

14.0 FLOOD RISK AND DRAINAGE

Introduction

- 14.1 This Chapter has been prepared by Mott MacDonald. This Chapter assesses the potential construction and operational effects from the Proposed Development comprising: the potential impact of the development on the drainage and flood risk of the surrounding area; and, the assessment of flood risk to the Proposed Development.
- 14.2 The Proposed Development boundary is defined by the red line boundary, as shown in **Figure 14.1**. Land drainage refers to surface water runoff, surface water sewers and combined foul water sewers; the Flood Risk Assessment (FRA, see **Appendix 14.1**) has determined the potential changes due to the Proposed Development in fluvial, pluvial, groundwater and artificial sources of flood risk, including consideration of climate change.
- 14.3 The Proposed Development will require site preparation and construction works which will have the potential to change flood risk in the vicinity of the Site through temporary works, landform/topographical changes, and changes to existing watercourses and drainage paths. In operation, the Proposed Development will have the potential to change flood risk in the vicinity of the Site through permanent topographical changes and changes to the existing drainage paths.
- 14.4 The assessment of flood risk impacts has been undertaken in accordance with best practice guidance and requirements identified by the National Planning Policy Framework (NPPF)ⁱ, and issued by the EA and the local planning authorities.

Legislation and Policy

- 14.5 The principal legislative and planning context for the environmental assessment of the flood risk and drainage elements of the Proposed Development is presented in the following sub-sections.

Legislation

- 14.6 The following pieces of legislation are relevant for the wider context of flood risk and environmental management relating to planning policy and new developments:
- The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 ⁱⁱ
 - Environmental Permitting (England and Wales) Regulations 2016 (as amended) ⁱⁱⁱ
 - The Flood and Water Management Act 2010 ^{iv}
 - The Water Resources Act 1991 (amendment) (England and Wales) Regulations 2009 ^v
 - The Flood Risk Regulations 2009 ^{vi}
 - Environmental Damage (Prevention and Remediation) Regulations (England) 2015 ^{vii}

- The Land Drainage Act 1991^{viii}

National Policy

The National Planning Policy Framework 2023

- 14.7 The NPPF states that when determining any planning application, local planning authorities should ensure that flood risk is not increased elsewhere. Where appropriate, applications should be supported by a site-specific FRA. Development should only be allowed in areas at risk of flooding where, in the light of this assessment (and the sequential and exception tests, as applicable) it can be demonstrated that:
- Within the Site, the most vulnerable development is located in areas of lowest flood risk, unless there are overriding reasons to prefer a different location;
 - The development is appropriately flood resistant and resilient such that, in the event of a flood, it could be quickly brought back into use without significant refurbishment;
 - It incorporates sustainable drainage systems, unless there is clear evidence that this would be inappropriate;
 - Any residual risk can be safely managed; and,
 - Safe access and escape routes are included where appropriate, as part of an agreed emergency plan.
- 14.8 Major developments should incorporate sustainable drainage systems (SuDs) unless there is clear evidence that this would be inappropriate.

National Planning Practice Guidance 2022

- 14.9 The National Planning Practice Guidance (NPPG)^{ix} sets out the Sustainable Drainage Hierarchy. Generally, the aim should be to discharge surface water runoff as high up the following hierarchy of drainage options as reasonably practicable:
- into the ground (infiltration);
 - to a surface water body;
 - to a surface water sewer, highway drain, or another drainage system; and
 - to a combined sewer.
- 14.10 It is necessary to identify the most appropriate method of controlling and discharging surface water from the Proposed Development. Where possible, surface water run-off from the developed site will be drained in such a way as to mimic the natural drainage system and thereby implement a SuDS approach. The design should seek to improve the local run-off profile by using systems that can either attenuate run-off and reduce peak-flow rates, or positively impact on the existing flood profile.

14.11 The Environment Agency requires, in accordance with the Government's Planning Practice Guidance – Technical Guidance document^x, that there should be no increase in the rate of surface water emanating from a newly developed site above that of any previous development. Furthermore, it is the joint aim of the Environment Agency and Local Planning Authorities to actively encourage a reduction in the discharge of storm water as a condition of approval for new developments.

Planning Practice Guidance for Flood Risk and Coastal Change 2022^{xi}

14.12 Planning Practice Guidance (PPG) for flood risk and coastal change, within the NPPG, advises how to take account of the NPPF policies to address the risks associated with flooding in the planning process.

14.13 The PPG provides greater details from the overview in the NPPF on Flood Risk Assessments from a risk-based perspective, together with the application of sustainable drainage systems and other mitigation measures to reduce and control the impacts of the Proposed Development.

Local/Regional Policy

Oxfordshire County Council Local Standards and Guidance for Surface Water Drainage on Major Development in Oxfordshire 2021

14.14 The document details Oxfordshire County Council's required approaches for the consideration of the management of surface water drainage for major developments. The document identifies how reductions in flood risk and opportunities to improve environmental habitats, water quality and amenities should be undertaken as part of the design of surface water management in major developments.

14.15 The document highlights specific local standards for the consideration of flood risk in the design process, including:

- Discharge rates from the development site;
- Assessment of current drainage discharge rates;
- Flow route across the Site in relation to buildings;
- Interaction and management of flow onto the Site from adjacent developments;
- SuDS capacity and maintenance;
- Freeboard provision in the drainage design; and
- Potential groundwater interaction with infiltration features.

14.16 The relevant policies within the Cherwell District Council Local Plan are outlined below.

Policy ESD 1: Mitigation and Adapting to Climate Change

14.17 This policy requires measures to be taken to mitigate the impact of development on climate change. Suitable adaptation measures in new development include minimising the risk of flooding, making use of sustainable drainage methods and reducing the effects of development on the microclimate.

Policy ESD 6: Sustainable Flood Risk Management

14.18 The policy aims to manage and reduce flood risk through using a sequential approach to development, locating vulnerable developments in areas at lower risk of flooding. Development proposals will be assessed according to the sequential approach and where necessary the exceptions test as set out in the NPPF. Development will only be permitted in areas of flood risk where there are no reasonably available sites in areas of lower flood risk and the benefits of the development outweigh the risks from flooding.

14.19 Site specific flood risk assessments will be required to accompany development proposals of an area of one hectare or more located in Flood Zone 1.

14.20 Flood risk assessments should assess all sources of flood risk and demonstrate that:

- There will be no increase in surface water discharge rates or volumes during storm events up to and including the 1% AEP storm event with an allowance for climate change (the design storm event); and
- Developments will not flood from surface water up to and including the design storm event or any surface water flooding beyond the 3.33% AEP storm event, up to and including the design storm event will be safely contained on site.

14.21 Development should be safe and remain operational (where necessary) and proposals should demonstrate that surface water will be managed effectively on site and that the development will not increase flood risk elsewhere, including sewer flooding.

Policy ESD 7: Sustainable Drainage Systems (SuDS)

14.22 The policy states that all development will be required to use SuDS for the management of surface water run-off. Where site specific Flood Risk Assessments are required in association with development proposals, they should be used to determine how SuDS can be used on particular sites and to design appropriate systems.

14.23 In considering SuDS solutions, the need to protect groundwater quality must be taken into account, especially where infiltration techniques are proposed. Where possible, SuDS should seek to reduce flood risk, reduce pollution and provide landscape and wildlife benefits. SuDS will require the approval of Oxfordshire County Council as Lead Local Flood Authority (LLFA) and SuDS Approval Body, and proposals must include an agreement on the future management, maintenance and replacement of the SuDS features.

Cherwell District Council Level 1 Strategic Flood Risk Assessment (SFRA) Update 2017^{xiii}

14.24 The SFRA does not identify the Site in its mapping of potential development sites. The overall document has however been used to identify elements of flood risk, these elements are discussed in the FRA, see **Appendix 14.1**.

Guidance

14.25 The following industry standard and best practice guidance in relation to the water environment relate to the Proposed Development:

- Flood Risk Assessments: Climate Change Allowances ^{xiv};
- SuDS Manual C753 ^{xv};
- Control of water pollution from construction sites: Guidance for consultants and contractors C532 ^{xvi}; and
- Sewerage Sector Guidance, **Appendix C**: Design and Construction Guidance for foul and surface water sewers offered for adoption under the Code for adoption agreements for water and sewerage companies operating wholly or mainly in England ^{xvii}.

Assessment Methodology and Significance Criteria

Study Area

14.26 The study area defined for flood risk is shown **Figure 14.2** which covers a 1km radius around the perimeter of the Proposed Development. Extensions to the study area from the fixed size and shape of the area were considered in case other sensitive features could be affected. However, no additional receptors outside the 1km study area were identified. This precautionary approach determined that any potential effects of the Proposed Development have been sufficiently identified.

Methodology

Baseline assessment

- 14.27 The baseline assessment considers the existing conditions both on and around the Site.
- 14.28 The baseline condition review has identified the fluvial flood risk as low importance to the Proposed Development for the baseline and future scenarios. Therefore, fluvial flood risk is assessed to the minimum requirement of the FRA (see **Appendix 14.1**).

Impact assessment method

- 14.29 The EIA assessment methodology identified the significance of an effect by firstly considering the sensitivity of the receptor (its importance and ability to tolerate and recover from change) and by considering the likely magnitude of the impact (its spatial extent and duration). By combining sensitivity and magnitude, the significance of the effect was established. Where significant negative effects were identified, mitigation measures were stated to reduce the significance.
- 14.30 An FRA has been prepared in accordance with the requirements of the LLFA, EA and relevant contents of NPPF and NFFG policy and PPG guidance and assesses all relevant sources of flood risk. The assessment for flood risk draws upon the studies and conclusions completed within the FRA.
- 14.31 Receptors have been identified through desk study to identify risks to flooding from the Proposed Development. The sensitivity classifications have been used from Chapter 2 of this document and these classifications have been mapped to the flood risk receptor categories in the NPPF Annex 3: Flood risk vulnerability classification^{xviii}. The types of flood risk receptors have been classified as High, Medium or Low sensitivity as defined in **Table 14.1**.

Table 14.1: Sensitivity of impact definitions

Sensitivity	Criteria for assessing sensitivity	Flood risk sensitivity (NPPF categories Annex 3)	Examples of receptors for flood risk sensitivities (NPPF Annex 3)
High	The receptor has little ability to absorb an increase in flood risk without fundamentally altering its present character, is of high environmental value, or is of international or national importance (e.g., Special Protection Area (SPA),	Essential infrastructure	Essential transport and utility infrastructure
		Highly Vulnerable	Emergency services, basement dwellings and caravan parks for permanent residence

Sensitivity	Criteria for assessing sensitivity	Flood risk sensitivity (NPPF categories Annex 3)	Examples of receptors for flood risk sensitivities (NPPF Annex 3)
	Area of Outstanding National Beauty (AONB)).	More vulnerable	Hospitals, care homes, buildings used for dwellings and holiday parks for temporary residence
Medium	The receptor has moderate capacity to absorb an increase in flood risk without significantly altering its present character, has some environmental value or is of regional importance.	Less vulnerable	Commercial premises, and land and buildings for agriculture and forestry
Low	The receptor is tolerant of an increase in flood risk without detriment to its character, is of low environmental value or is of low or local importance.	Water-compatible development	Water-based recreation, amenity open space and areas of nature conversation and biodiversity
Negligible	The receptor is resistant to an increase in flood risk or is of little environmental value	-	-

Source: Adapted from the methodology set out in Chapter 2 of this document.

14.32 The criteria to determine the magnitude of impact related to flood risk is summarised in **Table 14.2**. The magnitude of impact will be classified as Negligible, Low, Medium or High.

Table 14.2: Magnitude of adverse impact definitions

Magnitude of adverse impact	Description	Example
High	Results in a loss of attribute and/or quality and integrity of the attribute. Following development, the baseline situation is fundamentally changed.	Examples include: Loss of flood storage/increased flood risk. Large change in: <ul style="list-style-type: none"> • NPPF Flood Risk Vulnerability Classification; • Surface water flood risk; and • Fluvial flood risk - increase in peak flood level (>100mm)
Medium	Results in impact on integrity of attribute, or loss of part of attribute. Following development, the baseline situation is noticeably changed.	Examples include: Contribution of a significant proportion of the effluent in the receiving river, but insufficient to change its qualities. Moderate change in: <ul style="list-style-type: none"> • NPPF Flood Risk Vulnerability Classification; • Surface water flood risk; and • Fluvial flood risk – increase in peak flood level (>50mm, <100mm)
Low	Results in some measurable change in attribute's quality or	Examples include: Measurable changes in attribute, but of limited extent/duration.

	vulnerability. Following development, the baseline situation is largely unchanged with barely discernible differences.	Small change in: <ul style="list-style-type: none"> • NPPF Flood Risk Vulnerability Classification; • Surface water flood risk; and • Fluvial flood risk – increase in peak flood level (>10mm, <50mm)
Negligible	The impacts are unlikely to be detectable or outside the norms of natural variation.	<ul style="list-style-type: none"> • Negligible change to peak flood level (<+/- 10mm)

Source: Adapted from the methodology set out in Chapter 2 of this document.

14.33 Upon confirming the sensitivity of the receptor and the magnitude of the change, the impact to the receptor can be determined based on **Table 14.3**; an asterisk denotes a significant effect.

Table 14.3: Determining significance of effect

Magnitude	Sensitivity of receptor			
	High sensitivity	Medium sensitivity	Low sensitivity	Negligible
High	Major*	Major/Moderate*	Moderate*/Minor	Negligible
Medium	Major/Moderate*	Moderate*	Minor	Negligible
Low	Moderate*/Minor	Minor	Minor/Negligible	Negligible
Negligible	Negligible	Negligible	Negligible	Negligible

Source: Adapted from the methodology set out in Chapter 2 of this document.

14.34 The terms outlined in the above table have been defined as follows:

- Major (adverse or beneficial) – where the development would cause significant deterioration (or improvement) of the existing environment;
- Moderate (adverse or beneficial) – where the development would cause noticeable deterioration (or improvement) to the existing environment;
- Minor (adverse or beneficial) – where the development would cause perceptible deterioration (or improvement) to the existing environment; and
- Negligible – no discernible improvement or deterioration to the existing environment.

Consultation

14.35 Consultation regarding flood risk has been undertaken with Oxfordshire County Council as the LLFA, and Cherwell District Council.

Oxfordshire County Council

14.36 A response was received from Oxfordshire County Council, as the LLFA, to the Scoping Request for the Proposed Development on 27 September 2023. The response identifies the key legislation and policies to be addressed in the design of the Proposed Development (as set out above). The

response identifies that a site-specific FRA is required for the planning application, as appended to this Chapter in **Appendix 14.1**.

- 14.37 The response highlights aspects of the NPPF and the NPPG requiring a sequential approach to be used for planning applications in areas of current or future flood risk. This approach has been completed within the appended FRA.
- 14.38 The comments also emphasise the design principles for the surface water management for the Proposed Development, including the SuDS Policy^{xix}. Details of the proposed surface water drainage systems, SuDS and the overall Surface Water Management Strategy are also included in the FRA.
- 14.39 The Council's response also includes comments from the Local Council Member for the Kidlington East Ward as summarised in the following list. The points are considered in detail in the FRA and are part of the ES assessment process in this document.
- Highlighting of the risk of flooding in the general area of the Site due to the interrelated aspects of historic flood management in the area.
 - A concern regarding the 'knock-on effect' of the removal of vegetation for the Proposed Development on flood risk to other areas including the railway station and the Stratfield Brake sports ground nearby.
 - The change in land cover and land use for the Proposed Development site having a potential impact to flood risk for other areas.
 - A query of the capacity of the field ditches/channels and the culvert under the A4260 to serve the Site and the sub-catchment areas connected by the drainage ditches.
 - The risk that the Proposed Development may have on groundwater flooding, with groundwater flooding issues noted in the nearby Garden City area.
 - A suggestion for a discussion with Thames Water regarding their capacity for dealing with surface water and waste from the Site.
- 14.40 Further discussion between Oxfordshire County Council (in its capacity as both the LLFA and Highways Authority) and the applicant are ongoing to arrange for the A4260 culvert to be unblocked prior to construction and maintained throughout the design life of the Proposed Development.

Cherwell District Council

- 14.41 The scoping response from Cherwell District Council was received on 29 September 2023. The response confirms the Site's location in the Environment Agency's Flood Zone 1, with an area of surface water flood risk on part of the Site due to the low topography.

- 14.42 The collated responses related to flood risk from consultees in Cherwell District Council's correspondence comprise the following points. The points are considered in detail in the FRA and are part of the ES assessment process in this document.
- Thames Water: A consideration that surface water drainage requirements are met in the Proposed Design.
 - Cherwell District Council Land Drainage: The response highlights the need for the planning application to consider surface water management as the surface water discharge leaves the Site. The comments recommend consideration of (i) the impact of the surface water discharge from the Site on downstream flood risk; and (ii) the potential impact of blockage and maintenance issues at the downstream siphon under the Oxford Canal on the floodplain and the Site. The comment requests consideration to both the hydraulic and ecological effects of the Site drainage.
 - Review of appraisal process for flood risk: The response shows agreement from Cherwell District Council on the sources of flooding that should be scoped into the ES being surface water, groundwater and artificial sources; the response excludes fluvial flood risk from the scope of the assessment.
 - The response cross-references the comments from the Cherwell District Council Land Drainage team, as discussed above and the comments from the LLFA from Oxford City Council.
- 14.43 A meeting was held with the Cherwell District Council Flood Risk Manager on 11 October 2023, and a follow up meeting was undertaken on site on the 17 October 2023. The meetings reduced the level of the flood risk concerns raised by Cherwell District Council in their response to the ES scoping report.
- 14.44 During the site visit, it was identified by both parties that the size and gradient of the downstream ditch/channel from the Site was larger than expected with approximate dimensions 1-1.5m deep, 1m channel base width and 2-3m bank top width. It is expected that the ditch/channel is owned and therefore maintained by the Woodland Trust as part of the Stratfield Brake woodland area.
- 14.45 During the site visit, a significant blockage of silt in the existing culvert under the A4260 that drains the Site was observed. Estimates from the site walkover indicated that the ditch/channel gradient as 1:300, with an estimated elevation difference between the A4260 culvert and the siphon under the Oxford Canal of 2-3m. The channel was relatively clear of dense vegetation in the upstream reach near the A4260, but was progressively more overgrown, largely with brambles towards the canal.
- 14.46 The Flood Manager from Cherwell District Council noted that if the culvert and ditch were unblocked and cleared out there would be no significant concern for flood impacts from the Proposed Development downstream of the Site. The Flood Manager explained that historic flooding from the ditch/channel network had not been known to extend beyond the existing small pond adjacent to

the canal (grid reference 449130, 211865). The floodplain, considering the gradient along the ditch to the canal was agreed by both parties to be of a considerable size.

- 14.47 Foul water drainage is proposed to be discharged to the Thames Water sewer system to the north of Kidlington Roundabout. Consultation with Thames Water has identified that further Thames Water modelling of their sewer system would be required to determine sufficient capacity. Further discussions are required for the developing design to confirm this and to determine that the extent of the connection from the site to the Thames Water system is adopted by Thames Water.

Baseline Conditions

- 14.48 Information to assist with defining the existing baseline conditions were obtained from the FRA (see **Appendix 14.1**), including the following sources:
- Catchment Data Explorer (Environment Agency) ^{xx}
 - Flood Map for Planning (Environment Agency) ^{xxi}
 - Flood Risk Map for Surface Water and Artificial Sources (Environment Agency) ^{xxii}
 - Magic Map Application (MAGIC) ^{xxiii}
 - BGS Geology Viewer (British Geological Survey) ^{xxiv}
 - LandIS Soilscape mapping (Cranfield Environment Centre) ^{xxv}
 - Flood Risk Review as part of the feasibility stage (Ridge and Partners, 2023) ^{xxvi}
 - Areas Susceptible to Groundwater Flooding Map ^{xxvii}
- 14.49 The baseline identifies potential receptors and considers the range and interactions of processes which will influence flood risk.

Natural sources of flood risk

Fluvial flood risk

- 14.50 Using the statutory main river designation outlined by the Environment Agency (2019)^{xxviii}, there are no main rivers inside the red line boundary.
- 14.51 Using the same designation, there is a Main River, Kingsbridge Brook, within the 1km radius of the Site. The Kingsbridge Brook is located to the west of the Oxford Canal (further details of which are provided in artificial sources of flood risk section) and drains in a south-westerly direction away from the Site.
- 14.52 The Site is defined by the Environment Agency as being located in Flood Zone 1 (low probability, comprising of land having less than 1 in 1000 annual probability of river or sea flooding) for planning

purposes. The elevation of the Site above the floodplain of Kingsbridge Brook shows that the Site is not at flood risk from this watercourse.

- 14.53 The present-day fluvial flood risk has been assigned as Low importance as the whole Site is in Flood Zone 1 (low risk).
- 14.54 This categorisation is unlikely to change under climate change scenarios. This is due to the Site being at a large distance from the nearest main river (approximately 750m) and the Proposed Development being perched at a higher elevation (approximately 3m higher) than the ground levels to the east and west.

Pluvial flood risk

- 14.55 Pluvial flood risk refers to flooding as a result of rainwater not being able to drain away through the normal drainage system. For the Site of the Proposed Development, the drainage system is being defined as recognisable watercourses or drainage ditches that are not defined as Main Rivers by the Environment Agency (2019), but which have the potential to impact the study area.
- 14.56 Defined by the BGS, the bedrock geology of the Site is clay/mudstone as part of the Oxford Clay formation and West Walton formation. The superficial deposits are unspecified. The Soilscape^{xxix} defines the soil across the Site as “slowly permeable, seasonally wet, slightly acid but base-rich loamy and clayey”.
- 14.57 The combination of the geological and soil characteristics means the Site is likely have a flashy response to rainfall events, and subsequent surface water runoff.
- 14.58 Site investigation identified a number of ditches that are located within the Site. The ditch arrangements have been highlighted in **Figure 14.3**, which shows the estimated locations of the ditches and the culvert under the A4260.
- 14.59 The Site has existing field ditches running along the south-eastern and north-western boundaries, predominantly draining west, and discharging to the west via a culvert beneath the A4260. The south-eastern drainage ditch is culverted to the east and potentially discharges into the adjacent road drainage system. The ditches form the existing field and land drainage for the Site.
- 14.60 There are areas of high risk of pluvial flooding (3.33% AEP or greater probability of flooding each year), as defined by the Environment Agency’s surface water flood risk map, shown in **Figure 14.2**. This area of higher risk is located to the west of the Site and correlates with an area of low topography approaching the culvert underneath the A4260.

- 14.61 A site visit in July 2023 identified that the existing culvert (approximately 825mm in diameter) under the A4260 is mostly blocked (approximately 85%) with silt in the baseline condition. This was confirmed during the consultation site visit with the Flood Risk Manager from Cherwell District Council on 18 October 2023. This is likely to restrict flows during large storm events, contributing to localised flooding in the vicinity of the culvert inlet.
- 14.62 There are no other areas of pluvial flood risk within the Proposed Development boundary.

Groundwater flood risk

- 14.63 As defined by the BGS, the bedrock geology of the Site is weathered Oxford Clay overlying unweathered Oxford Clay. The superficial deposits are unspecified. The aquifer designation of the bedrock and superficial deposits are specified by the BGS and are designated as unproductive aquifers.
- 14.64 This area of the Cherwell District is therefore likely to present a low risk to groundwater flooding. This is reflected in the Areas Susceptible to Groundwater Flooding (AStGWF) map where the Site spans low (0-25%) and medium susceptibility (25-50%) to groundwater emergence.
- 14.65 The combination of the geology and absence of productive aquifers at the Site indicates that groundwater flooding could pose a low baseline risk to the Proposed Development.

Climate Change

- 14.66 Climate forecasts show that because of climate change, the UK is likely to experience slightly wetter winters and drier summers with changing frequencies and intensities of rainfall across both. Current climatic conditions will be considered representative of the climate during the construction period. Effects associated with the operation of the Proposed Development have taken into account the likely impacts of climate change on the frequency and intensity of rainfall events, river flows and flood levels, based on published data, where relevant.
- 14.67 A climate change uplift value for rainfall depths of 40% has been used for the design development in accordance with the Oxfordshire County Council flood risk standards ^{xxx}. Climate change values for river flows have been disregarded as there is a Very Low risk of fluvial flooding at the Proposed Development.

Artificial sources of flood risk

- 14.68 The artificial sources of flood risk that are considered are public sewers (drainage infrastructure), reservoirs and canals.

Adopted Drainage

- 14.69 Sewer records obtained from Thames Water show that there is no surface water owned and managed by Thames Water within 300 metres of the Proposed Development (further information can be found in the FRA, **Appendix 14.1**).

Highway Drainage

- 14.70 Based on the results of a desktop study, it has become evident that a filter drain exists within the verge area separating the proposed site and the A4260. It can be reasonably deduced that this filter drain captures surface water runoff from at least one lane of the carriageway, given that topographical data indicates the carriageway has a raised centre or crown. It should be noted that the filter drain is situated approximately 2-3 metres away from the existing drainage ditches.
- 14.71 The mechanism by which the filter drain discharges surface water, such as by drainage ditches or culverts, remains uncertain. Therefore, it is assumed that the highway drainage system on the A4260 operates independently from the site drainage system and poses no flood risk, providing the highway drainage is regularly maintained by the road operator (Oxford County Council).
- 14.72 Oxford Road has a series of road gullies adjacent the length of the Site with no indication of discharging within the Site. Therefore, it is assumed that Oxford Road drainage operates independently from the site drainage system and poses no flood risk, providing the highway drainage is regularly maintained by the road operator (Oxford County Council/National Highways).

Reservoir Flooding

- 14.73 The Environment Agency's Map for Flood Risk from Reservoirs shows that the site is not at risk from reservoir breach. The nearest areas of flood risk from reservoirs are approximately 600m to the east and 500m to the west.
- 14.74 The reservoirs will be subject to strict maintenance and inspection regimes under the Reservoirs Act 1975. As the Site is located outside the Environment Agency's reservoir risk mapping and the probability of reservoir failure is low with the mandatory inspection regimes, the risk from this flooding source is Low.

Canal and Artificial Water Body Flooding

- 14.75 The Oxford Canal is located approximately 750m to the west of the Site. The land immediately adjacent to the canal is approximately 63m Above Ordnance Datum (AOD), 3m lower than the lowest elevation of the Proposed Development. In the event of a local flood spill or breach from the canal, the flood water would be expected to flow north and south along the alignment of the canal and of

the Environment Agency fluvial floodplain for Kingsbridge Brook towards the River Thames and therefore away from the Site. Flood risk from the canal to the Site is therefore deemed to be of low flood risk importance.

- 14.76 Directly adjacent (east) of the Oxford Canal are a number of lakes, however it is unknown how these lakes are filled or what catchment they serve. Given that they are located approximately 700m from the Site and appear to be situated at the same level as the land adjacent to the canal they are deemed of low flood risk and importance.
- 14.77 The drainage channel downstream of the culvert under the A4260 crosses the Oxford Canal by means of an inverted siphon.
- 14.78 With the proposed drainage from the Site being limited to greenfield runoff, and no additional water reaching this structure from the Site of the Proposed Development, there will be no impact to the flows at this structure under the canal. Further information is provided in the FRA in **Appendix 14.1**.

Designated Sites

- 14.79 There are no designated sites within the study area, including Ramsar sites, Special Protection Areas (SPAs), Special Areas of Conservation (SACs), Sites of Special Scientific Interest (SSSIs), or Local Nature Reserve (LNR).
- 14.80 The study area is within the impact zone of the Pixey and Yarnton Meads SSSI. These impact zones are identified in Chapter 8 of the Environment Statement, where the effect on these impact zones is also addressed with respect to the water environment.

Receptors

- 14.81 **Table 14.4** provides a summary of the baseline sensitivities for the receptors at and in the study area of the Proposed Development.

Table 14.4: Summary of Baseline Receptor Sensitivity

Receptor	Flood Risk Sensitivity
Roads (Oxford Way and the A4260)	High
Residential properties	High
The Proposed Development	High
Commercial properties	Medium
Stratfield Brake woodland	Low
Sports fields	Low
Impact zone of the Pixey and Yarnton Meads SSSI.	Low

Receptor	Flood Risk Sensitivity
Wildlife area adjacent to both the Oxford Canal and the ditch/channel through Stratfield Brake woodland which conveys surface water drainage from the Proposed Development.	Low

Potential Effects

Summary of the Proposed Development

- 14.82 The layout for the Proposed Development is described and presented in Chapter 4: Proposed Development.
- 14.83 The total area of the Proposed Development includes the following impermeable areas:
- Football stadium footprint;
 - Pedestrian traffic 'buffer' zone around stadium;
 - Fan zone multi-functional space (multiple areas);
 - Car park; and
 - Carriageway (providing access/egress to site)
- 14.84 The remaining area has been classed as permeable and is predominantly made up of proposed soft landscaping areas, swales, rain gardens, ponds and attenuation basins.
- 14.85 The Site is bordered by the A4260 road (Frieze Way) to the west and Oxford Road to the east.
- 14.86 The Proposed Development includes the following aspects of the design which are embedded mitigation measures with respect to flood risk.
- 14.87 A SuDS based drainage system will be developed on the Site meeting the requirements of CIRIA C735, PPG and water quality guidance. The SuDS will comprise filter drains, rain gardens and two attenuation ponds. Two storage ponds and geo-cellular ground surface storage will provide flow attenuation. One pond will be positioned directly south of the stadium receiving runoff from the western part of the Site. The second pond will be located south-west of the stadium and will receive the runoff from the remainder of the Site and the stadium roof. Groundwater management such as lining features with impermeable membranes will be used to ensure that available storage is not reduced by groundwater ingress. Rain gardens will be located within the car park area together with a combination of filter drains, filter strips and swales providing further attenuation.
- 14.88 The SuDS system will be designed to provide attenuation storage for the 1% annual exceedance probability (AEP) plus 40% climate change event. The drainage system will remain operational during an extreme event and will not contribute to the flood event. The drainage strategy and the drainage design will include provision for the safe failure of the drainage systems during extreme events. In

these circumstances, surface water will be retained within the proposed site car park. The SuDS system shall undergo regular maintenance to ensure its continued correct function through the operational period of the Proposed Development.

- 14.89 A Hydrobrake will be installed at the outfall of the SuDS into the existing culvert under the A4260 to regulate the maximum discharge from the SuDS to greenfield runoff at 11.6l/s (or the revised greenfield runoff rate at RIBA 3 detailed design to be agreed with Oxford County Council and Cherwell District Council). In the event that the Hydrobrake flow control device becomes blocked, a bypass in the form of an overflow will be included such that any water unable to pass through will be diverted via an overflow pipe to the outfall. Likewise for the pond structures, in the event that the main outlets become blocked overflow pipes will divert storm water safely to the outfall.
- 14.90 The receiving network downstream of the drainage discharge point from the site will be unblocked and maintained by the landowner(s) to provide free and unimpeded flow from the SuDS outfall away from the Site. This includes unblocking of the drainage culvert under the A4260 and any repairs to the culvert that are required at the start of and during the operating period. The downstream ditch/channel must be regularly checked and maintained throughout the operating period by the landowner to provide drainage flow from the Site.
- 14.91 The finished floor levels of the buildings in the Proposed Development will be raised above the surrounding ground levels with ground surfaces sloping away from the buildings.
- 14.92 In the event of a storm greater in magnitude than the 1% AEP plus 40% climate change event, safe access and egress will be maintained from the site at all times for pedestrians and vehicles via the secondary access point connecting to the Oxford Road carriageway to the north-east.
- 14.93 A Flood Emergency Access plan will be developed and provided to the stadium and facility management team and the local emergency services to cover emergency procedures in the event of a flood or heavy rainfall event whilst the stadium is in use for events.
- 14.94 The design includes for the safe failure of the drainage systems on the Site during extreme events with surface water to be retained within the car park. The Flood Emergency Access Plan will provide procedures for the management of egress from the Site and emergency access, using the alternative access points away from the flooded area of the car park in this situation.

Construction

- 14.95 The drainage outfall from the construction area is proposed to leave the Site through the existing culvert under the A4260 road, draining to the existing ditch/watercourse network to the west. Approximately 85% of the existing culvert under the A4260 is currently blocked according to the

information from the baseline survey. Greenfield runoff flow from the Site would potentially be impeded at the culvert and leading to the risk of flooding of parts of the following receptors:

- The A4260 road: **Major** significance of effect, which is **significant** (High sensitivity, High magnitude);
- The construction site for the Proposed Development: **Major** significance of effect, which is **significant** (High sensitivity, High magnitude); and
- Stratfield Brake woodland and sports fields: **Minor** significance of effect, which is **not significant** (Low sensitivity, Low magnitude).

14.96 During the construction phase there is the potential for excavated or stockpiled material to be washed into local ditches/watercourses, causing a risk of blockage of hydraulic structures and the channels. This has the potential to lead to flooding from those watercourses impacting the following receptors:

- The A4260 road: **Major** significance of effect, which is **significant** (High sensitivity, High magnitude);
- The construction site for the Proposed Development: **Major** significance of effect, which is **significant** (High sensitivity, High magnitude); and
- Stratfield Brake woodland and sports fields: **Minor** significance of effect, which is **not significant** (Low sensitivity, Low magnitude).

14.97 Inadequate/inappropriate temporary drainage provision increasing pluvial flood risk. This has the potential to lead to flooding from the Site impacting the following receptors:

- The A4260 and Oxford Way roads: **Major** significance of effect, which is **significant** (High sensitivity, High magnitude);
- The construction site for the Proposed Development: **Major** significance of effect, which is **significant** (High sensitivity, High magnitude); and
- Stratfield Brake woodland: **Minor** significance of effect, which is **not significant** (Low sensitivity, Low magnitude).

14.98 Soil compaction from construction traffic has the potential to reduce soil infiltration capabilities and to increase surface water runoff from temporary access routes, construction compounds and other temporary construction areas. This has the potential to increase localised ponding on the Site and/or lead to uncontrolled discharge to nearby ditches/watercourses and a **Moderate** significance of effect, which is **significant** (High sensitivity, Medium magnitude).

14.99 As the embedded mitigation identifies that there will be no change to the greenfield runoff rates from the Site, there will be a **Negligible** significance of effect to the impact zone of the Pixey and Yarnton Meads SSSI, the wildlife area adjacent to the Oxford Canal and Stratfield Brake woodland during the construction period (Low sensitivity, Negligible magnitude).

14.100 All the above potential effects would be temporary during the construction phase and there are not considered to be any permanent effects from the construction phase.

Operation

14.101 The Proposed Development involves the construction of impermeable surfaces which has the potential to increase surface water run-off peak rates and volumes, increasing the flood risk both within and beyond the Site boundary. The construction of the SuDS based drainage system, as part of the embedded mitigation measures, will reduce surface water runoff rates and volumes within the Site boundary during rainfall events. The SuDS based drainage system has been designed to attenuate the 1% AEP plus 40% climate change pluvial event. The maximum runoff rate from the Site for pluvial events up to the magnitude of this event will be the greenfield runoff rate. Therefore, the significance of effect to the Proposed Development and the other identified receptors for events up to the 1% AEP plus 40% climate change pluvial event is **Negligible**, which is **not significant** (High sensitivity; Negligible magnitude).

14.102 The Environment Agency's Surface Water Flood Map for pluvial flood events shows that the western part of the site near the culvert under the A4260 is at risk of pluvial flooding, including areas with a chance of flooding of greater than 3.33% AEP. The embedded mitigation shows that the buildings in the Proposed Development will be raised above the surrounding floor levels with ground surfaces sloping away from the buildings. In addition, the drainage system will remove pluvial flooding from this area up to the 1% annual exceedance probability (AEP) plus 40% climate change storm event. For storm events above this magnitude, flooding may inundate this area of the Site, but the Flood Emergency Access plan will manage this situation, with several other pedestrian exits from the site and vehicular egress from the road access point on Oxford Road. The significance of effect therefore for this area of the car park near the access entrance to the Site from the A4260 is **Minor**, which is **not significant** (High sensitivity; Low magnitude).

14.103 Given the Site is in Flood Zone 1, there will be no direct risk of flooding to the Proposed Development from fluvial or tidal sources and no significant impacts from the Proposed Development on fluvial or tidal flood risk elsewhere. The significance of effect from fluvial and tidal flooding, both to the Proposed Development and to other receptors from the Proposed Development, is **Negligible**, which is **not significant** (High sensitivity, Negligible magnitude).

14.104 The outfall from the drainage system for the Proposed Development will discharge into the culvert under the A4260 road and into the ditch/channel system to the west. The embedded mitigation requires the culvert and the downstream ditch/channel to be unblocked and repaired at the start of the operating period and then checked and maintained during the operating period. As the Proposed Development will only discharge at greenfield runoff rates into this system, the significance of effect

for flood risk to the Proposed Development and other receptors downstream is **Minor**, which is **not significant** (High sensitivity, Low magnitude).

- 14.105 As the embedded mitigation identifies that there will be no change to the greenfield runoff rates from the Site, there will be a **Negligible** significance of effect to the impact zone of the Pixey and Yarnton Meads SSSI, the wildlife area adjacent to the Oxford Canal and Stratfield Brake woodland during the operational period (Low sensitivity, Negligible impact).

Mitigation Measures and Residual Effects

Construction mitigation

- 14.106 The appointed Contractor will prepare, implement and adhere to a Construction Environmental Management Plan (CEMP) prior to commencement of construction of the development which will include best practice and site-specific measures to control flood risk and drainage. These measures will include, but will not be limited to, the following mitigation measures.
- 14.107 The appointed Contractor will maintain a buffer area between the construction works activities and any part of the surface water drainage system to prevent sediment and construction materials entering drains and watercourses. Construction compounds, soil/material stockpiles, plant and temporary work areas shall be located away from the surface water drainage system. The surface water drainage system includes the existing drains around the perimeter of the site and the drainage culvert under the A4260.
- 14.108 The landowner (Oxford County Council) will ensure the clearance and repairs to the drainage culvert under the A4260 and will be completed before construction work on the Proposed Development commences. The maintenance of the downstream ditch is the responsibility of the landowner (Woodland Trust). There must be a functioning drainage route from the Site at the commencement of the works and the culvert and downstream ditch/channel must be maintained throughout the duration of the works to provide unrestricted drainage flow from the Site.
- 14.109 The appointed Contractor will prepare and adhere to Construction Method Statements to plan and manage in-channel and near-channel works to be approved by Oxfordshire County Council/Cherwell District Council prior to construction. The method statements will help to ensure that proposed construction methods and techniques follow good practice and minimise risk of temporary flooding and silt release.
- 14.110 The appointed Contractor will apply good practice during construction of all works within and near watercourses in line with relevant contemporary Environment Agency/Oxford County Council guidance for the protection of the water environment during the construction of the civil engineering works.

- 14.111 The period of exposure of bare areas and uncontrolled runoff from newly paved areas will be limited as far as practicable through careful phasing and implementation of the works to reduce the risk of increased runoff to watercourses.
- 14.112 The appointed Contractor will sign up to receiving alerts from the Met Office and Environment Agency's weather and flood warning systems, and in the event of predicted heavy rainfall alerts, appropriate actions will be taken to secure materials/plant and ensure the safety of construction workers around the construction site.
- 14.113 Temporary drainage systems will be installed early in the construction programme to alleviate localised flood risk and prevent obstruction of surface runoff pathways. The CEMP will include for the phasing of works to mitigate the impact of pluvial flooding in the localised area at the west of the site that is caused by low topography. The works would include the installation of temporary drains, reprofiling and raising this area of the Site and the construction of the drainage system early in the programme.
- 14.114 A network of pre-earthworks/cut-off drains will be installed to keep runoff from the natural catchment separate from construction site runoff. 'Clean' runoff from the natural catchment will be directed towards watercourses, ensuring that temporary treatment systems do not become overwhelmed by additional runoff waters and cause localised flooding.

Operation mitigation

- 14.115 Whilst no significant effects were identified, best practice measures will be implemented, to include the following as a minimum.
- 14.116 The appointed Contractor will prepare, implement and adhere to an Environmental Management Plan (EMP) prior to commencement of the operation of the development, which will include best practice and site-specific measures to control flood risk and drainage.
- 14.117 The development shall incorporate, where possible, design elements that implement flood resilience and resistance from the outset. This shall include details of the utilities layout, details of the finished floor levels of the buildings and specific construction techniques and materials.
- 14.118 The design of the buildings shall incorporate, where possible, flood resilience and flood resistance measures. These shall include raised utility entry points and first floor or ceiling down electrical circuits. The development shall also use flood resistant construction design approaches, where possible, particularly on the ground floor, for below ground structures and the building facades. These shall include the use of solid floors, sealed door and window cavities, locating IT infrastructure

at high level, building facades to be constructed with water resilient materials and the presence of accessible emergency utility shut-off points. Any electrical plant, cables and sockets shall be located above the flood level and any potential pollutants, including plant fuels, oils and petrol will also be stored securely above flood levels.

- 14.119 Finished external levels will be designed to direct surface water away from the proposed building to low risk areas of the site such as the car park and public open spaces. Boundary features such as walls/bunds will help to retain flows within these areas until the pressure on the network has subsided and the area can be drained. Vulnerable buildings will have raised thresholds to provide further protection in the event of extreme storm events, groundwater emergence or network failure.
- 14.120 In addition to the SuDS measures identified in the embedded mitigation, the developing design for the Proposed Development shall consider additional drainage approaches as part of the overall SuDS system, including green roofs, permeable paving, swales and filter strips, where advantageous and beneficial to the design.

Residual Effects

- 14.121 There are no predicted residual construction impacts. The construction mitigation measures to be applied in the CEMP reduce the Major temporary effects of the construction works on flood risk to **Minor** effects, which are **not significant**.
- 14.122 There are no predicted residual impacts for the operational period. Best practice measures for flood risk shall be applied during the operational period for the Proposed Development to maintain flood risk effects at a **Minor** level, which is **not significant**.

Cumulative Effects

- 14.123 Cumulative effects are those that may result from the combination of past, present or future actions of existing or planned activities in a project's zone of influence. While a single activity may itself result in an insignificant impact, it may, when combined with other impacts (significant or insignificant) in the same geographical area and occurring at the same time, result in a cumulative effect that is significant.
- 14.124 The current list of planned developments which are included in the cumulative impact assessment, are those identified in Chapter 2. The potential cumulative effects of these planned developments with the Proposed Development are summarised in **Table 14.5**.
- 14.125 There are not considered to be an intra-project effects on the water environment due to the combined environmental effects of the Proposed Development as the design for the Proposed Development is in one phase and is fully integrated.

14.126 All inter-project effects due to the cumulative effects of the above-mentioned schemes are considered to be negligible.

Table 14.5: Summary of inter-project cumulative effects for flood risk and drainage

Planned developments	Potential cumulative effect	Discussion
Allocation for residential development to land east of Oxford Road, North Oxford. Comprising 690 dwellings, a primary school, formal sports, play areas and allotments, and public open green space	Negligible	Due to the Proposed Developments being served by a separate watercourse system for surface water drainage, it is unlikely there will be a cumulative effect.
Allocation for residential development to land west of Oxford Road, North Oxford. Consisting of 670 dwelling with formal sports, play areas and allotments	Negligible	Due to the Proposed Developments being served by a separate watercourse system for surface water drainage, it is unlikely there will be a cumulative effect.
Golf course on land at Frieze Farm, Kidlington	Due to the position of this site next to the outfall watercourse from the stadium development, there is a potential cumulative effect of schemes at both sites. If both developments discharge at greenfield runoff rates, the significance of effect should be Negligible and therefore not significant.	At the time of writing, no planning application has been submitted for this site. As the Proposed Development will only discharge at greenfield runoff, no change is anticipated to the downstream ditch/channel flows. If the planned development for the golf club site also discharges at greenfield runoff rates there is unlikely to be a cumulative effect for flood risk.
Allocation for residential development to land at Bicester Road, Kidlington. Comprising 430 dwelling with provision of play areas, allotments and community facilities	Negligible	Due to the Proposed Developments being served by a separate watercourse system for surface water drainage, it is unlikely there will be a cumulative effect.
Allocation for residential development to land adjacent Water Eaton Lane, Gosford. Comprising 430 dwellings and provision of play areas, allotments and community facilities. PR7a Land North of 66 and Adjacent Water Eaton Lane, Gosford	Negligible	Due to the Proposed Developments being served by a separate watercourse system for surface water drainage, it is unlikely there will be a cumulative effect.
Allocation of residential development at Stratfield Farm, Oxford Road, North Oxford. Comprising 120 dwellings, with the provision of play areas and	Due to the position of this site next to the outfall watercourse from the stadium development, there is a potential cumulative effect of schemes at both sites.	A Proposed Development for this site has been submitted for planning with an accompanying FRA. This assessment sets a restricted discharge rate for surface water from the Site to the

Planned developments	Potential cumulative effect	Discussion
allotments, creation of a nature conservation area and a new public bridleway	If both developments discharge at greenfield runoff rates, the significance of effect should be Negligible and therefore not significant.	greenfield runoff rate and there is unlikely to be a cumulative effect for flood risk.
Allocation of residential development on former Piggery and land north of Woodstock Road, Yarnton. Comprising 1950 dwellings and supporting community facilities (including a secondary school, two primary schools and other local facilities)	Negligible	Due to the Proposed Developments being served by a separate watercourse system for surface water drainage, it is unlikely there will be a cumulative effect.
Allocation of residential development at Begbroke Science Park for 1950 dwellings and supporting community facilities (including secondary school, two primary schools and other local facilities)	Negligible	Due to the Proposed Developments being served by a separate watercourse system for surface water drainage, it is unlikely there will be a cumulative effect.
Policy PR9 - Land West of Yarnton Allocation of residential development at land west of Rutten Lane, Yarnton for 540 dwellings and associated community facilities.	Negligible	Due to the Proposed Developments being served by a separate watercourse system for surface water drainage, it is unlikely there will be a cumulative effect.
Residential development site - Policy SP24 – No. of units 125. Land south-west of St Frideswide Farm, Banbury Road, Oxford, OX2 8EH	Negligible	Due to the Proposed Developments being served by a separate watercourse system for surface water drainage, it is unlikely there will be a cumulative effect.
Allocated for residential development - policy SP25 in the adopted Oxford Local Plan 2036. Hill View Farm, Mill Lane, Marston, Oxford, OX3 0QG	Negligible	Due to the Proposed Developments being served by a separate watercourse system for surface water drainage, it is unlikely there will be a cumulative effect.
Allocated for residential development as policy SP26 in the adopted Oxford Local Plan 2036. Land to the West of Mill Lane, Marston, Oxford, OX3 0QA	Negligible	Due to the Proposed Developments being served by a separate watercourse system for surface water drainage, it is unlikely there will be a cumulative effect.

Planned developments	Potential cumulative effect	Discussion
39 dwellings on an allocated site (Policy SP23) within the adopted Local Plan. Marston Paddock, Butts Lane, Oxford, OX3 0QN	Negligible	Due to the Proposed Developments being served by a separate watercourse system for surface water drainage, it is unlikely there will be a cumulative effect.
Oxford North (Northern Gateway). Land Adjacent to A44, A40, A34 and Wolvercote Roundabout	Negligible	Due to the Proposed Developments being served by a separate watercourse system for surface water drainage, it is unlikely there will be a cumulative effect.
Buildings 8-11 Oxford Technology Park, Technology Drive, Kidlington, OX5 1GN	Negligible	Due to the Proposed Developments being served by a separate watercourse system for surface water drainage, it is unlikely there will be a cumulative effect.
Land West of Cuckoo Lane and adjacent to the A40, Eynsham Oxfordshire	Negligible	Due to the Proposed Developments being served by a separate watercourse system for surface water drainage, it is unlikely there will be a cumulative effect.
Policy STRAT13 Land North of Bayswater Brook, Oxford	Negligible	Due to the Proposed Developments being served by a separate watercourse system for surface water drainage, it is unlikely there will be a cumulative effect.
Policy SP52 Oxford University Press Sports Ground	Negligible	Due to the Proposed Developments being served by a separate watercourse system for surface water drainage, it is unlikely there will be a cumulative effect.
Land North of Manor Farm, Noke	Negligible	Due to the Proposed Developments being served by a separate watercourse system for surface water drainage, it is unlikely there will be a cumulative effect.
New Science Park, Land West of the Junction with The Boulevard, Oxford Airport	Negligible	Due to the Proposed Developments being served by a separate watercourse system for surface water drainage, it is unlikely there will be a cumulative effect.

Conclusions

14.127 A summary of effects is presented within **Table 14.6**.

14.128 Following mitigation, the Proposed Development is shown to not have any residual significant effects on flood risk and drainage and the impacts are assessed to be **Minor**. The Proposed Development is shown to have an overall neutral residual effect on flood risk and drainage.

Table 14.6: Summary of residual effects for flood risk and drainage

Predicted Impacts	Receptor (sensitivity)	Magnitude	Nature/level of effect	Mitigation	Residual Effect
Construction					
Construction works would increase flood risk to sensitive receptors including the Proposed Development	The A4260 road (High)	High	Temporary / Major	The CEMP	Minor (not significant)
	The construction site for the Proposed Development (High)	High	Temporary / Major	The CEMP	Minor (not significant)
	Stratfield Brake woodland and sports fields (Low)	Low	Temporary/ Minor/ Negligible	The CEMP	Minor (not significant)
	Temporary access routes, construction compounds and construction areas (High)	High	Temporary / Major	The CEMP	Minor (not significant)
	The impact zone of Pixey and Yarnton Meads SSSI and the wildlife area adjacent to the Oxford Canal (Low)	Negligible	Temporary / Negligible	The CEMP	Negligible (not significant)
Operation					
Surface water flooding associated with new impermeable surfaces. Managed via the embedded mitigation in the design	The Proposed Development and roads (High)	Negligible	Long term / Negligible	Best practice measures	Negligible (Not Significant)
Pluvial flooding. Managed via the	Western side of the	Low	Long term / Minor	Best practice measures	Minor (not significant)

Predicted Impacts	Receptor (sensitivity)	Magnitude	Nature/level of effect	Mitigation	Residual Effect
embedded mitigation in the design including the Flood Emergency Access Plan	Proposed Development Site (High)				
Fluvial flooding. The Site is in Flood Zone 1, therefore no direct risk of fluvial flooding.	The Proposed Development and roads (High)	Negligible	Long term / Negligible	Best practice measures	Negligible (Not Significant)
Flood risk associated with blocked and unmaintained culvert under the A4260 and the downstream ditch/channel. Managed via embedded mitigation - necessary ongoing maintenance to the culvert and the downstream ditch/channel system	The Proposed Development and downstream receptors (High)	Low	Long term / Minor	Best practice measures	Minor (not significant)
Flood risk associated with runoff from the Site. Managed via embedded mitigation - maintenance of greenfield run off rates	The impact zone of Pixey and Yarnton Meads SSSI, the wildlife area adjacent to the Oxford Canal, Stratfield Brake and the sports fields (Low)	Negligible	Long term / Negligible	Best practice measures	Negligible (Not Significant)
Cumulative					
Surface water flood risk exacerbated by inter-project developments	High (including for roads and the development)	Low	Long-term / Moderate	Other Proposed Developments to also implement surface water drainage systems that restrict flows to greenfield runoff rates	Negligible (not significant)

References

- ⁱ National Planning Policy Framework (Her Majesty's Government, 2012, updated 2023) [online]. Available at: [National Planning Policy Framework - GOV.UK \(www.gov.uk\)](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/101361/nppf-2012.pdf)
- ⁱⁱ The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 (Her Majesty's Government) [online]. Available at: [The Water Environment \(Water Framework Directive\) \(England and Wales\) Regulations 2017 \(legislation.gov.uk\)](https://www.legislation.gov.uk/uksi/2017/1251/contents/made)
- ⁱⁱⁱ The Environmental Permitting (England and Wales) Regulations (Her Majesty's Government) [online]. Available at: [The Environmental Permitting \(England and Wales\) Regulations 2016 \(legislation.gov.uk\)](https://www.legislation.gov.uk/uksi/2016/1251/contents/made)
- ^{iv} Flood and Water Management Act 2010 (Her Majesty's Government) [online]. Available at: [Flood and Water Management Act 2010 \(legislation.gov.uk\)](https://www.legislation.gov.uk/ukpga/2010/23/contents)
- ^v Water Resources Act 1991 (Her Majesty's Government) [online]. Available at: [Water Resources Act 1991 \(legislation.gov.uk\)](https://www.legislation.gov.uk/ukpga/1991/54/contents)
- ^{vi} The Flood Risk Regulations 2009 (Her Majesty's Government) [online]. Available at: [The Flood Risk Regulations 2009 \(legislation.gov.uk\)](https://www.legislation.gov.uk/uksi/2009/1251/contents/made)
- ^{vii} The Environmental Damage (Prevention and Remediation) (England) Regulations 2015 (Her Majesty's Government) [online]. Available at: [The Environmental Damage \(Prevention and Remediation\) \(England\) Regulations 2015 \(legislation.gov.uk\)](https://www.legislation.gov.uk/uksi/2015/1251/contents/made)
- ^{viii} Land Drainage Act 1991 (Her Majesty's Government) [online]. Available at: [Land Drainage Act 1991 \(legislation.gov.uk\)](https://www.legislation.gov.uk/ukpga/1991/24/contents)
- ^{ix} National Planning Practice Guidance (NPPG), Flood Risk (Paragraph: 056 Reference ID: 7-056-20220825) (Her Majesty's Government, Revision Date 2022) [online]. Available at: [Flood risk and coastal change - GOV.UK \(www.gov.uk\)](https://www.gov.uk/guidance/flood-risk-and-coastal-change)
- ^x Technical Guidance to the National Planning Policy Framework (Her Majesty's Government, 2012) [online]. Available at: [Technical Guidance to the National Planning Policy Framework \(publishing.service.gov.uk\)](https://www.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/101361/technical-guidance-to-the-national-planning-policy-framework.pdf)
- ^{xi} Guidance: Flood Risk and Coastal Change (Her Majesty's Government, 2014, updated 2022) [online]. Available at: [Flood risk and coastal change - GOV.UK \(www.gov.uk\)](https://www.gov.uk/guidance/flood-risk-and-coastal-change)
- ^{xii} Adopted Cherwell Local Plan (Cherwell District Council, 2015) [online]. Available at: [Adopted Cherwell Local Plan 2011-2031 \(Part 1\) | Adopted Cherwell Local Plan 2011-2031 \(Part 1\) | Cherwell District Council](https://www.cherwell.gov.uk/adopted-cherwell-local-plan-2011-2031-part-1)
- ^{xiii} PR32 Cherwell Level 1 Strategic Flood Risk Assessment (Cherwell District Council, 2017) [online]. Available at: [PR31 Cherwell Level 1 Strategic Flood Risk Assessment Update May 2017 | Cherwell District Council](https://www.cherwell.gov.uk/pr32-cherwell-level-1-strategic-flood-risk-assessment-update-may-2017)
- ^{xiv} Flood Risk Assessments: Climate Change Allowances (Her Majesty's Government, 2016, updated 2022) [online]. Available at: [Flood risk assessments: climate change allowances - GOV.UK \(www.gov.uk\)](https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances)
- ^{xv} SuDS Manual C753 (CIRIA, 2017) [online]. Available at: https://www.ciria.org/CIRIA/CIRIA/Item_Detail.aspx?iProductCode=C753
- ^{xvi} Control of water pollution from construction sites: Guidance for consultants and contractors (CIRIA, 2001) [online]. Available at: https://www.ciria.org/CIRIA/CIRIA/Item_Detail.aspx?iProductCode=C532&Category=BOOK
- ^{xvii} Sewerage Sector Guidance Appendix C (Water UK, 2022) [online]. Available at: [SSG Appendix C - Design and Construction Guidance v2-2.pdf \(water.org.uk\)](https://www.water.org.uk/~/media/Files/Appendix_C_-_Design_and_Construction_Guidance_v2-2.pdf)
- ^{xviii} Flood Risk Vulnerability Classification (Her Majesty's Government, 2012) [online]. Available at: [National Planning Policy Framework - Annex 3: Flood risk vulnerability classification - Guidance - GOV.UK \(www.gov.uk\)](https://www.gov.uk/guidance/national-planning-policy-framework-annex-3-flood-risk-vulnerability-classification)
- ^{xix} Sustainable Drainage Systems Policy ((Her Majesty's Government, 2015) [online]. Available at: [6.-DCLG-sustainable-drainage-systems.pdf \(parliament.uk\)](https://www.parliament.uk/document/6-dclg-sustainable-drainage-systems-pdf)
- ^{xx} Catchment Data Explorer (Environment Agency) [online]. Available at: [England | Catchment Data Explorer](https://www.environment-agency.gov.uk/catchment-data-explorer)
- ^{xxi} Flood Map for Planning (Environment Agency) [online]. Available at: [Flood map for planning - GOV.UK \(flood-map-for-planning.service.gov.uk\)](https://www.environment-agency.gov.uk/flood-map-for-planning)
- ^{xxii} Flood Risk Map for Surface Water (Environment Agency) [online]. Available at: [Check the long term flood risk for an area in England - GOV.UK \(www.gov.uk\)](https://www.environment-agency.gov.uk/check-the-long-term-flood-risk-for-an-area-in-england)
- ^{xxiii} Magic Map Application (Defra) [online]. Available at: [Magic Map Application \(defra.gov.uk\)](https://www.defra.gov.uk/magic-map-application)
- ^{xxiv} BGS Geology Viewer (British Geological Survey) [online]. Available at: [BGS Geology Viewer - British Geological Survey](https://www.bgs.ac.uk/geology-viewer)
- ^{xxv} LandIS Soilscape mapping (Cranfield Environment Centre) [online]. Available at: [Soilscape soil types viewer - Cranfield Environment Centre. Cranfield University \(landis.org.uk\)](https://www.landis.org.uk/soilscape-mapping)
- ^{xxvi} Stage 1 - Flood Risk Review, 5018932-RDG-XX-XX-DOC-C-0001 P1 (RIDGE, 2023).
- ^{xxvii} Groundwater flooding maps (British Geological Survey) [online]. Available at: [Groundwater flooding - British Geological Survey \(bgs.ac.uk\)](https://www.bgs.ac.uk/groundwater-flooding)

-
- ^{xxviii} Main river map for England (Environment Agency, 2015, updated 2019) [online]. Available at: [Main river map for England: proposed changes and decisions - GOV.UK \(www.gov.uk\)](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/401242/main_river_map_for_england_proposed_changes_and_decisions.pdf)
- ^{xxix} LandIS Soilscape mapping (Cranfield Environment Centre) [online]. Available at: [Soilscales soil types viewer - Cranfield Environment Centre. Cranfield University \(landis.org.uk\)](https://landis.org.uk/)
- ^{xxx} Local Standards and Guidance for Surface Water Drainage on Major Developments in Oxfordshire, L6, Oxfordshire Flood ToolKit (Oxfordshire County Council) [online]. Available at: [Local Standards for publication v1.3 September 2017 \(oxfordshirefloodtoolkit.com\)](https://www.oxfordshirefloodtoolkit.com/)