impact	Significance of Effect	Significant / Not significant	Notes
							flood depths for the design event.
Flood Risk – Fluvial (on Airport)	Very High to Low	Change in flood risk due to encroachment into floodplain	Long-term	Medium to No Change	Major Beneficial to Minor Adverse	Significant (beneficial)	Potential impact on flood risk is long-term, however, if the risk is realised, the flooding would be a short-term event. Small extent of increase at Fire training Ground
Flood Risk - Reservoir	Very High to Low	Increased exposure to flooding as a result of reservoir failure	Long-term	No Change	No Change	Not significant	Potential impact on flood risk is long-term, however, if the risk is realised, the flooding would be a short-term event.

Receptor	Receptor Sensitivity	Description of Impact	Short / Medium / Long Term / Permanent	Magnitude of Impact	Significance of Effect	Significant / Not significant	Notes
Flood Risk - Groundwater	Very High to Low	Interception or diversion of groundwater flows due to new structures	Long-term	Negligible	Negligible to Minor Adverse	Not significant	Potential impact on flood risk is long-term, however, if the risk is realised, the flooding would be a short-term event.
Flood Risk – Sewer/ Water Supply	Very High to Low	Additional loading to the airport foul sewerage system and additional water supply infrastructure installed	Long-term	Negligible	Minor Beneficial to Minor Adverse	Not significant	Potential impact on flood risk is long-term, however, if the risk is realised, the flooding would be a short-term event.
Water Infrastructure - Wastewater	Medium	Increased demand on wastewater network due to passenger growth	Long-term	Negligible	Negligible to Minor Adverse	Not significant	
Water Infrastructure - Water Supply	Very Low	Increase in water demand due to passenger growth	Long-term	Low Adverse	Negligible to Minor Adverse	Not significant	

Receptor	Receptor Sensitivity	Description of Impact	Short / Medium / Long Term / Permanent	Magnitude of Impact	Significance of Effect	Significant / Not significant	Notes
River Mole overall effect				Minor Beneficial			
Gatwick Stream overall effect				Minor Adverse			
Crawter's Brook overall effect				Minor Adverse			
Burstow Stream overall effect				Negligible			

11.14 References

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11.15 Glossary

Table 11.15.1: Glossary of Terms

Term	Description
AEP	Annual Exceedance Probability
AOD	Above Ordnance Datum
ATMs	Air Traffic Movements
BGS	British Geological Survey
CAMS	Catchment Abstraction Management Strategy
CBC	Crawley Borough Council
CEA	Cumulative Effects Assessment
CoCP	Code of Construction Practice
DCLG	Department of Communities and Local Government
DMRB	Design Manual for Roads and Bridges
EIA	Environmental Impact Assessment
ES	Environmental Statement
EU	European Union
FCA	Flood Compensation Area
FRA	Flood Risk Assessment
GEP	Good Ecological Potential
GES	Good Ecological Status
GI	Ground Investigation
GWDTE	Groundwater Dependent Terrestrial Ecosystem
LLFA	Lead Local Flood Authority
LNR	Local Nature Reserve
mbgl	Metres below ground level
Ml/d	Megaliters (one million litres) per day
NPPF	National Planning Policy Framework
NPPG	National Planning Practice Guidance
NPS	National Policy Statement
Ofwat	The (England and Wales) Water Services Regulation Authority
PEIR	Preliminary Environmental Information Report
PINS	Planning Inspectorate
PS	Pumping Station
RBD	River Basin District
RBMP	River Basin Management Plan
RoFSW	Risk of Flooding from Surface Water
RTD	River Terrace Deposits
SAC	Special Area of Conservation
SESW	Sutton and East Surrey Water

Term	Description
SFRA	Strategic Flood Risk Assessment
SPA	Special Protection Area
SPZ	Source Protection Zone
SSSI	Site of Special Scientific Interest
STW	Sewage Treatment Works
SWMP	Surface Water Management Plan
TW	Thames Water
UKCP	United Kingdom Climate Predictions (2009 and 2018)
UWWTD	Urban Wastewater Treatment Directive
ZoI	Zone of Influence